REVISED

GEOTECHNICAL BASELINE REPORT

Carolina Crossroads Phase 3C
Lexington County, South Carolina

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SCDOT Project ID: P043325
F&ME Project No. G5662.03

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Re: Geotechnical Baseline Report
Carolina Crossroads – Phase 3C
Lexington County, South Carolina
SCDOT Project ID: P043325
F&ME Project No.: G5662.03

Dr. Tupper:

Submitted herein is F&ME Consultants, Inc's (FME) revised Geotechnical Baseline Report (GBR) for the Phase 3C portion of the Carolina Crossroads project. Revisions to our previously submitted report, dated August 9, 2024, include re-locating the boring locations identified as AUBJV Test Locations. Included is a summary of the subsurface data, the subsurface findings, the soil laboratory test results, and our conceptual geotechnical assessment of the assumed bridge structures, roadway structures, and bridge/roadway embankments. We note that the GBR is included with the Project Information Package (PIP), which is not contractual in accordance with the RFP. From the RFP, "*SCDOT makes no representations or warranties regarding the reliability or accuracy of the information contained [in the PIP] and Proposers assume the risk in using this information*". For contractual geotechnical information, refer to the Geotechnical Subsurface Data Report (GSDR) provided with Attachment B of the RFP.

Please notify us if there are any questions or if we can be of further assistance.

Sincerely,

F&ME CONSULTANTS

Digitally signed by John Hamilton
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John F. Hamilton, PE
Geotechnical Design Manager

Attachments

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1. PROJECT DESCRIPTION

The project is located near Columbia, South Carolina. A site location plan is presented in Section 1 of the Appendix.

The Phase 3C project consists of widening Interstate 20 southwest of the intersection of Interstate 26 and Interstate 20. The project generally extends approximately two (2) miles along I-20, from the US 378 interchange to the Bush River Road interchange. Two (2) existing bridges are designated for replacement within the Phase 3C project corridor to facilitate the interstate widening: the I-20 bridge over the Saluda River and the I-20 bridge over CSX Railroad. Based on the conceptual plans, the proposed bridge and roadway construction will mostly require fill placement, but there are locations where cuts are required to meet the planned roadway grade. Furthermore, retaining walls, sound walls, drainage structures, and overhead sign foundations are planned within the project corridor. Each of these roadway structures contains a component that will require geotechnical design.

Multiple geotechnical investigations were performed within the project corridor. The geotechnical subsurface investigations were performed in general accordance with the 2022 SCDOT Geotechnical Design Manual (GDM). The conceptual bridge foundation analyses and the development of conceptual design recommendations, provided herein, were performed in general accordance with the GDM and/or the AASHTO LRFD Bridge Design Specifications.

2. GEOTECHNICAL SUBSURFACE EXPLORATIONS

Multiple geotechnical subsurface investigations were performed at the project site. As part of the original contract, S&ME performed a geotechnical investigation in 2018. The Archer-United-Blythe Joint Venture (AUBJV) performed a geotechnical investigation in 2023 as part of the pursuit of the Phase 3 design-build project that has since been re-phased into smaller sections. As a requirement of the Phase 3 RFP, the soil borings performed by the Design-Build proposers of the Phase 3 project were provided to the SCDOT with the Technical Proposal submittal, and these soil borings are included herein for information only relative to the Phase 3C project. In 2024, F&ME performed supplementary soil borings to further refine the subsurface characteristics at the Phase 3C site.

Due to the quantity of information generated, we have placed the field investigation summary table in the Appendix.

2.1. S&ME INVESTIGATION

From January to March, 2018, S&ME performed twelve (12) soil borings at the site. The soil borings are designated as B-47 through B-51, DH-4, RW-40, P-44, P-45, P-47, P-48, and P-49. The soil test borings were advanced utilizing a Diedrich D-50 track-mounted drill rig and a CME 55 truck mounted drill rig. The bridge, embankment, and seismic soil borings were advanced using rotary wash drilling techniques. The pavement soil borings utilized hollow stem auger drilling techniques to maintain a stable borehole. Standard Penetration Tests (SPT) tests were continuously obtained in the top ten (10) feet of each soil boring. Following the continuous sampling, SPT samples were obtained at regular, five (5) foot intervals throughout the remaining depths of the borings. SPT samples were performed in

general accordance with ASTM D-1586 to determine the relative densities and consistencies of the subsurface soils and to collect subsurface soil samples. An automatic hammer was used to perform the SPTs. The measured energy ratio for the Diedrich D-50 hammer is 87%, and the measured energy ratio for the CME 55 hammer is 84%.

One (1) offset auger boring (designated at B-50UD) was performed adjacent to soil boring B-50. The primary purpose of the auger boring was to provide a conduit for collecting intact, Shelby Tube samples of soft, clay-like soils. In the auger boring, two (2) Shelby Tube samples were collected at approximate depths of thirteen (13) feet and thirty-five (35) feet.

Three (3) bulk soil samples were collected adjacent to soil borings RW-40, P-44, and P-47. California Bearing Ratio (CBR) tests were performed on the bulk samples collected at P-44 and P-47 locations. Ignition Loss testing was performed on the bulk samples collected at the RW-40 location.

2.2. AUBJV INVESTIGATION

As part of their pursuit of the Phase 3 design-build project that has since been re-phased into smaller sections, AUBJV performed four (4) soil borings within the Phase 3C project corridor in June 2023. The soil borings are designated as G-18A, G-44, G-46, and G-49. The soil test borings were advanced utilizing a Diedrich D50 track-mounted drill rig. The soil borings were advanced using hollow stem auger drilling techniques. Standard Penetration Tests (SPT) tests were continuously obtained for a majority of the test depths. An automatic hammer was used to perform the SPTs. The measured energy ratio for the Diedrich D50 hammer is 81%.

2.3. F&ME INVESTIGATION

From March to May, 2024, F&ME performed fifteen (15) soil borings at the site. The soil borings are designated as C3C-B1 through C3C-B7, C3C-W1 to C3C-W5, and C3C-U1 to C3C-U3. The soil test borings were advanced utilizing a CME 550 ATV mounted drill rig. The soil borings were advanced using either hollow stem auger (HSA) or rotary wash drilling techniques. Standard Penetration Tests (SPT) tests were continuously obtained in the top ten (10) feet of each soil boring. Following the continuous sampling, SPT samples were obtained at regular, five (5) foot intervals throughout the remaining depths of the borings. SPT samples were performed in general accordance with ASTM D-1586 to determine the relative densities and consistencies of the subsurface soils and to collect subsurface soil samples. An automatic hammer was used to perform the SPTs. The measured energy ratio for the CME 550 hammer is 85%.

In addition, cone penetration tests (CPTs) were performed at three (3) locations. The CPTs are designated as CPT-1, CPT-2, CPT-2A, CPT-2B, and CPT-3. At the CPT-2 location, CPT advancement reached a shallow refusal condition at an approximate test depth of five (5) feet. The test location was offset to two (2) locations near the original test location, with each location reaching a refusal condition at a similar test depth. We interpret the material on which the CPTs are refusing to be hard/dense Piedmont Residual soils and not bedrock or boulders. At CPT-1 and CPT-3 test locations, the test depths extended to approximately twenty (20) feet and forty (40) feet, respectively. At these depths, a maximum reaction force was of the CPT equipment was observed.

3. LABORATORY TESTING SUMMARY

Following completion of the subsurface investigation(s), soil samples were selected for laboratory testing. The tests were conducted in an AASHTO certified laboratory in accordance with applicable ASTM/AASHTO standards.

The laboratory testing performed on the soil and rock samples collected by S&ME is summarized in the table below. Data sheets containing the results from this testing are provided in the Appendix.

Laboratory Testing Summary Table – S&ME Investigation

Type of Test	Quantity	Procedure
Moisture Content	39	AASHTO T265 (ASTM D2216)
Atterberg Limits	39	AASHTO T89/T90 (ASTM D4318)
Grain-Size Distribution w/ Wash 200	39	ASTM D6913/AASHTO T11 (ASTM D1140)
Compressive Strength of Rock Cores	20	ASTM D7012
CU Triaxial Shear	2	AASHTO T297 (ASTM D4767)
Standard Proctor	3	AASHTO T99 (ASTM D698)
California Bearing Ratio	2	AASHTO T193 (ASTM D1883)
Ignition Loss	1	SC T-36
pH	6	AASHTO T289/ASTM G51
Resistivity	6	AASHTO T288
Chloride	6	AASHTO T291
Sulfate	6	AASHTO T290 (ASTM C1580)

The laboratory testing performed on the soil samples collected by AUBJV is summarized in the table below. Data sheets containing the results from this testing are provided in the Appendix.

Laboratory Testing Summary Table – AUBJV Investigation

Type of Test	Quantity	Procedure
Moisture Content	16	AASHTO T265 (ASTM D2216)
Atterberg Limits	16	AASHTO T89/T90 (ASTM D4318)
Grain-size Distribution w/ Wash 200	16	ASTM D6913/AASHTO T11 (ASTM D1140)

The laboratory testing performed on the soil and rock samples collected by F&ME is summarized in the table below. Data sheets containing the results from this testing are provided in the Appendix.

Laboratory Testing Summary Table – F&ME Investigation

Type of Test	Quantity	Procedure
Moisture Content	73	AASHTO T265 (ASTM D2216)
Atterberg Limits	71	AASHTO T89/T90 (ASTM D4318)

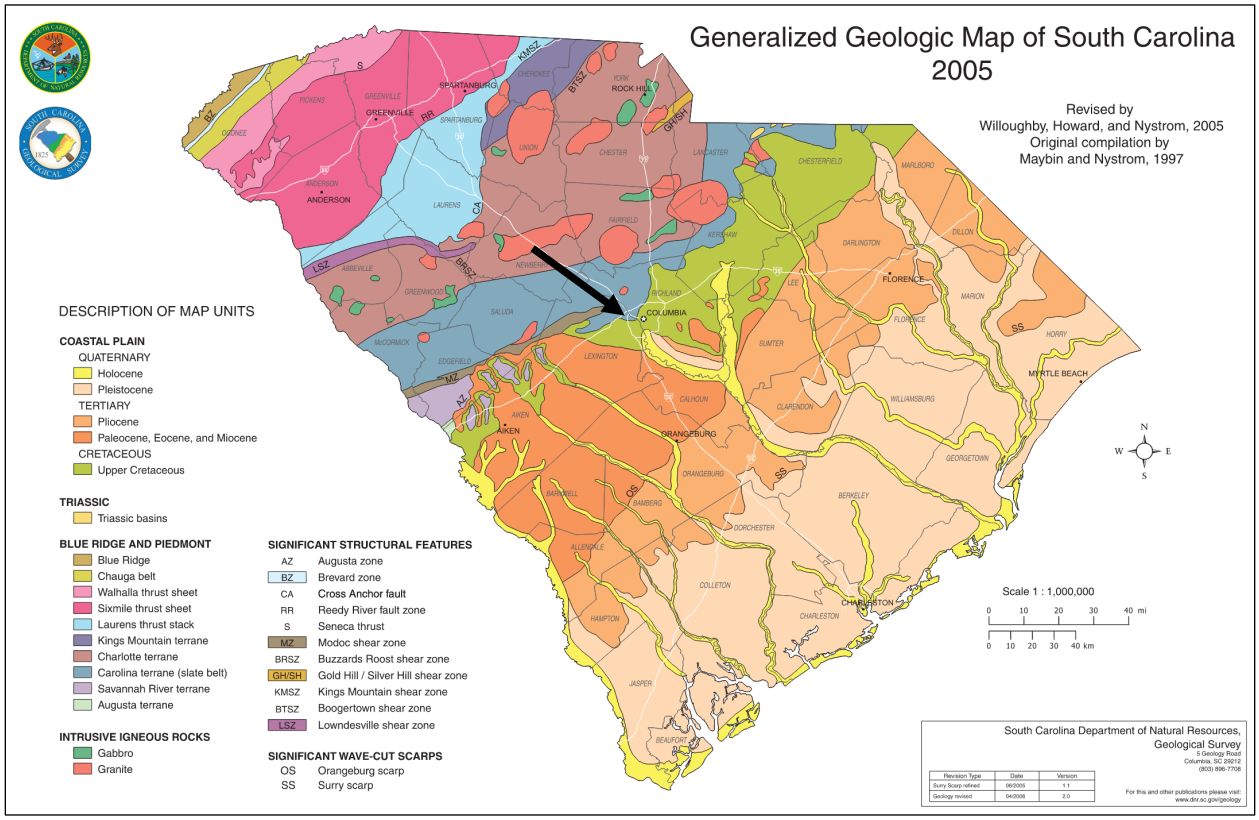
Grain-Size Distribution w/ Wash 200	3	ASTM D6913/AASHTO T11 (ASTM D1140)
Wash 200 Grain Size	70	AASHTO T11 (ASTM D1140)
Compressive Strength of Rock Cores	13	ASTM D7012

4. SUBSURFACE CONDITIONS

4.1. SITE GEOLOGY

The project is situated in the Piedmont Geologic Province, in the South Carolina Fall Line zone. The Piedmont unit is characterized by gently rolling topography, weathered bedrock, and few hard rock outcrops. The site subsurface conditions generally consist of existing embankment fill, alluvial soils, Coastal Plain soils, residual soils, and bedrock. Being so close to the Fall Line, the degree of weathering and the depth of the bedrock may be highly variable.

The following figure displays the location of the site relative to the Generalized Geologic Map of South Carolina.



The following geologic strata were encountered in the subsurface investigation(s). The strata are presented in descending order relative to their age (youngest to oldest).

- Existing Embankment Fill
- Alluvium (Holocene)
- Coastal Plain sediments
- Piedmont Residuum
- Bedrock (Phyllite/Schist)

At the Saluda River crossing and surrounding floodplain, Holocene-aged alluvial soils were encountered below the existing embankment fill. The alluvial soils are generally present under the I-20 embankments from the end of the Saluda River bridge and the beginning of the CSX bridge. Due to their recent deposition, the relative densities of this material will be lower and their proximity to the water could potentially lend them to a loss in shear strength from sand-like liquefaction or clay-like softening. The loss in shear strength from seismic shaking may result in slope instability and/or additional loads acting on the bridge foundations. In general, SPT N-values suggest loose to medium dense sands and soft to firm silts and clays. Either Coastal Plain or Piedmont Residual soils were encountered below the alluvium, where present.

In general, a relatively small deposit of Coastal Plain soils was encountered west of the Saluda River bridge. These soils are considered Cretaceous-aged. The relative densities of this material will be lower compared to the underlying residuum. In accordance with the GDM, these Coastal Plain soils have a low potential for seismic soil shear strength loss due to their relative age. In general, SPT N-values suggest loose to dense sands and stiff to very stiff clays. Piedmont Residual soils were encountered below the Coastal Plain soils, where present.

The encountered Piedmont Residuum generally consists of varying amounts of sand, silt, and clay. The thickness of the residual soils will vary across the project. At some locations, the residuum was on the order of ten (10) feet thick, and at other locations the thickness was on the order of thirty (30) feet. In general, SPT N-values suggest loose to dense sands and very stiff to hard silts and clays.

Within the residuum, soils classified as Intermediate Geo-Material (IGM) were identified. IGM is considered a residual soil deposit that is experiencing a transition from the parent bedrock to weathered in-place, residuum. Previous definitions of IGM were based on the soil material exhibiting SPT blow counts greater than 50 bpf. We recognize that SCDOT has revised the definition of IGM to include compressive strength percent clay fraction laboratory testing. Since none of these laboratory tests were performed on this material, the IGM terminology may not be used, and the soil is considered to be a hard/dense residual deposit.

Below the residuum, bedrock was encountered. Rocks of the Carolina Terrane typically consist of metamorphosed volcanic and sedimentary rocks. The rocks encountered along this project consist of Phyllite and Schist.

4.2. SOIL STRATIGAPHY

The soil borings indicate five (5) geologic strata at the site. The following table summarizes the geologic stratigraphy.

Soil Stratification Table

Geology	[1]Elevation of Top of Layer (ft-MSL)	USCS Soil Type	SPT N-Values (bpf)
Existing Fill	*VARIES*	SM, SC, SP-SM, ML, MH, CL, CH	3 to 37
Coastal Plain	+200	SM, SC, ML, CL	7 to 38
Holocene (Alluvium)	+175	SM, SC, ML, CL, CH	2 to 21
Piedmont Residuum	+165	SM, SP-SM, ML, MH, CL, CH	5 to 100+
Bedrock	+145	N/A	N/A

[1] Elevations are generalized from the totality of subsurface information collected

4.3. GROUNDWATER

Groundwater tables measurements were recorded immediately following completion of the borings/soundings and/or 24-hours following completion of the boring/sounding. The depth to the groundwater table is variable along the Phase 3C corridor. The depth to the groundwater table ranged from approximately five (5) to twenty-five (25) feet. Groundwater elevations along this project will fluctuate with climactic events. During and following periods of rainfall, the water table may be encountered at higher elevations than identified on the field testing logs. In addition, the project is conducive to perched groundwater conditions. We would expect that water from recent rainfall would sit atop the denser, fine-grained residuum. Perched groundwater is not indicative of the true, static groundwater table. The Design-Build team should evaluate the groundwater conditions at discrete locations and exercise engineering judgement to assign an appropriate groundwater table for design purposes.

5. REGIONAL SEISMICITY

Most of the seismic research and discussion in the United States is confined to the western part of the country, but there are historical records that indicate major seismic events have occurred in the Central and Eastern United States (CEUS). In 1886, the largest historic seismic event in the southeastern United States occurred near Charleston, South Carolina. This event had an estimated moment magnitude (M_w) of 7.3. This seismic event has dominated the development of the design seismic accelerations in South Carolina. The following sections globally discuss the field investigation procedures used to aid in the development of the design seismic accelerations and the resulting estimated seismic hazard potential at the project site.

5.1. SUBSURFACE SHEAR WAVE VELOCITY

Geophysical testing was performed at five (5) locations within or near the Phase 3C corridor. Acceleration Design Response Spectra (ADRS) curves were developed for each of the geophysical test locations. A project specific ADRS curve was then created that enveloped the five (5) ADRS curve sets.

Following completion of the SPT testing at the locations designated for geophysical testing, the boreholes were prepared for downhole geophysical testing. Seismic data for the downhole testing was collected by recording seismic shear-wave velocities directly with a downhole geophone receiver. The geophysical testing was performed prior to the new GDM requirements for measuring compression wave velocities. As such, compression wave velocities are not provided with this report.

From the downhole geophysical test data performed at the site, a subsurface shear wave velocity profile was developed for the borehole depths. For development of the ADRS curves, SCDOT requires a shear wave velocity profile to at least the Site Class B and Site Class C boundary depth. FME interprets the B-C boundary to be located at a depth where the shear wave velocities are consistently greater than 2,500 ft/sec. For this definition, we interpret that the B-C boundary was encountered in each of the five (5) geophysical test locations, and the SCDOT geophysical testing requirements for ADRS curve development were achieved.

F&ME submitted each of the five (5) shear wave velocity profiles to SCDOT to generate the design seismic accelerations. Using their software, SCDOT generated the 3-point ADRS for the site. The Project Specific design accelerations generated from the ADRS data provided by SCDOT are discussed in the following section.

5.2. ACCELERATION DESIGN RESPONSE SPECTRA

The following table summarizes the seismic design accelerations from the ADRS curves that were selected for this project. The ADRS curves were developed by SCDOT using their proprietary software.

Acceleration Design Response Spectra			
Design Event	PGA	S_{DS}	S_{D1}
FEE	0.20	0.36	0.10
SEE	0.39	0.82	0.28

5.3. GEOTECHNICAL SEISMIC HAZARD POTENTIAL

Geotechnical seismic hazards consist of a loss in a soil's shear strength through cyclic ground motions induced by earthquakes. The GDM classifies this phenomenon with the term Soil Shear Strength Loss (SSL). Liquefaction is the traditional term used to describe SSL in sand-like soils. Cyclic-softening is the typical terminology for clay-like soils. Liquefaction and cyclic softening are considered the most devastating seismically induced geotechnical hazards.

Liquefaction is the loss of a soil's shear strength due to a rapid increase in pore water pressure resulting from seismic shaking. The seismic shaking causes the soil particles to dilate within the soil matrix. The result is that the soil particles are suspended in the groundwater and the relative strength of the soil is greatly reduced. Soils most susceptible to liquefaction generally consist of saturated, loose sands.

Cyclic softening from seismic shaking occurs in clay-like soils. The softening effect occurs when seismic-induced shear stresses exceed the soil's cyclic shear resistance, which causes an accumulation of micro-deformations and, thus, strain softening. Soils most susceptible to strain softening generally consists of saturated, sensitive, moderate to high plasticity silts and clays.

Screening for potential SSL soils was performed based on the results from the soil borings, CPTs, and laboratory test results. The SSL screening process was performed in accordance with the GDM. Based on the SSL screening process, the Holocene-aged alluvial soils below the groundwater table are considered susceptible for SSL, and a full SSL analysis is required. Both sand-like and clay-like SSL is anticipated. The effects of the predicted sand-like liquefaction and clay-like softening are globally discussed in the proceeding sections of the report.

6. CONCEPTUAL GEOTECHNICAL ASSESSMENT FOR BRIDGE & ROADWAY DESIGN

Based on our understanding of the project, the elements considered for the conceptual geotechnical design consist of the following:

- Earthen embankments (bridge and roadway embankments);
- Earth Retaining Structures (ERS);
- Bridge foundations;
- Noise Walls;
- Drainage Structures; and,
- Miscellaneous structures (ie. overhead sign foundations and light pole foundations)

A global discussion of the conceptual geotechnical design of the elements noted above is provided in the proceeding sections.

6.1. EMBANKMENTS

The GDM separates embankments into two (2) categories: bridge embankments and roadway embankments. The GDM defines the bridge embankment as *"The portion of the approach embankment that requires an Extreme Event limit state global stability check, unless indicated otherwise within the GDM. The longitudinal length of Bridge Embankment shall be based on the specified mitigation method (either geotechnical or structural) that is required to achieve satisfactory global stability for the Extreme Event limit state check."* At a minimum, the bridge embankment consists of the front slope and extends to 3.25 times the height of the abutment, measured from the end of the approach slab (refer to Figure 2-1 & 2-2 of the GDM).

The GDM defines the roadway embankment as *"The portion of the embankment that extends beyond the bridge embankment and extends between the toes of the slopes on either side"*.

In general, the GDM requires a static and seismic evaluation of the bridge embankments. Only a static evaluation is required for the roadway embankments. As such, static and seismic settlement analyses and static and seismic slope stability analyses should be performed for the bridge embankments. Static settlement and static slope stability analyses should be performed for the roadway embankments. Each of these analyses is globally discussed in the following sections.

6.1.1. EMBANKMENT SETTLEMENT

Bridge and roadway embankment settlements are separated into two (2) categories: static settlement as a result of fill placement and seismic settlement as a result of redistribution effects following liquefaction of sand-like soils. Each of these conditions is globally discussed in the following sections.

6.1.1.1. STATIC SETTLEMENT

Based on the conceptual plans, the proposed I-20 grade generally matches the existing grade at the roadway centerline. Maximum fill heights on the order of ten (10) feet are expected at the widened embankment side slope locations near the bridge locations.

Near the Saluda River, the bridge and roadway embankments will bear on alluvial sands and clays. In the upland areas outside of the Saluda River floodplain, the roadway embankments will bear on dense/stiff Piedmont residual soils. Regardless of the material on which the embankments will bear, we anticipate that the static settlements will occur during construction and will not require soil surcharging, wait periods, or ground improvement. The potential for long-term consolidation settlement at the site is considered low. The maximum static settlements along the project corridor will likely occur at the embankments near the Saluda River crosing.

6.1.1.2. SEISMIC SETTLEMENT

For the assumed SSL conditions, a subsequent deformation analysis was qualitatively performed to estimate the vertical settlement from the sand-like soil's redistribution effects. Seismic settlement is generally confined to only sand-like soils.

Based on the conceptual SSL screening, the seismic induced deformations are anticipated to meet the GDM performance limits and performance objectives without ground improvement. The seismic settlement may induce downdrag loadings on the bridge foundations, which should be accounted for in the geotechnical design.

6.1.2. EMBANKMENT SLOPE STABILITY

Static and seismic slope stability analyses should be performed on the bridge embankments. Only static slope stability analyses are required for the roadway embankments. The GDM requires that Spencer's method of slope stability be used for determining stability. The conceptual static and seismic slope stability analyses are qualitatively discussed in the following sections.

6.1.2.1. STATIC SLOPE STABILITY

From reviewing the boring logs, we anticipate that the static slope stability analyses will generate resistance factors that meet the GDM criteria without ground improvement. For the bridge embankment front slopes at the Saluda River crossing, the 100-yr and 500-yr scour profiles should also be evaluated with the static slope stability analyses. The static slope stability analyses for the non-scoured and 100-year scour conditions are governed by the Strength Limit State, and the static slope stability analyses for the 500-year scour conditions are governed by the Extreme Event limit state.

6.1.2.2. SEISMIC SLOPE STABILITY

The GDM requires that pseudo-static, limit equilibrium slope stability analyses be performed at bridge embankments. The inertial driving forces from the design seismic event in addition to the inclusion of the residual soil strength parameters shall be included in the seismic slope stability analyses.

From the SSL screening process, SSL is predicted at the site, within the alluvial soils at the Saluda River floodplain. In general, we would expect SSL would only be triggered by the SEE design seismic event. At select locations, SSL may be triggered from both the FEE and SEE design seismic events. Where SSL is triggered, the residual soil strength parameters determined from the SSL calculations should be applied in the seismic slope stability analyses. For the estimated SSL conditions, we would expect the slope stability resistance factors would be in excess of 1.00. For conditions where greater than 1.00 resistance factors are observed, a Newmark displacement analysis should be performed in accordance with the GDM. The calculated Newmark displacements should be included in the lateral bridge foundation analyses to determine compliance in accordance with the GDM Performance Objectives.

The GEOR and SEOR shall determine if geotechnical mitigation (ie. ground improvement) or structural mitigation is needed at the site. We note that the GDM performance objective for bridge embankments under the Extreme Event I limit state is that the bridge embankment does not adversely affect the bridge structure. As such, there are no performance limits provided, and the bridge embankments are allowed to move so long as the bridge design includes sufficient structural mitigation to resist the movements relative to the Performance Objectives of the bridge.

6.1.3. GROUND IMPROVEMENT

Seismic induced soil SSL was identified at this site, and both geotechnical mitigation and structural mitigation appear feasible. Geotechnical mitigation may consist of in-situ ground improvements, additional embankment excavation, and/or embankment reinforcement (geogrid or geotextile fabric). Structural mitigation consists of utilization of the bridge foundations as slope stabilizing elements. Based on a qualitative review of the soil borings, we would not expect large-scale geotechnical or structural ground improvements would be required at the bridge embankments within the Phase 3C project corridor.

6.2. EARTH RETAINING STRUCTURES

One (1) Earth Retaining Structures (ERS) is planned within the Phase 3C project corridor. The ERS is located near I-20 Station 35+00 to 38+00. The ERS type is considered a 'fill wall'. The primary purpose of the ERS is to limit the footprint of the proposed embankment widening from migrating onto the adjacent frontage road. The maximum retained wall height of the ERS is twenty (20) feet. We anticipate that either a Mechanically Stabilized Earth (MSE) wall or a concrete prefabricated modular wall will be used. Each of these ERS types uses the shallow foundation design methodology for the ERS external stability analyses.

The ERS will bear on either compacted fill or Piedmont Residual soils. We anticipate that the ERS will meet the design criteria and performance limits for external stability, global stability, and settlement without ground improvement. Standard MSE reinforcement lengths and concrete modular wall stem lengths are anticipated.

6.3. BRIDGE FOUNDATIONS

Two (2) existing bridge structures are designated to be replaced within the Phase 3C project corridor: the I-20 bridge over the Saluda River and the I-20 bridge over CSX Railroad. Deep foundations are anticipated for support of the new bridge structures. We assume typical, steel HP pile foundations will be used at the end bents and drilled shaft foundations will be used at the interior bents. The conceptual geotechnical assessment of these foundation elements is globally discussed in the following sections.

6.3.1. SUBSURFACE STEEL CORROSION & CONCRETE DETERIORATION

In accordance with AASHTO LRFD Bridge Design Specifications, the following soil or site conditions are considered indicative of a potential for steel and/or concrete deterioration or corrosion.

- Resistivity less than 2,000 ohm-cm;
- pH less than 5.5;
- Chloride concentrations greater than 500 mg/kg;
- Sulfate concentrations greater than 1,000 mg/kg;

The results from the performed corrosion series laboratory testing are summarized in the following table.

Corrosion Series Laboratory Test Result Summary

Test ID	Depth (ft)	Resistivity (ohm-cm)	pH	Chloride (mg/kg)	Sulfate (mg/kg)
DH-4	4.0-10.0	17,420	7.68	9	21
B-47	29.5-36.0	10,050	7.15	138	60
B-50	38.5-45.0	50,920	7.18	3	15
B-51	4.0-8.0	46,230	6.81	12	6
B-52 *	33.5-40.0	36,180	6.57	6	21
B-53 *	33.5-40.0	47,570	6.55	6	3

* These soil borings are located at the Bush River Rd. bridge over I-20, which falls just outside of the Phase 3C project boundary. We have elected to include the corrosion series lab results from these borings, since they may provide some global information relative to subsurface corrosion on the Phase 3C project.

The corrosion series laboratory testing results are provided in Section 7 of the Appendix. Based on the lab test results, the subsurface conditions at the site relative to steel corrosion are considered "non-aggressive". In addition, subsurface sulfate degradation of concrete elements is not expected at the site. We note that additional corrosion series laboratory testing is recommended for the final design.

6.3.2. DRIVEN PILE FOUNDATIONS

Driven pile foundations are anticipated for support of the bridge end bents. Commentary relative to the design of a driven pile foundation concept is discussed in the following sections.

6.3.2.1. AXIAL RESISTANCE

The Strength limit state axial loading conditions are likely to govern the geotechnical pile foundation designs at the bridge sites. Drilled pile installation techniques are not anticipated.

Driven piles will develop a majority of the required driving resistance through end bearing on hard/dense residuum or bedrock. We expect that medium to large pile hammers will be required to advance piles through the denser residuum to the bearing stratum. For a majority of the pile installations, the pile driving termination criteria may consist of driving the piles to a refusal condition. The Contractor should exercise care to not over-drive, over-stress, and damage piles on a hard bearing stratum.

If the pile tip elevations are placed above a location where a pile driving practical refusal condition exists, then the D-B Contractor may elect to perform Pile Dynamic Analyses (PDA) testing with CAPWAP measurements to monitor pile driving stresses during driving and to verify the in-place, driven pile resistance. Continuous PDA testing should be considered during both the initial drive and the re-strikes, as necessary. The number of required PDA tests shall be in accordance with the GDM.

6.3.2.2. LATERAL RESISTANCE

For the Strength Limit State, we anticipate that the driven piles will likely develop the required lateral stability in the soils above weathered rock and/or bedrock. We do not anticipate that pre-drilling operations will be required to extend the pile foundations to the minimum tip elevation required for lateral stability.

For the Extreme Event I limit state, the driven piles will also likely develop the required lateral stability in the soil material above weathered rock and/or bedrock. In accordance with the GDM, the available bridge abutment backwall passive pressure is on the order of 1.0 ksf for a 5.5 foot high backwall and an assumed sandy, cohesionless backfill material. The remaining lateral resistance, following use of the bridge abutment backwall resistance, will be carried by the pile foundations. If the bridge design is such that the end bent foundations are responsible for absorbing a significant amount of the lateral load, then we anticipate that large piles and/or multiple rows of piles may be required.

6.3.2.3. DRIVABILITY

Driven piles will likely use a diesel pile hammer. We anticipate that non-displacement piles (ie. steel H-piles or steel open-ended pipe piles) will be utilized at the end bents. At the I-20 bridge over the Saluda River, the anticipated pile lengths could vary from twenty (20) feet to forty (40) feet per pile. At the I-20 bridge over CSX Railroad, the anticipated pile lengths could vary from sixty (60) feet to seventy (70) feet per pile.

At the bridge sites within the Phase 3C project corridor, we do not expect that boulders would be located within the fill material or in the alluvium. If boulders are discovered during pile installations, predrilling and/or rock coring may be required to bypass the impenetrable layer.

Based on the assumed required driving resistances, we anticipate that a medium/large pile hammer will be required to advance the piles through the dense residuum to the bearing stratum. We expect that most piles will be driven to a practical refusal condition on hard residuum or bedrock. The Contractor should exercise care to not over-drive, over-stress, and damage piles on a hard bearing stratum after encountering a practical refusal condition.

For a properly selected driving system, we do not anticipate unusual pile driving issues for successful installation of the driven piles. The selected driving system should address pile driving compressive and tensile stresses to conform to the SCDOT standard criteria.

6.3.3. DRILLED SHAFT FOUNDATIONS

Drilled shafts are anticipated for support of the bridge interior bents. We anticipate that drilled shaft sizes could range from 60 inch to 96 inch diameter shafts. Commentary relative to the design of a drilled shaft foundation concept is discussed in the following sections.

6.3.3.1. AXIAL RESISTANCE

The Strength Limit State axial loading conditions are expected to govern the geotechnical design of drilled shaft foundations.

Depending on the approach taken by the Design-Build team, we expect that a majority of the drilled shafts will develop the required axial resistance through skin friction in residuum, IGM and bedrock. The drilled shafts may also develop the required axial resistance through only tip resistance on bedrock. In rock, drilled shafts mobilize side resistance and tip resistance at small and variable displacements, and it is difficult to predict the load transfer from side resistance to tip resistance. The Design-Build Team should exercise caution when using a drilled shaft design including both side resistance and tip resistance for drilled shafts bearing on rock.

Construction casing will be required to facilitate drilled shaft construction. It is anticipated that the casing would either be socketed in stable, residual soils or advanced to the top of bedrock. At each bridge site, we anticipate that casing lengths would be on the order of twenty (20) to fifty (50) feet long. The drilled shaft design methodology does not allow for development of axial resistance within the cased portion of the drilled shaft. As such, the drilled shaft design will generate the required resistance in the uncased portion of the shafts, below the casing tip elevations. The anticipated drilled shaft lengths below the casing tip elevations may range from ten (10) feet to fifty (50) feet.

6.3.3.2. LATERAL RESISTANCE

For the Strength Limit State and Extreme Event I Limit State, the drilled shafts will develop most of the required lateral stability in dense residuum, IGM, and/or rock. At the bridge over the Saluda River, we expect the scour profiles will be limited by the top of rock profile. The lateral resistance will be developed below the scour elevation. We expect the drilled shaft axial loading conditions will govern the geotechnical design. The depths required by the axial resistance design will provide the sufficient lateral stability requirements.

6.3.3.3. CONSTRUCTABILITY

Drilled shaft construction will likely require excavation of hard soil (SPT N-values in excess of 100 bpf) and/or rock. In general, the measured rock strengths along the project suggest weak to strong rock conditions. The measured rock strengths for the borings performed within the Phase 3C project corridor generally vary from 2,000 psi to 15,000 psi. In addition, the rock is soft and fine-grained at some locations with nearly vertical joints. The vertical jointing will affect the Contractor's drilling advancement rate. The Contractor should be prepared to deal with jointed and fractured rock in their drilled shaft installation plan. Specialized drilling

equipment may be required to excavate through the dense residuum and into bedrock. This may include, but not be limited to, rock augers, core barrels, or pneumatic equipment.

Uncased drilled shaft excavations in residuum without using a mineral slurry may result in sloughing of the sides of the excavation. The sloughed material may fall to the bottom of the excavation, and, if not properly cleaned prior to concreting, may result in defects or anomalies at the bottom of the drilled shaft.

6.4. NOISE BARRIER WALLS

One (1) noise barrier wall is planned within the Phase 3C project corridor. The noise wall extends from I-20 Station 67+00 to the Saluda River. Relative to the direction of increasing I-20 stationing, the noise wall is located on the right side of I-20. Noise walls typical use a deep foundation system. The noise wall construction criteria generally contain a strict adherence to foundation vertical plumbness. As a result, drilled pile installation techniques are generally preferred over pile driving, since the drilling process provides a higher degree of control of the pile vertical plumbness during the foundation installation. Since the noise walls have very little axial loads applied, the geotechnical design is mostly controlled by the lateral stability requirements. We expect that the lateral stability of the noise wall foundations will be achieved in the upper (20) feet of the groundline. From the soil borings performed, bedrock and/or very dense residuum is identified within the zone of foundation embedment. Predrilling into very dense soils and/or bedrock may be required to meet the design criteria and/or the desired performance.

6.5. DRAINAGE STRUCTURES

In accordance with the GDM, Drainage Structures are considered as reinforced concrete box culverts and pipe culverts with diameters equal to and greater than forty-eight (48) inches. Within the Phase 3C project corridor, we understand that one (1) drainage structure, in the form of an existing concrete box culvert, is planned to be extended. The box culvert is located near I-20 Station 77+00. Other existing drainage structures may exist within the project corridor, but we understand that these drainage structures will not be extended or replaced.

For box culvert extensions, the primary design objective is for the performance of the extension to best match the performance of the existing structure. Since the existing structure was not seismically designed, the extension should also not be seismically designed. Any resulting deformations from seismic induced SSL would likely result in similar settlements along the box culvert profile, which will diminish the risk of differential settlements.

A static settlement analysis should be performed to determine the immediate and long-term settlement potential of the bearing soils supporting the box culvert extension. The results from the static settlement analysis should be provided to the Hydraulic Engineer of Record (HEOR) to confirm the hydraulic design is not compromised and the Structural Engineer-of-Record (SEOR) for any differential settlements that may exceed those limits that would be considered tolerable by the structure.

6.6. UTILITIES

An existing force main sewer pipe runs generally parallel to the CSX Railroad, just inside the railroad right-of-way. The existing force main extends under the existing I-20 bridge embankment. A new force main pipe extension is proposed off the existing pipe. The proposed pipe alignment starts perpendicular to the existing pipe and extends out of the existing railroad right-of-way. The pipe then extends parallel to the existing pipe, under the I-20 embankment. On the other side of the embankment, the pipe turns back and connects to the existing pipe. For the section of pipe extending under the existing I-20 embankment, trenchless installation techniques are anticipated.

The invert elevation of the proposed force main pipe is approximately +165 ft-NAVD. Based on the soil borings performed at the vicinity of the force main, the top of very hard residuum (SPT blow counts greater than 100 bpf) elevation is approximately +160 ft-NAVD and the top of bedrock is approximately +140 ft-NAVD. Specialized drilling equipment may be necessary to drill through the hard residuum, if the trenchless excavation should need to extend below an elevation of +160-ft-NAVD. We do not anticipate that the trenchless excavation will encounter sound bedrock.

6.7. MISCELLANEOUS STRUCTURES

Based on our understanding of the project, the foundation design for support of miscellaneous structures such as overhead signs and light poles will be a function of the final design. The foundations for these structures will likely utilize drilled shafts. We expect that these foundations will develop the required axial and lateral resistance in the soils above bedrock. Based on the soils encountered, we anticipate no constructability issues for the drilled shafts at this site that will support overhead signs and light poles.

7. EXISTING PAVEMENT

Five (5) shallow soil test borings were performed at the existing interstate paved outside shoulder locations within the Phase 3C project corridor. At each soil boring location, an asphalt core of the existing paved shoulder was collected. The core thicknesses generally range from twelve (12) inches to seventeen (17) inches.

From the soil borings and subsequent CBR testing, we note that the quality of the subgrade material below the existing paved shoulders is considered poor to fair relative to interstate pavement structures. The following table summarizes the conditions at the existing interstate paved shoulders.

Existing Interstate Paved Shoulder Data

Boring ID	Shoulder Location	Pavement Thickness (in)	CBR @ 95% Compaction
P-44	I-20 WB Outside	13	6.6
P-45	I-20 EB Outside	12	N/A
P-47	I-20 EB Outside	17	7.9
P-48	I-20 WB Outside	12	N/A
P-49	I-20 EB Outside	12	N/A

8. LIMITATIONS OF REPORT

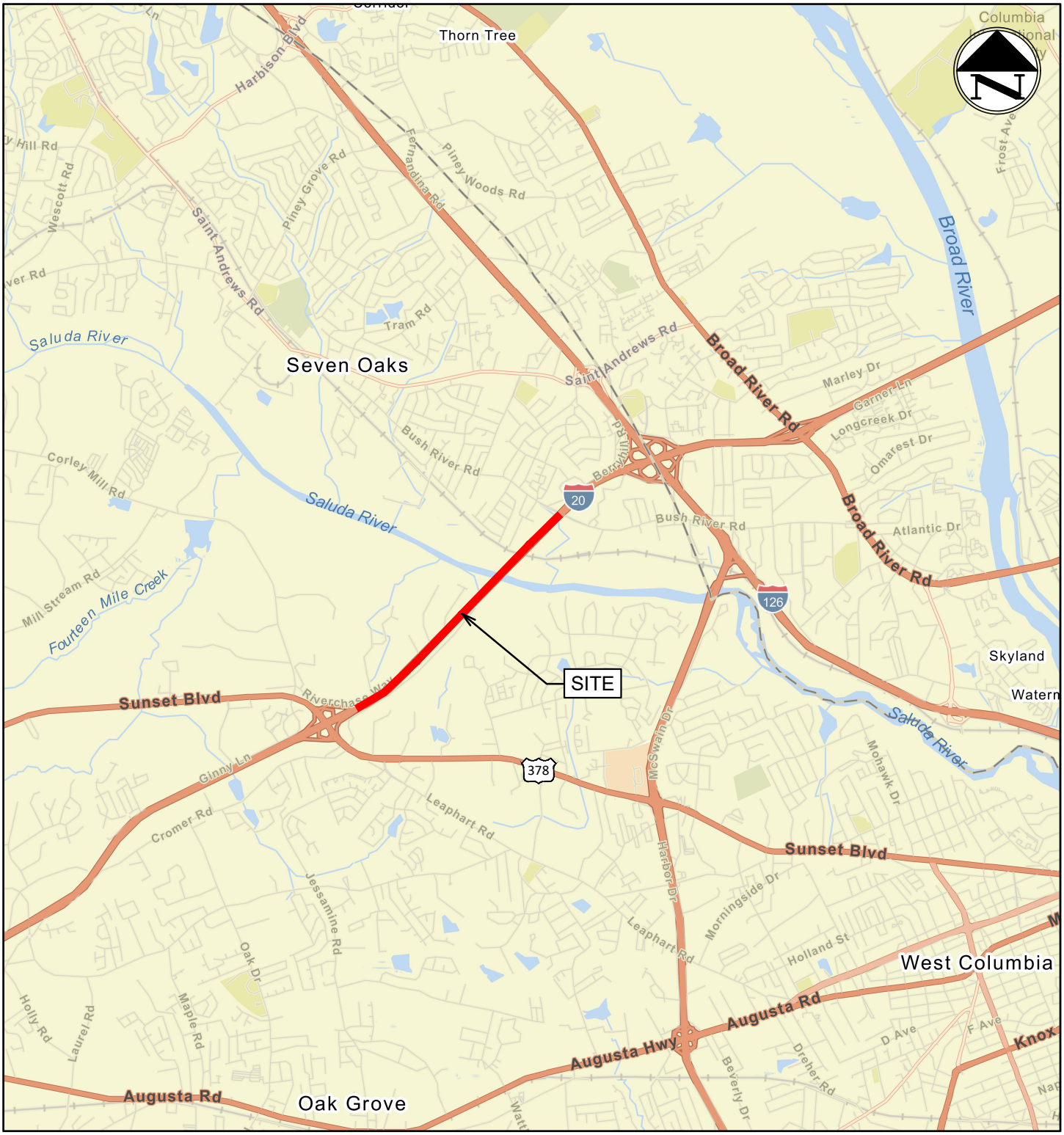
This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to the referenced bridge project. The conclusions and recommendations contained herein are based upon the provided test borings and test result data, contained within, and applicable standards in this geographic area at the time this report was prepared. No other warranty, expressed or implied, is made.

APPENDIX

SECTION 1 SITE LOCATION PLAN
SECTION 2 BORING LOCATION PLAN
SECTION 3 GENERALIZED SUBSURFACE PROFILES
SECTION 4 GEOTECHNICAL EXPLORATION LOGS
SECTION 4A SOIL BORING LOGS
SECTION 4B CPT LOGS
SECTION 4C AUGER BORING LOGS
SECTION 5 LABORATORY TEST RESULTS
SECTION 5A SPLIT-SPOON SAMPLES
SECTION 5B ROCK SAMPLES
SECTION 5C UD SAMPLES
SECTION 5D BULK SAMPLES
SECTION 6 GEOPHYSICAL TEST RESULTS
SECTION 7 ROCK CORE PHOTOS
SECTION 8 SPT HAMMER ENERGY REPORTS

APPENDIX

SECTION 1 SITE LOCATION PLAN



1:72,000

0 0.5 1 2 mi

0 0.75 1.5 3 km

F&ME CONSULTANTS, INC.
COLUMBIA, SC

REV.	BY	DATE	DESCRIPTION OF REVISION
4			
3			
2			
1			

TOPO. _____ DATE _____
DWG. CTC DATE 6.5.24 GROUP ____ – _____
R/W _____ DATE _____

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA

SITE LOCATION PLAN

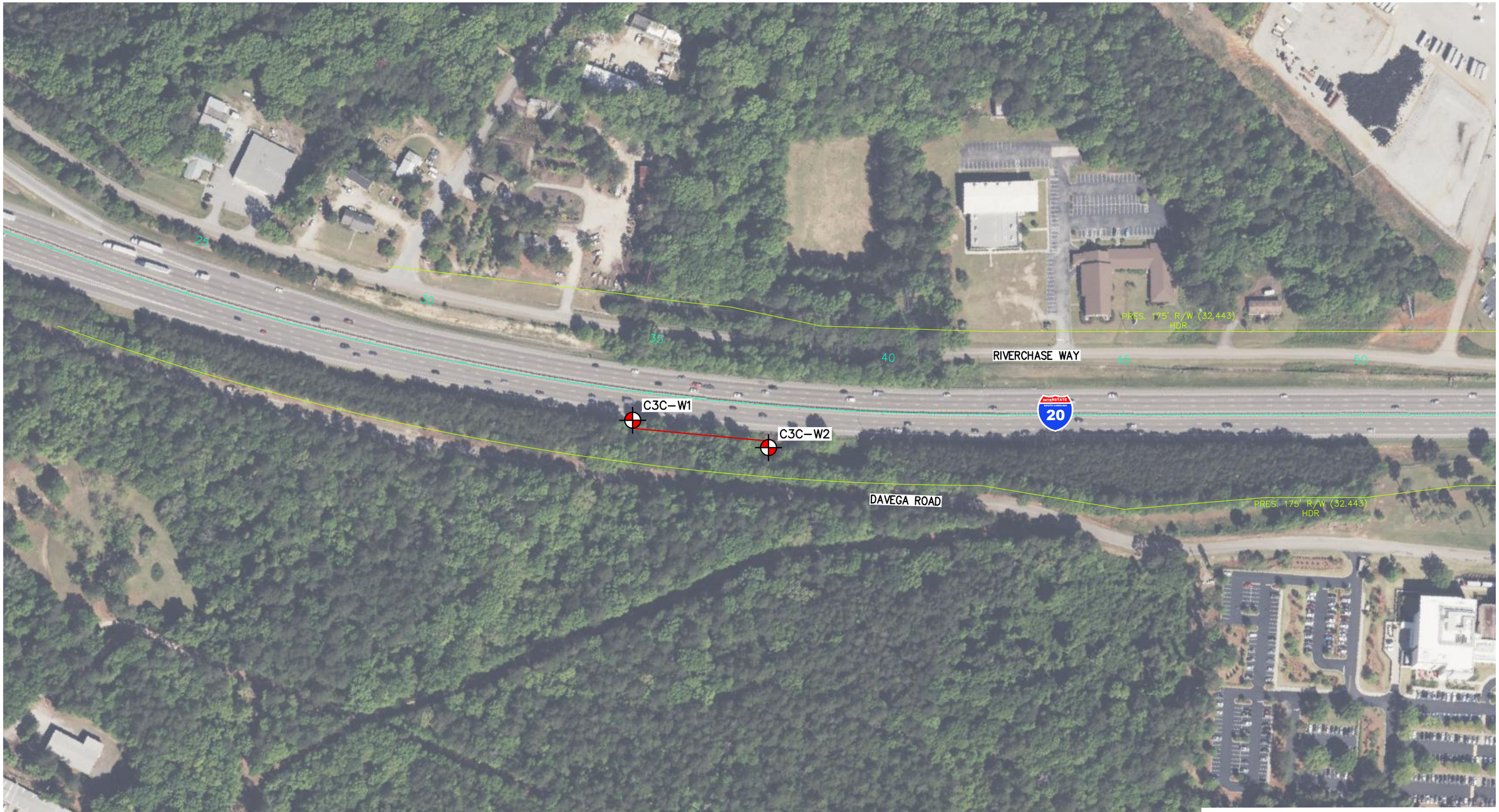
FME JOB NO. G5662.030

SCALE: AS NOTED

FIGURE 1

APPENDIX

SECTION 2 BORING LOCATION PLAN



LEGEND:

- F&ME SOIL TEST BORING LOCATION
- AUBJV TEST LOCATION
- S&ME TEST LOCATION

REV.	BY	DATE	DESCRIPTION OF REVISION
4			
3			
2			
1			

TOPO. _____ DATE _____
DWG. CTC DATE 6.25.24 GROUP ____ – _____
R/W _____ DATE _____

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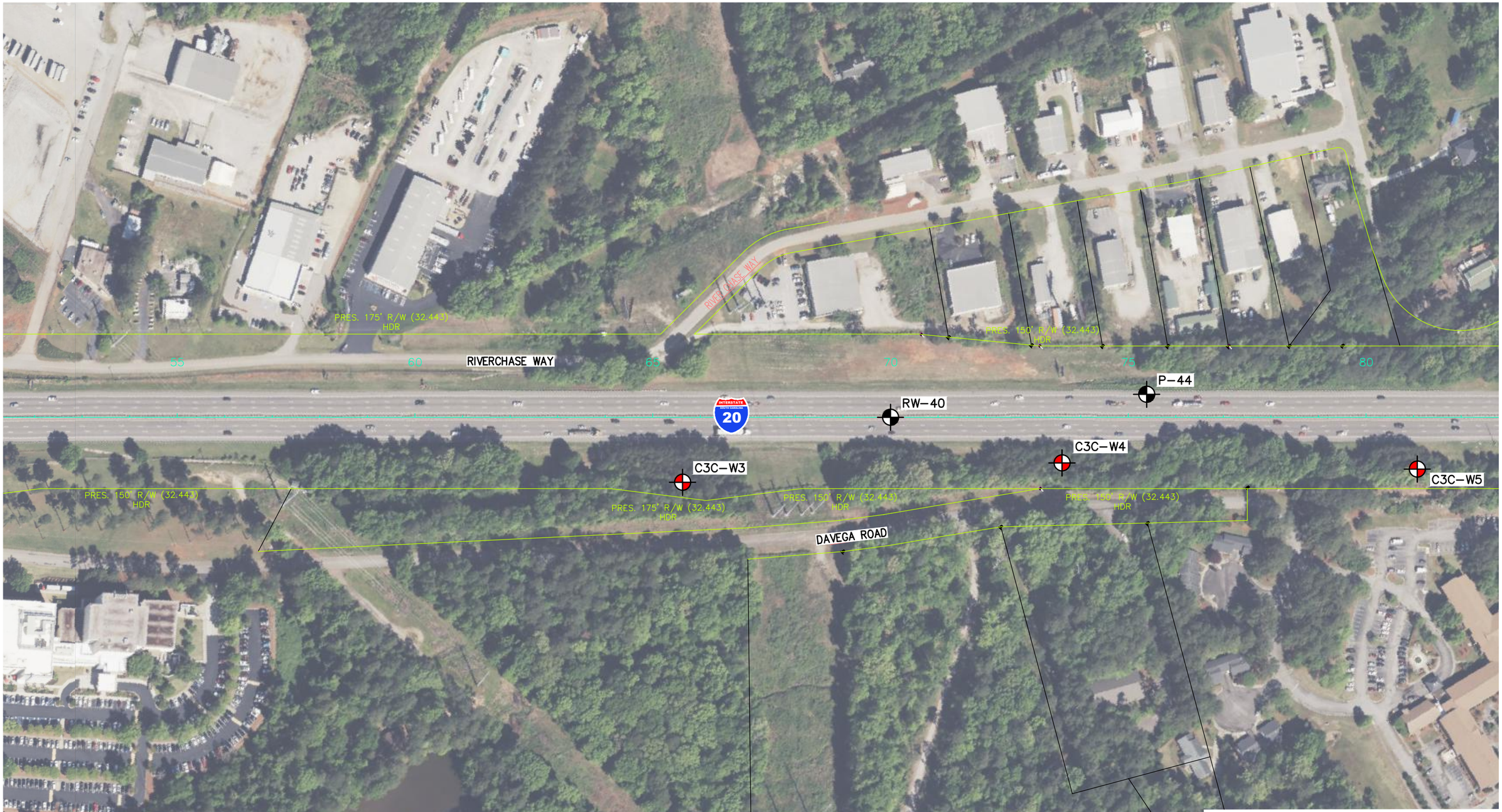
CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

FME JOB NO. G5662.030

SCALE: 1" = 200'

FIGURE 2



LEGEND:

- F&ME SOIL TEST BORING LOCATION
- AUBJV TEST LOCATION
- S&ME TEST LOCATION

REV.	BY	DATE	DESCRIPTION OF REVISION
4			
3			
2			
1			

TOPO. _____ DATE _____
DWG. CTC DATE 6.25.24 GROUP ____ – _____
R/W _____ DATE _____

F&ME CONSULTANTS, INC.
COLUMBIA, SC

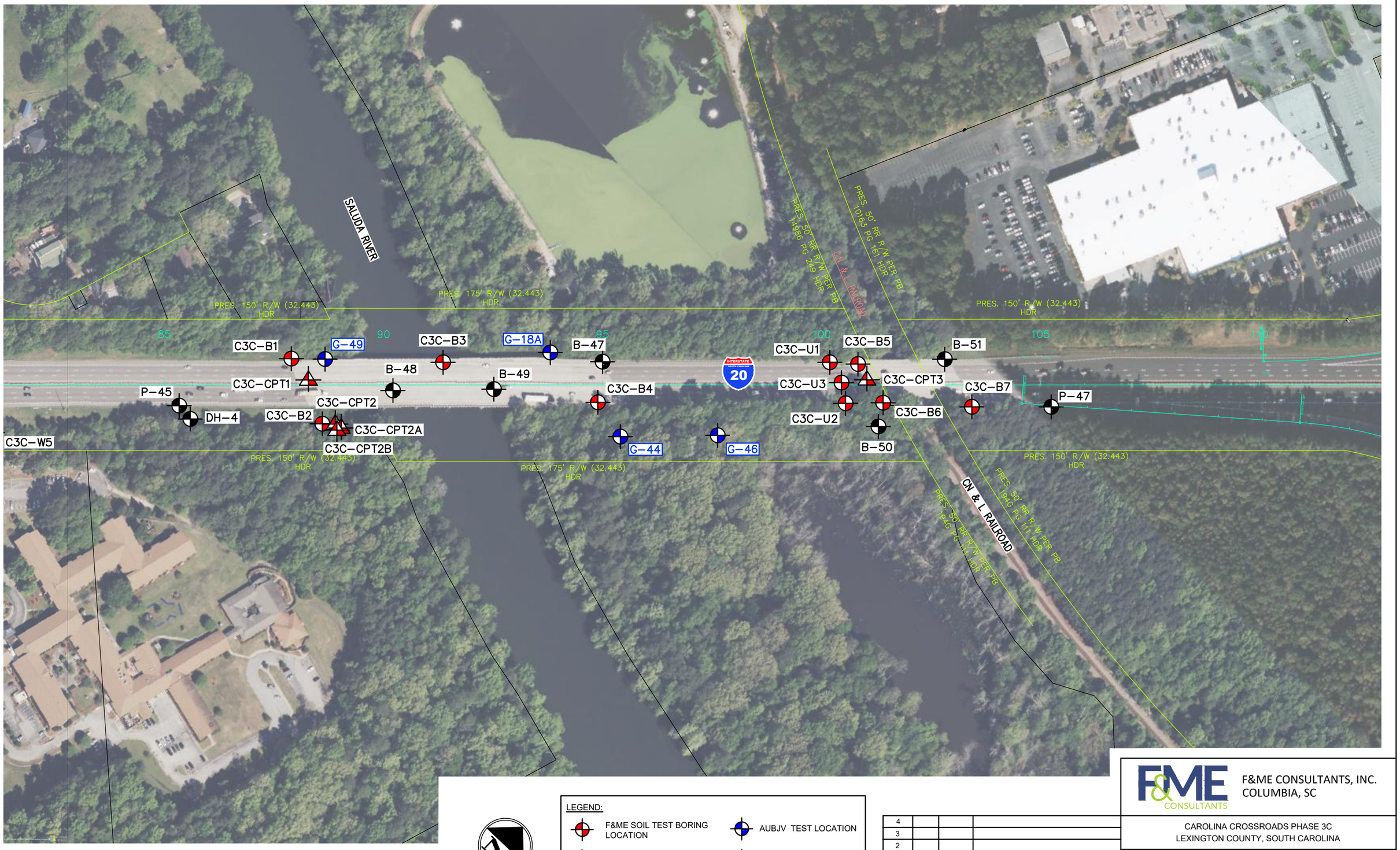
CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

FME JOB NO. G5662.030

SCALE: 1" = 200'

FIGURE 3



LEGEND:

- F&ME SOIL TEST BORING LOCATION
- F&ME CPT LOCATION
- AUBJV TEST LOCATION
- S&ME TEST LOCATION

REV.	BY	DATE	DESCRIPTION OF REVISION
4			
3			
2			
1			

TOPO. _____ DATE _____
DWG. CTC DATE 6.25.24 GROUP ____ – _____
R/W _____ DATE _____

F&ME CONSULTANTS, INC.
COLUMBIA, SC

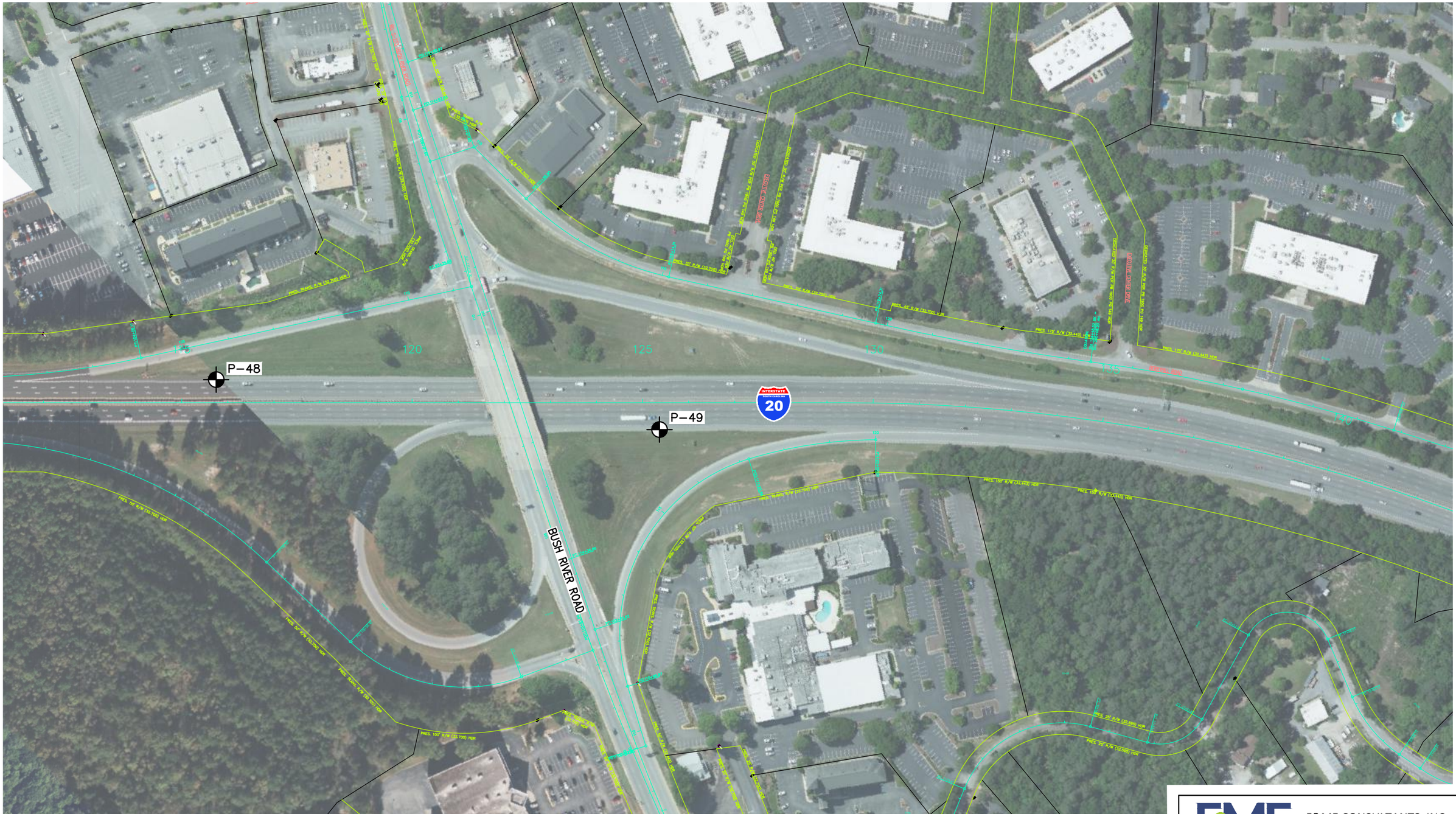
CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

FME JOB NO. G5662.030

SCALE: 1" = 200'

FIGURE 4



LEGEND:

- F&ME SOIL TEST BORING LOCATION
- AUBJV TEST LOCATION
- S&ME TEST LOCATION

REV.	BY	DATE	DESCRIPTION OF REVISION
4			
3			
2			
1			

TOPO. ____ DATE ____
DWG. CTC DATE 6.25.24 GROUP ____ – ____
R/W ____ DATE ____

F&ME CONSULTANTS, INC.
COLUMBIA, SC

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA

BORING LOCATION PLAN

SCALE: 1" = 200'

FME JOB NO. G5662.030

FIGURE 5

APPENDIX

SECTION 3 GENERALIZED SUBSURFACE PROFILES

C3C-W1
ELEV.334.00
13
11
18
17
12
100+
16
19
27
33
43
35
45
43
100+
100+
PIEDMONT RESIDUUM
C3C-W2
ELEV.318.00
11
7
8
20
24
12
26
22
34
51
24
100+
100+
100+
PIEDMONT RESIDUUM
340
330
320
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
35+00
36+00
37+00
38+00
39+00
40+00
41+00
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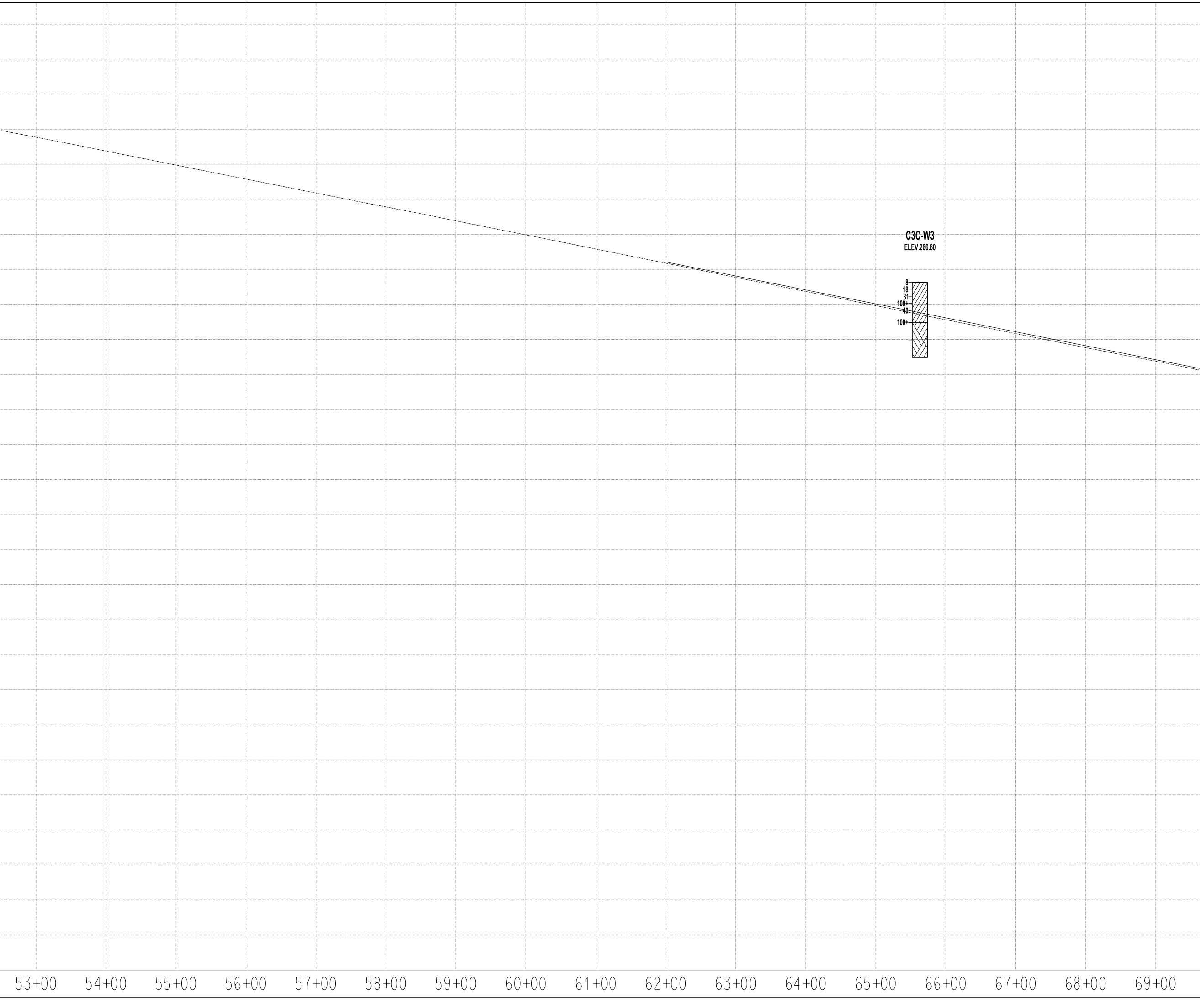
49+00
50+00
51+00
52+00


C3C-W3
ELEV.266.60
8
18
31
100+
40
100+
53+00
54+00
55+00
56+00
57+00
58+00
59+00
60+00
61+00
62+00
63+00
64+00
65+00
66+00
67+00
68+00
69+00

RW-40
ELEV.238.85
C3C-W4
ELEV.220.40
P-44
ELEV.220.34
EXISTING FILL
PIEDMONT RESIDUUM
C3C-W5
ELEV.197.90
G- 49
ELEV.172.90
COASTAL PLAIN
G- 18A
ELEV.170.80
PIEDMONT RESIDUUM
P-45
ELEV.193.38
DH-4
ELEV.185.72
G- 44
ELEV.172.50
EXISTING FILL
G- 46
ELEV.174.10
ALLUVIUM
C3C-B1
ELEV.190.70
C3C-CPT1
ELEV.191.40
q
(tsf)
C3C-B2
ELEV.177.20
C3C-CPT2
Tip Resistance
B-48
ELEV.173.29
BEDROCK
BEDROCK
70+00
71+00
72+00
73+00
74+00
75+00
76+00
77+00
78+00
79+00
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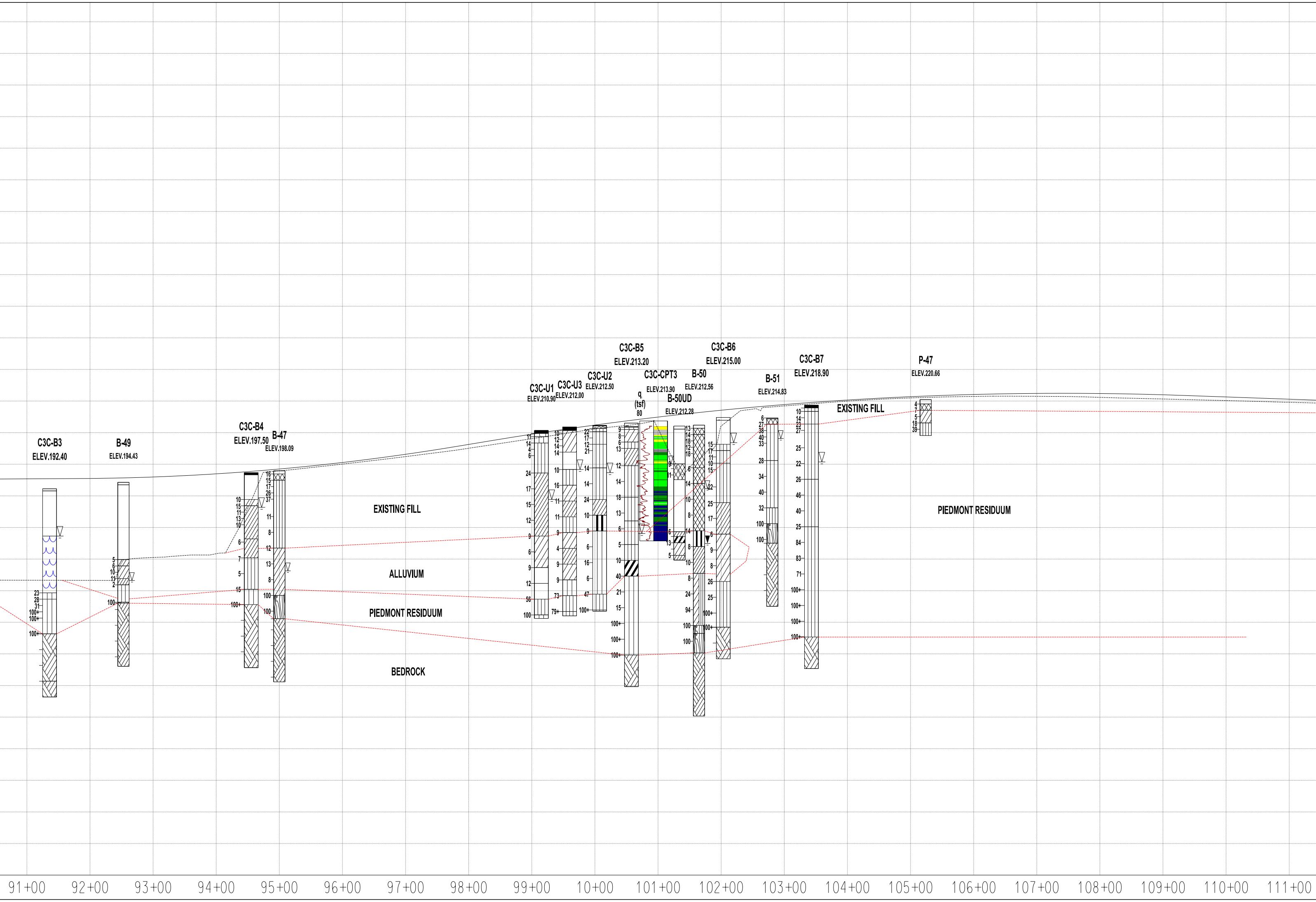
86+0
87+00
88+00
89+00
90+00


C3C-B3
ELEV.192.40
B-49
ELEV.194.43
C3C-B4
ELEV.197.50
B-47
ELEV.198.09
C3C-U1
ELEV.210.90
C3C-U3
ELEV.212.00
C3C-U2
ELEV.212.50
C3C-B5
ELEV.213.20
q
(tsf)
80
C3C-CPT3
ELEV.213.90
B-50
ELEV.212.56
B-50UD
ELEV.212.28
C3C-B6
ELEV.215.00
B-51
ELEV.214.83
C3C-B7
ELEV.218.90
P-47
ELEV.220.66
EXISTING FILL
ALLUVIUM
PIEDMONT RESIDUUM
BEDROCK
EXISTING FILL
PIEDMONT RESIDUUM
91+00
92+00
93+00
94+00
95+00
96+00
97+00
98+00
99+00
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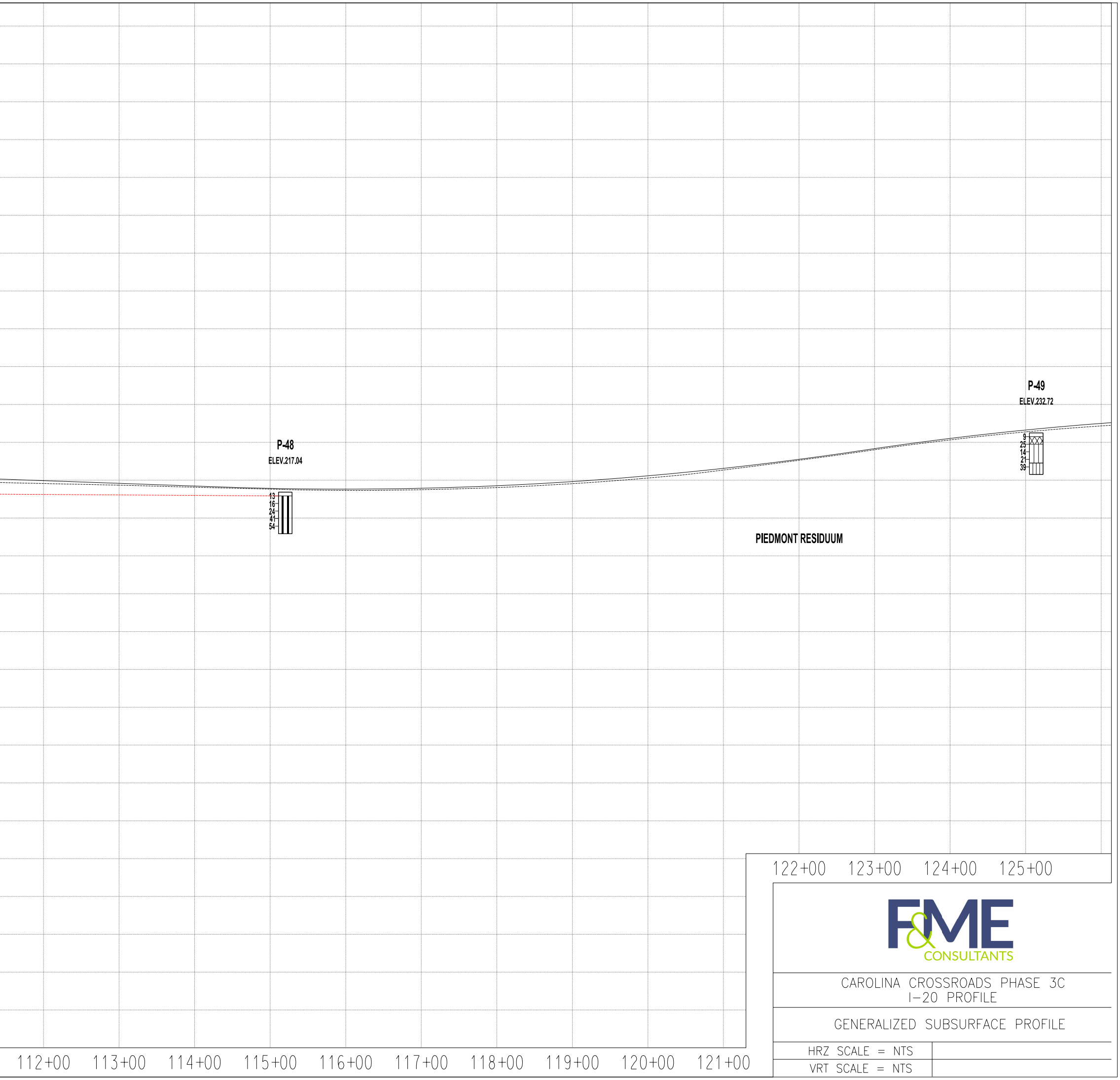
108+00
109+00
110+00
111+00

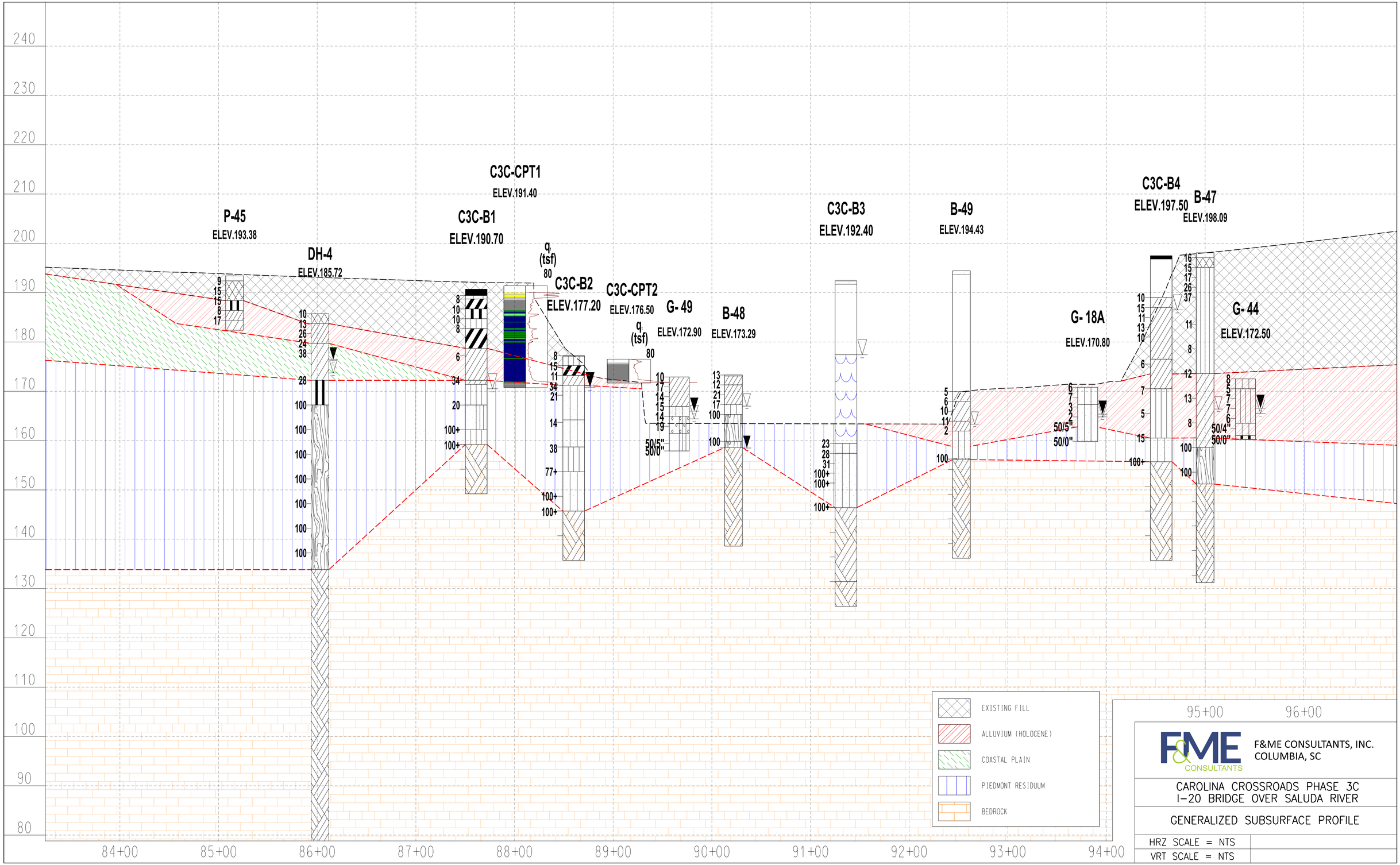

P-48
ELEV.217.04
13
16
24
41
54
P-49
ELEV.232.72
9
25
14
21
39
PIEDMONT RESIDUUM
112+00
113+00
114+00
115+00
116+00
117+00
118+00
119+00
120+00
121+00
122+00
123+00
124+00
125+00

F&ME CONSULTANTS

CAROLINA CROSSROADS PHASE 3C
I–20 PROFILE

GENERALIZED SUBSURFACE PROFILE

HRZ SCALE = NTS
VRT SCALE = NTS



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CAROLINA CROSSROADS PHASE 3C
I-20 BRIDGE OVER SALUDA RIVER

GENERALIZED SUBSURFACE PROFILE

HRZ SCALE = NTS
VRT SCALE = NTS

C3C-U1
ELEV.210.90

C3C-U3
ELEV.212.00

C3C-U2
ELEV.212.50

C3C-B5
ELEV.213.20

C3C-CPT3
ELEV.213.90

q_c (tsf)

B-50
ELEV.212.56

B-50UD
ELEV.212.28

C3C-B6
ELEV.215.00

B-51
ELEV.214.83

C3C-B7
ELEV.218.90

P-47
ELEV.220.66

230
220
210
200
190
180
170
160
150
140

98+00
99+00
100+00
101+00
102+00
103+00
104+00
105+00

EXISTING FILL
ALLUVIUM (HOLOCENE)
COASTAL PLAIN
PIEDMONT RESIDUUM
BEDROCK

F&ME CONSULTANTS, INC.
COLUMBIA, SC

CAROLINA CROSSROADS PHASE 3C
I-20 BRIDGE OVER CSX RR

GENERALIZED SUBSURFACE PROFILE

HRZ SCALE = NTS
VRT SCALE = NTS

APPENDIX

SECTION 4 GEOTECHNICAL EXPLORATION LOGS

Carolina Crossroads - Phase 3C
Lexington County, South Carolina

Field Investigation Summary

Test ID	Performed By	Test Hole Locale	Alignment	Station	Offset from CL	Northing	Easting	Latitude	Longitude	Elevation	Depth
					ft	*ft*	*ft*			*ft-MSL*	*ft*
C3C-B1	F&ME	Bridge	I-20 Median	87+90	60-L	797428	1960788	34.02500945	-81.12943314	190.7	41.5
C3C-B2	F&ME	Bridge	I-20 Median	88+60	89-R	797374	1960943	34.02486204	-81.12891973	177.2	41.5
C3C-B3	F&ME	Bridge	I-20 Median	91+36	52-L	797669	1961037	34.02567278	-81.12861274	192.4	66.0
C3C-B4	F&ME	Bridge	I-20 Median	94+90	40-R	797857	1961350	34.02619071	-81.12758027	197.5	61.8
C3C-B5	F&ME	Bridge	I-20 Median	100+83	48-L	798342	1961704	34.02752332	-81.12641358	213.2	83.5
C3C-B6	F&ME	Bridge	I-20 Median	101+41	40-R	798321	1961807	34.02746596	-81.1260731	215.0	76.5
C3C-B7	F&ME	Bridge	I-20 Median	103+43	50-R	798459	1961955	34.02784566	-81.12558276	218.9	83.5
C3C-CPT1	F&ME	Bridge	I-20 Median	88+29	11-L	797422	1960850	34.02499237	-81.12922819	191.4	20.7
C3C-CPT2	F&ME	Bridge	I-20 Median	88+90	89-R	797395	1960965	34.02491975	-81.12884866	176.5	4.8
C3C-CPT2A	F&ME	Bridge	I-20 Median	89+04	98-R	797398	1960980	34.02492833	-81.12879666	176.5	5.5
C3C-CPT2B	F&ME	Bridge	I-20 Median	88+94	103-R	797388	1960977	34.02489986	-81.12880858	176.5	6.0
C3C-CPT3	F&ME	Bridge	I-20 Median	101+04	12-L	798331	1961743	34.02749416	-81.12628214	213.9	38.0
C3C-W1	F&ME	Earth Retaining Structure	I-20 Median	34+72	61-R	793582	1957106	34.01442692	-81.14156777	334.0	66.5
C3C-W2	F&ME	Earth Retaining Structure	I-20 Median	37+59	88-R	793746	1957348	34.01487733	-81.14077013	318.0	49.4
C3C-W3	F&ME	Noise Wall	I-20 Median	65+63	137-R	795702	1959366	34.02026159	-81.13411829	266.6	21.5
C3C-W4	F&ME	Noise Wall	I-20 Median	73+61	96-R	796300	1959897	34.0219058	-81.13237003	220.4	28.7
C3C-W5	F&ME	Noise Wall	I-20 Median	81+08	109-R	796823	1960430	34.02334636	-81.13061226	197.9	37
C3C-U1	F&ME	Utility	I-20 Median	100+19	52-L	798299	1961656	34.02740527	-81.12657176	210.9	59.6
C3C-U2	F&ME	Utility	I-20 Median	100+55	42-R	798259	1961748	34.02729489	-81.12626802	212.5	58.9
C3C-U3	F&ME	Utility	I-20 Median	100+46	5-L	798285	1961707	34.02736797	-81.12640113	212.0	59.9
B-47	S&ME	Bridge	I-20 Median	86+31	46-L	797947	1961317	34.026437	-81.127687	198.1	66.9
B-48	S&ME	Bridge	I-20 Median	80+48	76-R	797446	1960995	34.025058	-81.128747	173.3	34.7
B-49	S&ME	Bridge	I-20 Median	84+09	42-L	797786	1961164	34.025993	-81.128191	194.4	58.3
B-50	S&ME	Bridge	I-20 Median	91+54	47-R	798255	1961751	34.027285	-81.126258	212.6	92.2
B-50UD	S&ME	Bridge	I-20 Median	91+52	49-R	798252	1961751	34.02727689	-81.12625825	212.3	42.5
B-51	S&ME	Bridge	I-20 Median	93+59	160-L	798545	1961746	34.028083	-81.126273	214.8	59.7
DH-4	S&ME	Downhole Seismic	I-20 Median	76+09	87-R	797125	1960696	34.024177	-81.129735	185.7	120.2
RW-40	S&ME	Embankment	I-20 Median	69+86	61-L	796143	1959522	34.021474	-81.133604	238.9	20.8
P-44	S&ME	Pavement	I-20 Median	74+76	48-L	796483	1959876	34.022409	-81.132440	220.3	11.1
P-45	S&ME	Pavement	I-20 Median	84+69	47-R	797125	1960639	34.024176	-81.129923	193.4	11.0
P-46	S&ME	**Not Performed**									
P-47	S&ME	Pavement	I-20 Median	104+83	46-R	798561	1962051	34.028128	-81.125269	220.7	11.4
P-48	S&ME	Pavement	I-20 Median	115+75	50-L	799407	1962748	34.030453	-81.122970	217.0	11.0
P-49	S&ME	Pavement	I-20 Median	125+37	59-R	800016	1963500	34.032131	-81.120490	232.7	11.0
G-18A	AUBJV	Bridge	I-20 Median	93+81	74-L	--	--	34.026200	-81.128090	170.8	11.0
G-44	AUBJV	Bridge	I-20 Median	95+41	118-R	--	--	34.026150	-81.127260	172.5	12.3
G-46	AUBJV	Bridge	I-20 Median	97+63	115-R	--	--	34.026580	-81.126760	174.1	19.2
G-49	AUBJV	Bridge	I-20 Median	89+67	59-L	--	--	34.025160	-81.129240	172.9	15.0

APPENDIX

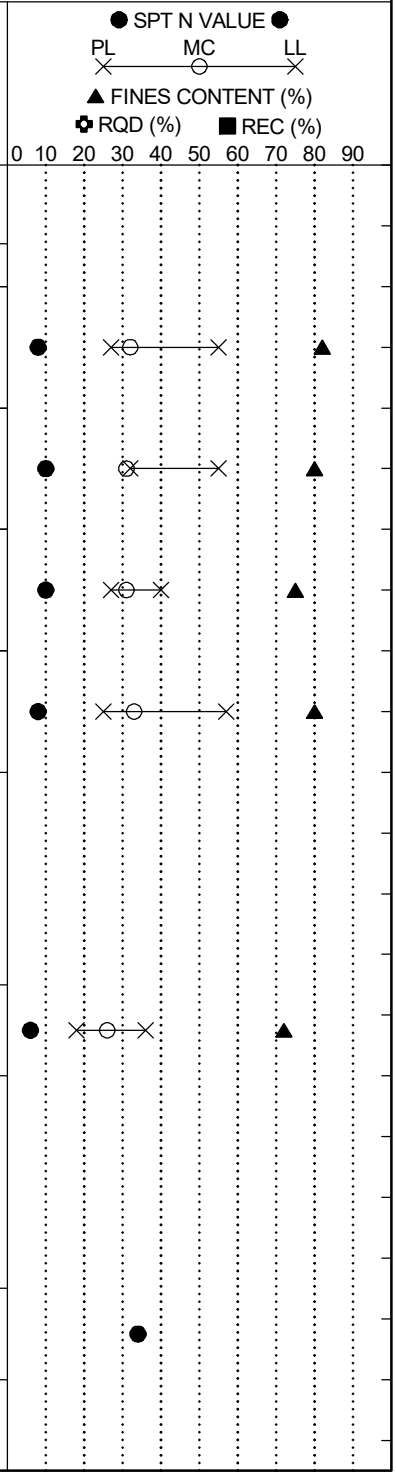
SECTION 4 GEOTECHNICAL EXPLORATION LOGS

SECTION 4A SOIL BORING LOGS

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	87+90	**Offset:**	60-L	**Alignment:**	I-20 Median
Elev.:	190.7 ft	**Latitude:**	34.02500945	**Longitude:**	-81.12943314	**Date Started:**	5/5/2024
Total Depth:	41.5 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	10 ft	**Date Completed:**	5/5/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	20.2 (Cave@24-HR)	Backfilled

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ASPHALT** (1.3-ft.)							
	1.3	**GABC** (8.5-in.)	1.3						
	2.0	**EXISTING FILL** Firm, Moist, Strong Brown, High Plasticity, Fat CLAY (CH/A-7-6) with Sand, 7.5YR5/8	2.0	SS-1	2	7			
		@SS-2: LL=55, PL=27, PI=28, NC=32.1%, %200=81.5		SS-2	3	4	4	7	8
	4.0		4.0						
185.7		Stiff, Moist, Strong Brown, High Plasticity, Elastic SILT (MH/A-7-5) with Sand, 7.5YR5/8		SS-3	4	4	6	5	10
	6.0	@SS-3: LL=55, PL=32, PI=23, NMC=31.1%, %200=79.7	6.0						
		Stiff, Moist, Strong Brown, Medium Plasticity, SILT (ML/A-6) with Sand, 7.5YR5/8		SS-4	3	4	6	5	10
	8.0	@SS-4: LL=40, PL=27, PI=13, NMC=30.5%, %200=74.7	8.0						
		@6.7-ft.: Brown, 7.5YR5/4		SS-5	3	4	4	4	8
180.7		Firm, Moist, Strong Brown, High Plasticity, Fat CLAY (CH/A-7-6) with Sand, 7.5YR4/6							
		@SS-5: LL=57, PL=25, PI=32, NMC=32.8%, %200=80.0							
	12.0	**ALLUVIUM (HOLOCENE)**							
		Firm, Moist, Brown, Medium Plasticity, Lean CLAY (CL/A-6) with Sand, 7.5YR5/4	13.5						
		@SS-6: LL=36, PL=18, PI=18, NMC=25.5%, %200=72.3		SS-6	2	3	3		6
175.7									
	18.5		18.5						
	19.3	Hard, Moist, Gray, Low Plasticity to Medium Plasticity, Lean CLAY (CL/A-6), 7.5YR5/1		SS-7	4	16	18		34
170.7		**PIEDMONT RESIDUUM** Hard, Moist, Brown, Low Plasticity to Medium Plasticity, SILT (ML/A-4), 7.5YR5/3							



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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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	87+90	**Offset:**	60-L	**Alignment:**	I-20 Median
Elev.:	190.7 ft	**Latitude:**	34.02500945	**Longitude:**	-81.12943314	**Date Started:**	5/5/2024
Total Depth:	41.5 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	10 ft	**Date Completed:**	5/5/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	20.2 (Cave@24-HR)	Backfilled

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5	Medium Dense, Moist, Gray, Non-Plastic to Low Plasticity, Fine to Medium Poorly Graded SAND (SP-SM/A-3) with Silt, 2.5YR5/1		23.5	SS-8	8	8	12		20
165.7	28.5	Hard, Moist, Dark Gray, Non-Plastic SILT (ML/A-4) with Sand & Trace Gravel, 7.5YR4/1		28.5	SS-9	50/5"				100+
160.7	31.5	@31.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		31.5	SS-10	50/0.5"				100+
		PHYLLITE		31.5						
		Metamorphic, Black, Very Fine Grained, Laminated, Quartz/Feldspar/Pyrite/Mica/Iron Oxide, Moderate to Severely Weathered, Medium Strong Rock, Numerous Joints Dip from 15° to 90°, J/Fo/V, M/N, Su/Fi/Cl/Fe/Py/Qz, Pl/St, VC, SR, %REC=92, %RQD=43, 2.6 min/ft., GSI=20-30, RMR=35, Class IV, Ultra #8 Bit			NQ-1					
155.7		@NQ-2: Pl/Lr, S/SR, %REC=92, %RQD=78, GSI=35-45, RMR=46, Class III, 2.2 min/ft., q_u=6,840 psi		36.5						
					NQ-2					
150.7	41.5	Boring Terminated at 41.5-ft. Below the Existing Ground Surface in Bedrock.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

LEGEND

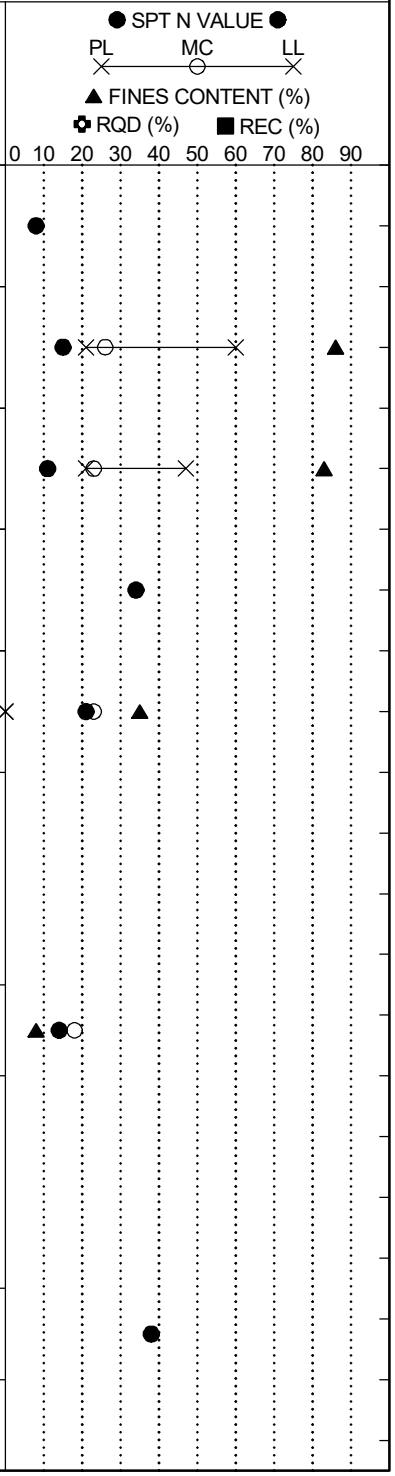
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	88+60	**Offset:**	89-R	**Alignment:**	I-20 Median
Elev.:	177.2 ft	**Latitude:**	34.02486204	**Longitude:**	-81.12891973	**Date Started:**	3/20/2024
Total Depth:	41.5 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	10 ft	**Date Completed:**	3/20/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE	**24HR**	7(Cave@18)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0		0.0						
	0.1	TOPSOIL							
		EXISTING FILL							
		Firm, Moist, Yellow/ Brown/ Reddish Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), 10YR7/6 & 7.5YR4/3 & 5YR3/4							
	2.0	**ALLUVIUM (HOLOCENE)**	2.0	SS-1	4	4	4	5	8
		Stiff, Moist, Reddish Yellow/ Very Pale Brown, High Plasticity, Fat CLAY (CH/A-7-6), 5YR6/6 & 10YR7/4		SS-2	4	7	8	9	15
	4.0	@SS-2: LL=60, PL=21, PI=39, NMC=26.3%, %200=86.3	4.0	SS-3	3	4	7	9	11
172.2	6.0	Stiff, Moist, Gray/ Strong Brown, High Plasticity, Lean CLAY (CL/A-6) with Sand,5Y6/1 & 7.5YR5/6	6.0	SS-4	8	15	19	19	34
		@SS-3: LL=47, PL=21, PI=26, NMC=23.1%, %200=82.9	8.0	SS-5	4	8	13	18	21
		PIEDMONT RESIDUUM							
167.2		Dense to Medium Dense, Moist, Gray/ Strong Brown, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), 5Y6/1 & 7.5YR5/6							
		@SS-5: LL=NP, PL=NP, PI=NP, NMC=23.1%, %200=35.2							
	13.0	Medium Dense, Moist, Very Pale Brown, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), 10YR8/4	13.5	SS-6	6	6	8		14
162.2		@SS-6: Wet, Very Pale Brown, 10YR4/4 LL=NP, PL=NP, PI=NP, NMC=18.0%, %200=8.4							
	18.5	Hard, Wet, Light Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), 7.5YR6/4	18.5	SS-6	7	15	23		38
157.2									



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	88+60	**Offset:**	89-R	**Alignment:**	I-20 Median
Elev.:	177.2 ft	**Latitude:**	34.02486204	**Longitude:**	-81.12891973	**Date Started:**	3/20/2024
Total Depth:	41.5 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	10 ft	**Date Completed:**	3/20/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE	**24HR**	7(Cave@18)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5	Very Dense, Dry, Light Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), 7.5YR6/4	23.5	SS-7	27	50/4"			77+
152.2									
	28.5	@SS-9: with Gravel	28.5	SS-8	50/1.5"				100+
147.2									
	31.5	@31.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.	31.5	SS-9	50/0.3"				100+
		PHYLLITE/QUARTZ Metamorphic, Dark Bluish Gray, Coarse Grained to Very Fine Grained, Laminated to Thinly Laminated, Quartz/ Feldspar/ Mica, Moderately to Completely Weathered, Strong Rock, Numerous Joints Dip From 20° to 65°, J, M/N, Sp/Fi, Ch/Py, Wa/Ir, VC, SR/R, %REC=61, %RQD=34, RMR=23, GSI=20-30, Class IV, 3.4 min/ft, q_u=7,220 psi, Ultra #8 Bit	31.5	NQ-1					
142.2									
		@NQ-2: Moderately to Highly Weathered, Numerous Joints Dip From 20° to 85°, Wa/Pl/St/Ir, %REC=93, %RQD=19, RMR=18, GSI=25-35, Class V, 3.6 min/ft	36.5	NQ-2					
137.2									
	41.5	Boring Terminated at 41.5-ft. Below the Existing Ground Surface in Bedrock.							

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	91+36	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	192.4 ft	**Latitude:**	34.02567278	**Longitude:**	-81.12861274	**Date Started:**	5/6/2024
Total Depth:	66 ft	**Soil Depth:**	13 ft	**Core Depth:**	20 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	0.0						
	0.7	**CONCRETE BRIDGE DECK** (8.0-in.)					
		AIR GAP (15.0-ft.)					
187.4							
182.4							
	15.0 ▽	WATER (18.0-ft.)					
177.4							
172.4							

SPT N VALUE ● PL × MC ○ LL ×
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	91+36	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	192.4 ft	**Latitude:**	34.02567278	**Longitude:**	-81.12861274	**Date Started:**	5/6/2024
Total Depth:	66 ft	**Soil Depth:**	13 ft	**Core Depth:**	20 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
167.4									
162.4									
	33.0	**PIEDMONT RESIDUUM** Medium Dense, Wet, Brown, Non-Plastic, Silty GRAVEL (GM/A-1-b) with Sand, 7.5YR4/2	33.0	SS-1	3	7	16	10	23
157.4	35.0	@SS-1: LL=NP, PL=NP, PI=NP, NMC=17.3%, %200=17.6 Medium Dense to Dense, Gray, Low Plasticity, Silty fine to Coarse SAND (SM/A-1-b) with Gravel, 7.5YR5/1	35.0	SS-2	2	14	14	17	28
		@SS-2: LL=22, PL=21, PI=1, NMC=13.5%, %200=20.9	37.0	SS-3	27	12	19	50/3"	31
		@SS-3: Moist, Non-Plastic, (SM/A-2-4) LL=NP, PL=NP, PI=NP, NMC=13.8%, %200=34.7	39.0	SS-4	50/2.5"				100+
152.4		@SS-4: Very Dense, Gray, 7.5YR6/1	41.0	SS-5	50/2"				100+

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	91+36	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	192.4 ft	**Latitude:**	34.02567278	**Longitude:**	-81.12861274	**Date Started:**	5/6/2024
Total Depth:	66 ft	**Soil Depth:**	13 ft	**Core Depth:**	20 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	46.0	@46.0-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.	45.9	SS-6	50/1"	100+
		PHYLLITE Metamorphic, Black, Very Fine Grained, Laminated, Quartz/Feldspar/Pyrite/Mica/Iron Oxide, Slightly to Moderately Weathered, Medium Strong Rock, Numerous Joints Dip from 10° to 45°, J/Fo, M/N, Su/Fi/Cl/Fe/Py/Qz, Pl, VC, S/SR, %REC=86, %RQD=73, GSI=30-40, RMR=42, Class III, 3.0 min/ft., q_u=4,310 psi, Ultra #8 Bit	46.0	NQ-1		
142.4			51.0			
		@NQ-2: Thinly Laminated, Quartz/Feldspar/Pyrite, Numerous Joints Dip from 5° to 50°, N, Su/Fi/Fe/Qz, Pl/St, %REC=100, %RQD=80, GSI=35-45, RMR=46, 2.0 min/ft., q_u=5,010 psi		NQ-2		
137.4			56.0			
		@NQ-3: Laminated, Quartz/Mica/Feldspar/Pyrite, Slightly to Severely Weathered, Poor Rock, Numerous Joints Dip from 25° to 50°, J/Sh/V, M/N, Su/Sp/Fi/Fe/H/Py/Qz, Pl/Ir, %REC=91, %RQD=50, GSI=32-42, RMR=33, Class IV, 3.2 min/ft.		NQ-3		
132.4						
	61.0	**PHYLLITE/QUARTZ** Metamorphic, Gray/Pink, Fine to Coarse Grained, Laminated/Masively Foliated, Quartz/Feldspar/Mica/Pyrite, Moderate to Severely weathered, Numerous Joints Dip from 40° to 90°, J/Fo/V, M/N, Su/Sp/Fi/Fspar/Py/Qz, Pl/Lr, VC, S/SR, %REC=96, %RQD=0, GSI=5-15, RMR=20, Class V, 3.0 min/ft., Ultra #8 Bit	61.0	NQ-4		
127.4						
	66.0	Boring Terminated at 66.0-ft. Below the Existing Bridge Deck Surface in Bedrock.				

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B4		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	94+90	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	197.5 ft	**Latitude:**	34.02619071	**Longitude:**	-81.12758027	**Date Started:**	4/17/2024
Total Depth:	61.8 ft	**Soil Depth:**	33.3 ft	**Core Depth:**	20 ft	**Date Completed:**	4/17/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 11 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.7	**CONCRETE BRIDGE DECK** (8.0-in.)								
		AIR GAP (7.5-ft.)								
192.5										
	8.5	**EXISTING FILL**		8.5						
		Loose, Dry, Reddish Yellow, Medium Plasticty, Clayey Fine to Coarse SAND (SC/A-6), with Trace Gravel (Quartz), 7.5YR7/6			SS-1	2	4	6	6	10
187.5	10.5	@SS-1: LL=40, PL=22, PI=18, NMC=9.4%, %200=45.9		10.5	SS-2	6	7	8	8	15
		Stiff to Firm, Dry, Reddish Yellow, High Plasticity, Sandy Lean CLAY (CL/A-7-6), with Trace Gravel (Quartz), 7.5YR6/6		12.5	SS-3	8	6	5	5	11
		@SS-3: Reddish Yellow, 7.5YR7/6 LL=41, PL=18, PI=23, NMC=12.0%, %200=56.3		14.5	SS-4	14	7	6	6	13
182.5		@SS-4: Moist to Dry, Yellowish Red, 5YR5/6		16.5	SS-5	5	5	5	5	10
		@SS-5: Wet, Yellowish Red, (CL/A-6), 5YR5/8 LL=40, PL=17, PI=23, NMC=27.4%, %200=68.1								
177.5	21.0									

SPT N VALUE ● PL × MC ○ LL × ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B4		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	94+90	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	197.5 ft	**Latitude:**	34.02619071	**Longitude:**	-81.12758027	**Date Started:**	4/17/2024
Total Depth:	61.8 ft	**Soil Depth:**	33.3 ft	**Core Depth:**	20 ft	**Date Completed:**	4/17/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 11 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		ALLUVIUM (HOLOCENE)		22.0						
		Stiff, Wet, Yellowish Red, High Plasticity, Sandy Lean CLAY (CL/A-6), 5YR5/8			SS-6	2	3	3		6
		@SS-6: Moist to Wet, with Talc & Reduced Gravel Content								
172.5										
	27.0			27.0						
		Firm, Moist to Wet, Dark Gray, Non-Plastic, SILT (ML/A-4) with Sand, 5Y4/1			SS-7	2	3	4		7
		@SS-7: LL=NP, PL=NP, PI=NP, NMC=29.1%, %200=84.9								
167.5										
				32.0						
		@SS-8:Light Olive Brown, 2.5Y5/3			SS-8	3	2	3		5
162.5										
	37.0			37.0						
		PIEDMONT RESIDUUM								
		Medium Dense, Moist to Wet, Very Dark Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), 2.5Y3/1			SS-9	1	1	14		15
		@SS-9: LL=NP, PL=NP, PI=NP, NMC=33.4%, %200=42.7								
157.5										
	41.8			41.8						
		@41.8-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		41.8	SS-10	50/0.5"				100+

SPT N VALUE ● PL × MC ○ LL × ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

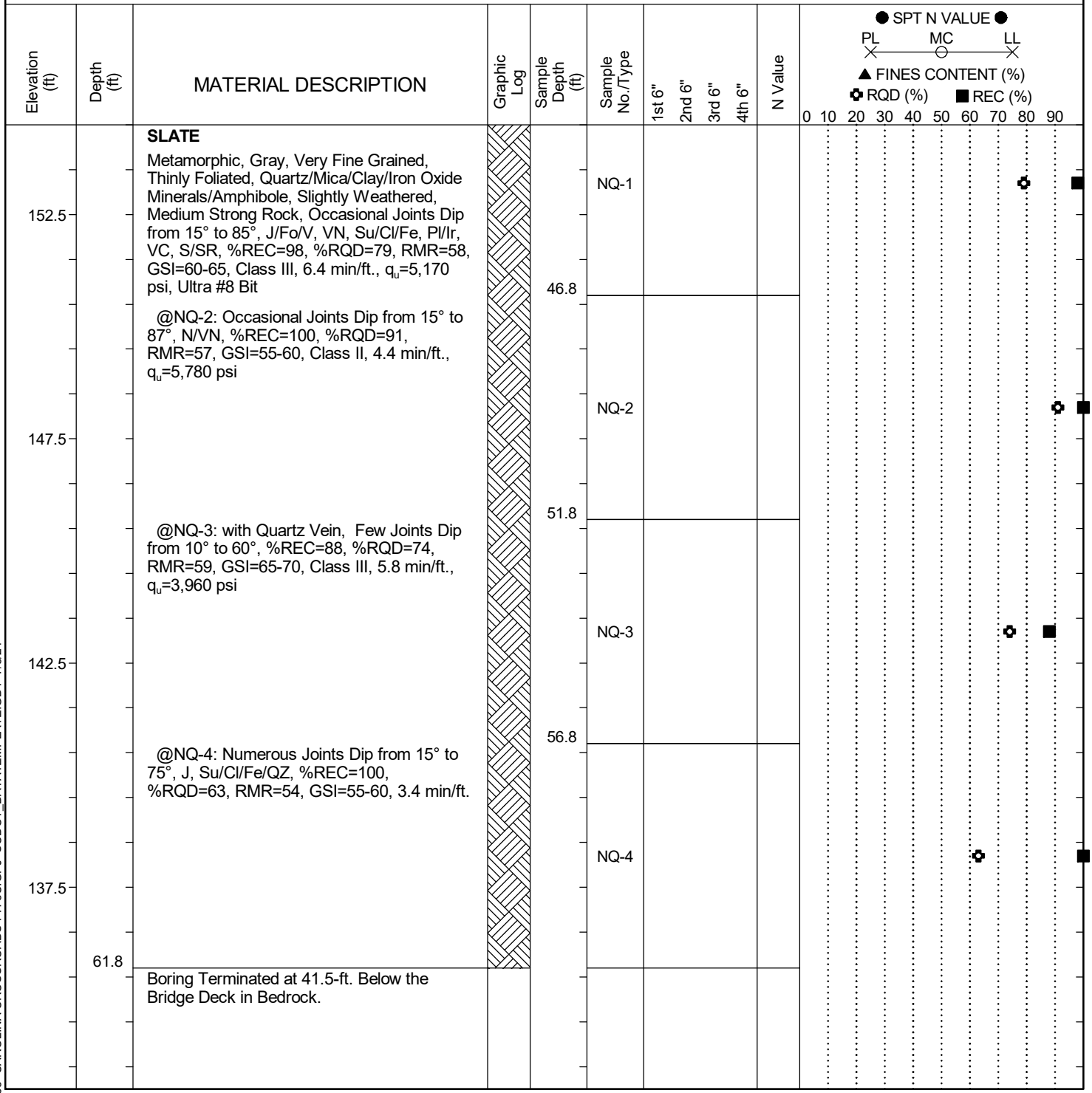
LEGEND

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B4		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	94+90	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	197.5 ft	**Latitude:**	34.02619071	**Longitude:**	-81.12758027	**Date Started:**	4/17/2024
Total Depth:	61.8 ft	**Soil Depth:**	33.3 ft	**Core Depth:**	20 ft	**Date Completed:**	4/17/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 11 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
152.5		**SLATE** Metamorphic, Gray, Very Fine Grained, Thinly Foliated, Quartz/Mica/Clay/Iron Oxide Minerals/Amphibole, Slightly Weathered, Medium Strong Rock, Occasional Joints Dip from 15° to 85°, J/Fo/V, VN, Su/Cl/Fe, Pl/Ir, VC, S/SR, %REC=98, %RQD=79, RMR=58, GSI=60-65, Class III, 6.4 min/ft., q_u=5,170 psi, Ultra #8 Bit			NQ-1		
		@NQ-2: Occasional Joints Dip from 15° to 87°, N/VN, %REC=100, %RQD=91, RMR=57, GSI=55-60, Class II, 4.4 min/ft., q_u=5,780 psi		46.8	NQ-2		
147.5							
		@NQ-3: with Quartz Vein, Few Joints Dip from 10° to 60°, %REC=88, %RQD=74, RMR=59, GSI=65-70, Class III, 5.8 min/ft., q_u=3,960 psi		51.8	NQ-3		
142.5							
		@NQ-4: Numerous Joints Dip from 15° to 75°, J, Su/Cl/Fe/QZ, %REC=100, %RQD=63, RMR=54, GSI=55-60, 3.4 min/ft.		56.8	NQ-4		
137.5							
	61.8	Boring Terminated at 41.5-ft. Below the Bridge Deck in Bedrock.					



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+83	**Offset:**	48-L	**Alignment:**	I-20 Median
Elev.:	213.2 ft	**Latitude:**	34.02752332	**Longitude:**	-81.12641358	**Date Started:**	4/23/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/23/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	35(Cave@77?)	**24HR** N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**CONCRETE BRIDGE DECK** (13.0-in.)								
	1.1			1.3						
	1.3	AIR GAP (2.5-in.)			SS-1	2	9			
	2.0	**EXISTING FILL**		2.0						
		Loose, Moist, Grayish Brown, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), 10Y5/2			SS-2	6	4	5	4	9
				4.0						
208.2		Loose, Moist, Reddish Yellow/Red, High Plasticity, Clayey Fine to Coarse SAND (SC/A-7-6), with Trace Gravel (Quartz), 7.5YR8/6 & 2.5YR4/8			SS-3	5	4	4	4	8
	6.0	@SS-2: LL=45, PL=16, PI=29, NMC=12.4%, %200=45.7		6.0						
		@SS-3: Light Reddish Brown, 2.5YR7/4			SS-4	1	2	4	4	6
		Firm, Moist, Red, Low Plasticity, Sandy SILT (ML/A-4), 2.5YR5/6								
	8.0	@SS-4: LL=34, PL=25, PI=9, NMC=21.4%, %200=66.5		8.0	SS-5	5	6	7	7	13
203.2		Firm, Moist, Red, High Plasticity, Sandy Lean CLAY (CL/A-6), 2.5YR5/6								
		@SS-5: LL=40, PL=19, PI=21. NMC=18.3%, %200=66.6								
	13.5			13.5						
		Stiff to Very Stiff, Moist, Yellowish Red, Medium Plasticity, Sandy SILT (ML/A-6), Laminated, 5YR5/6			SS-6	3	5	7	7	12
198.2		@SS-6: LL=37, PL=26, PI=11, NMC=13.2%, %200=58.3								
				18.5						
		@SS-7: Red, with Trace Gravel & Partially Cemented Lenses, 10R4/8			SS-7	5	8	9		14
193.2										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+83	**Offset:**	48-L	**Alignment:**	I-20 Median
Elev.:	213.2 ft	**Latitude:**	34.02752332	**Longitude:**	-81.12641358	**Date Started:**	4/23/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/23/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	35(Cave@77)	**24HR** N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5	Very Stiff, Moist, Yellowish Red, Non-Plastic, SILT (ML/A-4), 5YR5/6		23.5	SS-8	7	9	9		18
188.2		@SS-8: LL=NP, PL=NP, PI=NP, NMC=33.4%, %200=86.8								
		@SS-9: Red, 2.5YR4/6		28.5	SS-9	4	5	8		13
183.2	31.0	**ALLUVIUM (HOLOCENE)** Firm, Moist, Red, Non-Plastic, SILT (ML/A-4), 2.5YR4/6								
		@SS-10: Yellowish Red/Gray, 5YR5/6 & 2.5Y6/1		33.5	SS-10	3	3	3		6
178.2		▽								
	38.5	Firm, Moist, Reddish Brown, Medium Plasticity, SILT (ML/A-7-6) with Sand & Trace Gravel, 5YR4/4		38.5	SS-11	1	2	3		5
173.2		@SS-11: LL=45, PL=29, PI=16, NMC=27.7%, %200=74.0								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+83	**Offset:**	48-L	**Alignment:**	I-20 Median
Elev.:	213.2 ft	**Latitude:**	34.02752332	**Longitude:**	-81.12641358	**Date Started:**	4/23/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/23/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	35(Cave@77?)	**24HR** N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	43.5			43.5						
		Stiff, Moist, Light Olive Brown/Gray, Mottled, High Plasticity, Fat CLAY (CH/A-7-6), with Trace Organics (Tree Root), 2.5Y5/6 & N6/			SS-12	3	4	6		10
168.2		@SS-12: LL=56, PL=25, PI=31, NMC=26.9%, %200=84.3								
	48.5			48.5						
		PIEDMONT RESIDUUM								
		Dense to Very Dense, Moist, Yellowish Brown, Non-Plastic, Silty Fine to Medium SAND (SM/A-4), 10YR5/4			SS-13	9	10	30		40
163.2										
				53.5						
					SS-14	8	7	14		21
158.2										
				58.5						
		@SS-15: Gray/Strong Brown, with Vertical Laminations, 5Y6/1 & 7.5YR5/8			SS-15	6	5	10		15
153.2		LL=NP, PL=NP, PI=NP, NMC=28.8%, %200=37.4								
				63.5						
		@SS-16: Gray, 5Y6/1			SS-16	50/2"				100+

SPT N VALUE ● PL × MC ○ LL ×
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+83	**Offset:**	48-L	**Alignment:**	I-20 Median
Elev.:	213.2 ft	**Latitude:**	34.02752332	**Longitude:**	-81.12641358	**Date Started:**	4/23/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/23/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	35(Cave@77)**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
148.2				68.5	SS-17	50/5"	100+
143.2							
	73.5	@SS-18: Dark Gray, 5Y4/1 @73.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		73.5 73.5	SS-18	50/0.8"	100+
138.2		**CLORITE/PHYLLITE** Metamorphic, Gray/Green, Very Fine Grained, Thinly Foliated, Quartz/Chlorite/Amphiboles/Clay/Iron Oxide Minerals, Weak Rock, Numerous Joints Dip from 10° to 89°, J/Fo/V, VN, Su/Cl/Fe/Qz, Pl/Ir, VC, S, %REC=98, %RQD=81, RMR=56, GSI=60-65, Class III, 3.0 min/ft., Ultra #8 bit			NQ-1		
		@NQ-2.1: Occasional Joints Dip from 5° to 65°, Su/Fe/Limonite, %REC=100, %RQD=87, RMR=66, GSI=70-75, Class II, 3.2 min/ft., q_u=1,930 psi		78.5	NQ-2.1		
133.2		@NQ-2.2: RMR=66, q_u=2,300 psi		82.0	NQ-2.2		
	83.5	Boring Terminated at 83.5-ft. Below the Existing Ground Surface in Bedrock.					
128.2							

SPT N VALUE: PL, MC, LL
FINES CONTENT (%)
RQD (%)
REC (%)
0 10 20 30 40 50 60 70 80 90

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B6		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	101+41	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	215.0 ft	**Latitude:**	34.02746596	**Longitude:**	-81.1260731	**Date Started:**	4/18/2024
Total Depth:	76.5 ft	**Soil Depth:**	58 ft	**Core Depth:**	10 ft	**Date Completed:**	4/24/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** Cave@33	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**CONCRETE BRIDGE DECK** (11.0-in.)								
	0.9	AIR GAP (7.6-ft.)								
210.0										
	8.5	**EXISTING FILL**		8.5						
		Stiff, Dry, Reddish Yellow, Non-Plastic, Sandy SILT (ML/A-4), with Trace Gravel (Quartz), 5YR6/6			SS-1	2	6	9	11	15
205.0	10.5	Very Stiff to Stiff, Dry, Red, Medium Plasticity, SILT (ML/A-6) with Sand & Trace Gravel, 2.5YR5/8		10.5	SS-2	10	9	8	8	17
		@SS-2: LL=39, PL=26, PI=13, NMC=13.0%, %200=70.6		12.5	SS-3	6	5	6	7	11
	14.5	@SS-3: Light Reddish Brown, 2.5YR7/4		14.5						
200.0		Stiff to Very Stiff, Moist to Dry, Strong Brown, Low Plasticity, Sandy SILT (ML/A-4), 7.5YR5/6			SS-4	2	4	6	5	10
		@SS-4: LL=35, PL=26, PI=9, NMC=14.9%, %200=52.5		16.5	SS-5	5	6	9	10	15
		@SS-5: Reddish Yellow, 7.5YR7/6 LL=30, PL=27, PI=3, NMC=12.1%, %200=57.2								
195.0										
				22.0						
		@SS-6: Reddish Brown, 5YR5/4 LL=31, PL=26, PI=5, NMC=18.9%, %200=61.3			SS-6	4	8	14		22
190.0										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B6		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	101+41	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	215.0 ft	**Latitude:**	34.02746596	**Longitude:**	-81.1260731	**Date Started:**	4/18/2024
Total Depth:	76.5 ft	**Soil Depth:**	58 ft	**Core Depth:**	10 ft	**Date Completed:**	4/24/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** Cave@33	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	27.0	Very Stiff, Moist, Yellowish Red, Medium Plasticity, Sandy Lean CLAY (CL/A-6) with Trace Gravel, 5YR5/6		27.0	SS-7	6	10	15		25
185.0		@SS-7: LL=37, PL=21, PI=16, NMC=18.8%, %200=56.9								
		@SS-8: Red/White, with Trace Organics (Roots) & 3.0-in. Kaolin Bed, 2.5YR4/8 & 2.5YR8/1		32.0	SS-8	4	8	9		17
180.0										
	37.0	**ALLUVIUM (HOLOCENE)** Loose, Moist, Strong Brown, Medium Plasticity, Clayey Fine to Medium SAND (SC/A-6), 7.5YR5/6		37.0	SS-9	2	3	3		6
175.0		@SS-9: LL=35, PL=24, PI=11, NMC=19.9%, %200=48.0								
		@SS-10: Moist to Wet, Black, 7.5YR2.5/1		42.0	SS-10	3	4	5		9
170.0										
		@SS-11: Gray, 5Y6/1		47.0	SS-11	1	4	4		8
165.0										
	52.0			52.0						

SPT N VALUE ● PL × MC ○ LL × ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B6		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	101+41	**Offset:**	40-R	**Alignment:**	I-20 Median
Elev.:	215.0 ft	**Latitude:**	34.02746596	**Longitude:**	-81.1260731	**Date Started:**	4/18/2024
Total Depth:	76.5 ft	**Soil Depth:**	58 ft	**Core Depth:**	10 ft	**Date Completed:**	4/24/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** Cave@33	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
215.0		**PIEDMONT RESIDUUM**								
		Very Stiff to Hard, Moist, Yellow/Black, Non-Plastic, Sandy SILT (ML/A-4) with Partially Cemented Lenses, Laminated, 10YR7/8 & 10YR2/1			SS-12	6	12	14		26
160.0		@SS-12: LL=NP, PL=NP, PI=NP, NMC=20.5%, %200=51.7								
		@SS-13: Gray, 5Y6/1		57.0	SS-13	13	9	16		25
155.0										
				62.0	SS-14	50/4"				100+
150.0										
	66.5	@66.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		66.5	SS-15	50/0.5"				100+
		PHYLLITE		66.5						
		Metamorphic, Gray, Very Fine Grained, Thinly Foliated, Quartz/Mica, Slightly Weathered, Weak Rock, Few Joints Dip from 20° to 30°, J/Fo, N, Su/No/Cl/Fe/No, Pl, VC, S, %REC=67, %RQD=63, RMR=52, GSI=65-70, Class III, 2.4 min/ft., q_u=2110 psi, Ultra #8 Bit			NQ-1					
145.0				71.5						
		@NQ-2: Few Joints Dip from 20° to 50°, Su/Cl/Fe/No, %REC=100, %RQD=100, RMR=69, GSI=75-80, Class II, 2.6 min/ft.			NQ-2					
140.0										
	76.5	Boring Terminated at 76.5-ft. Below the Existing Bridge Deck Surface in Bedrock.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

LEGEND

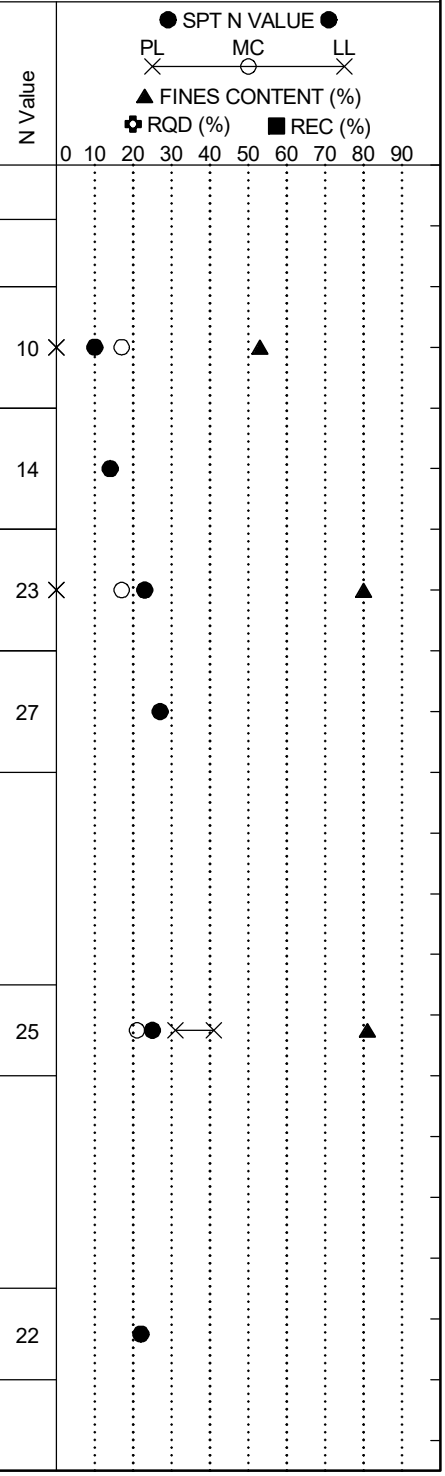
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B7		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	103+43	**Offset:**	50-R	**Alignment:**	I-20 Median
Elev.:	218.9 ft	**Latitude:**	34.02784566	**Longitude:**	-81.12558276	**Date Started:**	4/21/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/22/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 18(Cave@48)	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ASPHALT** (11.0-in.)							
	0.9	**EXISTING FILL**	0.9						
		Firm, Moist, Red, Non-Plastic to Low Plasticity, SILT (ML/A-4), 2.5YR5/8		SS-1	7	8			
	2.0	Stiff, Moist, Red/ Dark Yellowish Brown,Non-Plastic, Sandy SILT (ML/A-4), 10R5/6 & 10YR4/6	2.0	SS-2	3	6	4	6	10
		@SS-2: LL=NP, PL=NP, PI=NP, NMC=16.6%, %200=53.3	4.0						
213.9		@SS-3: Yellowish Red, 5YR4/6		SS-3	6	6	8	11	14
	6.0	**PIEDMONT RESIUDUUM**	6.0						
		Very Stiff to Hard, Moist, Yellowish Red/ Red, Non-Plastic to Low Plasticity, SILT (ML/A-4) with Sand & Trace Gravel (Quartz), Laminated, 5YR4/6 & 10R5/6		SS-4	10	10	13	18	23
		@SS-4: LL=NP, PL=NP, PI=NP, NMC=17.3%, %200=79.9	8.0						
		@SS-5: Dark Yellowish Brown/ Red, Reduced Gravel Content, 10YR4/6 & 10R5/8		SS-5	8	12	15	19	27
208.9									
			13.5						
		@SS-6: Red/ Yellowish Brown, Low Plasticity, (ML/A-5), 2.5YR4/6 & 10YR5/8		SS-6	7	12	13		25
		LL=41, PL=31, PI=10, NMC=20.5%, %200=80.7							
203.9									
			18.5						
		@SS-7: Pale Red/ Yellowish Brown/ Red, with Trace Gravel (Quartz), 10R6/4 & 10YR5/8 & 2.5YR4/6		SS-7	5	10	12		22
198.9									



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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-B7		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	103+43	**Offset:**	50-R	**Alignment:**	I-20 Median
Elev.:	218.9 ft	**Latitude:**	34.02784566	**Longitude:**	-81.12558276	**Date Started:**	4/21/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/22/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 18(Cave@48)	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5	Very Stiff to Hard, Moist, Red, Low Plasticity, Sandy SILT (ML/A-4), 10R4/6		23.5	SS-8	6	11	15		26
193.9		@SS-8: LL=35, PL=28, PI=7, NMC=24.5%, %200=65.2								
				28.5	SS-9	11	18	28		46
		@SS-9: Greenish Gray/Yellowish Brown, Micaceous, 10GY6/1 & 10YR5/6								
188.9										
				33.5	SS-10	7	15	25		40
183.9										
	38.5	Very Stiff to Hard, Moist, Brownish Yellow, Low Plasticity, SILT (ML/A-4) with Sand, 10YR6/8		38.5	SS-11	6	8	17		25
178.9		@SS-11: LL=40, PL=32, PI=8, NMC=26.7%, %200=71.3								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B7		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	103+43	**Offset:**	50-R	**Alignment:**	I-20 Median
Elev.:	218.9 ft	**Latitude:**	34.02784566	**Longitude:**	-81.12558276	**Date Started:**	4/21/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/22/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 18(Cave@48)	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				43.5						
		@SS-12: Moist to Wet, Greenish Gray, 5GY5/1			SS-12	11	34	56		84
173.9										
				48.5						
		@SS-13: Brownish Yellow/Black, 10YR6/8 & 10YR2/1			SS-13	14	34	49		83
168.9										
				53.5						
		@SS-14: Light Gray/Brownish Yellow, 10YR7/1 & 10YR6/8			SS-14	22	25	46		71
163.9										
				58.5	SS-15	50/3.5"				100+
		@SS-15: Moist, Greenish Gray, 10Y6/1								
158.9										
				63.5	SS-16	50/3.5"				100+

SPT N VALUE
PL MC LL
FINES CONTENT (%)
RQD (%) REC (%)
0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-B7		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	103+43	**Offset:**	50-R	**Alignment:**	I-20 Median
Elev.:	218.9 ft	**Latitude:**	34.02784566	**Longitude:**	-81.12558276	**Date Started:**	4/21/2024
Total Depth:	83.5 ft	**Soil Depth:**	73.5 ft	**Core Depth:**	10 ft	**Date Completed:**	4/22/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 18(Cave@48)	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
153.9										
				68.5	SS-17	50/1.5"				100+
148.9										
	73.5	@SS-18: Dark Greenish Gray, 10Y4/1 @73.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		73.4 73.5	SS-18	50/1"				100+
143.9		**PHYLLITE** Metamorphic, Gray, Very Fine Grained, Thinly Foliated, Quartz/Mica/Pyrite, Slightly Weathered, Weak Rock, Numerous Joints Dip from 50° to 90°, J/Fo, N, Su/No/Cl/Fe/No, Pl, VC S, %REC=77, %RQD=62, RMR=52, GSI=60-65, Class III, 2.8 min/ft., Ultra #8 bit			NQ-1					
		@NQ-2: Numerous Joints dip from 60° to 90°, %REC=72, %RQD=47, RMR=47, GSI=60-65, 2.6 min/ft.		78.5						
138.9					NQ-2					
	83.5	Boring Terminated at 83.5-ft. Below the Existing Ground Surface in Bedrock.								
133.9										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 7/8/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-W1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	34+72	**Offset:**	61-R	**Alignment:**	I-20 Median
Elev.:	334.0 ft	**Latitude:**	34.01442692	**Longitude:**	-81.14156777	**Date Started:**	4/9/2024
Total Depth:	66.5 ft	**Soil Depth:**	66.5 ft	**Core Depth:**	0 ft	**Date Completed:**	4/9/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE	**24HR**	NE

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ASPHALT** (10.5-in.)							
	0.9	**EXISTING FILL**	0.9						
	2.0	Very Soft, Moist, Light Brown, Non-Plastic to Low Plasticity, SILT (ML/A-4) with Sand, 7.5YR6/4	2.0	SS-1	3	2			
	4.0	Stiff, Moist, Reddish Brown/ Very Pale Brown, High Plasticity, Lean CLAY (CL/A-4), 5YR5/4 & 10YR8/4	4.0	SS-2	4	6	7	9	13
329.0		@SS-2: LL=39, PL=15, PI=24, NMC=13.7%, %200=95.3		SS-3	6	6	5	7	11
	6.0	Stiff, Moist, Light Brown, High Plasticity, Lean CLAY (CL/A-7-6) with Sand, 7.5YR6/4	6.0	SS-4	5	8	10	11	18
		@SS-3: LL=45, PL=19, LL=26, NMC=14.6%, %200=82.2							
	8.0	Medium Dense, Moist, Reddish Yellow/ Very Pale Brown, Medium Plasticity, Clayey Fine to Coarse SAND (SC/A-2-6), 7.5YR7/6 & 10YR8/4	8.0	SS-5	5	8	9	12	17
324.0		@SS-4: LL=34, PL=21, PI=13, NMC=18.3%, %200=32.7							
		Medium Dense, Moist, Reddish Yellow/ Pale Red, Low Plasticity, Silty Fine to Coarse SAND (SM/A-4), 5YR6/6 & 7.5YR5/4							
	13.5	@SS-5: LL=32, PL=26, PI=6, NMC=22.0%, %200=38.2	13.5	SS-6	4	5	7		12
		PIEDMONT RESIDUUM							
319.0		Stiff, Moist, Pink/ Pale Red, Medium Plasticity, Sandy Lean CLAY (CL/A-6), 7.5YR8/3 & 7.5YR6/2							
		@SS-6: LL=35, PL=22, PI=13, NMC=21.3%, %200=63.8	18.5	SS-7	29		50/5.5"		100+
		@SS-7: Hard, Mostly Organics (9-in. Piece of Wood)							
314.0									

SPT N VALUE ● PL × MC ○ LL ×
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

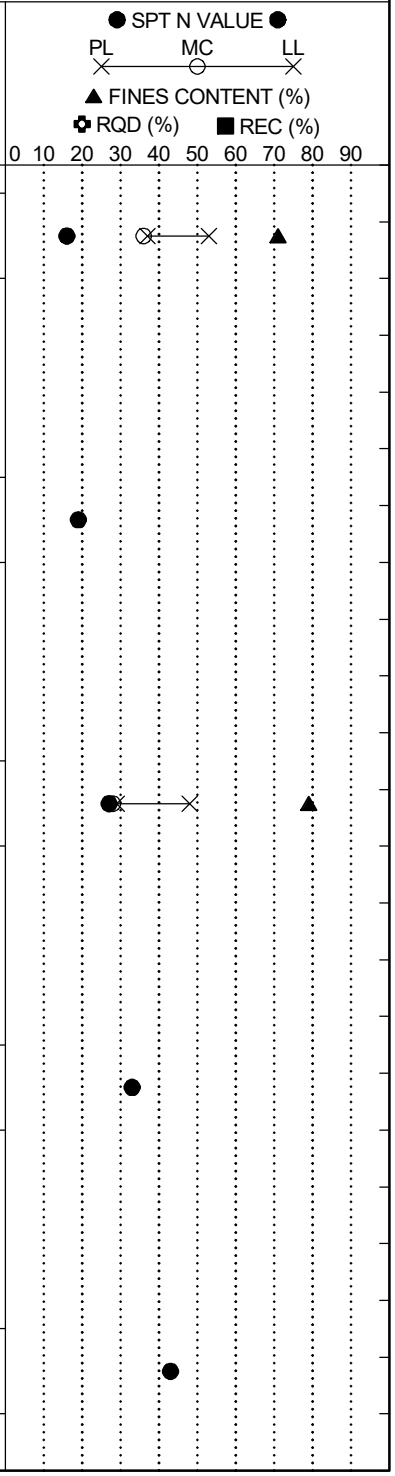
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/12/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-W1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	34+72	**Offset:**	61-R	**Alignment:**	I-20 Median
Elev.:	334.0 ft	**Latitude:**	34.01442692	**Longitude:**	-81.14156777	**Date Started:**	4/9/2024
Total Depth:	66.5 ft	**Soil Depth:**	66.5 ft	**Core Depth:**	0 ft	**Date Completed:**	4/9/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE	**24HR**	NE

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5			23.5						
309.0		Very Stiff, Moist, Brown, Medium Plasticity, Elastic SILT (MH/A-7-6) with Sand, 10YR5/3 @SS-8: LL=53, PL=37, PI=16, NMC=36.4%, %200=71.1			SS-8	4	6	10		16
	28.5			28.5						
		@SS-9: No Recovery			SS-9	8	9	10		19
304.0										
	33.5			33.5						
		Very Stiff, Moist, Very Dark Gray, Medium Plasticity, SILT (ML/A-7-6) with Sand, 5Y3/1 @SS-10: LL=48, PL=29, PI=19, NMC=27.5%, %200=79.2			SS-10	6	10	17		27
299.0										
	38.5			38.5						
		Dense, Moist, Reddish Yellow/ Dark Reddish Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), 7.5YR6/6 & 5YR3/2			SS-11	4	7	26		33
294.0										
	43.5			43.5						
		Hard, Moist, Gray/ Reddish Yellow, Non-Plastic to Low Plasticity, SILT (ML/A-4) with Sand & Trace Gravel, 7.5YR5/1 & 7.5YR6/6			SS-12	8	17	26		43
289.0										



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-W1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	34+72	**Offset:**	61-R	**Alignment:**	I-20 Median
Elev.:	334.0 ft	**Latitude:**	34.01442692	**Longitude:**	-81.14156777	**Date Started:**	4/9/2024
Total Depth:	66.5 ft	**Soil Depth:**	66.5 ft	**Core Depth:**	0 ft	**Date Completed:**	4/9/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE	**24HR**	NE

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				48.5						
		@SS-13: Strong Brown, Reduced Gravel Content			SS-13	9	16	19		35
284.0										
	53.5			53.5						
		Hard, Moist, Strong Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), 7.5YR5/6			SS-14	12	22	23		45
279.0										
				58.5						
		@SS-15: Brown/ Dark Gray, 7.5YR4/4 & 5Y4/1			SS-15	8	21	22		43
274.0										
				63.5						
		@SS-16: Gray, 2.5Y5/1			SS-16	6	22	50/5"		100+
269.0										
	66.5			66.5	~~SS-17~~	~~50/0"~~				~~100+~~
		Boring Terminated at 66.5-ft. Below the Existing Ground Surface.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

>> >>

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/12/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-W2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	37+59	**Offset:**	88-R	**Alignment:**	I-20 Median
Elev.:	318.0 ft	**Latitude:**	34.01487733	**Longitude:**	-81.14077013	**Date Started:**	3/19/2024
Total Depth:	49.4 ft	**Soil Depth:**	49.4 ft	**Core Depth:**	0 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 24.7(Cave@24)	**24HR**	17(Cave@25)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0		0.0	SS-1	1	5	6	4	11
	0.4	**TOPSOIL** (4.0-in.)	2.0	SS-2	2	4	3	3	7
		EXISTING FILL	4.0	SS-3	3	3	5	7	8
		Medium Dense to Loose, Moist, Light Yellowish Brown, Non-Plastic, Fine to Coarse Poorly Graded SAND (SP-SM/A-3) with Silt & Trace Gravel, 10YR6/4	6.0	SS-4	4	9	11	15	20
	4.0	@SS-1: LL=NP, PL=NP, PI=NP, NMC=3.9%, %200=10.0	8.0	SS-5	9	10	14	14	24
313.0		Firm, Moist, Yellowish Red/ Yellow, High Plasticity, Lean CLAY (CL/A-7-6) with Sand, 5YR5/6							
		@SS-4: Very Stiff							
		LL=49, PL=25, PI=24, NMC=24.7%, %200=82.0							
308.0									
	13.5	**PIEDMONT RESIDUUM**	13.5	SS-6	4	5	7		12
		Stiff, Moist, Yellowish Red/ Yellow, Medium Plasticity, Elastic SILT (MH/A-7-5), 5YR5/6							
303.0		@SS-4: LL=60, PL=40, PI=20, NMC=37.8%, %200=94.6							
			18.5	SS-6	8	11	15		26
298.0									
	23.5		23.5	SS-7	6	9	13		22
		Very Stiff, Moist, Greenish Gray/ Strong Non-Plastic to Low Plasticity, SILT (ML/A-4) with Sand, 5GY7/1 & 7.5YR5/6							
293.0									

SPT N VALUE ● PL × MC ○ LL ×
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-W2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	37+59	**Offset:**	88-R	**Alignment:**	I-20 Median
Elev.:	318.0 ft	**Latitude:**	34.01487733	**Longitude:**	-81.14077013	**Date Started:**	3/19/2024
Total Depth:	49.4 ft	**Soil Depth:**	49.4 ft	**Core Depth:**	0 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 24.7(Cave@24)	**24HR**	17(Cave@25)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	28.5			28.5						
288.0		Hard, Moist, Brown/ Gray, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), 7.5YR4/3 & 5Y5/1			SS-8	11	16	18		34
		@SS-10: Gray, 2.5YR6/1		33.5	SS-9	13	20	31		51
283.0										
	38.5			38.5						
278.0		Very Stiff to Hard, Wet, Gray/ Red, Non-Plastic to Low Plasticity, SILT (ML/A-4), with Trace Gravel (Partially Weathered Rock), 2.5YR6/1 & 10YR4/6			SS-10	5	13	11		24
				43.5	SS-11	50/5"				100+
273.0										
	48.5			48.5	SS-12	50/2"				100+
	49.4	Hard, Wet, Gray/ Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), with Trace Gravel (Rock Fragments), 2.5Y6/1 & 7.5YR5/4		49.4	SS-13	50/0.5"				100+
268.0		Boring Terminated at 49.4-ft. Below the Existing Ground Surface Due to Auger Refusal.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

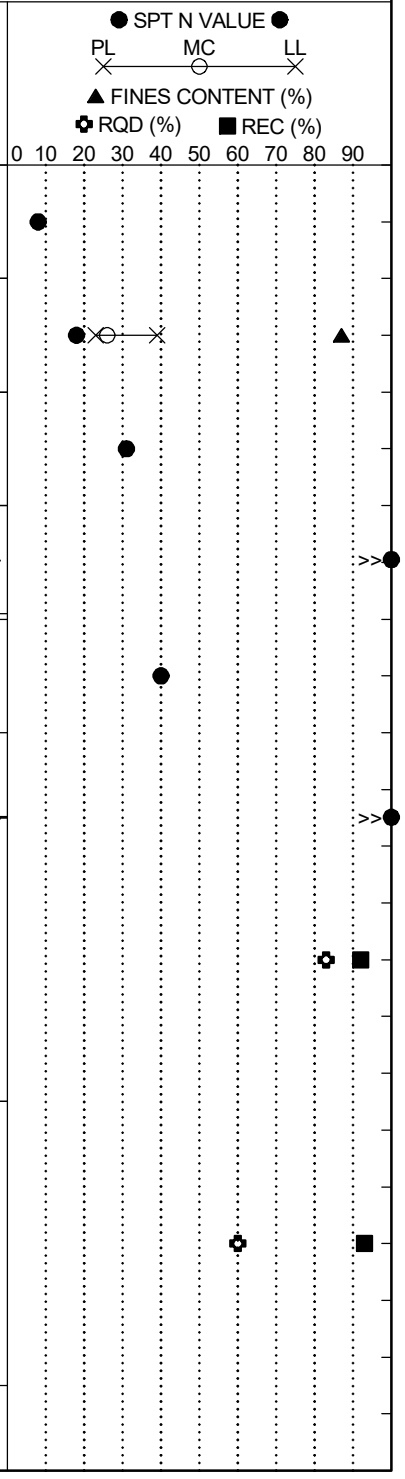
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/12/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-W3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	65+63	**Offset:**	137-R	**Alignment:**	I-20 Median
Elev.:	266.6 ft	**Latitude:**	34.02026159	**Longitude:**	-81.13411829	**Date Started:**	3/19/2024
Total Depth:	21.5 ft	**Soil Depth:**	11.5 ft	**Core Depth:**	10 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	NQ	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE(Cave@8)	**24HR**	NE(Cave@10)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.1	**TOPSOIL** (1.0-in.)		0.0						
		PIEDMONT RESIDUUM Firm, Yellowish Red/ Yellow, Medium Plasticity, Lean CLAY (CL/A-6), 5YR5/6			SS-1	2	3	5	6	8
		@SS-2: LL=39, PL=23, PI=16, NMC=25.9%, %200=86.9		2.0	SS-2	5	8	10	12	18
		@SS-2: Very Stiff		4.0						
		@SS-3: Hard, Reddish Yellow, 7.5YR7/6			SS-3	6	12	19	25	31
261.6				6.0						
					SS-4	6	11	37	50/4.5"	100+
				8.0						
					SS-5	13	19	21	19	40
256.6										
	11.5	@11.5-ft: Drilling Terminated on SPT Refusal. Start Rock Coring.		11.5	SS-6	50/0.3"				100+
		PHYLLITE Metamorphic, Dark Bluish Gray, Very Fine Grained, Thinly Laminated, Quartz/ Feldspar/ Mica, Moderately Weathered, Medium Strong Rock		11.5	NQ-1					
251.6		@NQ-1: Numerous Joints Dip From 16° to 65°, J, N/VN, Su/Fe, Pl/Ir, VC, SR, %REC=92, %RQD=83, RMR=38, GSI=40-50, Class IV, 3.0 min/ft, q_u=4,430 psi, Ultra #8 Bit								
		@NQ-2: Highly to Moderately Weathered, Very Strong Rock, Numerous Joints Dip From 15° to 70°, M/VN, Pl/St/Ir, %REC=93, %RQD=60, RMR=36, GSI=20-30, 3.0 min/ft, q_u=16,260 psi		16.5	NQ-2					
246.6										
	21.5	Boring Terminated at 21.5-ft. Below the Existing Ground Surface in Bedrock								



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-W4		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	73+61	**Offset:**	96-R	**Alignment:**	I-20 Median
Elev.:	220.4 ft	**Latitude:**	34.0219058	**Longitude:**	-81.13237003	**Date Started:**	3/19/2024
Total Depth:	28.7 ft	**Soil Depth:**	28.7 ft	**Core Depth:**	0 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** NE(Cave@23.5)	**24HR**	14(Cave@22)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.1	**TOPSOIL** (1.0-in.)		0.0	SS-1	4	7	10	13	17
		EXISTING FILL Very Stiff to Stiff, Moist, Brown, Medium Plasticity, Lean CLAY (CL/A-6) with Sand, 7.5YR5/3		2.0	SS-2	4	7	7	9	14
		@SS-2: Light Yellowish Brown, 10YR6/4 LL=41, PL=25, PI=16, NMC=19.9%, %200=93.2		4.0	SS-3	9	16	21	17	37
215.4	6.0	@SS-3: Hard		6.0	SS-4	9	16	25	32	41
		PIEDMONT RESIDUUM Dense to Very Dense, Moist, Gray, Non-Plastic to Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4), 2.5Y6/1		8.0	SS-5	23	31		50/5"	81+
210.4		@SS-5: Grayish Brown, 2.5Y5/2								
	13.5	Hard, Dry, Brown/ Gray, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4),10YR5/3 & 10YR6/1		13.5	SS-6	10	42		50/4.5"	100+
205.4										
				18.5	SS-6	30		50/5.8"		100+
200.4										
	23.5	Very Dense, Dry, Grayish Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), 2.5Y5/2		23.5	SS-7		50/5.8"			100+
195.4										
	28.7	@SS-9: No Recovery		28.5	SS-8		50/2"			100+
190.4		Boring Terminated at 28.7-ft. Below the Existing Ground Surface.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-W5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	81+08	**Offset:**	109-R	**Alignment:**	I-20 Median
Elev.:	197.9 ft	**Latitude:**	34.02334636	**Longitude:**	-81.13061226	**Date Started:**	3/19/2024
Total Depth:	37 ft	**Soil Depth:**	37 ft	**Core Depth:**	0 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 20.8(Cave@24)	**24HR**	11(Cave@20)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0		0.0						
	0.3	**TOPSOIL** (3.0-in.)							
		COASTAL PLAIN Stiff, Moist, Reddish Brown, Non-Plastic to Low Plasticity, SILT (ML/A-4), with Trace Gravel, 2.5YR4/4		SS-1	1	6	8	7	14
	2.0		2.0						
		Medium Dense to Loose, Moist, Reddish Brown, High Plasticity, Clayey Fine to Medium SAND (SC/A-7-6), 5YR5/4		SS-2	5	6	6	7	12
		@SS-3: Yellowish Red/ Reddish Yellow, 5YR5/6 & 7.5YR6/6	4.0						
192.9		LL=42, PL=16, PI=26, NMC=14.8%, %200=41.9		SS-3	3	3	4	4	7
	6.0		6.0						
		Very Stiff, Moist, Strong Brown/ Light Gray, High Plasticity, Lean CLAY (CL/A-7-6) with Sand, 7.5YR5/6 & 7.5YR7/1		SS-4	4	8	12	16	20
		@SS-4: LL=49, PL=24, PI=25, NMC=21.4%, %200=78.2	8.0						
		@SS-5: with Trace Gravel		SS-5	6	10	12	22	22
187.9									
	13.5		13.5						
	14.0	Medium Dense, Moist, Brown/ Light Brownish Gray, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), with Trace Gravel, 10YR5/3 & 2.5Y6/2	14.0	SS-6.1	11	7	7		14
		@SS-6.1: LL=NP, PL=NP, PI=NP, NMC=6.1%, %200=14.6		SS-6.2					
182.9		**PIEDMONT RESIDUUM** Stiff, Moist, Brown/ Light Brownish Gray, High Plasticity, Sandy Fat CLAY (CH/A-7-6), 10YR5/3 & 2.5Y6/2							
		@SS-6.2: LL=60, PL=15, PI=45, NMC=15.7%, %200=51.9	18.5						
	18.5			SS-7	10	19	36		55

SPT N VALUE ● PL × MC ○ LL ×
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-W5		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	81+08	**Offset:**	109-R	**Alignment:**	I-20 Median
Elev.:	197.9 ft	**Latitude:**	34.02334636	**Longitude:**	-81.13061226	**Date Started:**	3/19/2024
Total Depth:	37 ft	**Soil Depth:**	37 ft	**Core Depth:**	0 ft	**Date Completed:**	3/19/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 20.8(Cave@24HR)		11(Cave@20)

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		Very Dense, Moist, Light Gray/ Brownish Yellow, Non-Plastic to Low Plasticity, Silty Fine SAND (SM/A-2-4), with Trace Gravel, Micaceous, 10YR7/1 & 10YR6/6								
	23.5			23.5	SS-8	50/5.8"				100+
172.9		Hard, Moist, Light Yellowish Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4), 10YR6/4								
	28.5			28.5	SS-9	8	22	22		44
167.9		Dense, Moist, Light Yellowish Brown, Non-Plastic to Low Plasticity, Silty Fine to Coarse SAND (SM/A-2-4), with Trace Gravel, 10YR6/4								
	33.5			33.5	SS-10	40	50/3.5"			100+
162.9		Hard, Moist, Light Brown, Non-Plastic to Low Plasticity, SILT (ML/A-4), 7.5YR6/3								
	37.0			37.0	SS-11	50/0.5"				100+
		Boring Terminated at 37.0-ft. Below the Existing Ground Surface Due to Auger Refusal.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/12/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-U1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	100+19	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	210.9 ft	**Latitude:**	34.02740527	**Longitude:**	-81.12657176	**Date Started:**	5/5/2024
Total Depth:	59.6 ft	**Soil Depth:**	59.6 ft	**Core Depth:**	0 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	21.9(Cave@24HR)	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ASPHALT** (12.0-in.)								
	1.0	**GABC** (12.0-in.)		1.0						
	2.0	**EXISTING FILL** Medium Dense, Moist, Light Brown, Non-Plastic to Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4), 7.5YR6/4		2.0	SS-1	5	8			
	4.0			4.0	SS-2	4	5	6	7	11
205.9		Stiff, Moist, Light Brown, Low Plasticity, SILT (ML/A-4) with Sand, 7.5YR6/3 @SS-3: LL=34, PL=31, PI=3, NMC=14.8%, %200=75.8			SS-3	2	6	8	5	14
		@SS-4: Soft to Firm, Reddish Yellow, 7.5YR6/6 LL=NP, PL=NP, PI=NP, NMC=22.9%, %200=74.8		6.0	SS-4	3	2	2	2	4
				8.0	SS-5	2	3	3	5	6
200.9										
	13.5			13.5						
		Very Stiff to Stiff, Moist, Light Reddish Brown, Medium Plasticity, Sandy Lean CLAY (CL/A-6), 2.5YR6/4			SS-6	6	14	10		24
195.9		@SS-6: LL=35, PL=23, PI=12, NMC=10.6%, %200=60.1								
				18.5						
		@SS-7: (CL/A-7-6) LL=43, PL=24, PI=19, NMC=18.6%, %200=52.8			SS-7	6	7	10		17
190.9										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	100+19	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	210.9 ft	**Latitude:**	34.02740527	**Longitude:**	-81.12657176	**Date Started:**	5/5/2024
Total Depth:	59.6 ft	**Soil Depth:**	59.6 ft	**Core Depth:**	0 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	21.9(Cave@24HR)	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				23.5	SS-8	7	7	8		15
185.9										
				28.5	SS-9	3	6	6		12
		@SS-9: Light Reddish Brown/Gray, 2.5YR6/4 & 2.5YR5/1								
180.9										
	33.5	**ALLUVIUM (HOLOCENE)**		33.5	SS-10	5	5	4		9
		Loose, Moist, Dusky Red, High Plasticity, Clayey Fine to Medium SAND (SC/A-6), 2.5YR3/2								
175.9		@SS-10: LL=37, PL=14, PI=23, NMC=14.6%, %200=44.4								
				38.5	SS-11	2	3	3		6
170.9										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

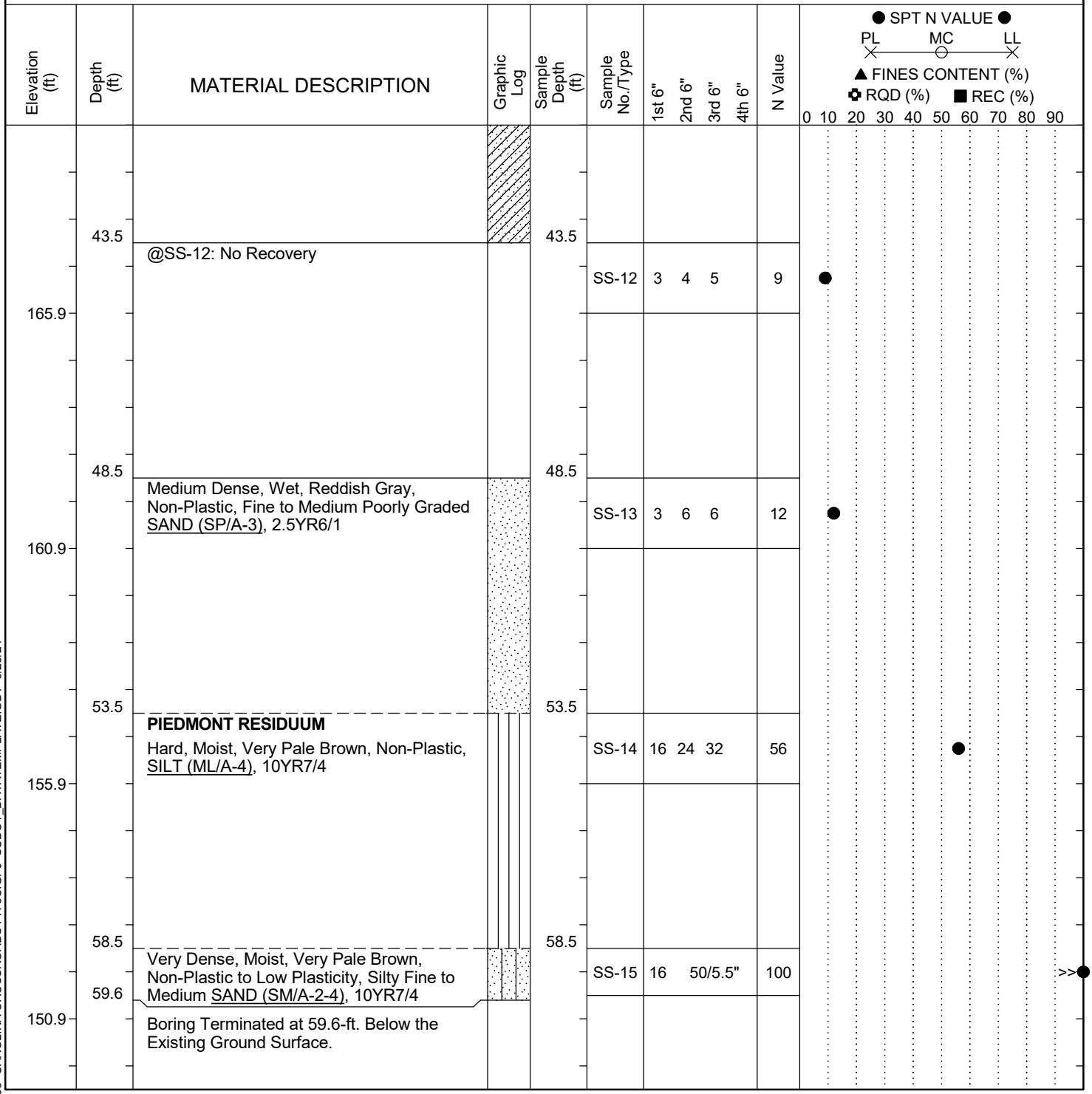
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/25/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-U1		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Thomas	**Boring Location:**	100+19	**Offset:**	52-L	**Alignment:**	I-20 Median
Elev.:	210.9 ft	**Latitude:**	34.02740527	**Longitude:**	-81.12657176	**Date Started:**	5/5/2024
Total Depth:	59.6 ft	**Soil Depth:**	59.6 ft	**Core Depth:**	0 ft	**Date Completed:**	5/6/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB**	21.9(Cave@24HR	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	43.5	@SS-12: No Recovery	43.5	SS-12	3	4	5		9
165.9	48.5	Medium Dense, Wet, Reddish Gray, Non-Plastic, Fine to Medium Poorly Graded SAND (SP/A-3), 2.5YR6/1	48.5	SS-13	3	6	6		12
160.9	53.5	**PIEDMONT RESIDUUM** Hard, Moist, Very Pale Brown, Non-Plastic, SILT (ML/A-4), 10YR7/4	53.5	SS-14	16	24	32		56
155.9	58.5	Very Dense, Moist, Very Pale Brown, Non-Plastic to Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4), 10YR7/4	58.5	SS-15	16	50/5.5"			100
150.9	59.6	Boring Terminated at 59.6-ft. Below the Existing Ground Surface.							



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+55	**Offset:**	42-R	**Alignment:**	I-20 Median
Elev.:	212.5 ft	**Latitude:**	34.02729489	**Longitude:**	-81.12626802	**Date Started:**	4/18/2024
Total Depth:	58.9 ft	**Soil Depth:**	58.9 ft	**Core Depth:**	0 ft	**Date Completed:**	4/18/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**ASPHALT** (2.0-in.)								
	1.0	**GABC** (10.0-in.)		1.0						
		EXISTING FILL			SS-1	6	6			
	2.0	Firm, Moist, Yellowish Red, Non-Plastic, SILT (ML/A-4) with Trace Gravel, 5YR5/8		2.0						
		Stiff to Very Stiff, Moist, Yellow/Red, Non-Plastic, Sandy SILT (ML/A-4), Laminated, 10YR8/6 & 2.5YR4/8			SS-2	8	10	12	12	22
		@SS-2: LL=NP, PL=NP, PI=NP, NMC=17.2%, %200=64.4		4.0						
207.5		@SS-3: Light Red/Yellow, 10YR6/6 & 10YR8/6			SS-3	10	9	8	9	17
	6.0	LL=NP, PL=NP, PI=NP, NMC=11.8%, %200=68.4		6.0						
		Stiff to Very Stiff, Moist, Red/Reddish Brown, Non-Plastic, SILT (ML/A-4) with Sand & Kaolin Nodule, Laminated, 2.5YR4/8 & 2.5YR5/4			SS-4	4	4	8	10	12
		@SS-4: LL=NP, PL=NP, PI=NP, NMC=16.1%, %200=76.3		8.0						
202.5		@SS-5: Light Reddish Brown, Slight Cementation, 2.5YR7/3			SS-5	5	11	10	11	21
	13.5	Stiff, Moist, Red, Non-Plastic, Sandy SILT (ML/A-4) with Trace Gravel, 2.5YR4/8		13.5						
		@SS-6: LL=NP, PL=NP, PI=NP, NMC=19.7%, %200=56.5			SS-6	3	8	6		14
197.5										
		@SS-7: Strong Brown, 7.5YR4/6		18.5						
					SS-7	5	6	8		14
192.5										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+55	**Offset:**	42-R	**Alignment:**	I-20 Median
Elev.:	212.5 ft	**Latitude:**	34.02729489	**Longitude:**	-81.12626802	**Date Started:**	4/18/2024
Total Depth:	58.9 ft	**Soil Depth:**	58.9 ft	**Core Depth:**	0 ft	**Date Completed:**	4/18/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	23.5			23.5						
		Very Stiff, Moist, Strong Brown, Medium Plasticity, Sandy Lean CLAY (CL/A-6), 7.5YR5/6			SS-8	6	8	16		24
187.5		@SS-6: LL=38, PL=18, PI=20, NMC=20.0%, %200=50.3								
	28.5			28.5						
		Stiff, Moist, Red/White, High Plasticity, Elastic SILT (MH/A-7-6), 2.5YR4/8 & 10YR8/1			SS-9	3	4	6		10
182.5		@SS-9: LL=51, PL=29, PI=22, NMC=27.5%, %200=75.7								
		@29.7-ft.: 4.0-in. Kaolin Lense, Partially Cemented								
	33.5			33.5						
		ALLUVIUM (HOLOCENE)								
		Loose to Medium Dense, Moist, Dark Reddish Brown, Non-Plastic, Silty Fine to Medium SAND (SM/A-4), with Trace Gravel & Organics (Roots), 2.5YR2.5/3			SS-10	1	4	5		9
177.5										
				38.5						
		@SS-11: Strong Brown, with Reduced Gravel & Organic Content, 7.5YR4/6			SS-11	2	2	4		6
172.5		LL=NP, PL=NP, PI=NP, NMC=16.6%, %200=46.4								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U2		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	G. Cantelle	**Boring Location:**	100+55	**Offset:**	42-R	**Alignment:**	I-20 Median
Elev.:	212.5 ft	**Latitude:**	34.02729489	**Longitude:**	-81.12626802	**Date Started:**	4/18/2024
Total Depth:	58.9 ft	**Soil Depth:**	58.9 ft	**Core Depth:**	0 ft	**Date Completed:**	4/18/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 15 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		@SS-12: Very Stiff, Moist to Wet, Greenish Gray, Reduced Gravel Content, 10GY5/1	43.5	SS-12	4	7	9		16
167.5									
		@SS-13: Light Gray, (SM/A-2-4), 5Y7/2 LL=NP, PL=NP, PI=NP, NMC=307%, %200=34.3	48.5	SS-13	1	2	4		6
162.5									
	53.5	**PIEDMONT RESIDUUM** Hard, Moist, Dark Yellowish Brown, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4) with Trace Gravel, 10YR4/6	53.5	SS-14	20	24	23		47
157.5									
	58.5		58.5	SS-15	50/5"				100+
	58.9	Hard, Moist, Light Gray, Non-Plastic to Low Plasticity, SILT (ML/A-4) with Laminated Cemented Lenses, 10YR7/2							
152.5		Boring Terminated at 58.9-ft. Below the Existing Ground Surface.							

● SPT N VALUE ●
PL MC LL
▲ FINES CONTENT (%)
✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/25/24

SCDOT Soil Test Log

Project ID:	P039720	**County:**	Richland	**Boring No.:**	C3C-U3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+46	**Offset:**	5-L	**Alignment:**	I-20 Median
Elev.:	212.0 ft	**Latitude:**	34.02736797	**Longitude:**	-81.12640113	**Date Started:**	5/7/2024
Total Depth:	59.9 ft	**Soil Depth:**	59.9 ft	**Core Depth:**	0 ft	**Date Completed:**	5/7/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 13.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ASPHALT** (1.2-in.)								
	1.2	**EXISTING FILL** Loose to Medium Dense, Moist, Red, High Plasticity, Clayey Fine to Coarse SAND (SC/A-6), 2.5YR5/6 @SS-2: with Trace Gravel (Quartz) LL=39, PL=17, PI=22, NMC=15.8%, %200=42.8		1.2						
				2.0	SS-1	3	7			
					SS-2	4	4	6	8	10
				4.0						
207.0		@2.9-ft.: Light Reddish Brown, 2.5YR6/4			SS-3	4	6	6	9	12
		@SS-4: Light Reddish Brown/Yellow, 2.5YR6/4 & 10YR7/8		6.0	SS-4	5	7	7	7	14
	8.0			8.0						
		@SS-5: No Recovery			SS-5	4	6	8	9	14
202.0										
	13.5 ▽			13.5						
		Stiff, Moist, Reddish Yellow, Low Plasticity, Sandy SILT (ML/A-4), with Trace Gravel (Quartz), 7.5YR7/6			SS-6	5	5	5		10
197.0		@SS-6: LL=33, PL=31, PI=2, NMC=15.5%, %200=52.2								
	18.5			18.5						
		Medium Dense, Moist, Light Red, High Plasticity, Clayey Fine to Coarse SAND (SC/A-7-6), with Trace Gravel (Quartz), 2.5Y6/6			SS-7	5	8	8		16
192.0										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

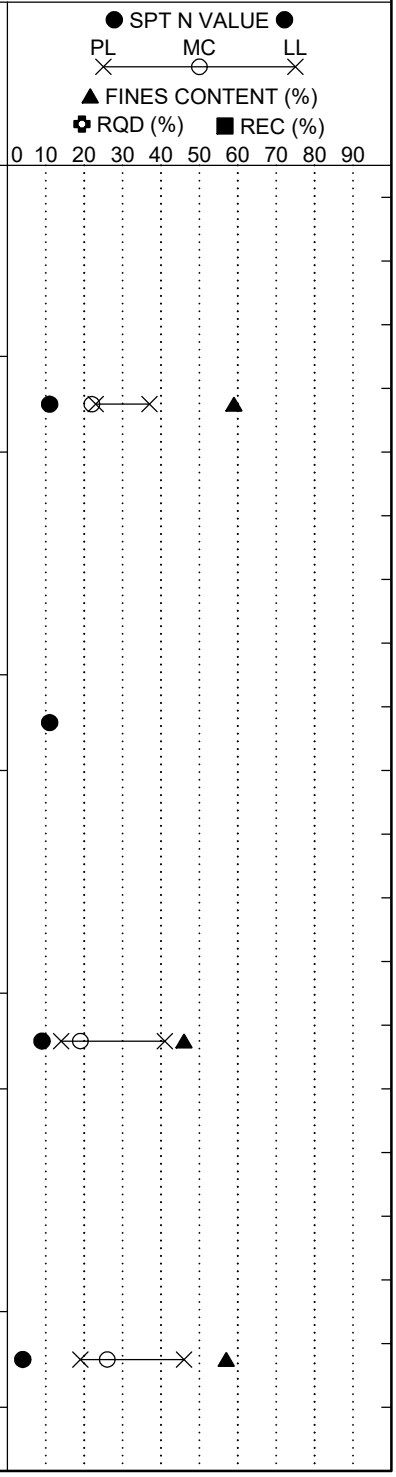
Continued Next Page

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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+46	**Offset:**	5-L	**Alignment:**	I-20 Median
Elev.:	212.0 ft	**Latitude:**	34.02736797	**Longitude:**	-81.12640113	**Date Started:**	5/7/2024
Total Depth:	59.9 ft	**Soil Depth:**	59.9 ft	**Core Depth:**	0 ft	**Date Completed:**	5/7/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 13.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		@SS-7: LL=50, PL=28, PI=22, NMC=21.1%, %200=45.4								
	23.5			23.5						
		Stiff, Moist, Yellowish Red/Light Brown, Medium Plasticity, Sandy Lean CLAY (CL/A-6), 5YR5/6 & 7.5YR6/4			SS-8	5	6	5		11
187.0		@SS-8: LL=37, PL=23, PI=14, NMC=22.3%, %200=58.9								
	28.5			28.5						
		Stiff, Moist, Red, Low Plasticity to Medium Plasticity, SILT (ML/A-4), with Trace Gravel (Quartz), 2.5YR5/6			SS-9	2	5	6		11
182.0										
	33.5			33.5						
		ALLUVIUM (HOLOCENE) Loose, Moist, Brown, High Plasticity, Clayey Fine to Coarse SAND (SC/A-7-6), with Trace Gravel (Quartz), 10YR5/3			SS-10	2	5	4		9
177.0		@SS-10: LL=41, PL=14, PI=27, NMC=19.2%, %200=46.3								
	38.5			38.5						
		Soft, Moist, Light Reddish Brown, High Plasticity, Sandy Lean CLAY (CL/A-7-6), 5YR6/3			SS-11	2	1	3		4
172.0		@SS-11: LL=46, PL=19, PI=27, NMC=25.9%, %200=56.8								



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:	P039720	**County:**	Richland	**Boring No.:**	C3C-U3		
Site Description:	Carolina Crossroads Phase 3C			**Route:**	I-20		
Eng./Geo.:	C. Piercy	**Boring Location:**	100+46	**Offset:**	5-L	**Alignment:**	I-20 Median
Elev.:	212.0 ft	**Latitude:**	34.02736797	**Longitude:**	-81.12640113	**Date Started:**	5/7/2024
Total Depth:	59.9 ft	**Soil Depth:**	59.9 ft	**Core Depth:**	0 ft	**Date Completed:**	5/7/2024
Bore Hole Diameter (in):	3	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	85.4%
Core Size:	N/A	**Driller:**	L. Guempel	**Groundwater:**	**TOB** 13.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		@39.5-ft.: Dark Grayish Brown, with Trace Organics (Roots), 10YR4/2								
	43.5			43.5						
167.0		Loose, Moist, Greenish Gray, Medium Plasticity, Clayey Fine to Medium SAND (SC/A-6), 5BG6/1 @SS-12: LL=33, PL=13, PI=20, NMC=27.6%, %200=42.3			SS-12	3	4	5		9
	48.5			48.5						
162.0		Loose, Moist, Brown, Non-Plastic to Low Plasticity, Silty Fine to Medium SAND (SM/A-2-4), Micaceous, 10YR5/3			SS-13	3	3	6		9
	53.5			53.5						
157.0		**PIEDMONT RESIDUUM** Hard, Moist, Yellowish Brown/Blueish Gray, Non-Plastic to Low Plasticity, Sandy SILT (ML/A-4) with Trace Gravel (Quartz), 10YR6/4 & 5B6/1			SS-14	15	32	41		73
	58.5			58.5						
		Hard, Moist, Yellowish Brown/Blueish Gray, Non-Plastic to Low Plasticity, SILT (ML/A-4), 10YR6/4 & 5B6/1			SS-15	20	29	50/5"		79+
152.0	59.9	Boring Terminated at 59.9-ft. Below the Existing Ground Surface.								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)

0 10 20 30 40 50 60 70 80 90

>>

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	

SC_DOT G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT_DATATEMPLATE.GDT 6/25/24

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-47
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	86+30.73	**Offset:**	L:46.226'	**Alignment:**	Proposed
Elev.:	198.1 ft	**Latitude:**	34.026437	**Longitude:**	-81.127687	**Date Started:**	2/12/2018
Total Depth:	66.9 ft	**Soil Depth:**	46.9 ft	**Core Depth:**	20 ft	**Date Completed:**	2/12/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.7 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.								
	1.0	**FILL - SANDY LEAN CLAY (CL)** - very stiff, moist, red (10R 5/6), mostly low plasticity fines, some fine to medium sands, [LL=30, PL=17, PI=13, NMC=15.3%, %#200=57.2], AASHTO = A-6 (5).		1.0	SS-1	11	9	6	7	16
	3.0	**PIEDMONT RESIDUUM - SILT WITH SAND (ML)** - stiff, moist, red (10R 5/6), mostly low plasticity fines, little fine sands, few weathered rock fragments.		3.0	SS-2	6	7	8	8	15
193.1		@ 5 feet - very stiff.		5.0	SS-3	7	8	9	11	17
		@ 7 feet - [LL=35, PL=26, PI=9, NMC=17.7%, %#200=71.7], AASHTO = A-4 (6).		7.0	SS-4	11	12	14	14	26
		@ 9 feet - hard.		9.0						
188.1					SS-5	16	18	19	20	37
				14.5						
183.1		@ 14.5 feet - medium dense, trace weathered rock fragments.			SS-6	6	5	6		11
				19.5						
		@ 19.5 feet - firm, wet.								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662	**County:**	Lexington/Richland	**Boring No.:**	B-47		
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project			**Route:**	Site 43		
Eng./Geo.:	AKS	**Boring Location:**	86+30.73	**Offset:**	L:46.226'	**Alignment:**	Proposed
Elev.:	198.1 ft	**Latitude:**	34.026437	**Longitude:**	-81.127687	**Date Started:**	2/12/2018
Total Depth:	66.9 ft	**Soil Depth:**	46.9 ft	**Core Depth:**	20 ft	**Date Completed:**	2/12/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.7 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● / PL MC LL / ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
					SS-7	6	4	4		8	
	24.5			24.5							
173.1		**CLAYEY SAND WITH GRAVEL (SC)** - medium dense, wet, red (10R 5/6), mostly fine to coarse sands, some low plasticity fines, little weathered rock fragments, [LL=39, PL=25, PI=14, NMC=23.5%, %#200=41.5], AASHTO = A-6 (2).			SS-8	5	5	7		12	
				29.5							
168.1					SS-9	3	6	7		13	
		▽									
				34.5							
163.1		@ 34.5 feet - loose, brown (7.5YR 4/3).			SS-10	3	4	4		8	
	39.5			39.5							
		PARTIALLY WEATHERED ROCK (PWR)			SS-11	50/4"	-	-		100	

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:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-47
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	86+30.73	**Offset:**	L:46.226'	**Alignment:**	Proposed
Elev.:	198.1 ft	**Latitude:**	34.026437	**Longitude:**	-81.127687	**Date Started:**	2/12/2018
Total Depth:	66.9 ft	**Soil Depth:**	46.9 ft	**Core Depth:**	20 ft	**Date Completed:**	2/12/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.7 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		- SILTY SAND (SM) - very dense, moist, dark gray (GLEY 1 4/), mostly fine to medium sands, some low plasticity fines.						
				44.5	SS-12	50/4"- -	100	
153.1								
	46.9	Tri-Cone Bit Refusal at 46.9 feet. Install NW Casing to 46.9 feet for NQ wireline coring.		46.9				
		For discontinuity descriptors, see discontinuity worksheet.			RC-1			
		<u>METAMORPHIC BEDROCK</u> - SCHIST - dark gray (GLEY 1 4/), fine grained, foliated, with pyrite quartz and epidote, slightly weathered, strong rock.						
148.1				50.4				
		@ 50 feet - moderately weathered. RC-1 : Rec= 94.3%, RQD= 69.0%, GSI= 20-30, RMR = 22.						
		@ 52 feet - slightly weathered.			RC-2			
		RC-2 : Rec= 86.0%, RQD= 40.0%, GSI= 20-30.						
143.1		@ 54.7 feet - moderately weathered.		55.4				
		@ 55.4 feet - slightly weathered.						
					RC-3			
		@ 58.2 feet - absent pyrite and foliations. RC-3 : Rec= 100%, RQD= 60.0%, GSI= 20-30, RMR = 22.						

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:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-47
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	86+30.73	**Offset:**	L:46.226'	**Alignment:**	Proposed
Elev.:	198.1 ft	**Latitude:**	34.026437	**Longitude:**	-81.127687	**Date Started:**	2/12/2018
Total Depth:	66.9 ft	**Soil Depth:**	46.9 ft	**Core Depth:**	20 ft	**Date Completed:**	2/12/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.7 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
				60.4				
		RC-4 : Rec= 100%, RQD= 83.3%, GSI= 20-30, RMR = 26.			RC-4			
133.1		@ 64.5 feet - moderately weathered.		65.4				
	66.9	RC-5 : Rec= 100%, RQD= 0.0%, GSI= 20-30.			RC-5			
		Boring Terminated at 66.9 feet.						
128.1								
123.1								

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 2/12/2018

Boring Number: B-47
Core Barrel Type: NQ
Core Barrel Length: 5 ft
Coring Technique: Wireline
Number of Core Boxes: 2

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
47.2	1	J	26	N/A	Su	Fe	Pl	S	
48.1	2	J	33	N/A	No	N/A	Pl	S	
48.8	3	J	N/A	N/A	Su	Fe	Ir	SR	
50	4	J	N/A	N/A	No	N/A	Ir	SR	Fractured zone 50 - 50.4
50.6	5	J	36	N/A	Su	Fe	Pl	SR	
51	6	J	N/A	N/A	Su	Fe	Ir	SR	Fractured zone 51 - 51.5
53.1	7	J	N/A	N/A	No	N/A	Ir	SR	Fractured zone 53.1 - 53.4
53.8	8	J	10	N/A	No	N/A	Ir	SR	
57.4	9	J	23	N/A	Fi	Qz	Pl	R	
57.8	10	J	29	N/A	No	N/A	St	SR	
59.7	11	J	52	N/A	Su	Fe	Pl	SR	
60	12	J	54	N/A	Su	Fe	Pl	SR	Fractured zone 60 - 60.4
62.2	13	J	41	N/A	Su	Fe	Pl	SR	
62.7	14	J	39	N/A	Su	Fe	Pl	SR	
63.2	15	J	19	N/A	No	N/A	St	SR	
63.5	16	J	37	N/A	No	N/A	Pl	SR	

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-48
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	80+47.91	**Offset:**	R:75.741'	**Alignment:**	Proposed
Elev.:	173.3 ft	**Latitude:**	34.025058	**Longitude:**	-81.128747	**Date Started:**	3/30/2018
Total Depth:	34.7 ft	**Soil Depth:**	14.7 ft	**Core Depth:**	20 ft	**Date Completed:**	3/31/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.3 ft	**24HR**	15.3 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS** - 2 inches of TOPSOIL.		0.0						
		ALLUVIUM - SANDY LEAN CLAY (CL) - stiff, moist, very dark gray (7.5YR 3/1), mostly low plasticity fines, some fine to medium sands, [LL=30, PL=18, PI=12, NMC=13.0%, %#200=57], AASHTO = A-6 (4).			SS-1	2	4	9	9	13
	2.0			2.0						
					SS-2	6	8	4	5	12
		LEAN CLAY WITH SAND (CL) - stiff, moist, gray (7.5YR 5/1), mostly low plasticity fines, little fine sands, trace mica, [LL=40, PL=24, PI=16, NMC=29.3%, %#200=84], AASHTO = A-6 (14).		4.0						
168.3					SS-3	6	8	13	14	21
		@ 4 feet - very stiff.								
	6.0			6.0						
		PIEDMONT RESIDUUM - SILTY SAND WITH GRAVEL (SM) - medium dense, moist, strong brown (7.5YR 4/6), subangular, mostly fine to coarse sands, some low plasticity fines, little weathered rock fragments, [LL=32, PL=23, PI=9, NMC=17.0%, %#200=39], AASHTO = A-4 (0).			SS-4	5	7	10	11	17
	8.0			8.0						
					SS-5	41	50/3"	-	-	100
163.3		**PARTIALLY WEATHERED ROCK (PWR) - SANDY SILT (ML)** - very hard, moist, gray (7.5YR 5/1) and strong brown (7.5YR 4/6), mostly low plasticity fines, some fine sands, relict rock structure.								
	13.5			13.5						
		SILTY GRAVEL (GM) - very dense, moist, very dark gray (7.5YR 3/1), mostly fine to coarse weathered rock fragments, little low plasticity fines.			SS-6	50/1"	-			100
	14.7			14.7						
158.3		Tri-Cone Bit Refusal at 14.7 feet. Install NW Casing to 14.7 feet for NQ wireline coring.								
		For discontinuity descriptors, see discontinuity worksheet.			RC-1					
		METAMORPHIC BEDROCK - SCHIST - gray (GLEY 1 4/), fine grained, foliated, slightly weathered, medium strong rock, trace epidote alteration.								
		@ 15.7 feet - few pyrite veins.		19.7						

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-48
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	80+47.91	**Offset:**	R:75.741'	**Alignment:**	Proposed
Elev.:	173.3 ft	**Latitude:**	34.025058	**Longitude:**	-81.128747	**Date Started:**	3/30/2018
Total Depth:	34.7 ft	**Soil Depth:**	14.7 ft	**Core Depth:**	20 ft	**Date Completed:**	3/31/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.3 ft	**24HR**	15.3 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		RC-1: Rec= 96.0%, RQD= 25.0%, GSI= 50-60, RMR = 24.						
		@ 21 feet - absent pyrite veins.			RC-2			
		RC-2: Rec= 100%, RQD= 65.0%, GSI= 55-65, RMR = 39.		24.7				
148.3		@ 25.1 feet - moderately weathered.			RC-3			
		RC-3: Rec= 88.0%, RQD= 8.3%, GSI= 45-55.		29.7				
143.3		@ 29.7 feet - quartz vein.						
		@ 32 feet - slightly weathered.			RC-4			
		@ 33 feet - pyrite vein.						
		RC-4: Rec= 100%, RQD= 40.0%, GSI= 45-55, RMR = 34.						
	34.7							
138.3		Boring Terminated at 34.7 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	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 4/2/2018

Boring Number: B-48
Core Barrel Type: NQ
Core Barrel Length: 5 ft
Coring Technique: Wireline
Number of Core Boxes: 2

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
15.1	1	J	28	VN	Pa	Cl	Pl	SR	
16.2	2	J	35	N	Pa	Cl	Ir	SR	
16.7	3	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 16.7' - 17.6'
18.1	4	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 18.1' - 19.7'
20.9	5	J	70	N	No	N/A	Pl	SR	
21.2	6	J	90	VN	No	N/A	Pl	SR	
21.3	7	J	64	VN	Pa	Cl	Pl	SR	
21.7	8	J	51	N	Pa	Cl	St	SR	
22.6	9	J	838	VN	Pa	Cl	St	SR	
23.1	10	J	17	T	No	N/A	Pl	SR	
23.4	11	J	79	N	No	N/A	St	SR	
23.9	12	J	88	N	No	N/A	Pl	SR	
24.3	13	J	56	T	No	N/A	Pl	SR	
25.1	14	J	39	N	Pa	Cl	Pl	SR	
26.2	15	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 26.2' - 31.1'
30.6	16	J	3	N	No	N/A	Pl	SR	
30.8	17	J	5	VN	Pa	Cl	Pl	SR	
30.9	18	J	N/A	N/A	No	N/A	Ir	SR	Fractured zone 30.9' - 31.2'
31.6	19	J	2	VN	No	N/A	Wa	SR	
31.8	20	J	86	VN	No	N/A	Ir	SR	
32.3	21	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 32.3' - 32.9'
33.5	22	J	76	VN	Pa	Cl	Pl	SR	
33.6	23	J	19	T	No	N/A	Pl	SR	
33.9	24	J	4	VN	No	N/A	Pl	SR	

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-49
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	84+08.75	**Offset:**	L:42.286'	**Alignment:**	Proposed
Elev.:	194.4 ft	**Latitude:**	34.025993	**Longitude:**	-81.128191	**Date Started:**	2/22/2018
Total Depth:	58.3 ft	**Soil Depth:**	38.3 ft	**Core Depth:**	20 ft	**Date Completed:**	2/22/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.1 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	0.0							
	0.8	**SURFACE MATERIALS** - 10 inches of BRIDGE DECK CONCRETE.						
189.4								
184.4		24.5 feet from top of bridge deck to existing ground surface.						
179.4								

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662	**County:**	Lexington/Richland	**Boring No.:**	B-49		
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project			**Route:**	Site 43		
Eng./Geo.:	AKS	**Boring Location:**	84+08.75	**Offset:**	L:42.286'	**Alignment:**	Proposed
Elev.:	194.4 ft	**Latitude:**	34.025993	**Longitude:**	-81.128191	**Date Started:**	2/22/2018
Total Depth:	58.3 ft	**Soil Depth:**	38.3 ft	**Core Depth:**	20 ft	**Date Completed:**	2/22/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.1 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	24.5		24.5						
169.4		**ALLUVIUM - CLAYEY SAND WITH GRAVEL (SC)** - loose, moist, dark grayish-brown (2.5Y 4/2), subangular, mostly fine to medium sands, some low plasticity fines, little fine gravel, few wood organics, [LL=32, PL=23, PI=9, NMC=24%, %#200=35.0], AASHTO = A-2-4.		SS-1	3	2	3	2	5
	26.5	**CLAYEY SAND (SC)** - loose, moist, brown (2.5Y 4/3), mostly fine to medium sands, some low plasticity fines, [LL=25, PL=17, PI=8, NMC=23%, %#200=43.3], AASHTO = A-4 (0).	26.5	SS-2	2	3	3	4	6
			28.5	SS-3	5	5	5	6	10
164.4	30.5	**LEAN CLAY WITH SAND (CL)** - stiff, wet, dark gray (2.5Y 4/1), mostly low plasticity fines, little fine sands, [LL=39, PL=25, PI=14, NMC=49%, %#200=75.5], AASHTO = A-6 (10).	30.5	SS-4	5	5	6	7	11
	32.5	**SILTY SAND (SM)** - very loose, wet, dark gray (2.5Y 4/1), mostly fine sands, some low plasticity fines, [LL=25, PL=NP, PI=NP, NMC=47%, %#200=35.8], AASHTO = A-4 (0).	32.5	SS-5	1	1	1	3	2
159.4									
	38.0		38.0	SS-6	50/0"	-	-		100
	38.3	**PARTIALLY WEATHERED ROCK (PWR)** - no recovery. Tri-cone bit refusal at 38.3 feet. Install NW casing to 38.3 for NQ wireline coring.	38.3	RC-1					

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-49
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	84+08.75	**Offset:**	L:42.286'	**Alignment:**	Proposed
Elev.:	194.4 ft	**Latitude:**	34.025993	**Longitude:**	-81.128191	**Date Started:**	2/22/2018
Total Depth:	58.3 ft	**Soil Depth:**	38.3 ft	**Core Depth:**	20 ft	**Date Completed:**	2/22/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 31.1 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		For discontinuity descriptors, see discontinuity worksheet.		40.3				
		<u>METAMORPHIC BEDROCK</u> - SCHIST - very dark gray (GLEY 1 3/N), fine grained, foliated (foliation angles ranging from 30 degrees to 90 degrees), moderately weathered, medium strong rock, trace pyrite on foliation surfaces.			RC-2			
		RC-1: Rec= 100%, RQD= 20.8%, GSI= 55-65.						
149.4		@ 40.3 feet - highly weathered.		45.3				
		@ 41.3 feet - moderately weathered.						
		RC-2: Rec= 58.0%, RQD= 0.0%, GSI= 45-55, low core recovery likely due to seams of completely weathered rock or residual soil washed away by drilling process.			RC-3			
		@ 45.5 feet - slightly weathered, strong rock.						
		@ 48.9 feet - moderately weathered, medium strong rock.						
144.4		@ 49.2 feet - slightly weathered, strong rock.		50.3				
		RC-3: Rec= 100%, RQD= 56.7%, GSI= 55-65, RMR = 51.			RC-4			
139.4		RC-4: Rec= 100%, RQD= 31.7%, GSI= 50-60.		55.3				
		@ 55.3 feet to 55.5 feet - quartz vein.			RC-5			
	58.3	RC-5: Rec= 100%, RQD= 67.7%, GSI= 60-70, RMR = 38.						
		Boring Terminated at 58.3 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	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 2/22/2018

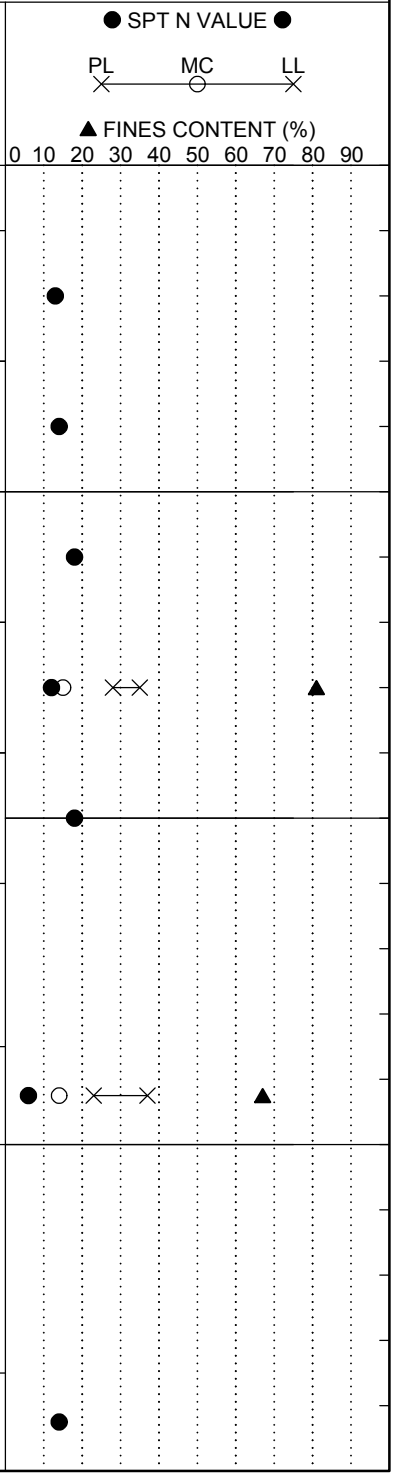
Boring Number: B-49
Core Barrel Type: NQ
Core Barrel Length: 5 ft
Coring Technique: Wireline
Number of Core Boxes: 2

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
39	1	J	79	N	Pa	Cl	Ir	SR	
40.3	2	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 40.3' - 45.6'
47.2	3	J	50	VN	Pa	Cl	Pl	SR	
47.7	4	J	3	T	Pa	Cl	Pl	SR	
48.1	5	J	9	T	No	N/A	St	SR	
48.4	6	J	7	T	No	N/A	Ir	SR	
49.1	7	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 49.1' - 49.5'
50.4	8	J	54	VN	Pa	Cl	Pl	SR	
52.3	9	J	52	T	Pa	Cl	Wa	SR	Fractured zone 52.3' - 55.6'
52.8	10	J	60	T	No	N/A	Ir	SR	
52.9	11	J	70	T	No	N/A	Ir	SR	
53.1	12	J	65	T	No	N/A	Ir	SR	
53.3	13	J	70	T	No	N/A	St	SR	
53.5	14	J	30	T	No	N/A	St	SR	
53.9	15	J	65	T	No	N/A	Ir	SR	
54.7	16	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 54.7' - 55.6'
57.6	17	J	0	N	Pa	Cl	Ir	SR	
58.1	18	J	N/A	N/A	Pa	Cl	Ir	SR	Fractured zone 58.1' - 58.3'

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+54.21	**Offset:**	R:46.690'	**Alignment:**	Proposed
Elev.:	212.6 ft	**Latitude:**	34.027285	**Longitude:**	-81.126258	**Date Started:**	2/18/2018
Total Depth:	92.2 ft	**Soil Depth:**	72.2 ft	**Core Depth:**	20 ft	**Date Completed:**	2/18/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	NQ	**Driller:**	T. Miller	**Groundwater:**	**TOB** 20.1 ft	**24HR**	38 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.								
	1.0	**FILL - SILTY SAND (SM)** - medium dense, moist, strong brown (7.5YR 5/8), mostly fine to medium sands, some low plasticity fines.		1.0	SS-1	10	5	8	7	13
	3.0	**SILT WITH SAND (ML)** - stiff, moist, light red (2.5YR 6/6) and reddish-yellow (7.5YR 6/6), mostly low plasticity fines, little fine sands.		3.0	SS-2	8	7	7	11	14
207.6		@ 5 feet - very stiff.		5.0	SS-3	5	9	9	6	18
		@ 7 feet - stiff, little fine to medium sands, [LL=35, PL=28, PI=7, NMC=14.5%, %#200=80.7], AASHTO = A-4 (6).		7.0	SS-4	4	6	6	8	12
		@ 9 feet - very stiff.		9.0	SS-5	9	8	10	12	18
202.6	13.5	**SANDY LEAN CLAY (CL)** - firm, moist, yellowish-red (5YR 5/8), mostly low plasticity fines, little fine to medium sands, trace fine gravel, [LL=37, PL=23, PI=14, NMC=18.7%, %#200=67.3], AASHTO = A-6 (8).		13.5	SS-6	3	3	3		6
197.6	18.5	**SANDY SILT (ML)** - stiff, moist, reddish-yellow (7.5YR 6/6), mostly low plasticity fines, little fine to medium sands, few quartz gravel.		18.5	SS-7	3	7	7		14



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:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+54.21	**Offset:**	R:46.690'	**Alignment:**	Proposed
Elev.:	212.6 ft	**Latitude:**	34.027285	**Longitude:**	-81.126258	**Date Started:**	2/18/2018
Total Depth:	92.2 ft	**Soil Depth:**	72.2 ft	**Core Depth:**	20 ft	**Date Completed:**	2/18/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	NQ	**Driller:**	T. Miller	**Groundwater:**	**TOB** 20.1 ft	**24HR**	38 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		▽								
		@ 23.5 feet - [LL=42, PL=28, PI=14, NMC=18.7%, %#200=62.7], AASHTO = A-7-6 (8).		23.5	SS-8	5	5	5		10
187.6										
		@ 28.5 feet - firm.		28.5	SS-9	4	4	4		8
182.6										
	33.5	**ALLUVIUM - ELASTIC SILT WITH SAND (MH)** - stiff, moist, reddish-brown (5YR 5/4) and black (5YR 2.5/1), mostly high plasticity fines, little fine to coarse sands, trace fine gravel, trace wood/organics, [LL=51, PL=32, PI=19, NMC=28.8%, %#200=75.8], AASHTO = A-7-5 (16).		33.5	SS-10	2	7	7		14
177.6		▼								
	38.5	**LEAN CLAY WITH SAND (CL)** - firm, moist, reddish-brown (5YR 5/4) and black (5YR 2.5/1), mostly low to medium plasticity fines, little fine sands, few wood organics.		38.5	SS-11	2	3	5		8

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+54.21	**Offset:**	R:46.690'	**Alignment:**	Proposed
Elev.:	212.6 ft	**Latitude:**	34.027285	**Longitude:**	-81.126258	**Date Started:**	2/18/2018
Total Depth:	92.2 ft	**Soil Depth:**	72.2 ft	**Core Depth:**	20 ft	**Date Completed:**	2/18/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	NQ	**Driller:**	T. Miller	**Groundwater:**	**TOB** 20.1 ft	**24HR**	38 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 43.5 feet - stiff, greenish-gray (GLEY 1 5/1).		43.5	SS-12	3	4	6		10	
167.6	47.0	**PIEDMONT RESIDUUM - SILTY CLAYEY SAND (SC-SM)** - loose, moist, dark yellowish-brown (10YR 4/6), mostly fine sands, some low plasticity fines, micaceous.		48.5	SS-13	1	4	4		8	
162.6											
		@ 53.5 feet - medium dense, [LL=26, PL=22, PI=4, NMC=28%, %#200=32.6], AASHTO = A-2-4.		53.5	SS-14	8	9	15		24	
157.6											
		@ 58.5 feet- very dense, greenish-gray (GLEY 1 5/1).		58.5	SS-15	28	45	49		94	

Continued Next Page

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:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+54.21	**Offset:**	R:46.690'	**Alignment:**	Proposed
Elev.:	212.6 ft	**Latitude:**	34.027285	**Longitude:**	-81.126258	**Date Started:**	2/18/2018
Total Depth:	92.2 ft	**Soil Depth:**	72.2 ft	**Core Depth:**	20 ft	**Date Completed:**	2/18/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	NQ	**Driller:**	T. Miller	**Groundwater:**	**TOB** 20.1 ft	**24HR**	38 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	63.5			63.5				
147.6		**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - very dense, moist, greenish-gray (GLEY 1 5/1), mostly fine to medium sands, some low plasticity fines, micaceous.			SS-16	24 43 50/5"	100	●
	66.0	**SILT WITH SAND (ML)** - very hard, moist, gray (GLEY 1 5/), mostly non-plastic fines, little fine sands.		68.5				
142.6					SS-17	31 41 50/4"	100	●
	72.2	Tri-Cone Bit Refusal at 72.2 feet. Install NW Casing to 72.2 feet for NQ wireline coring.		72.2				
		For discontinuity descriptors, see discontinuity worksheet.						
137.6		**METAMORPHIC BEDROCK - SCHIST** - dark greenish-gray (GLEY 1 4/1), fine grained, foliated, tightly laminated to laminated, fresh, medium strong rock.			RC-1			
		RC-1: Rec= 98.0%, RQD= 80.0%, GSI= 15-25, RMR = 40.		77.2				
		@ 78.6 feet - slightly weathered.			RC-2			

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+54.21	**Offset:**	R:46.690'	**Alignment:**	Proposed
Elev.:	212.6 ft	**Latitude:**	34.027285	**Longitude:**	-81.126258	**Date Started:**	2/18/2018
Total Depth:	92.2 ft	**Soil Depth:**	72.2 ft	**Core Depth:**	20 ft	**Date Completed:**	2/18/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	NQ	**Driller:**	T. Miller	**Groundwater:**	**TOB** 20.1 ft	**24HR**	38 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		RC-2: Rec= 100.0%, RQD= 90.0%, GSI= 15-25, RMR = 35.		82.2				
127.6					RC-3			
		RC-3: Rec= 80.0%, RQD= 46.0%, GSI= 15-25.		87.2				
122.6					RC-4			
		@ 91 feet - moderately weathered.						
	92.2	RC-4: Rec= 100.0%, RQD= 64.0%, GSI= 15-25, RMR = 19.						
		Boring Terminated at 92.2 feet.						
117.6								

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

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	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Miller
Logged By: Nathaniel Shuff
Date: 2/18/2018

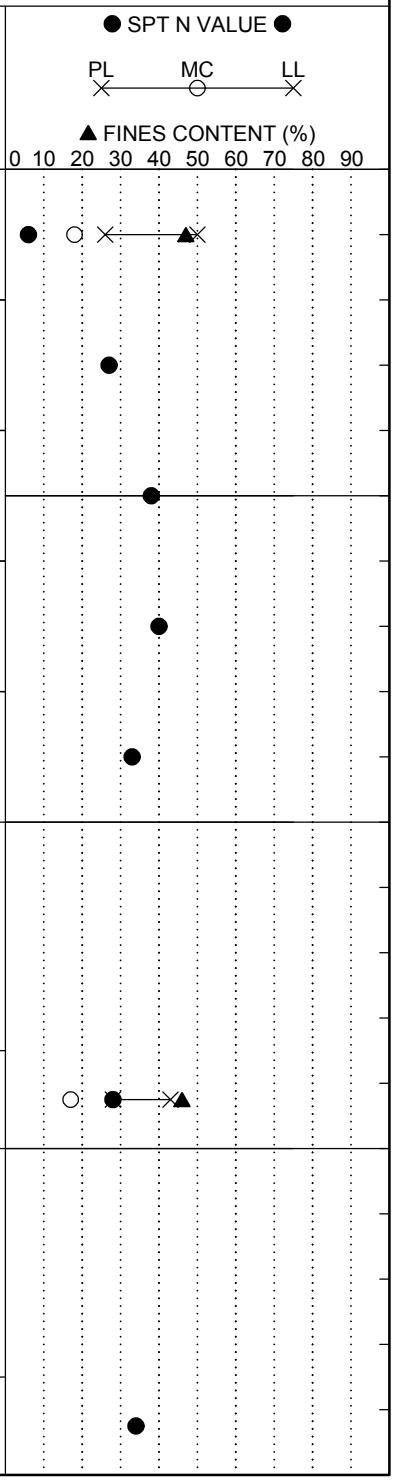
Boring Number: B-50
Core Barrel Type: NQ
Core Barrel Length: 5 ft
Coring Technique: Wireline
Number of Core Boxes: 2

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
73.2	1	J	60	VN	Su	Fe	Pl	SR	
73.7	2	J	5	MW	No	N/A	Wa	SR	
74.3	3	J	50	VN	Sp	Ca	Pl	SR	
76.9	4	J	25	MW	No	N/A	Pl	SR	
77.7	5	J	5	MW	No	N/A	Pl	SR	
79.4	6	J	60	N	No	N/A	Wa	SR	
79.7	7	J	60	VN	No	N/A	Wa	SR	
80.7	8	J	60	VN	No	N/A	Wa	S	
80.9	9	J	60	N	Su	Fe	Wa	SR	
81.3	10	J	60	VN	No	N/A	Wa	SR	
82.7	11	J	55	N	No	N/A	Wa	S	
82.9	12	J	55	VN	No	N/A	Wa	S	
83	13	J	55	VN	Sp	Cl	Wa	S	
83.1	14	J	60	VN	No	N/A	Wa	SR	
83.5	15	J	55	VN	No	N/A	Wa	SR	
83.8	16	J	60	VN	No	N/A	Wa	S	
84.2	17	J	60	VN	Sp	Cl	Wa	S	
84.8	18	J	60	N	No	N/A	Wa	SR	
85.3	19	J	55	VN	Sp	Fe	Wa	S	
85.9	20	J	55	N	No	N/A	Wa	S	
86.1	21	J	55	N	No	N/A	Wa	S	
87.7	22	J	55	N	No	N/A	Wa	S	
88.5	23	J	55	VN	No	N/A	Wa	S	
88.9	24	J	55	VN	No	N/A	Wa	S	
89.1	25	J	60	N	Su	Fe	Wa	SR	
89.6	26	J	60	N	Su	Fe	Wa	SR	
80.2	27	J	60	N	Su	Fe/Cl	Wa	SR	
91.2	28	J	55	N	Su	Cl	Wa	SR	
91.4	29	J	60	N	Su	Fe	Wa	SR	

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-51
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	AKS	**Boring Location:**	93+58.51	**Offset:**	L:160.130'	**Alignment:**	Proposed
Elev.:	214.8 ft	**Latitude:**	34.028083	**Longitude:**	-81.126273	**Date Started:**	2/8/2018
Total Depth:	59.7 ft	**Soil Depth:**	39.7 ft	**Core Depth:**	20 ft	**Date Completed:**	2/8/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS** - 3 inches of TOPSOIL.		0.0	SS-1	2	3	3	10	6
	2.0	**FILL - CLAYEY SAND (SC)** - loose, moist, red (10R 4/6), mostly fine to coarse sands, some high plasticity fines, few fine gravel, [LL=50, PL=26, PI=24, NMC=18.2%, %#200=46.5], AASHTO = A-7-6 (7).		2.0	SS-2	10	12	15	30	27
209.8		**PIEDMONT RESIDUUM - SILTY SAND WITH GRAVEL (SM)** - medium dense, moist, red (10R 4/6), gray (10YR 5/1) and yellow (10YR 7/6), mostly fine to coarse sands, some low plasticity fines, little fine gravel-sized rock fragments.		4.0	SS-3	15	18	20	28	38
		@ 4 feet - dense.		6.0	SS-4	15	18	22	29	40
		@ 6 feet - relict rock structure.		8.0	SS-5	13	15	18	24	33
204.8										
	13.5	**SILT SAND WITH GRAVEL (SM)** - medium dense, moist, red (10R 4/6), gray (10YR 5/1) and yellow (10YR 7/6), mostly fine to coarse sand, some low plasticity fines, little fine to medium gravel-sized rock fragments, [LL=43, PL=28, PI=15, NMC=16.5%, %#200=46.4], AASTHO = A-7-6 (4).		13.5	SS-6	10	14	14		28
199.8										
				18.5	SS-7	14	17	17		34



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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-51
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	AKS	**Boring Location:**	93+58.51	**Offset:**	L:160.130'	**Alignment:**	Proposed
Elev.:	214.8 ft	**Latitude:**	34.028083	**Longitude:**	-81.126273	**Date Started:**	2/8/2018
Total Depth:	59.7 ft	**Soil Depth:**	39.7 ft	**Core Depth:**	20 ft	**Date Completed:**	2/8/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
				23.5	SS-8	14 17 23	40
189.8	28.5	**SILT WITH SAND (ML)** - hard, moist, light greenish-gray (5YR 8/10), mostly low plasticity fines, little fine sands, [LL=39, PL=26, PI=13, NMC=23.4%, %#200=80.4], AASHTO = A-6 (11).		28.5	SS-9	13 14 18	32
184.8	33.5	**PARTIALLY WEATHERED ROCK (PWR) - SILT (ML)** - very hard, moist, light greenish-gray (5YR 8/1), mostly low plasticity fines, trace fine sands.		33.5	SS-10	50/4"- -	100
179.8				38.5	SS-11	50/1"- -	100
	39.7	@ 38.5 feet - no recovery Tri-Cone Refusal at 39.7 feet. Install NW Casing to 39.7 feet for NQ wireline coring.		39.7			

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-51
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	AKS	**Boring Location:**	93+58.51	**Offset:**	L:160.130'	**Alignment:**	Proposed
Elev.:	214.8 ft	**Latitude:**	34.028083	**Longitude:**	-81.126273	**Date Started:**	2/8/2018
Total Depth:	59.7 ft	**Soil Depth:**	39.7 ft	**Core Depth:**	20 ft	**Date Completed:**	2/8/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		For discontinuity descriptors, see discontinuity worksheet.						
		<u>METAMORPHIC BEDROCK</u> - SCHIST - gray (GLEY 1 5/), very fine grained, thinly laminated, highly weathered, extremely weak rock, quartz veins and stringer throughout.			RC-1			
		@ 39.9 feet - completely weathered.						
		RC-1 : Rec= 100%, RQD= 0.0%, GSI= 10-20.		44.7				
169.8		@ 44.8 feet - highly weathered.						
		Moderate recoveries below 44.7 feet likely due to seams of completely weathered rock or residual soil.			RC-2			
		RC-2 : Rec= 76.0%, RQD= 21.7%, GSI= 10-20.		49.7				
164.8					RC-3			
		RC-3 : Rec= 50.0%, RQD= 26.7%, GSI= 10-20.		54.7				
159.8					RC-4			
	59.7	RC-4 : Rec= 48.0%, RQD= 20.0%, GSI= 10-20.						

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-51
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	AKS	**Boring Location:**	93+58.51	**Offset:**	L:160.130'	**Alignment:**	Proposed
Elev.:	214.8 ft	**Latitude:**	34.028083	**Longitude:**	-81.126273	**Date Started:**	2/8/2018
Total Depth:	59.7 ft	**Soil Depth:**	39.7 ft	**Core Depth:**	20 ft	**Date Completed:**	2/8/2018
Bore Hole Diameter (in):	3.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.5 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Boring Terminated at 59.7 feet.						
149.8								
144.8								
139.8								

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 2/8/2018

Boring Number: B-51
Core Barrel Type: NQ
Core Barrel Length: 5 ft
Coring Technique: Wireline
Number of Core Boxes: 1

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
40.8	1	J	5	N	No	N/A	Pl	SR	
41.8	2	J	55	N	No	N/A	Ir	R	
42.1	3	J	5	N	No	N/A	Ir	R	
42.7	4	J	10	VN	No	N/A	Ir	R	

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**FILL - CLAYEY SAND (SC)** - loose, moist, brown (10YR 5/3), subangular to subrounded, mostly fine to medium sands, little low plasticity fines, [LL=24, PL=14, PI=10, NMC=10.5%, %#200=28.4], AASHTO = A-2-4.		0.0	SS-1	4	5	5	9	10
	2.0	**COASTAL PLAIN - SANDY LEAN CLAY (CL)** - stiff, moist, reddish yellow (5YR 6/8), mostly low plasticity fines, some fine to medium sands, [LL=42, PL=23, PI=19, NMC=17.2%, %#200=65.6], AASHTO = A-7-6 (11).		2.0	SS-2	3	4	9	15	13
180.7		@ 4 feet - very stiff.		4.0	SS-3	5	5	21	19	26
	6.0	**CLAYEY SAND WITH GRAVEL (SC)** - medium dense, moist, reddish brown (5YR 4/3), reddish yellow (5YR 6/8) and gray (GLEY 1 6/), subangular to subrounded, mostly fine to coarse sands, little low plasticity fines, little rounded pebbles, [LL=44, PL=21, PI=23, NMC=16.7%, %#200=27.1], AASHTO = A-2-7 (2).		6.0	SS-4	9	10	14	35	24
175.7		@ 8 feet - dense.		8.0	SS-5	18	22	16	19	38
	13.5	**PIEDMONT RESIDUUM - ELASTIC SILT WITH SAND (MH)** - very stiff, moist, gray (GLEY 1 6/), mostly high plasticity fines, little fine sands, [LL=63, PL=38, PI=25, NMC=31.2%, %#200=80.9], AASHTO = A-7-5 (24).		13.5	SS-6	11	12	16		28
170.7										
	18.5	**PARTIALLY WEATHERED ROCK (PWR) - SANDY SILT (ML)** - very hard, moist, gray (GLEY 1 6/), mostly low plasticity fines, some fine sands.		18.5	SS-7	29	50/4"	-		100

SPT N VALUE ● PL × MC ○ LL × ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
				23.5	SS-8	42 50/3" -	100
160.7				28.5	SS-9	43 50/5" -	100
155.7				33.5	SS-10	50/1" - -	100
150.7				38.5	SS-11	50/4" - -	100
		@ 38.5 feet - gray (GLEY 1 6/) with mottled brown (10YR 5/3), some fine to coarse sands, trace gravel.					

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
				43.5	SS-12	50/5" - -	100	
		@ 43.5 feet - some fine to medium sands, absent gravel, relict foliation.						
140.7								
				48.5	SS-13	50/1" - -	100	
135.7								
	51.9	Tri-Cone Bit Refusal at 51.9 feet. Install HW Casing to 51.9 feet for HQ wireline coring.		51.9				
		For discontinuity descriptors, see discontinuity worksheet.			RC-1			
130.7		**METAMORPHIC BEDROCK - SCHIST**- bluish-gray (GLEY 2 5/1), fine grained, foliated, slightly weathered to fresh, strong rock, quartz veins and stringers throughout.		55.2				
		RC-1: Rec= 78.9%, RQD= 78.9%, GSI= 45-55.			RC-2			
		RC-2: Rec= 100.0%, RQD= 86.0%, GSI= 50-60, RMR = 52.						

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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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		RC-3: Rec= 100%, RQD= 94.2%, GSI= 70-80.		60.2	RC-3			
120.7		@ 64.9 feet - very dark greenish-gray (GLEY 2 3/1), bluish-gray (GLEY 2 5/1), pale red (10R 6/3), fresh.		65.2	RC-4			
		RC-4: Rec= 98.0%, RQD= 98.0%, GSI= 70-80, RMR = 61.						
115.7		@ 70.8 feet - epidote mineralization.		70.2	RC-5			
		RC-5: Rec= 100.0%, RQD= 100.0%, GSI= 70-80.						
110.7		@ 74.3 feet - epidote mineralization.		75.2	RC-6			
		RC-6: Rec= 100.0%, RQD= 100.0%, GSI= 70-80, RMR = 61.						

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 80.0 feet - pyrite mineralization.		80.2				
		@ 81.8 feet - quartz veins, pyrite mineralization throughout RC-7.			RC-7			
		RC-7: Rec= 100.0%, RQD= 94.0%, GSI= 70-80.						
100.7		@ 85.2 feet - quartz veins, pyrite throughout RC-8.		85.2				
					RC-8			
		RC-8: Rec= 100.0%, RQD= 88.0%, GSI= 65-75, RMR = 58.						
95.7				90.2				
					RC-9			
		RC-9: Rec= 100.0%, RQD= 94.0%, GSI= 75-85.						
90.7				95.2				
		@ 97.6 feet - pegmatite dike (epidote and quartz), light grayish-green (GLEY 6/1) and white (10YR 8.5/1).			RC-10			
		RC-10: Rec= 100.0%, RQD= 100.0%, GSI= 70-80, RMR = 66.						

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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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 99 feet - very dark greenish-gray (GLEY 2 3/1), bluish-gray (GLEY 2 5/1) and pale red (10R 6/3), fresh, strong rock.		100.2				
					RC-11			
		RC-11: Rec= 100.0%, RQD= 96.0%, GSI= 75-85.						
80.7				105.2				
					RC-12			
		RC-12: Rec= 102.0%, RQD= 83%, GSI= 70-80, RMR = 48.						
		@ 108.2 feet - pegmatite dike (quartz), white (10YR 8.5/1).						
75.7		@ 109.2 feet - very dark greenish-gray (GLEY 2 3/1), bluish-gray (GLEY 2 5/1), pale red (10R 6/3), fresh, strong rock.		110.2				
		@ 110.2 feet - bluish-gray (GLEY 2 5/1), foliated, slightly weathered, weak rock.						
					RC-13			
		RC-13: Rec= 100.0%, RQD= 100%, GSI= 70-80.						
70.7				115.2				
					RC-14			
		RC-14: Rec= 96.0%, RQD= 96.0%, GSI= 70-80, RMR = 61.						
		@ 119.6 feet - pegmatite dike (quartz, mica						

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	DH-4
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 43
Eng./Geo.:	AKS	**Boring Location:**	76+09.40	**Offset:**	R:86.778'	**Alignment:**	Proposed
Elev.:	185.7 ft	**Latitude:**	34.024177	**Longitude:**	-81.129735	**Date Started:**	1/4/2018
Total Depth:	120.2 ft	**Soil Depth:**	51.8 ft	**Core Depth:**	68.4 ft	**Date Completed:**	1/9/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	HQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 12.0 ft	**24HR**	9.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	120.2	and feldspar), white (10YR 8.5/1), pale yellow (5Y 8/3), fresh, strong rock.						
		Boring Terminated at 120.2 feet.						
60.7								
55.7								
50.7								

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	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 1/4/2018 - 1/9/2018

Boring Number: DH-4
Core Barrel Type: HQ
Core Barrel Length: 5 feet
Coring Technique: Wireline
Number of Core Boxes: 5

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
52.4	1	J	50	N	No	N/A	Pl	R	
52.9	2	J	9	N	No	N/A	W	R	
53.6	3	J	32	MW	No	N/A	Pl	R	
53.7	4	J	0	N	No	N/A	W	R	
55	5	J	43	MW	No	N/A	Pl	SR	
54.3	6	V	47	W	Fi	Ca	Pl	N/A	
55.5	7	V	55	MW	Fi	Ca	Pl	N/A	
57.4	8	J	26	T	No	N/A	W	R	
58.7	9	J	14	T	No	N/A	Pl	R	
58.9	10	J	5	T	No	N/A	Pl	R	
59.5	11	J	20	T	No	N/A	Pl	R	
63.3	12	J	63	T	No	N/A	Pl	R	
64.7	13	J	65	T	No	N/A	Pl	SR	
67.8	14	J	9	T	No	N/A	W	SR	
69.1	15	J	0	T	No	N/A	St	R	
69.7	16	J	6	T	No	N/A	Pl	SR	
71.6	17	J	27	T	No	N/A	St	R	
74.5	18	J	10	T	No	N/A	Pl	SR	
76.3	19	J	21	T	No	N/A	Pl	SR	
77.2	20	J	13	T	No	N/A	Pl	SR	
78.2	21	V	35	MW	Fi	Qz	Pl	N/A	
78.9	22	V	63	W	Fi	Qz	Pl	N/A	
81.4	23	J	25	T	No	N/A	Pl	R	
81.6	24	J	16	T	No	N/A	St	R	
82.5	25	J	11	T	No	N/A	Pl	R	
83.6	26	J	25	T	No	N/A	W	R	
84.1	27	J	18	T	No	N/A	Pl	R	
85.8	28	J	0	T	No	N/A	Pl	R	
87	29	J	0	T	No	N/A	Pl	R	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 1/4/2018 - 1/9/2018

Boring Number: DH-4
Core Barrel Type: HQ
Core Barrel Length: 5 feet
Coring Technique: Wireline
Number of Core Boxes: 5

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
87.9	30	J	0	T	No	N/A	Pl	R	
88.2	31	J	0	T	No	N/A	W	R	
88.8	32	J	N/A	N/A	No	N/A	N/A	N/A	Fractured zone 88.8' - 89.6'
91.9	33	J	0	T	No	N/A	St	SR	
92.9	34	J	15	T	No	N/A	Pl	SR	
93.2	35	J	12	T	Fi	Qz	W	R	
91.4	36	V	46	MW	Fi	Qz/Py	W	N/A	
91.9	37	V	72	MW	Fi	Qz/Py	Pl	N/A	
95.3	42	V	44	MW	Fi	Qz	Pl	N/A	
96	43	V	83	N	Fi	Epidote	Pl	N/A	
96.5	44	V	78	N	Fi	Epidote	Pl	N/A	
96.7	40	J	12	T	No	N/A	Pl	R	
97.4	45	V	85	N	Fi	Epidote	Pl	N/A	
97.8	38	J	26	T	No	N/A	St	R	
98.2	39	J	8	T	No	N/A	Pl	R	
99.4	41	J	0	T	No	N/A	St	SR	
104.3	46	J	14	T	No	N/A	Pl	SR	
104.6	47	J	17	T	No	N/A	Pl	SR	
106.1	48	J	47	T	No	N/A	Pl	R	
106.4	49	J	46	T	No	N/A	Pl	R	
107.8	50	J	27	T	No	N/A	St	R	
108	51	J	0	T	No	N/A	Pl	R	
109.3	52	J	0	T	No	N/A	Pl	R	
111	53	Sh	63	T	No	N/A	Pl	Slk	
111.8	54	Sh	6	T	No	N/A	Pl	Slk	
113.6	55	Sh	62	T	No	N/A	Pl	Slk	
114.8	56	Sh	39	T	No	N/A	Pl	Slk	
116.5	57	J	15	T	No	N/A	Pl	R	
117.6	58	J	0	T	No	N/A	Ir	SR	

Rock Core Discontinuity Worksheet

Project Name: Carolina Crossroads I-20/I-26/I-126 Improvement Project
Project Number: 1461-16-047
Driller (Company/Name): S&ME/Millwood
Logged By: Austin Syms
Date: 1/4/2018 - 1/9/2018

Boring Number: DH-4
Core Barrel Type: HQ
Core Barrel Length: 5 feet
Coring Technique: Wireline
Number of Core Boxes: 5

Depth (ft)	Disc. No.	Disc. Type	Dip Angle (deg)	Disc. Width (mm)	Infill Amount	Infill Type	Surface Shape	Surface Roughness	Notes
118.7	59	Sh	35	T	No	N/A	Pl	Slk	
119.6	60	J	0	T	No	N/A	Pl	SR	

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	RW-40
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	AKS	**Boring Location:**	69+86.46	**Offset:**	L:60.995'	**Alignment:**	Proposed
Elev.:	238.9 ft	**Latitude:**	34.021474	**Longitude:**	-81.133604	**Date Started:**	2/13/2018
Total Depth:	20.8 ft	**Soil Depth:**	20.8 ft	**Core Depth:**	0 ft	**Date Completed:**	2/13/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	H.S.A / RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 3.3 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**PIEDMONT RESIDUUM - SANDY SILT (ML)** - stiff, moist, reddish yellow (7.5YR 7/8), mostly low plasticity fines, little fine sands, trace weathered rock fragments.		0.0	SS-1	3	4	5	5	9
		@ 2 feet - [LL=43, PL=32, PI=11, NMC=30.8%, %#200=83.2], AASHTO = A-7-5 (11).		2.0	SS-2	3	5	7	13	12
		@ 4 feet - very stiff, pinkish-gray (7.5YR 7/2), trace fine gravel.		4.0	SS-3	5	13	17	20	30
233.9		@ 6 feet - brown (7.5YR 5/2), absent gravel.		6.0	SS-4	14	18	22	29	40
		@ 8 feet - hard.		8.0	SS-5	12	18	29	41	47
228.9										
	13.5	**PARTIALLY WEATHERED ROCK (PWR) - SANDY SILT (ML)** - very hard, moist, brown (7.5YR 5/2), mostly low plasticity fines, some fine to medium sands, relict rock structure.		13.5	SS-6	50/5"-	-			100
223.9										
				18.5	SS-7	50/1"-	-			100

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	RW-40
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	AKS	**Boring Location:**	69+86.46	**Offset:**	L:60.995'	**Alignment:**	Proposed
Elev.:	238.9 ft	**Latitude:**	34.021474	**Longitude:**	-81.133604	**Date Started:**	2/13/2018
Total Depth:	20.8 ft	**Soil Depth:**	20.8 ft	**Core Depth:**	0 ft	**Date Completed:**	2/13/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	H.S.A / RW	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 3.3 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	20.8	Boring Terminated at 20.8 feet due to Tri-Cone but refusal. Obtained bulk sample from auger cuttings 0.0 to 10.0 feet.						
213.9								
208.9								
203.9								

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	P-44
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	AKS	**Boring Location:**	74+76.27	**Offset:**	L:47.554'	**Alignment:**	Proposed
Elev.:	220.3 ft	**Latitude:**	34.022409	**Longitude:**	-81.132440	**Date Started:**	2/13/2018
Total Depth:	11.1 ft	**Soil Depth:**	11.1 ft	**Core Depth:**	0 ft	**Date Completed:**	2/13/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	N/A	**Driller:**	J. Millwood	**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"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 13 inches of ASPHALT.								
	1.1	**FILL - FAT CLAY WITH SAND (CH)** - stiff, moist, dark red (2.5YR 3/6), mostly high plasticity fines, little fine to medium sands, trace fine gravel, [LL=62, PL=25, PI=37, NMC=30.1%, %#200=83.5], AASHTO = A-7-6 (34).		1.1	SS-1	7	7	5	6	12
	3.1	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - medium dense, dry to moist, light gray (GLEY 1 7/), mostly fine to medium sands, some low plasticity fines.		3.1	SS-2	7	6	9	11	15
215.3				5.1	SS-3	9	10	11	13	21
		@ 7.1 feet - dense.		7.1	SS-4	18	17	16	17	33
	9.1	**LEAN CLAY (CL)** - hard, moist, very dark greenish-gray (GLEY 1 3/1), mostly low plasticity fines, trace fine sands, micaceous.		9.1	SS-5	21	22	25	30	47
210.3	11.1	Boring Terminated at 11.1 feet.								
205.3										

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	P-45
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	ELF	**Boring Location:**	84+69.20	**Offset:**	R:46.558'	**Alignment:**	Proposed
Elev.:	193.4 ft	**Latitude:**	34.024176	**Longitude:**	-81.129923	**Date Started:**	2/15/2018
Total Depth:	11 ft	**Soil Depth:**	11 ft	**Core Depth:**	0 ft	**Date Completed:**	2/15/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**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"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.		1.0						
	1.0	**FILL - CLAYEY SAND WITH GRAVEL (SC)** - loose, moist to wet, yellowish-red (5YR 5/8), mostly fine to medium sands, some low plasticity fines, little fine gravel, [LL=42, PL=19, PI=23, NMC=13.6%, %#200=33.3], AASHTO = A-2-7 (2).			SS-1	4	4	5	5	9
		@ 3 feet - medium dense, yellowish-red (5YR 5/8) and white (5YR 8/1), mostly fine to coarse sands.		3.0	SS-2	3	6	9	9	15
188.4	5.0	**ALLUVIUM - ELASTIC SILT (MH)** - firm, moist, red (2.5YR 4/8), mosty high plasticity fines, few fine sands.		5.0	SS-3	7	7	8	9	15
	7.0	**SANDY LEAN CLAY (CL)** - soft, moist, reddish-gray (2.5YR 4/8), mostly low plasticity fines, some fine to coarse sands, trace fine gravel.		7.0	SS-4	3	3	5	6	8
	9.0	**CLAYEY SAND (SC)** - medium dense, moist, dark reddish-gray (2.5YR 3/1), mostly fine to medium sands, some low plasticity fines.		9.0	SS-5	8	8	9	7	17
183.4	11.0	Boring Terminated at 11 feet.								
178.4										

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

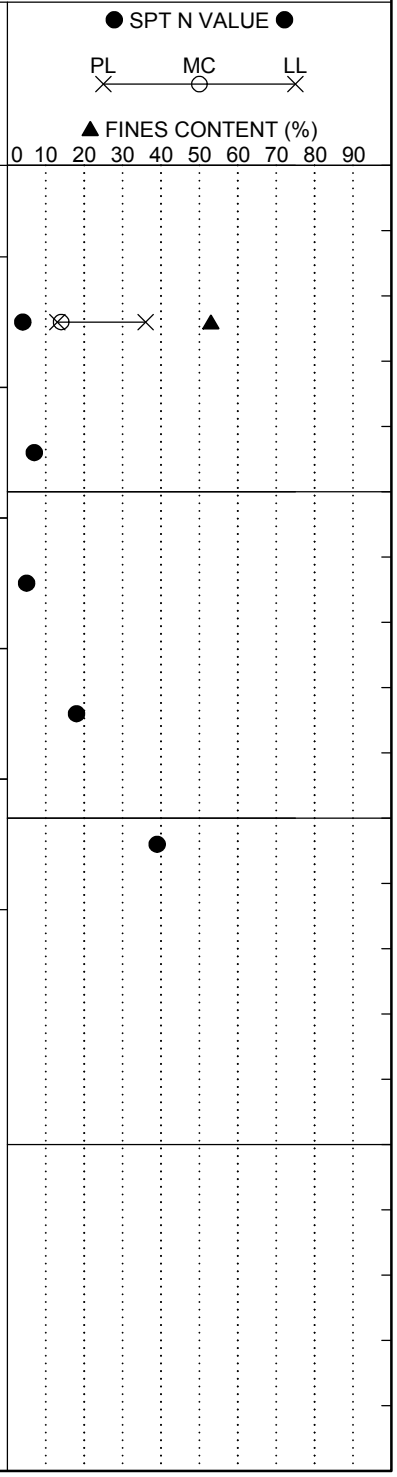
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	P-47
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	ELF	**Boring Location:**	104+83.25	**Offset:**	R:45.744'	**Alignment:**	Proposed
Elev.:	220.7 ft	**Latitude:**	34.028128	**Longitude:**	-81.125269	**Date Started:**	2/15/2018
Total Depth:	11.4 ft	**Soil Depth:**	11.4 ft	**Core Depth:**	0 ft	**Date Completed:**	2/15/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**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"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 17 inches of ASPHALT.								
	1.4	**FILL - SANDY LEAN CLAY (CL)** - soft, moist, dark red (2.5YR 3/6), mostly low plasticity fines, some fine to medium sands, [LL=36, PL=13, PI=23, NMC=14.1%, %#200=52.8], AASHTO = A-6 (8).		1.4	SS-1	1	2	2	4	4
	3.4	**PIEDMONT RESIDUUM - CLAYEY SAND (SC)** - loose, moist, yellowish-red (5YR 4/6) and brown (7.5YR 5/3), mostly fine to medium sands, little low plasticity fines.		3.4	SS-2	3	3	4	3	7
215.7		@ 5.4 feet - dark reddish-brown (5YR 3/3).		5.4	SS-3	3	3	2	5	5
	7.4	**SANDY SILT (ML)** - very stiff, moist, dark red (2.5YR 3/6), mostly low plasticity fines, few fine sands.		7.4	SS-4	5	7	11	12	18
210.7		@ 9.4 feet - hard, red (2.5YR 4/8) and light red (2.5YR 7/8).		9.4	SS-5	14	20	19	18	39
	11.4	Boring Terminated at 11.4 feet.								
205.7										



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

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	P-48
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	AKS	**Boring Location:**	115+74.80	**Offset:**	L:49.969'	**Alignment:**	Proposed
Elev.:	217.0 ft	**Latitude:**	34.030453	**Longitude:**	-81.122970	**Date Started:**	2/7/1018
Total Depth:	11 ft	**Soil Depth:**	11.0 ft	**Core Depth:**	0 ft	**Date Completed:**	2/7/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	86.5%
Core Size:	N/A	**Driller:**	J. Millwood	**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"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.								
	1.0	**PIEDMONT RESIDUUM - SANDY ELASTIC SILT (MH)** - stiff, moist, olive yellow (5Y 6/6), mostly high plasticity fines, some fine to coarse sands, little fine gravel, [LL=51, PL=30, PI=21, NMC=19%, %#200=51.1], AASHTO = A-7-5 (8).		1.0						
		@ 3 feet - very stiff, red (7.5YR 5/6).			SS-1	9	6	7	7	13
				3.0	SS-2	6	7	9	9	16
212.0				5.0	SS-3	9	10	14	18	24
		@ 7 feet - hard.		7.0	SS-4	15	18	23	28	41
		@ 9 feet - very hard, pale red (7.5R 7/2), trace fine gravel.		9.0	SS-5	16	24	30	32	54
207.0	11.0	Boring Terminated at 11 feet.								
202.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

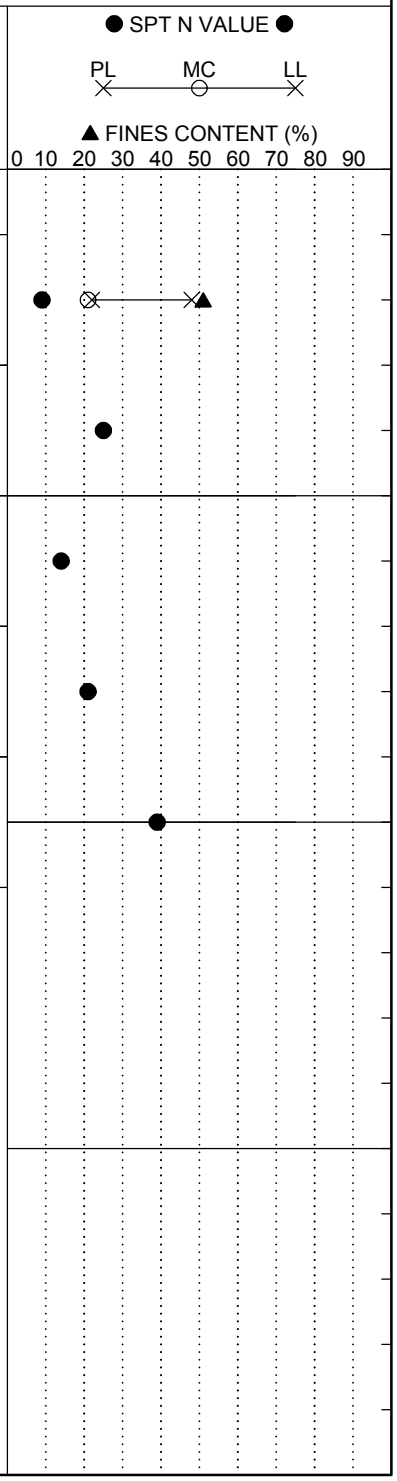
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	P-49
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	I-20
Eng./Geo.:	ELF	**Boring Location:**	125+36.64	**Offset:**	R:58.851'	**Alignment:**	Proposed
Elev.:	232.7 ft	**Latitude:**	34.032131	**Longitude:**	-81.120490	**Date Started:**	2/15/2018
Total Depth:	11 ft	**Soil Depth:**	11 ft	**Core Depth:**	0 ft	**Date Completed:**	2/15/2018
Bore Hole Diameter (in):	7.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**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"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.								
	1.0	**FILL - SANDY LEAN CLAY (CL)** - stiff, moist, dusky red (2.5YR 3/2), mostly low plasticity fines, some fine to medium sands, [LL=48, PL=22, PI=26, NMC=20.89%, %#200=50.7], AASHTO = A-7-6 (9).		1.0	SS-1	3	4	5	12	9
	3.0	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - medium dense, moist, dark red (2.5YR 3/6) and yellowish-red (5YR 5/8), mostly fine sands, some low plasticity fines.		3.0	SS-2	7	12	13	15	25
227.7		@ 5 feet - yellowish-red (5YR 4/6) and white (5YR 8/1), mostly fine to medium sands.		5.0	SS-3	2	6	8	10	14
	8.0	**SILT (ML)** - very stiff, moist, red (2.5YR 4/8) and light red (2.5YR 6/8), mostly low plasticity fines, trace fine sands.		7.0	SS-4	7	10	11	11	21
222.7		@ 9 feet - hard, weak red (10R 4/4) and pinkish-gray (10R 7/1), few gravel sized rock fragments.		9.0	SS-5	14	15	24	28	39
	11.0	Boring Terminated at 11 feet.								
217.7										



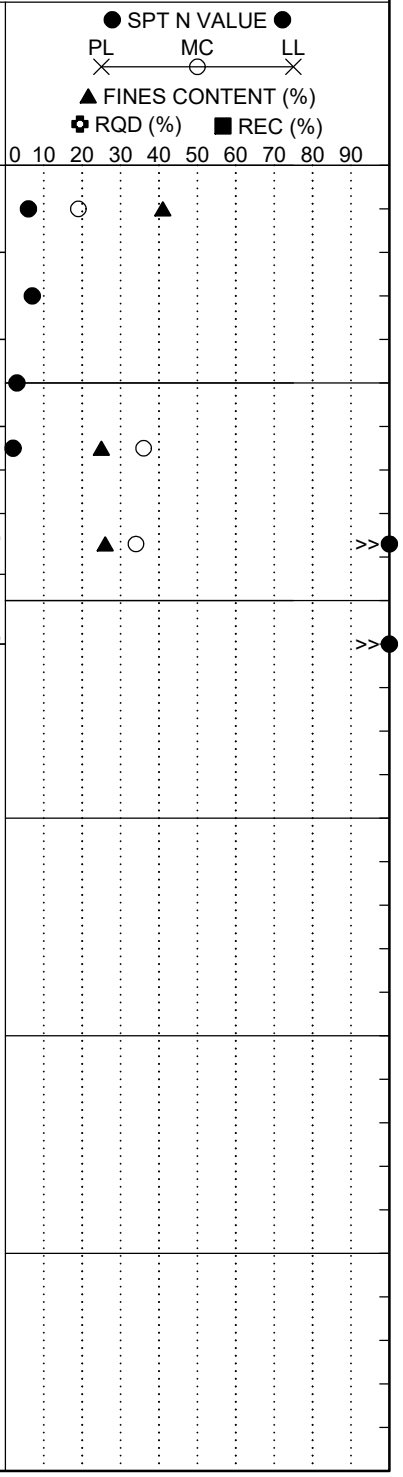
LEGEND

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	

INFRASTRUCTURE CONSULTING & ENGINEERING

Project ID:	P027662	**County:**	Richland			**Boring No.:**	G- 18A
Site Description:	Carolina Crossroads Phase 3					**Route:**	Proposed
Eng./Geo.:	C. McIlroy	**Boring Location:**	83+95	**Offset:**	74' LT	**Alignment:**	I_20
Elev.:	170.8 ft	**Latitude:**	34.0262	**Longitude:**	-81.12809	**Date Started:**	6/1/2023
Total Depth:	11 ft	**Soil Depth:**	11 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/1/2023
Bore Hole Diameter (in):	2.25	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50 #439	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	81%
Core Size:	N/A	**Driller:**	R. Cassell	**Groundwater:**	**TOB** 6.0 ft	**24HR**	5.5 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**Fill** Brown and Orange, Moist, Loose, Silty Sand (SM) SS-98: NM=19.1% LL=NP PL=NP PI=NP #200=41.3% (A-4 (0))		0.0	SS-98	3	3	3	4	6
				2.0	SS-99	3	3	4	3	7
	3.5	**Alluvial**		4.0						
165.8		Gray, Moist to Wet, Soft to Very Dense, Silty Sand (SM) SS-101: NM=35.9% LL=NP PL=NP PI=NP #200=25.3% (A-2-4 (0)) SS-102: NM=33.9% LL=NP PL=NP PI=NP #200=26.2% (A-2-4 (0))			SS-100	1	1	2	1	3
				6.0	SS-101	WOH	WOH	2	3	2
				8.0	SS-102	2	20	50/5"		50/5"
160.8	11.0	Auger Refusal at 11.0 Feet		11.0	NR	50/0"				50/0"
155.8										
150.8										
145.8										



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	NR - No Recovery

SC_DOT_CCR3_PURSUIT_BH.GPJ SCDOT_DATATEMPLATE.GDT 2/5/24

INFRASTRUCTURE CONSULTING & ENGINEERING

Project ID:	P027662	**County:**	Richland			**Boring No.:**	G- 44
Site Description:	Carolina Crossroads Phase 3					**Route:**	Proposed
Eng./Geo.:	C. McIlroy	**Boring Location:**	85+55	**Offset:**	118' RT	**Alignment:**	I-20
Elev.:	172.5 ft	**Latitude:**	34.02615	**Longitude:**	-81.12726	**Date Started:**	6/1/2023
Total Depth:	12.3 ft	**Soil Depth:**	12.3 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/1/2023
Bore Hole Diameter (in):	2.25	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50 #439	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	81%
Core Size:	N/A	**Driller:**	R. Cassell	**Groundwater:**	**TOB** 7.0 ft	**24HR**	6.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**Fill** Orange, Moist, Loose, Silty Sand	0.0	SS-103	4	4	4	3	8
	2.0	Orange and Tan, Moist, Firm, Sandy Silt (ML) SS-104: NM=24.7% LL=NP PL=NP PI=NP #200=69.6% (A-4 (0))	2.0	SS-104	2	1	4	5	5
167.5			4.0	SS-105	3	3	4	5	7
			6.0	SS-106	3	3	4	4	7
	9.0	**Alluvial** Gray, Wet, Very Loose, Silty Sand (SM)	8.0	SS-107	2	3	3	3	6
162.5		SS-107: NM=27.9% LL=NP PL=NP PI=NP #200=37% (A-4 (0))	10.0	SS-108	WOH	WOH	WOH	50/4"	50/4"
	11.5								
	12.3	SS-108: NM=29.3% LL=NP PL=NP PI=NP #200=39.9% (A-4 (0))	12.3	NR	50/0"				50/0"
		Residual Gray, Very Dense, Saprolitic, Clayey Silt							
157.5		Auger Refusal at 12.3 Feet							
152.5									
147.5									

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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	NR - No Recovery

SC_DOT_CCR3_PURSUIT_BH.GPJ SCDOT_DATATEMPLATE.GDT 2/5/24

INFRASTRUCTURE CONSULTING & ENGINEERING

Project ID:	P027662	**County:**	Richland			**Boring No.:**	G- 46
Site Description:	Carolina Crossroads Phase 3					**Route:**	Proposed
Eng./Geo.:	C. McIlroy	**Boring Location:**	87+77	**Offset:**	115' RT	**Alignment:**	I-20
Elev.:	174.1 ft	**Latitude:**	34.02658	**Longitude:**	-81.12676	**Date Started:**	6/1/2023
Total Depth:	19.2 ft	**Soil Depth:**	19.2 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/1/2023
Bore Hole Diameter (in):	2.25	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50 #439	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	81%
Core Size:	N/A	**Driller:**	R. Cassell	**Groundwater:**	**TOB** N/A	**24HR**	4.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**Fill** Orange, Moist, Stiff, Sandy Silt	0.0	SS-109	9	8	7	3	15
	2.0	Orange, Gray and Tan, Moist to Wet, Firm to Stiff, Lean Clay with Sand (CL) SS-110: NM=24.1% LL=32 PL=23 PI=9 #200=74.7% (A-4 (6))	2.0	SS-110	3	3	4	5	7
169.1		SS-111: NM=20.2% LL=34 PL=18 PI=16 #200=75.6% (A-6 (11))	4.0	SS-111	3	4	5	7	9
			6.0	SS-112	5	6	9	8	15
			8.0	SS-113	4	5	4	6	9
164.1	10.5	**Alluvial** Gray, Wet, Loose, Clayey Sand (SC)	10.0	SS-114	1	2	3	4	5
	12.0	SS-114: NM=19.8% LL=28 PL=18 PI=10 #200=39.7% (A-4 (1))	12.0	SS-115	4	1	2	4	3
	14.0	Tan, Wet, Very Loose, Poorly Graded Sand (SP)	14.0	SS-116	1	5	10	12	15
159.1		SS-115: NM=25.1% LL=NP PL=NP PI=NP #200=4% (A-1-b (0))	16.0	SS-117	34 50/2.5"				50/2.5"
	16.3								
	17.0	Tan, Wet, Medium Dense, Poorly Graded Sand with Silt (SP-SM) SS-116: NM=21.6% LL=NP PL=NP PI=NP #200=5% (A-1-b (0))	18.5	SS-118	35 50/3"				50/3"
	19.2								
154.1		**Residual** Gray, Hard, Saprolitic, Clayey Silt							
		Gray, Very Dense, Saprolitic, Silty Sand (SM) SS-118: NM=12% LL=NP PL=NP PI=NP #200=40.4% (A-4 (0))							
		Boring Terminated at 19.2 Feet							
149.1									

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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	NR - No Recovery

SC_DOT_CCR3_PURSUIT_BH.GPJ SCDOT_DATATEMPLATE.GDT 2/5/24

INFRASTRUCTURE CONSULTING & ENGINEERING

Project ID:	P027662	**County:**	Richland			**Boring No.:**	G- 49
Site Description:	Carolina Crossroads Phase 3					**Route:**	Proposed
Eng./Geo.:	C. McIlroy	**Boring Location:**	78+82	**Offset:**	59' LT	**Alignment:**	I-20
Elev.:	172.9 ft	**Latitude:**	34.02516	**Longitude:**	-81.12924	**Date Started:**	6/2/2023
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	6/2/2023
Bore Hole Diameter (in):	2.25	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	D-50 #439	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	81%
Core Size:	N/A	**Driller:**	R. Cassell	**Groundwater:**	**TOB** 8.5 ft	**24HR**	7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**Roadway Embankment** Orange, Moist, Stiff to Very Stiff, Sandy Lean CLAY (CL) with Trace Gravel SS-119: NM=16.6% LL=39 PL=21 PI=18 #200=65.4% (A-6 (10))	0.0	SS-119	3	4	6	6	10
			2.0	SS-120	5	7	10	11	17
167.9			4.0	SS-121	4	5	9	14	14
	6.0	**Alluvial** Orange and Brown, Wet, Medium Dense, Silty SAND with Gravel (SM)	6.0	SS-122	7	7	8	5	15
	8.0	SS-122: NM=15.9% LL=NP PL=NP PI=NP #200=12.6% (A-1-b (0))	8.0	SS-123	8	7	7	10	14
162.9		Orange and Gray, Wet, Medium Dense, Well-Graded SAND with Silt and Gravel (SW-SM)	10.0	SS-124	2	5	14	45	19
	11.5	SS-123: NM=13.8% LL=NP PL=NP PI=NP #200=9.4% (A-1-b (0))	13.5	SS-125	29	50/5"			50/5"
		Residual Gray, Wet, Very Dense, Saprolitic, Well-Graded SAND with Silt (SW-SM)	15.0	NR	50/0"				50/0"
157.9	15.0	SS-124: NM=19.3% LL=NP PL=NP PI=NP #200=9.5% (A-3 (0))							
		Auger Refusal at 15.0 Feet							
152.9									
147.9									

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) ✿ RQD (%) ■ REC (%)
0 10 20 30 40 50 60 70 80 90

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	NR - No Recovery

SC_DOT_CCR3_PURSUIT_BH.GPJ SCDOT_DATATEMPLATE.GDT 2/5/24

APPENDIX

SECTION 4 GEOTECHNICAL EXPLORATION LOGS

SECTION 4B CPT LOGS

Cone Penetration Test

Carolina Crossroads I-20/26/126 Corridor Improvements (South Carolina)

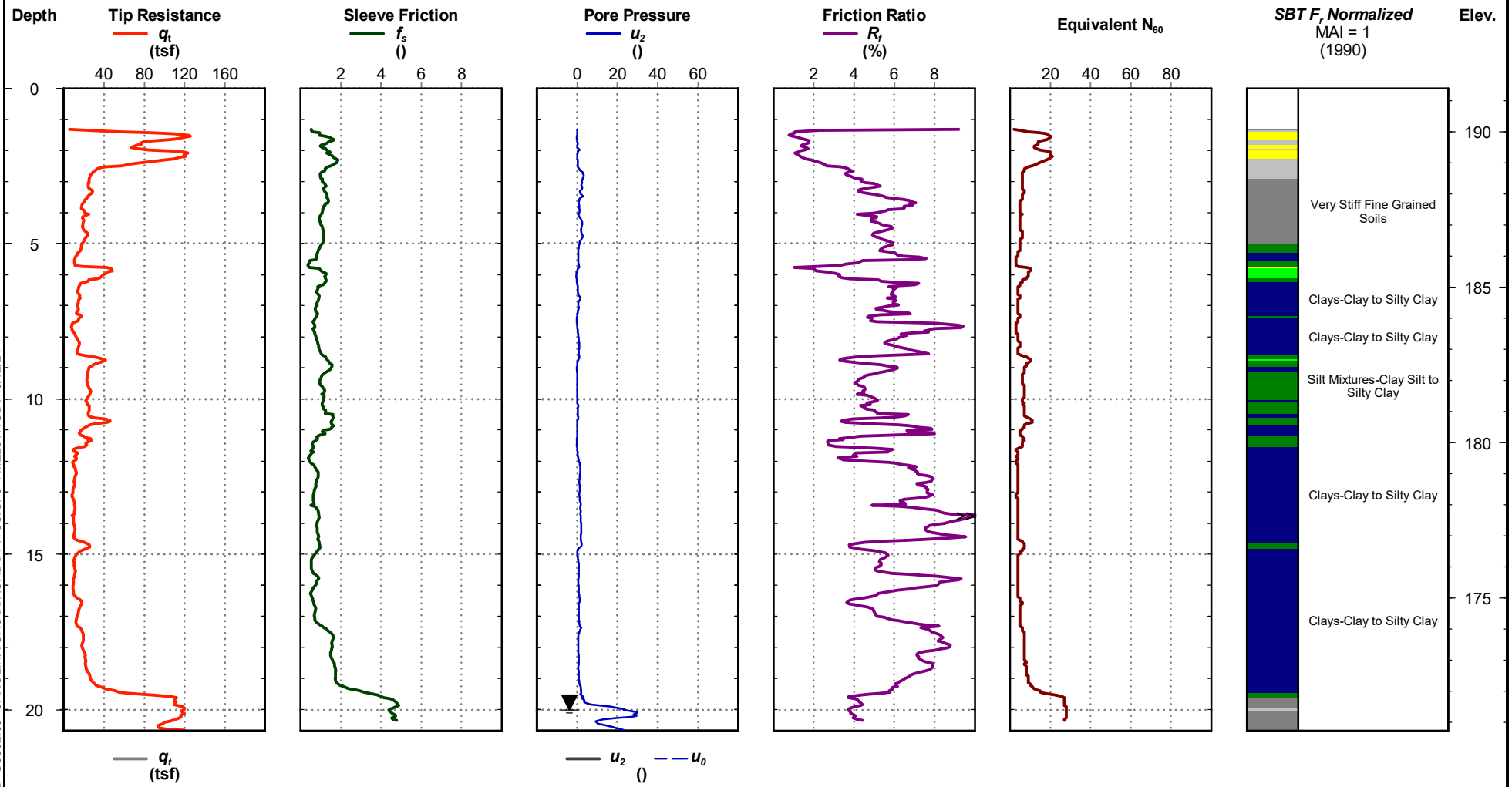
Project No. :P039720

C3C-CPT1

Date: May. 7, 2024
Estimated Water Depth: 20 ft
Rig/Operator: C. Piercy

Station: 88+29
Offset: 11-L
Elevation: 191.4 ft-MSL

Total Depth: 20.7 ft
Termination Criteria: Maximum Reaction Force
CPT Probe ID: DDG1330



CPT REPORT - STANDARD G5662.03- CAROLINA CROSSROADS PH 3C.GPJ FME2017.GDT 6/12/24

C3C-CPT1

Electronic File Name: G5662.03 CCR Phase 3C C3C-CPT-1.cpt

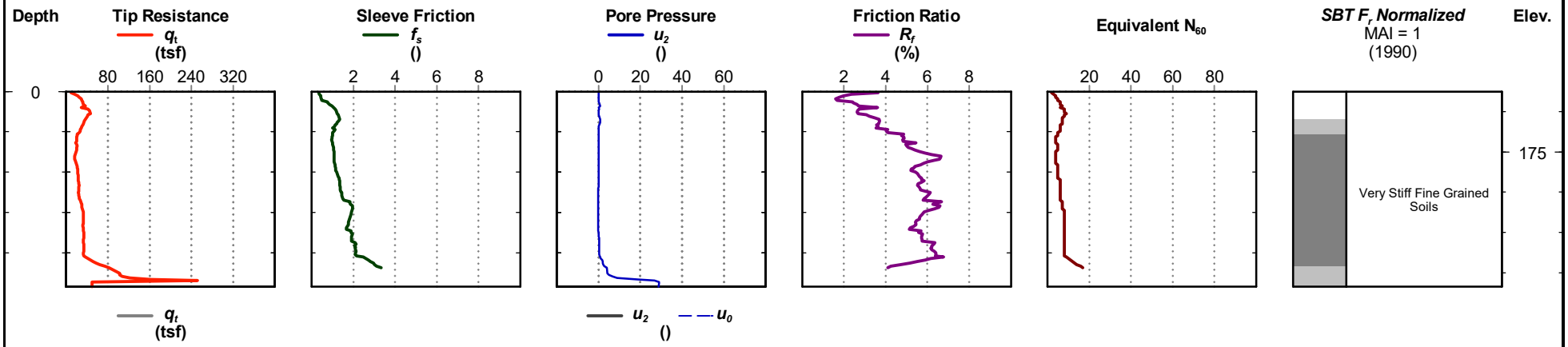
Carolina Crossroads Phase 3C
(South Carolina)
Project No. :P039720

C3C-CPT2

Date: Mar. 20, 2024
Estimated Water Depth: NE
Rig/Operator: C. Piercy

Station: 88+90
Offset: 89-R
Elevation: 176.5 ft-MSL

Total Depth: 4.8 ft
Termination Criteria: Maximum Reaction Force
CPT Probe ID: DDG1330



CPT REPORT - STANDARD G5662.03- CAROLINA CROSSROADS PH 3C.GPJ FME2017.GDT 6/12/24

C3C-CPT2

Electronic File Name: G5662.02 CCR Phase 3C C3C-CPT2.cpt

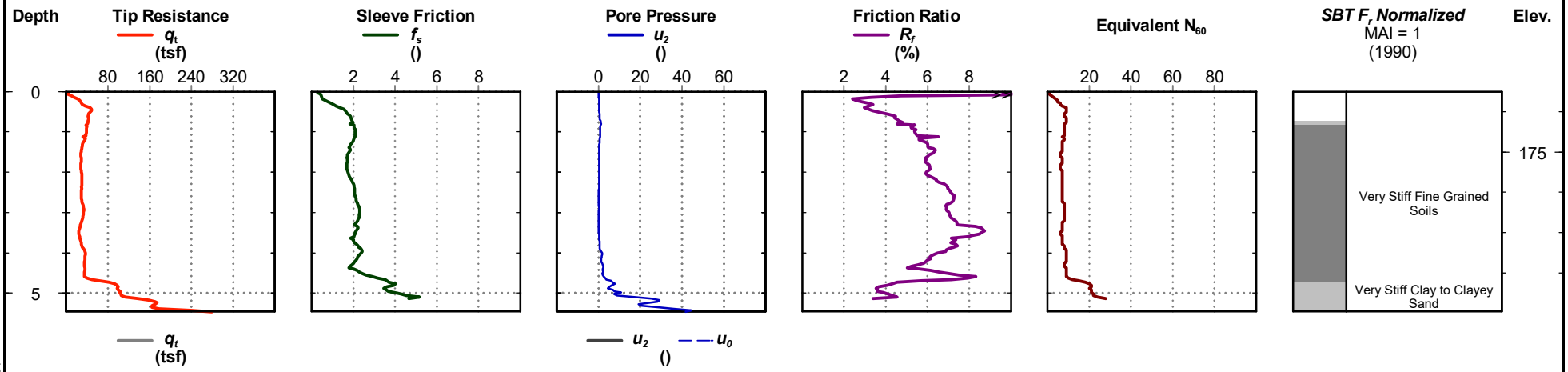
Carolina Crossroads Phase 3C
(South Carolina)
Project No. :P039720

C3C-CPT2A

Date: Mar. 20, 2024
Estimated Water Depth: NE
Rig/Operator: C. Piercy

Station: 89+04
Offset: 98-R
Elevation: 176.5 ft-MSL

Total Depth: 5.5 ft
Termination Criteria: Maximum Reaction Force
CPT Probe ID: DDG1330



C3C-CPT2A

Electronic File Name: G5662.02 CCR Phase 3C C3C-CPT2A.cpt

F&ME CONSULTANTS

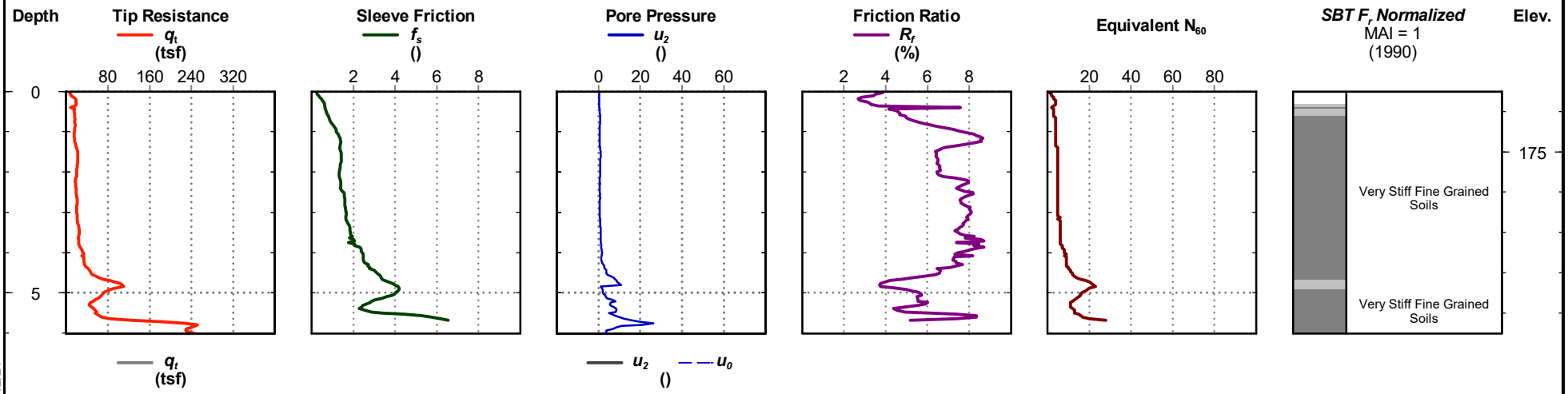
Carolina Crossroads Phase 3C
(South Carolina)
Project No. :P039720

C3C-CPT2B

Date: Mar. 20, 2024
Estimated Water Depth: NE
Rig/Operator: C. Piercy

Station: 88+94
Offset: 103-R
Elevation: 176.5 ft-MSL

Total Depth: 6.0 ft
Termination Criteria: Maximum Reaction Force
CPT Probe ID: DDG1330



C3C-CPT2B

Electronic File Name: G5662.02 CCR Phase 3C C3C-CPT2B.cpt

Cone Penetration Test

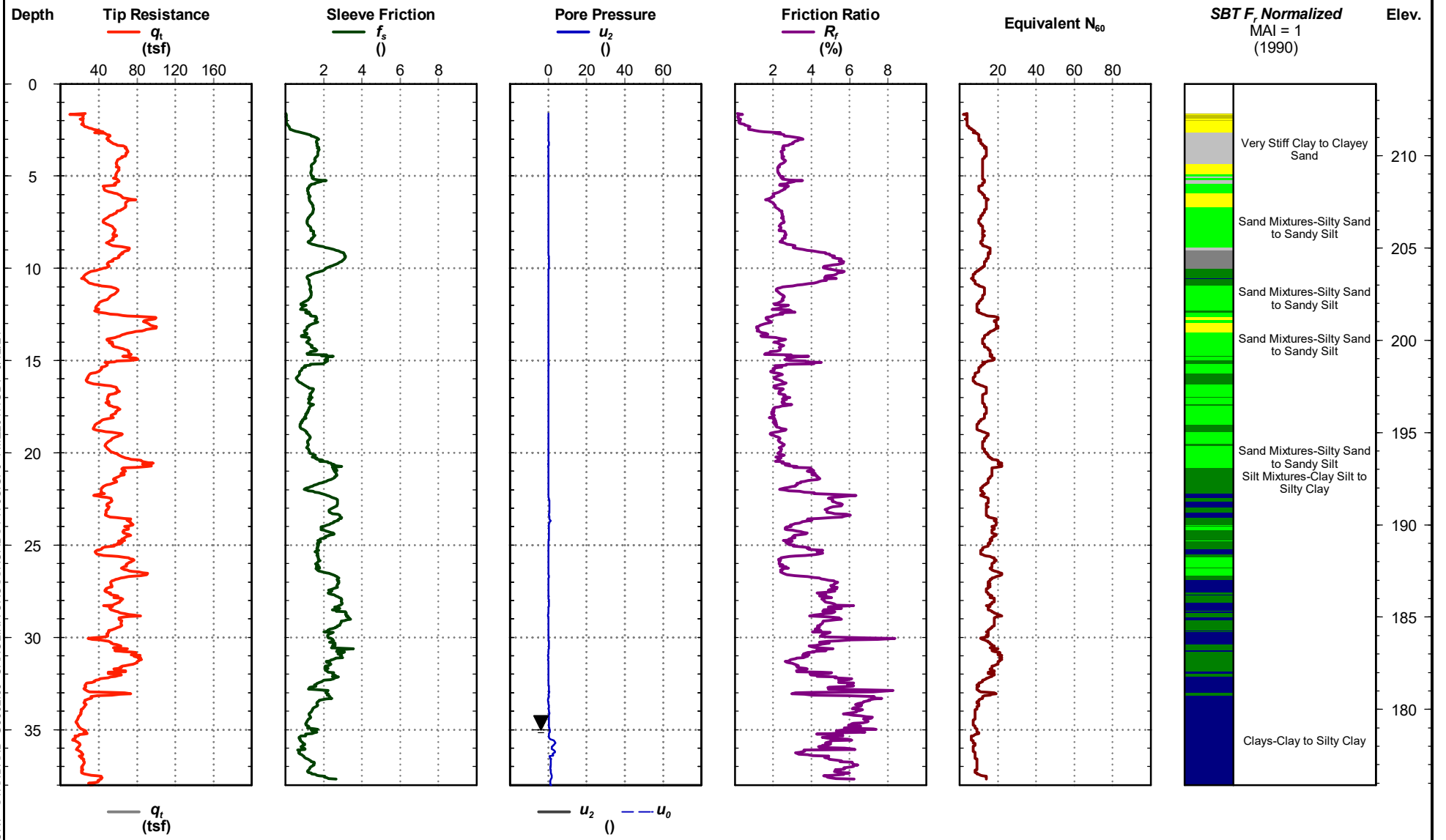
C3C-CPT3

Carolina Crossroads Phase 3C
(South Carolina)
Project No. :P039720

Date: May. 7, 2024
Estimated Water Depth: 35 ft
Rig/Operator: C. Piercy

Station: 101+04
Offset: 12-L
Elevation: 213.9 ft-MSL

Total Depth: 38.0 ft
Termination Criteria: Maximum Reaction Force
CPT Probe ID: DDG1330



CPT REPORT - STANDARD G5662.03- CAROLINA CROSSROADS PH 3C.GPJ FME2017.GDT 6/12/24

C3C-CPT3

Electronic File Name: G5662.03 CCR Phase 3C C3C-CPT-3.cpt

APPENDIX

SECTION 4 GEOTECHNICAL EXPLORATION LOGS

SECTION 4C AUGER BORING LOGS

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50UD
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+52.23	**Offset:**	R:48.640'	**Alignment:**	Proposed
Elev.:	212.3 ft	**Latitude:**	34.027277	**Longitude:**	-81.126258	**Date Started:**	3/27/2018
Total Depth:	42.5 ft	**Soil Depth:**	42.5 ft	**Core Depth:**	0 ft	**Date Completed:**	3/27/2018
Bore Hole Diameter (in):	4.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**Groundwater:**	**TOB** 12 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 12 inches of ASPHALT.								
	1.0									
207.3		Drilled without sampling to 12 feet.								
202.3										
	12.0 ▽	**FILL - SILT WITH SAND (ML)** - stiff, moist, light brown (7.5YR 6/5), mostly low plasticity fines, little fine sands, trace fine gravel.		12.0	SS-1	4	5	4		9
		@ 13.5 feet - light red (2.5YR 6/6), micaceous, [LL=38, PL=29, PI=9, %#200=74.2], AASHTO = A-4 (7).		13.5	UD-1					
197.3		@ 15.5 feet - light brown (7.5YR 6/5).		15.5	SS-2	5	5	6		11
	17.0									

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50UD
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+52.23	**Offset:**	R:48.640'	**Alignment:**	Proposed
Elev.:	212.3 ft	**Latitude:**	34.027277	**Longitude:**	-81.126258	**Date Started:**	3/27/2018
Total Depth:	42.5 ft	**Soil Depth:**	42.5 ft	**Core Depth:**	0 ft	**Date Completed:**	3/27/2018
Bore Hole Diameter (in):	4.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**Groundwater:**	**TOB** 12 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
187.3		Drilled without sampling to 33.5 feet.								
182.3										
	33.5	**RIVER TERRACE ALLUVIUM - LEAN CLAY WITH SAND (CL)** - firm, moist, dark reddish-brown (2.5YR 3/4), mostly low to medium plasticity fines, little fine to medium sands, trace wood/organics.		33.5	SS-3	3	3	3		6
177.3	35.0	**SANDY FAT CLAY (CH)** - moist, dark reddish-brown (2.5YR 3/4), mostly high plasticity fines, some fine to medium sands, trace fine gravel, [LL=51, PL=28, PI=23, %#200=51.0], AASHTO = A-7-6 (9).		35.0	UD-2					
	37.0	**CLAYEY SAND (SC)** - medium dense, moist, light brownish-gray (10YR 6/2), mostly fine to medium sands, some low to medium plasticity fines.		37.0	SS-4	6	7	6		13
		@ 39 feet - light brownish-gray (1YR 6/2).		39.0						

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

SCDOT Soil Test Log

Project ID:	P027662			**County:**	Lexington/Richland	**Boring No.:**	B-50UD
Site Description:	Carolina Crossroads I-20/26/126 Corridor Improvement Project					**Route:**	Site 44
Eng./Geo.:	NGS	**Boring Location:**	91+52.23	**Offset:**	R:48.640'	**Alignment:**	Proposed
Elev.:	212.3 ft	**Latitude:**	34.027277	**Longitude:**	-81.126258	**Date Started:**	3/27/2018
Total Depth:	42.5 ft	**Soil Depth:**	42.5 ft	**Core Depth:**	0 ft	**Date Completed:**	3/27/2018
Bore Hole Diameter (in):	4.5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 55	**Drill Method:**	RW	**Hammer Type:**	Automatic	**Energy Ratio:**	84.1%
Core Size:	N/A	**Driller:**	T. Miller	**Groundwater:**	**TOB** 12 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
					UD-3					
	41.0			41.0						
		LEAN CLAY WITH SAND (CL) - firm, moist, greenish-gray (GLEY 1 5/1), mostly low to medium plasticity fines, little fine sands, trace wood/organics.			SS-5	3	2	3		5
	42.5	Boring Terminated at 42.5 feet.								
167.3										
162.3										
157.3										

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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	

SC_DOT 1461-16-047_ALL BORINGS - HGM 7-16-18.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/11/18

APPENDIX

SECTION 5 LABORATORY TEST RESULTS

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5662.03; SCDOT PROJECT NO.: P039720

SOIL LABORATORY RESULTS SUMMARY

Boring Number	Sample Number	Sample Depth (ft)	Index									Corrosion Series				Standard Proctor		CU Triaxial Shear			
			% Gravel	% Sand	% Fines (Silt/Clay)	LL	PL	PI	Moisture Content	USCS	AASHTO Class	pH	Resistivity (Ohms-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	φ (degrees)	C (psf)	φ' (degrees)	C' (psf)
C3C-B1	SS-2	2.0-4.0	--	--	81.5	55	27	28	32.1	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B1	SS-3	4.0-6.0	--	--	79.7	55	32	23	31.1	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
C3C-B1	SS-4	6.0-8.0	--	--	74.7	40	27	13	30.5	ML	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B1	SS-5	8.0-10.0	--	--	80.0	57	25	32	32.8	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B1	SS-6	13.5-15.0	--	--	72.3	36	18	18	25.5	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B2	SS-2	2.0-4.0	--	--	86.3	60	21	39	26.3	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B2	SS-3	4.0-6.0	--	--	82.9	47	21	26	23.1	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B2	SS-5	8.0-10.0	--	--	35.2	NP	NP	NP	23.1	SM	A-2-4	--	--	--	--	--	--	--	--	--	--
C3C-B2	SS-6	13.5-15.0	--	--	8.4	--	--	--	18.0	SM	A-2-4	--	--	--	--	--	--	--	--	--	--
C3C-B3	SS-1	0.0-2.0	27.3	39.3	17.6	NP	NP	NP	17.3	GM	A-1-b	--	--	--	--	--	--	--	--	--	--
C3C-B3	SS-2	2.0-4.0	34.3	44.8	20.9	22	21	1	13.5	SM	A-1-b	--	--	--	--	--	--	--	--	--	--
C3C-B3	SS-3	4.0-6.0	30.7	34.5	34.7	NP	NP	NP	13.8	SM	A-2-4	--	--	--	--	--	--	--	--	--	--
C3C-B4	SS-1	8.5-10.5	--	--	45.9	40	22	18	9.4	SC	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B4	SS-3	12.5-14.5	--	--	56.3	41	18	23	12.0	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B4	SS-5	16.5-18.5	--	--	68.1	40	17	23	27.4	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B4	SS-7	27.0-28.5	--	--	84.9	NP	NP	NP	29.1	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B4	SS-9	37.0-38.5	--	--	42.7	NP	NP	NP	33.4	SM	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-2	2.0-4.0	--	--	45.7	45	16	29	12.4	SC	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-4	6.0-8.0	--	--	66.5	34	25	9	21.4	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-5	8.0-10.0	--	--	66.6	40	19	21	18.3	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-6	13.5-15.0	--	--	58.3	37	26	11	13.2	ML	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-8	23.5-25.0	--	--	86.8	NP	NP	NP	33.4	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-11	38.5-40.0	--	--	74.0	45	29	16	27.7	ML	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-12	43.5-45.0	--	--	84.3	56	25	31	26.9	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-B5	SS-15	58.5-60.0	--	--	37.4	NP	NP	NP	28.8	SM	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-2	10.5-12.5	--	--	70.6	39	26	13	13.0	ML	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-4	14.5-16.5	--	--	52.5	35	26	9	4.9	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-5	16.5-18.5	--	--	57.2	30	27	3	12.1	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-6	22.0-23.5	--	--	61.3	31	26	5	18.9	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-7	27.0-28.5	--	--	56.9	37	21	16	18.8	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-9	37.0-38.5	--	--	48.0	35	24	11	19.9	SC	A-6	--	--	--	--	--	--	--	--	--	--
C3C-B6	SS-12	52.0-53.5	--	--	51.7	NP	NP	NP	20.5	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B7	SS-2	2.0-4.0	--	--	53.3	NP	NP	NP	16.6	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B7	SS-4	6.0-8.0	--	--	79.9	NP	NP	NP	17.3	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B7	SS-6	13.5-15.0	--	--	80.7	41	31	10	20.5	ML	A-5	--	--	--	--	--	--	--	--	--	--
C3C-B7	SS-8	23.5-25.0	--	--	65.2	35	28	7	24.5	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-B7	SS-11	38.5-40.0	--	--	71.3	40	32	8	26.7	ML	A-4	--	--	--	--	--	--	--	--	--	--

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5662.03; SCDOT PROJECT NO.: P039720

SOIL LABORATORY RESULTS SUMMARY

Boring Number	Sample Number	Sample Depth (ft)	Index									Corrosion Series				Standard Proctor		CU Triaxial Shear			
			% Gravel	% Sand	% Fines (Silt/Clay)	LL	PL	PI	Moisture Content	USCS	AASHTO Class	pH	Resistivity (Ohms-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	φ (degrees)	C (psf)	φ' (degrees)	C' (psf)
C3C-U1	SS-3	4.0-6.0	--	--	75.8	34	31	3	14.8	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U1	SS-4	6.0-8.0	--	--	74.8	NP	NP	NP	22.9	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U1	SS-6	13.5-15.0	--	--	60.1	35	23	12	10.6	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-U1	SS-7	18.5-20.0	--	--	52.8	43	24	19	18.6	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-U1	SS-10	33.5-35.0	--	--	44.4	37	14	23	14.6	SC	A-6	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-2	2.0-4.0	--	--	64.4	NP	NP	NP	17.2	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-3	4.0-6.0	--	--	68.4	NP	NP	NP	11.8	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-4	6.0-8.0	--	--	76.3	NP	NP	NP	16.1	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-6	13.5-15.0	--	--	56.5	NP	NP	NP	19.7	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-8	23.5-25.0	--	--	50.3	38	18	20	20.0	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-9	28.5-30.0	--	--	75.7	51	29	22	27.5	MH	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-11	38.5-40.0	--	--	46.4	NP	NP	NP	16.6	SM	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U2	SS-13	48.5-50.0	--	--	34.3	NP	NP	NP	30.7	SM	A-2-4	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-2	2.0-4.0	--	--	42.8	39	17	43	15.8	SC	A-6	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-6	13.5-15.0	--	--	52.2	33	31	52	15.5	ML	A-4	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-7	18.5-20.0	--	--	45.4	50	28	45	21.1	SC	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-8	23.5-25.0	--	--	58.9	37	23	59	22.3	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-10	33.5-35.0	--	--	46.3	41	14	46	19.2	SC	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-11	38.5-40.0	--	--	56.8	46	19	57	25.9	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-U3	SS-12	43.5-45.0	--	--	42.3	33	13	42	27.6	SC	A-6	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-2	2.0-4.0	--	--	95.3	39	15	24	13.7	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-3	4.0-6.0	--	--	82.2	45	19	26	14.6	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-4	6.0-8.0	--	--	32.7	34	21	13	18.3	SC	A-2-6	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-5	8.0-10.0	--	--	38.2	32	26	6	22.0	SM	A-4	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-6	13.5-15.0	--	--	63.8	35	22	13	21.3	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-8	23.5-25.0	--	--	71.1	53	37	16	36.4	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
C3C-W1	SS-10	33.5-35.0	--	--	79.2	48	29	19	27.5	ML	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W2	SS-1	0.0-2.0	--	--	10.0	NP	NP	NP	3.9	SP-SM	A-3	--	--	--	--	--	--	--	--	--	--
C3C-W2	SS-4	6.0-8.0	--	--	82.0	49	25	24	24.7	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W2	SS-6	13.5-15.0	--	--	94.6	60	40	20	37.8	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
C3C-W3	SS-2	2.0-4.0	--	--	86.9	39	23	16	25.9	CL	A-6	--	--	--	--	--	--	--	--	--	--
C3C-W4	SS-2	2.0-4.0	--	--	93.2	41	25	16	19.9	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W5	SS-3	4.0-6.0	--	--	41.9	42	16	26	14.8	SC	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W5	SS-4	6.0-8.0	--	--	78.2	49	24	25	21.4	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
C3C-W5	SS-6.1	13.5-14.0	--	--	14.6	--	--	--	6.1	SM	A-2-4	--	--	--	--	--	--	--	--	--	--
C3C-W5	SS-6.2	14.0-15.0	--	--	51.9	60	15	45	15.7	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
B-47	SS-1	1.0-3.0	0.4	42.4	57.2	30	17	13	15.3	CL	A-6	--	--	--	--	--	--	--	--	--	--

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5662.03; SCDOT PROJECT NO.: P039720

SOIL LABORATORY RESULTS SUMMARY

Boring Number	Sample Number	Sample Depth (ft)	Index									Corrosion Series				Standard Proctor		CU Triaxial Shear			
			% Gravel	% Sand	% Fines (Silt/Clay)	LL	PL	PI	Moisture Content	USCS	AASHTO Class	pH	Resistivity (Ohms-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	φ (degrees)	C (psf)	φ' (degrees)	C' (psf)
B-47	SS-4	7.0-9.0	10.0	18.3	71.7	35	26	9	17.7	ML	A-4	--	--	--	--	--	--	--	--	--	--
B-47	SS-8	24.5-26.0	21.6	37.0	41.5	39	25	14	23.5	SC	A-6	--	--	--	--	--	--	--	--	--	--
B-47	SS-9 & SS-10	29.5-36.0	--	--	--	--	--	--	--	--	--	7.15	10,050	60	138	--	--	--	--	--	--
B-48	SS-1	0.0-2.0	1.0	42.0	57.0	30	18	12	13.0	CL	A-6	--	--	--	--	--	--	--	--	--	--
B-48	SS-2	2.0-4.0	0.0	16.0	84.0	40	24	16	29.3	CL	A-6	--	--	--	--	--	--	--	--	--	--
B-48	SS-3	6.0-8.0	13.0	48.0	39.0	32	23	9	17.0	SM	A-4	--	--	--	--	--	--	--	--	--	--
B-49	SS-1	24.5-26.5	16.4	48.6	35.0	32	23	9	24.0	SC	A-2-4	--	--	--	--	--	--	--	--	--	--
B-49	SS-2	26.5-28.5	0.1	56.6	43.3	25	17	8	23.0	SC	A-4	--	--	--	--	--	--	--	--	--	--
B-49	SS-4	30.5-32.5	0.0	24.5	75.5	39	25	14	49.0	CL	A-6	--	--	--	--	--	--	--	--	--	--
B-49	SS-5	32.5-34.5	0.0	64.2	35.8	25	NP	NP	47.0	SM	A-4	--	--	--	--	--	--	--	--	--	--
B-50	SS-4	7.0-9.0	1.3	18.0	80.7	35	28	7	14.5	ML	A-4	--	--	--	--	--	--	--	--	--	--
B-50	SS-6	13.5-15.0	3.1	29.7	67.3	37	23	14	13.9	CL	A-6	--	--	--	--	--	--	--	--	--	--
B-50	SS-8	23.5-25.0	10.7	26.6	62.7	42	28	14	18.7	ML	A-7-6	--	--	--	--	--	--	--	--	--	--
B-50	SS-10	33.5-35.0	3.7	20.6	75.8	51	32	19	28.8	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
B-50	SS-11 & SS-12	38.5-45.0	--	--	--	--	--	--	--	--	--	7.18	50,920	15	3	--	--	--	--	--	--
B-50	SS-14	53.5-55.0	0.0	67.4	32.6	26	22	4	28.0	SC-SM	A-2-4	--	--	--	--	--	--	--	--	--	--
B-50UD	UD-1	13.5-15.5	3.3	22.5	74.2	38	29	9	--	ML	A-4	--	--	--	--	--	--	22	271	32	72
B-50UD	UD-2	35.0-37.0	4.7	44.3	51.0	51	28	23	--	CH	A-7-6	--	--	--	--	--	--	23	74	35	333
B-51	SS-1	0.0-2.0	11.3	42.2	46.5	50	26	24	18.2	SC	A-7-6	--	--	--	--	--	--	--	--	--	--
B-51	SS-3 & SS-4	4.0-8.0	--	--	--	--	--	--	--	--	--	6.81	61,640	6	12	--	--	--	--	--	--
B-51	SS-6	13.5-15.0	27.1	26.6	46.4	43	28	15	16.5	GM	A-7-6	--	--	--	--	--	--	--	--	--	--
B-51	SS-9	28.5-30.0	0.0	19.6	80.4	39	26	13	23.4	ML	A-6	--	--	--	--	--	--	--	--	--	--
DH-4	SS-1	0.0-2.0	0.4	71.2	28.4	24	14	10	10.5	SC	A-2-4	--	--	--	--	--	--	--	--	--	--
DH-4	SS-2	2.0-4.0	1.2	33.2	65.6	42	23	19	17.2	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
DH-4	SS-4	6.0-8.0	26.3	46.6	27.1	44	21	23	16.7	SC	A-2-7	--	--	--	--	--	--	--	--	--	--
DH-4	SS-3 & SS-5	4.0-10.0	--	--	--	--	--	--	--	--	--	7.68	60,300	21	9	--	--	--	--	--	--
DH-4	SS-6	13.5-15.0	0.0	19.1	80.9	63	38	25	31.2	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
P-44	SS-1	1.1-3.1	1.7	14.8	83.5	62	25	37	30.1	CH	A-7-6	--	--	--	--	--	--	--	--	--	--
P-45	SS-1	1.0-3.0	13.0	53.7	33.3	42	19	23	13.6	SC	A-2-7	--	--	--	--	--	--	--	--	--	--
P-47	SS-1	1.4-3.4	0.7	46.5	52.8	36	13	23	14.1	CL	A-6	--	--	--	--	--	--	--	--	--	--
P-48	SS-1	1.0-3.0	14.4	34.6	51.1	51	30	21	19.0	MH	A-7-5	--	--	--	--	--	--	--	--	--	--
P-49	SS-1	1.0-3.0	0.0	49.3	50.7	48	22	26	20.8	CL	A-7-6	--	--	--	--	--	--	--	--	--	--
RW-40	SS-2	2.0-4.0	4.6	12.3	83.2	43	32	11	30.8	ML	A-7-5	--	--	--	--	--	--	--	--	--	--
G-18A	SS-98	0.0-2.0	4.0	54.7	41.3	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-18A	SS-101	6.0-7.0	0.2	74.5	25.3	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-18A	SS-102	8.0-9.5	3.9	69.9	26.2	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-44	SS-104	2.0-4.0	0.3	30.1	69.6	NP	NP	NP	--	ML	--	--	--	--	--	--	--	--	--	--	--

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5662.03; SCDOT PROJECT NO.: P039720

SOIL LABORATORY RESULTS SUMMARY

Boring Number	Sample Number	Sample Depth (ft)	Index								Corrosion Series				Standard Proctor		CU Triaxial Shear			
			% Gravel	% Sand	% Fines (Silt/Clay)	LL	PL	PI	Moisture Content	USCS	AASHTO Class	pH	Resistivity (Ohms-cm)	Sulfate (mg/kg)	Chloride (mg/kg)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)	φ (degrees)	C (psf)	φ' (degrees)	C' (psf)
G-44	SS-107	8.0-10.0	0.0	63.0	37.0	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-44	SS-108	10.0-12.0	0.2	59.9	39.9	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-110	2.0-4.0	0.2	25.1	74.7	32	23	9	--	CL	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-111	4.0-6.0	0.3	24.1	75.6	34	18	16	--	CL	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-114	8.0-10.0	0.0	60.0	39.7	28	18	10	--	SC	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-115	10.0-12.0	0.0	96.0	4.0	NP	NP	NP	--	SP	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-116	12.0-14.0	0.0	94.4	5.0	NP	NP	NP	--	SP-SM	--	--	--	--	--	--	--	--	--	--	--
G-46	SS-117	16.0-16.5	9.1	50.5	40.4	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-49	SS-119	0.0-2.0	10.8	23.8	65.4	39	21	18	--	CL	--	--	--	--	--	--	--	--	--	--	--
G-49	SS-122	6.0-8.0	16.1	71.3	12.6	NP	NP	NP	--	SM	--	--	--	--	--	--	--	--	--	--	--
G-49	SS-123	8.0-10.0	28.2	62.4	9.4	NP	NP	NP	--	SW-SM	--	--	--	--	--	--	--	--	--	--	--
G-49	SS-124	10.0-12.0	12.5	78.0	9.5	NP	NP	NP	--	SW-SM	--	--	--	--	--	--	--	--	--	--	--
P-44 BS	BS-1	1.1-11.1	5.8	27.6	66.6	50	23	27	23.2	CH	A-7-6	--	--	--	--	20.0%	105.2	--	--	--	--
P-47 BS	BS-1	1.4-11.4	1.8	55.4	42.8	29	14	15	14.3	SC	A-6	--	--	--	--	10.7%	123.2	--	--	--	--
RW-40 BS	BS-1	0.0-10.0	3.4	17.6	79.0	42	23	19	22.6	CL	A-7-6	--	--	--	--	17.0%	108.3	--	--	--	--

CAROLINA CROSSROADS PHASE 3C
LEXINGTON COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G5662.03; SCDOT PROJECT NO.: P039720

ROCK LABORATORY RESULTS SUMMARY

Boring Number	Core Run Number	Rock Type	Sample Depth (ft)	Unit Weight (pcf)	Elasric Modulus (ksi)	Poissons Ratio	REC	RQD	RMR	GSI	Unconfined Compressive Strength (psi)
C3C-B1	NQ-2	Phyllite	36.9-37.3	173.7	5020	0.13	91	78	46	35-45	6,840
C3C-B2	NQ-1	Phyllite	32.1-32.4	159.4	4200	0.87	61	34	23	20-30	7,220
C3C-B3	NQ-1	Phyllite	46.8-47.2	170.6	2360	0.15	86	73	42	30-40	4,310
C3C-B3	NQ-2	Phyllite	51.1-51.5	174.5	4360	0.09	100	80	46	35-45	5,010
C3C-B4	NQ-1	Slate	43.0-43.4	169.6	1810	0.23	98	79	58	60-65	5,170
C3C-B4	NQ-2	Slate	47.2-47.6	170.6	3000	0.28	100	91	57	55-60	5,780
C3C-B4	NQ-3	Slate	52.1-52.5	170.3	3310	0.12	88	74	59	65-70	3,960
C3C-B5	NQ-2.1	Phyllite	81.6-82.0	169.5	1290	0.02	100	87	66	70-75	1,930
C3C-B5	NQ-2.2	Phyllite	83.0-83.4	168.1	1980	0.05	100	87	66	70-75	2,300
C3C-B6	NQ-1	Phyllite	66.5-66.9	165.1	2980	0.04	67	63	52	65-70	2,110
C3C-B6	NQ-2	Phyllite	74.3-74.7	165.5	3300	0.04	100	100	69	75-80	2,190
C3C-W3	NQ-1	Phyllite	12.3-12.7	172.3	2650	0.21	92	83	38	40-50	4,430
C3C-W3	NQ-2	Phyllite	16.5-16.9	170.1	5070	0.22	93	60	36	20-30	16,260
B-47	RC-1	Schist	47.2-47.8	166.4	1500		94	69	22	20-30	6260
B-47	RC-3	Schist	55.4-56.2	170.6	4220		100	60	22	20-30	4824
B-47	RC-4	Schist	64.0-65.0	169.3	5560		100	83	26	20-30	3260
B-48	RC-1	Schist	15.1-15.9	178.5	3000		96	22	24	50-60	11152
B-48	RC-2	Schist	19.7-20.6	175.9	1590		100	65	39	55-65	10712
B-48	RC-4	Schist	34.0-34.7	179.1	6160		100	40	34	40-50	19123
B-49	RC-3	Schist	49.2-50.3	167.8	5320		100	57	51	55-65	5919
B-49	RC-5	Schist	56.6-57.6	169.4	4840		100	67	38	60-70	6493
B-50	RC-1	Schist	73.7-74.3	170.8	4440		98	80	40	15-25	1969
B-50	RC-2	Schist	81.2-82.2	172.5	10000		100	90	35	15-25	1571
B-50	RC-4	Schist	87.7-88.5	167.6	1900		100	64	19	15-25	866
DH-4	RC-2	Schist	55.2-56.4	176	3600		100	86	52	50-60	1091
DH-4	RC-4	Schist	65.2-66.3	170.1	8240		98	98	61	70-80	11795
DH-4	RC-6	Schist	75.2-76.3	169.5	5590		100	100	61	70-80	13569
DH-4	RC-8	Schist	85.2-86.7	178.5	10120		100	88	58	65-75	9134
DH-4	RC-10	Schist	96.7-97.5	169.5	8270		100	100	66	70-80	14660
DH-4	RC-12	Schist	106.2-107.5	171.3	6930		102	83	48	70-80	12748
DH-4	RC-14	Schist	115.2-116.4	170.9	5360		96	96	61	70-80	7611

APPENDIX

SECTION 5 LABORATORY TEST RESULTS

SECTION 5A SPLIT-SPOON SAMPLES

REV 12/2023

F&ME CONSULTANTS
211 Business Park Blvd.
Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1537	**DATE REQUESTED:**	5/14/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AAB	**DATE OF TESTING:**	5/14/2024
WEIGHED BY:	AAB	**DATE OF WEIGHING:**	5/15/2024

BORING NO.	C3C-B1	C3C-B1	C3C-B1	C3C-B1	C3C-B1
SAMPLE NO.	SS-2	SS-3	SS-4	SS-5	SS-6
SAMPLE DEPTH	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	13.5 - 15.0
WATER CONTENT, W%	32.1	31.1	30.5	32.8	25.5

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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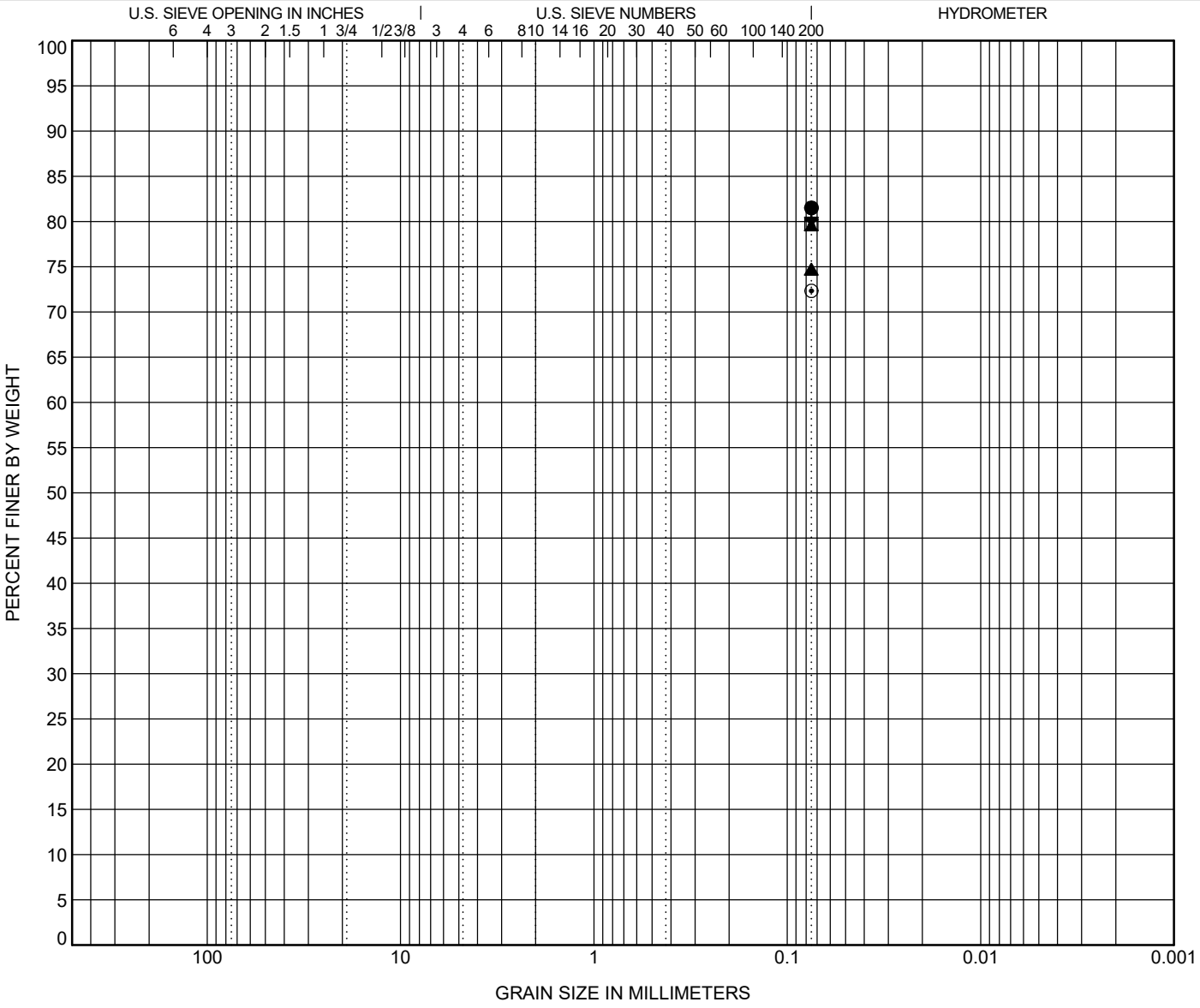
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-B1	4.0	FAT CLAY with SAND (CH/A-7-6)	55	27	28		
⊠	C3C-B1	6.0	ELASTIC SILT with SAND (MH/A-7-5)	55	32	23		
▲	C3C-B1	8.0	SILT with SAND (ML/A-6)	40	27	13		
★	C3C-B1	10.0	FAT CLAY with SAND (CH/A-7-6)	57	25	32		
⊙	C3C-B1	15.0	LEAN CLAY with SAND (CL/A-6)	36	18	18		

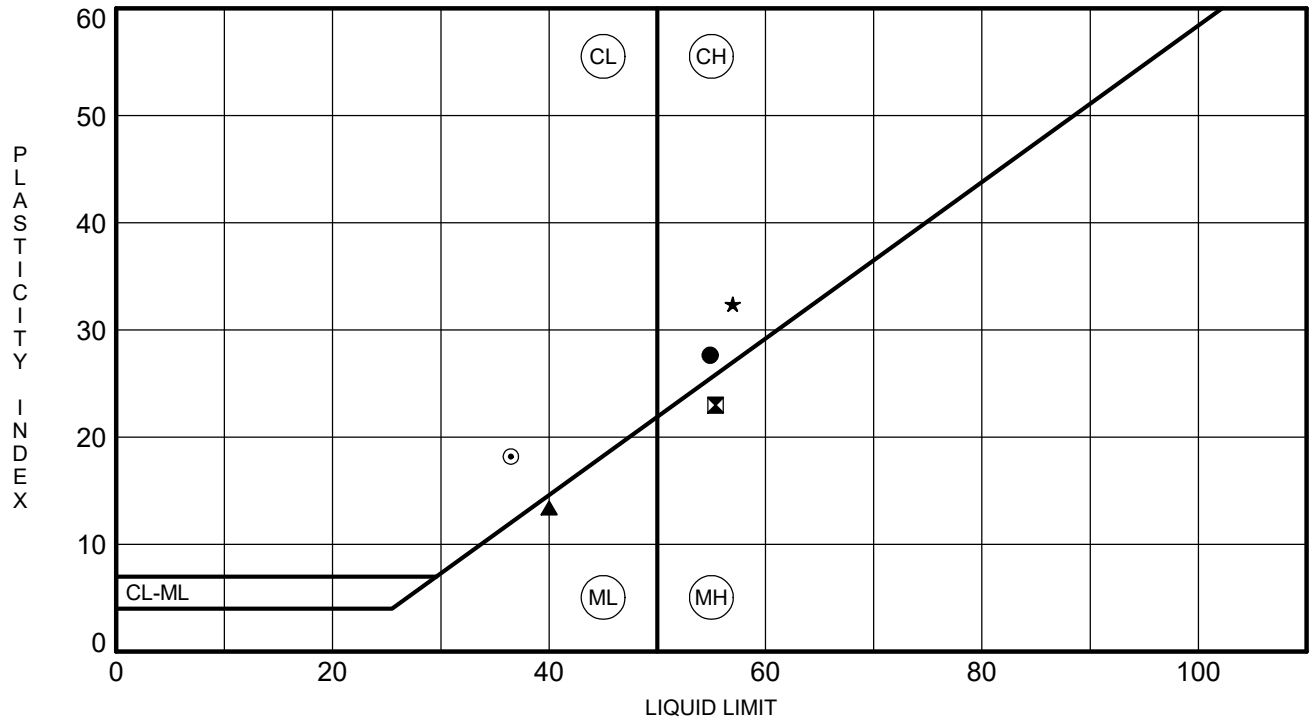
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-B1	4.0	0.075						81.5	
⊠	C3C-B1	6.0	0.075						79.7	
▲	C3C-B1	8.0	0.075						74.7	
★	C3C-B1	10.0	0.075						80.0	
⊙	C3C-B1	15.0	0.075						72.3	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-B1**	**4.0**	**55**	**27**	**28**	**82**	**FAT CLAY with SAND (CH/A-7-6)**
⊠	**C3C-B1**	**6.0**	**55**	**32**	**23**	**80**	**ELASTIC SILT with SAND (MH/A-7-5)**
▲	**C3C-B1**	**8.0**	**40**	**27**	**13**	**75**	**SILT with SAND (ML/A-6)**
★	**C3C-B1**	**10.0**	**57**	**25**	**32**	**80**	**FAT CLAY with SAND (CH/A-7-6)**
⊙	**C3C-B1**	**15.0**	**36**	**18**	**18**	**72**	**LEAN CLAY with SAND (CL/A-6)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-0975	**DATE REQUESTED:**	3/28/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AC	**DATE OF TESTING:**	3/28/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	3/29/2024

BORING NO.	C3C-B2	C3C-B2	C3C-B2	C3C-B2	
SAMPLE NO.	SS-2	SS-3	SS-5	SS-6	
SAMPLE DEPTH	2.0 - 4.0	4.0 - 6.0	8.0 - 10.0	13.5 - 15.0	
WATER CONTENT, W%	26.3	23.1	23.1	18.0	

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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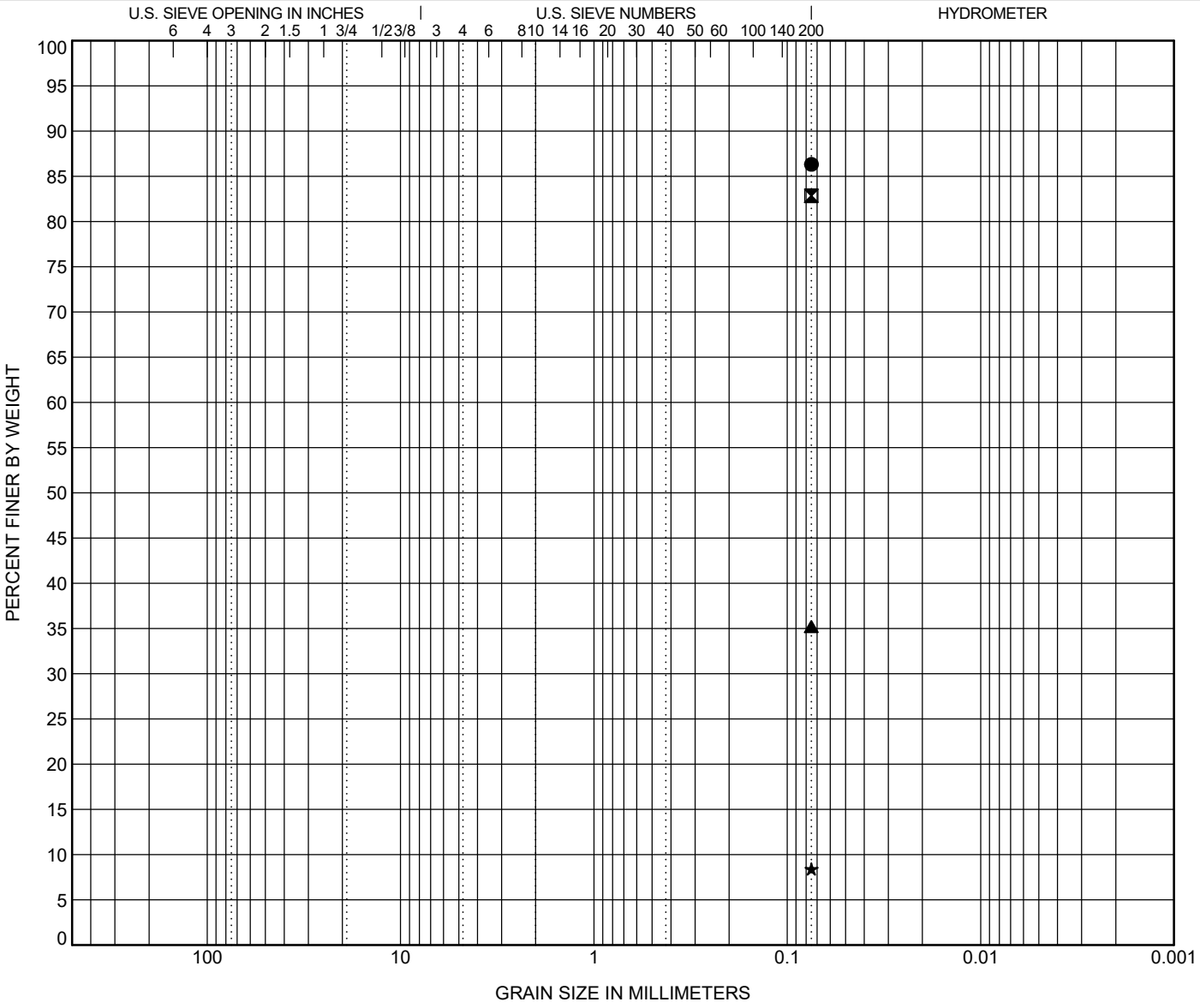
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-B2**	**4.0**	**FAT CLAY (CH/A-7-6)**	**60**	**21**	**39**		
⊠	**C3C-B2**	**6.0**	**LEAN CLAY with SAND (CL/A-7-6)**	**47**	**21**	**26**		
▲	**C3C-B2**	**10.0**	**SILTY SAND (SM/A-2-4)**	**NP**	**NP**	**NP**		
★	**C3C-B2**	**15.0**	**SILTY SAND (SM/A-2-4)**					

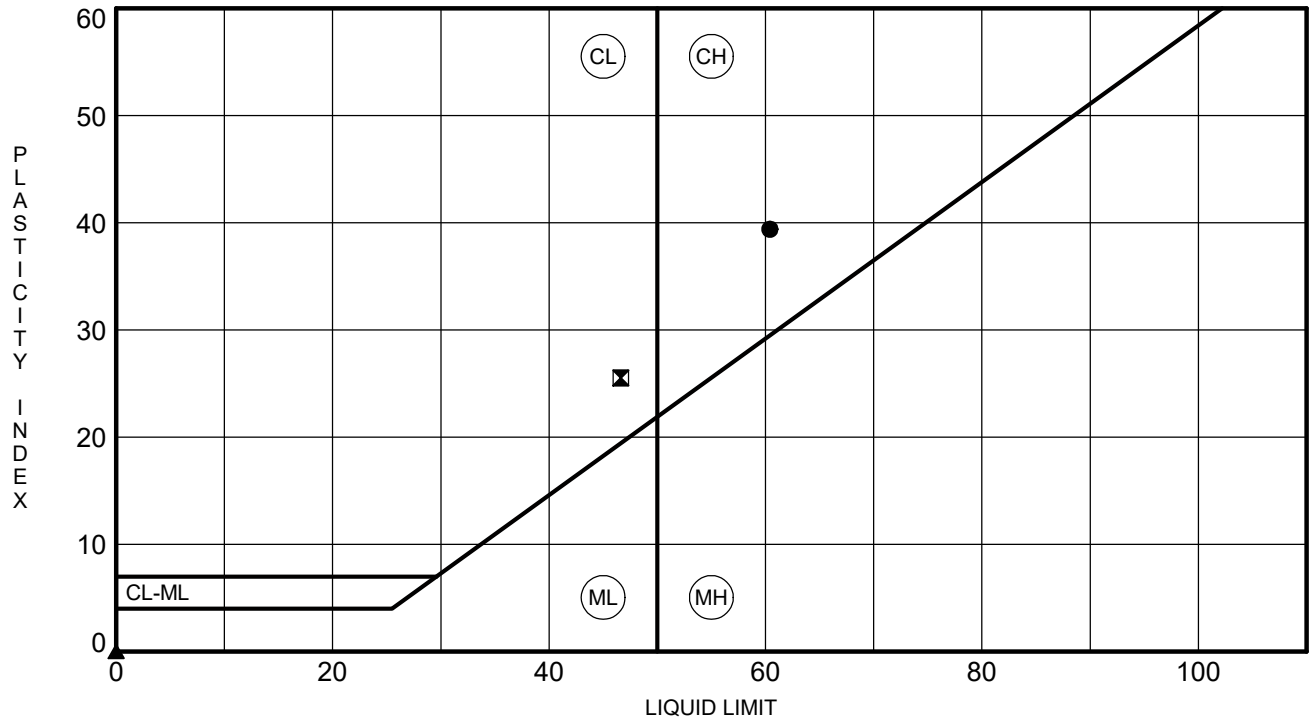
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-B2**	**4.0**	**0.075**						**86.3**	
⊠	**C3C-B2**	**6.0**	**0.075**						**82.9**	
▲	**C3C-B2**	**10.0**	**0.075**						**35.2**	
★	**C3C-B2**	**15.0**	**0.075**						**8.4**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-B2**	**4.0**	**60**	**21**	**39**	**86**	**FAT CLAY (CH/A-7-6)**
⊠	**C3C-B2**	**6.0**	**47**	**21**	**26**	**83**	**LEAN CLAY with SAND (CL/A-7-6)**
▲	**C3C-B2**	**10.0**	**NP**	**NP**	**NP**	**35**	**SILTY SAND (SM/A-2-4)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

REV 12/2023

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Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1538	**DATE REQUESTED:**	5/14/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AAB	**DATE OF TESTING:**	5/14/2024
WEIGHED BY:	AAB	**DATE OF WEIGHING:**	5/15/2024

BORING NO.	C3C-B3	C3C-B3	C3C-B3		
SAMPLE NO.	SS-1	SS-2	SS-3		
SAMPLE DEPTH	0.0 - 2.0	2.0 - 4.0	4.0 - 6.0		
WATER CONTENT, W%	17.3	13.5	13.8		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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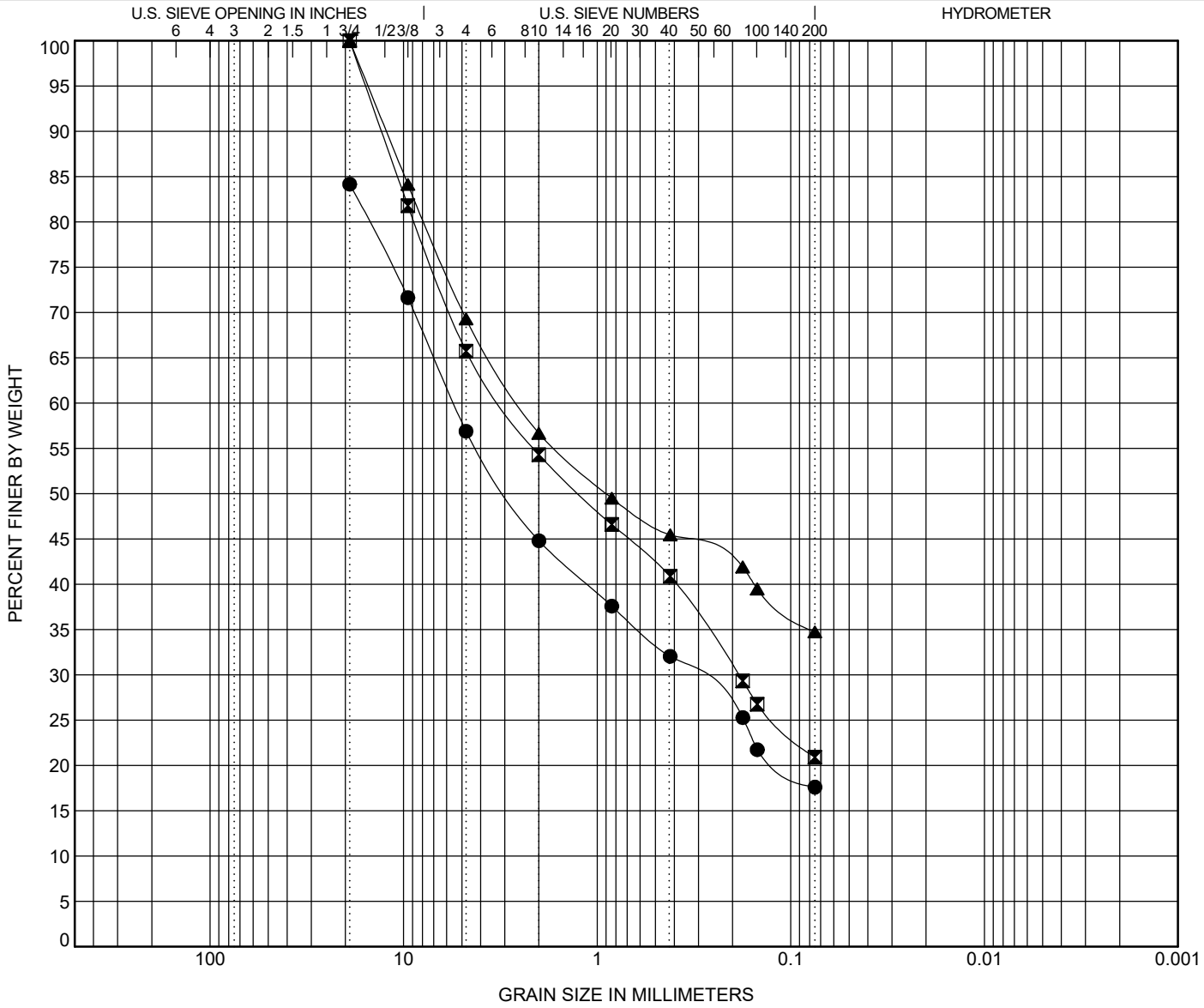
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-B3	2.0	SILTY GRAVEL with SAND (GM/A-1-b)	NP	NP	NP		
⊠	C3C-B3	4.0	SILTY SAND with GRAVEL (SM/A-1-b)	22	21	1		
▲	C3C-B3	6.0	SILTY SAND with GRAVEL (SM/A-2-4)	NP	NP	NP		

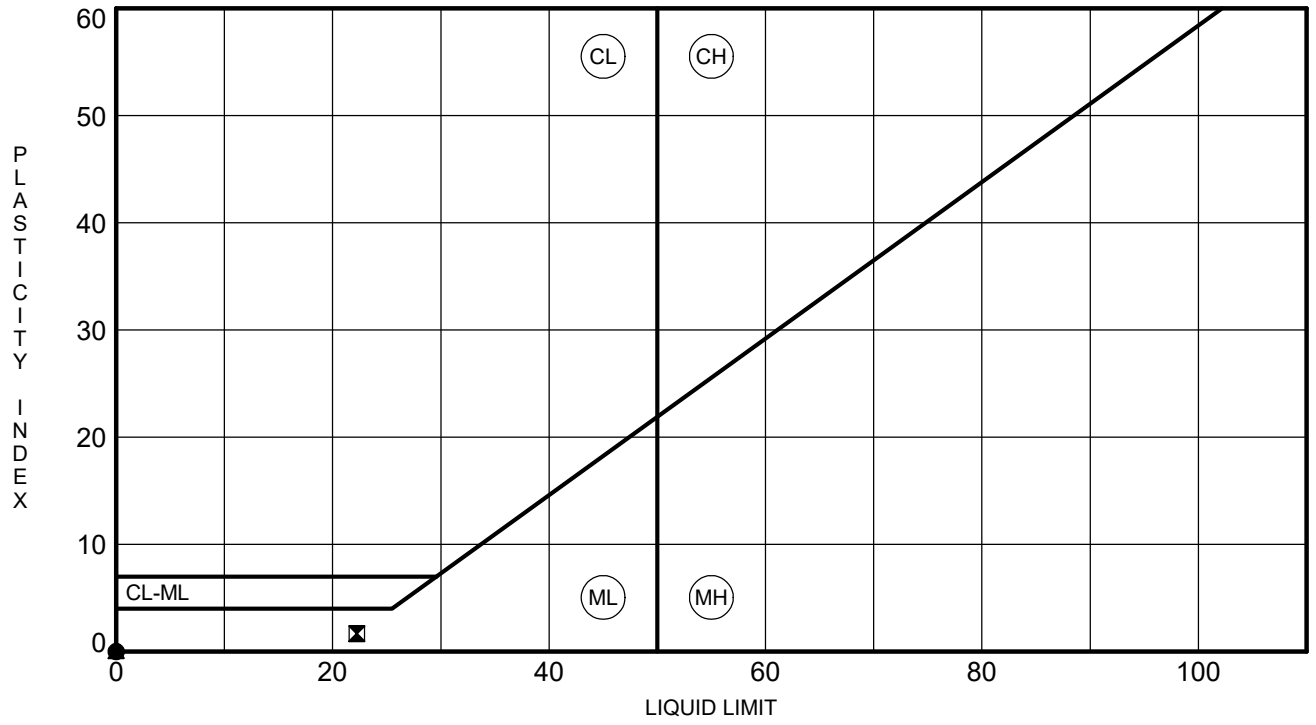
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-B3	2.0	19	5.507	0.323		27.3	39.3	17.6	
⊠	C3C-B3	4.0	19	3.083	0.186		34.3	44.8	20.9	
▲	C3C-B3	6.0	19	2.515			30.7	34.5	34.7	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-B3**	**2.0**	**NP**	**NP**	**NP**	**18**	**SILTY GRAVEL with SAND (GM/A-1-b)**
⊠	**C3C-B3**	**4.0**	**22**	**21**	**1**	**21**	**SILTY SAND with GRAVEL (SM/A-1-b)**
▲	**C3C-B3**	**6.0**	**NP**	**NP**	**NP**	**35**	**SILTY SAND with GRAVEL (SM/A-2-4)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1335	**DATE REQUESTED:**	4/22/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	CJ/CR	**DATE OF TESTING:**	4/22/2024
WEIGHED BY:	AGB	**DATE OF WEIGHING:**	4/23/2024

BORING NO.	C3C-B4	C3C-B4	C3C-B4	C3C-B4	C3C-B4
SAMPLE NO.	SS-1	SS-3	SS-5	SS-7	SS-9
SAMPLE DEPTH	8.5 - 10.5	12.5 - 14.5	16.5 - 18.5	27.0 - 28.5	37.0 - 38.5
WATER CONTENT, W%	9.4	12.0	27.4	29.1	33.4

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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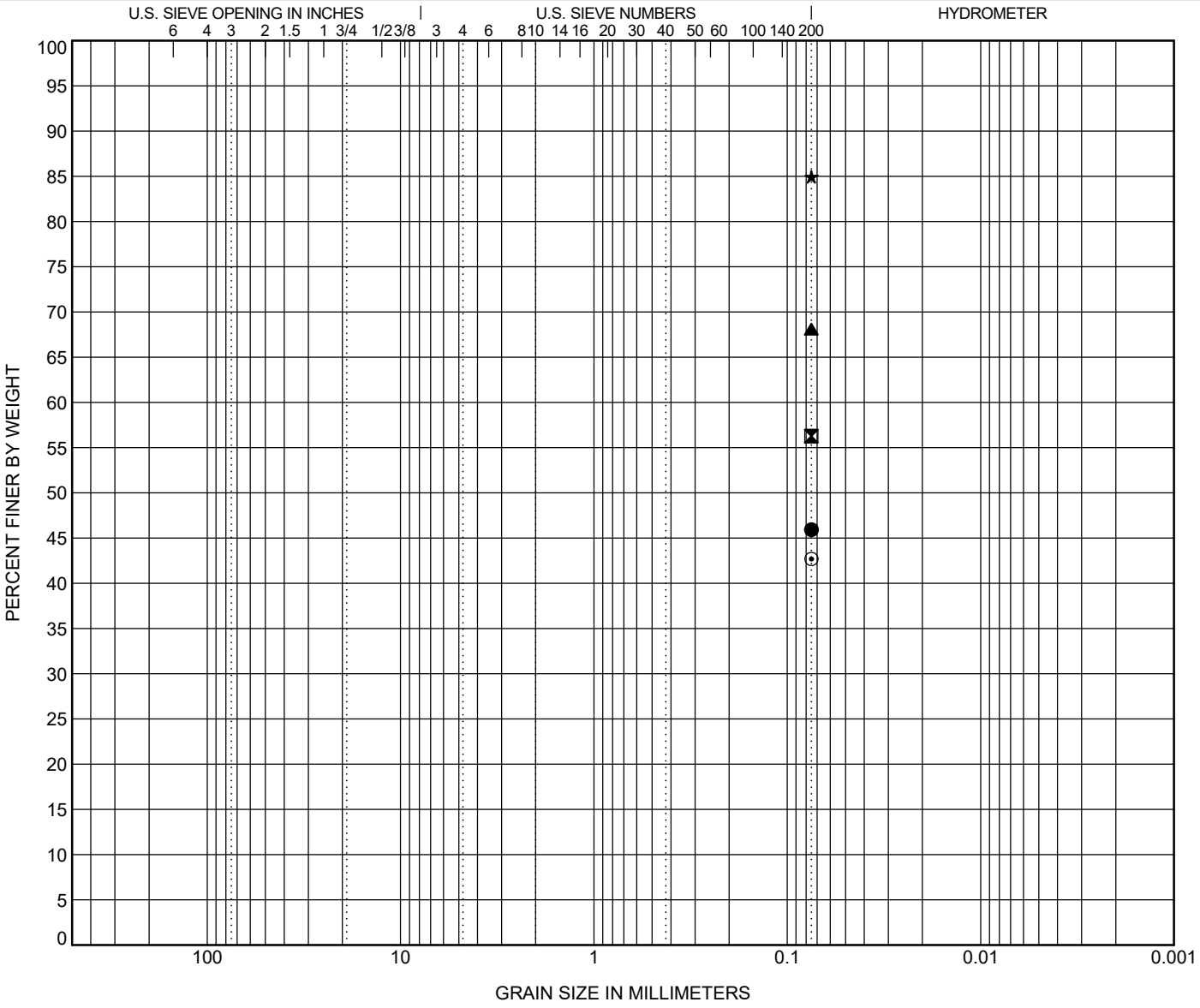
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-B4**	**10.5**	**CLAYEY SAND (SC/A-6)**	**40**	**22**	**18**		
⊠	**C3C-B4**	**14.5**	**SANDY LEAN CLAY (CL/A-7-6)**	**41**	**18**	**23**		
▲	**C3C-B4**	**18.5**	**SANDY LEAN CLAY (CL/A-6)**	**40**	**17**	**23**		
★	**C3C-B4**	**28.5**	**SILT with SAND (ML/A-4)**	**NP**	**NP**	**NP**		
⊙	**C3C-B4**	**38.5**	**SILTY SAND (SM/A-4)**	**NP**	**NP**	**NP**		

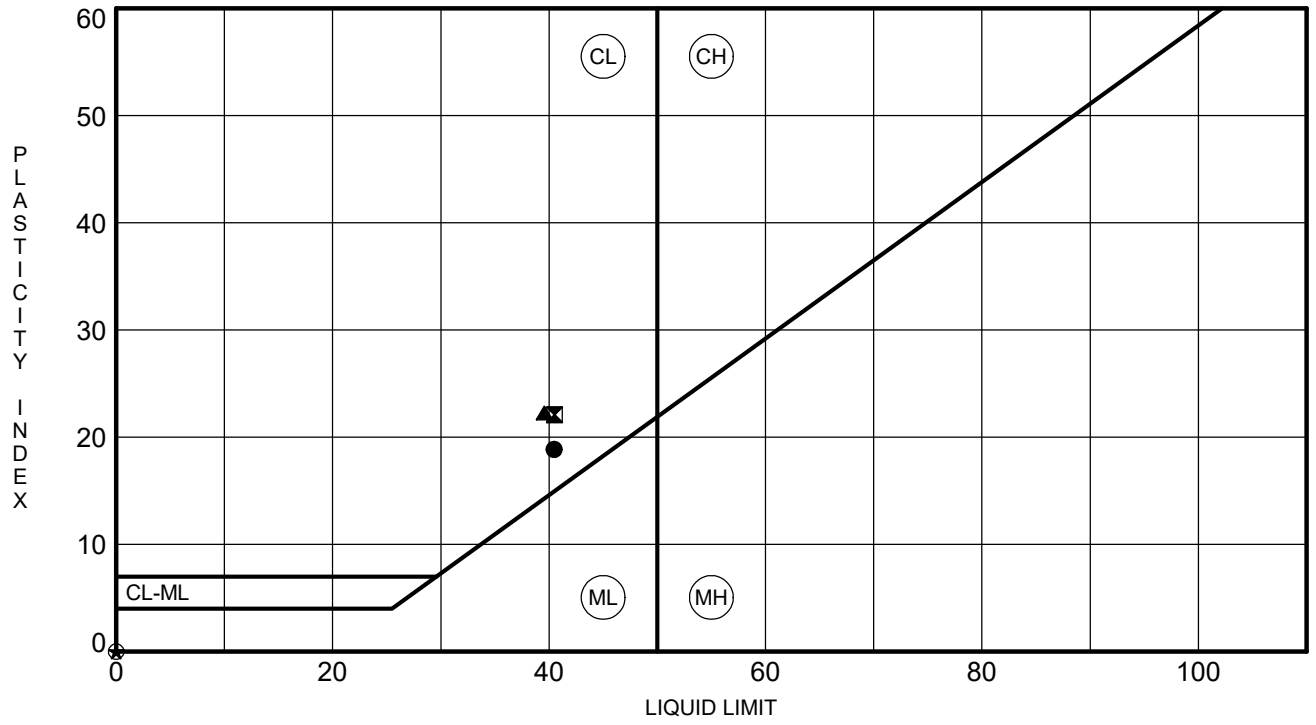
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-B4**	**10.5**	**0.075**						**45.9**	
⊠	**C3C-B4**	**14.5**	**0.075**						**56.3**	
▲	**C3C-B4**	**18.5**	**0.075**						**68.1**	
★	**C3C-B4**	**28.5**	**0.075**						**84.9**	
⊙	**C3C-B4**	**38.5**	**0.075**						**42.7**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-B4**	**10.5**	**40**	**22**	**18**	**46**	**CLAYEY SAND (SC/A-6)**
⊠	**C3C-B4**	**14.5**	**41**	**18**	**23**	**56**	**SANDY LEAN CLAY (CL/A-7-6)**
▲	**C3C-B4**	**18.5**	**40**	**17**	**23**	**68**	**SANDY LEAN CLAY (CL/A-6)**
★	**C3C-B4**	**28.5**	**NP**	**NP**	**NP**	**85**	**SILT with SAND (ML/A-4)**
⊙	**C3C-B4**	**38.5**	**NP**	**NP**	**NP**	**43**	**SILTY SAND (SM/A-4)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1368	**DATE REQUESTED:**	4/25/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	CR/TE	**DATE OF TESTING:**	4/25/2024
WEIGHED BY:	TW	**DATE OF WEIGHING:**	4/26/2024

BORING NO.	C3C-B5	C3C-B5	C3C-B5	C3C-B5	C3C-B5
SAMPLE NO.	SS-2	SS-4	SS-5	SS-6	SS-8
SAMPLE DEPTH	2.0 - 4.0	6.0 - 8.0	8.0 - 10.0	13.5 - 15.0	23.5 - 25.0
WATER CONTENT, W%	12.4	21.4	18.3	13.2	33.4

BORING NO.	C3C-B5	C3C-B5	C3C-B5		
SAMPLE NO.	SS-11	SS-12	SS-15		
SAMPLE DEPTH	38.5 - 40.0	43.5 - 45.0	58.5 - 60.0		
WATER CONTENT, W%	27.7	26.9	28.8		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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GRAIN SIZE DISTRIBUTION

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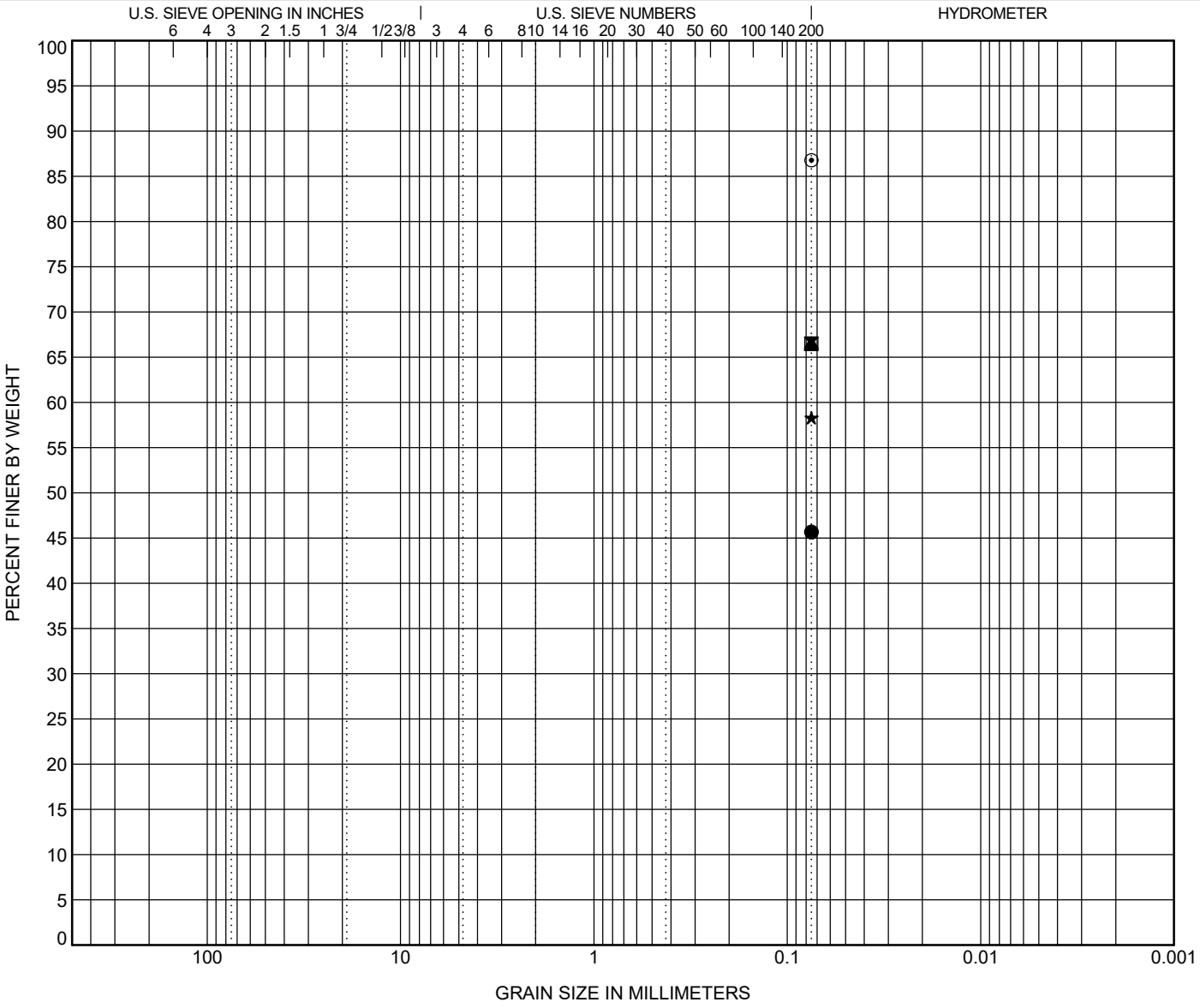
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-B5	4.0	CLAYEY SAND (SC/A-7-6)	45	16	29		
⊠	C3C-B5	8.0	SANDY SILT (ML/A-4)	34	25	9		
▲	C3C-B5	10.0	SANDY LEAN CLAY (CL/A-6)	40	19	21		
★	C3C-B5	15.0	SANDY SILT (ML/A-6)	37	26	11		
⊙	C3C-B5	25.0	SILT (ML/A-4)	NP	NP	NP		

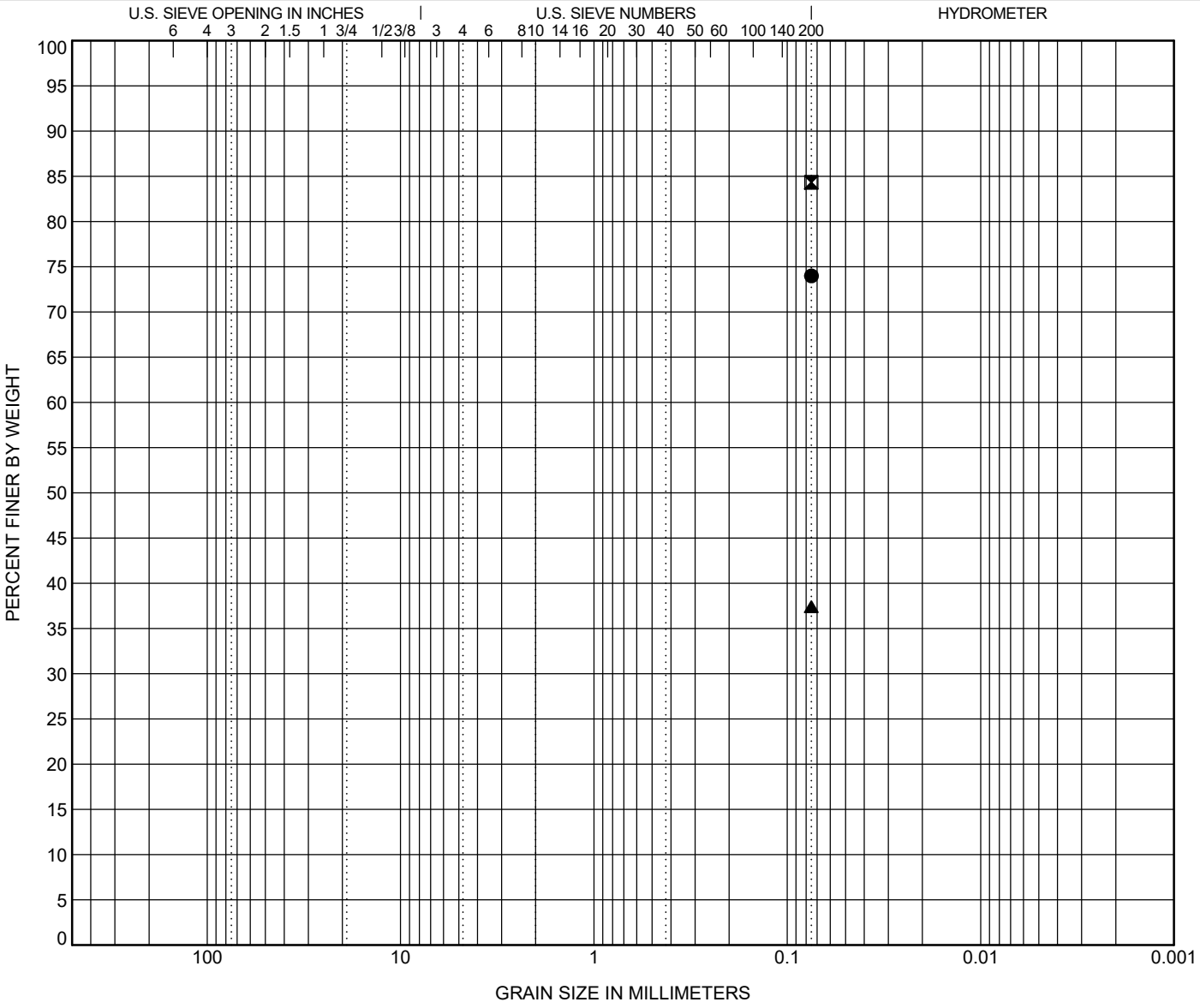
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-B5	4.0	0.075						45.7	
⊠	C3C-B5	8.0	0.075						66.5	
▲	C3C-B5	10.0	0.075						66.6	
★	C3C-B5	15.0	0.075						58.3	
⊙	C3C-B5	25.0	0.075						86.8	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-B5**	**40.0**	**SILT with SAND (ML/A-7-6)**	**45**	**29**	**16**		
⊠	**C3C-B5**	**45.0**	**FAT CLAY with SAND (CH/A-7-6)**	**56**	**25**	**31**		
▲	**C3C-B5**	**60.0**	**SILTY SAND (SM/A-4)**	**NP**	**NP**	**NP**		

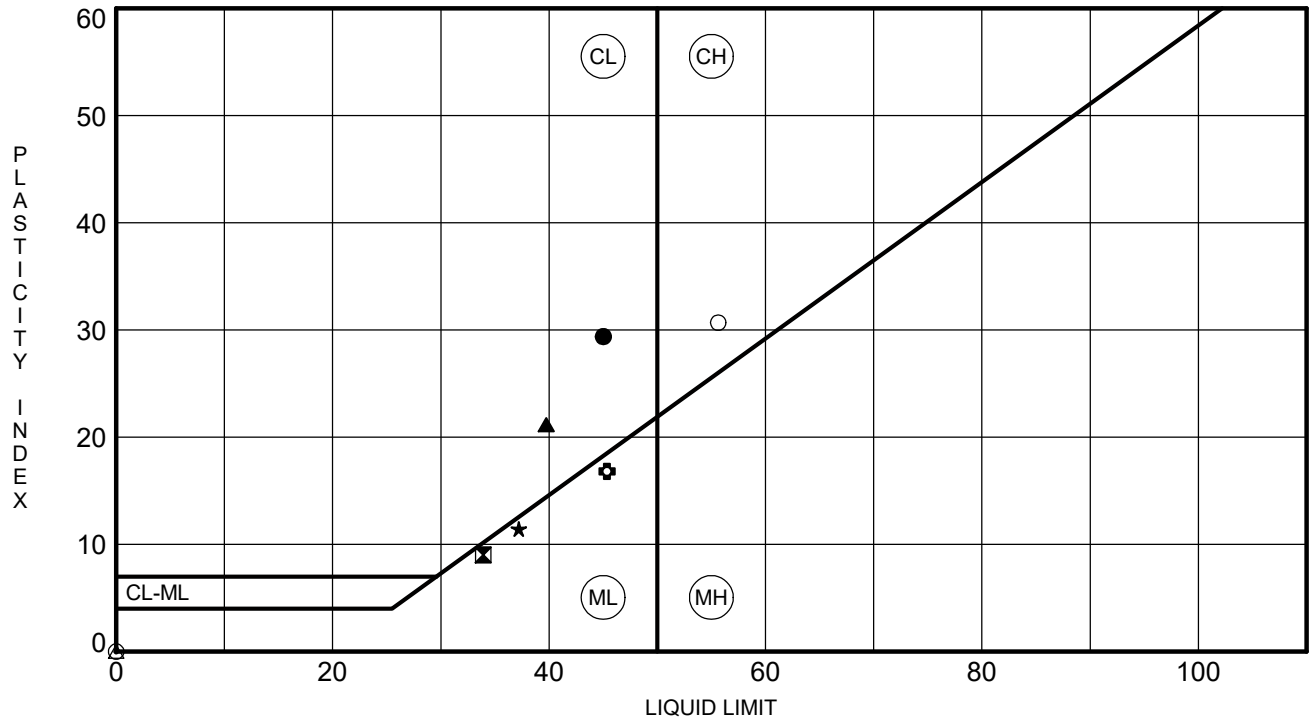
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-B5**	**40.0**	**0.075**						**74.0**	
⊠	**C3C-B5**	**45.0**	**0.075**						**84.3**	
▲	**C3C-B5**	**60.0**	**0.075**						**37.4**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	C3C-B5	4.0	45	16	29	46	CLAYEY SAND (SC/A-7-6)
⊠	C3C-B5	8.0	34	25	9	66	SANDY SILT (ML/A-4)
▲	C3C-B5	10.0	40	19	21	67	SANDY LEAN CLAY (CL/A-6)
★	C3C-B5	15.0	37	26	11	58	SANDY SILT (ML/A-6)
⊙	C3C-B5	25.0	NP	NP	NP	87	SILT (ML/A-4)
✿	C3C-B5	40.0	45	29	16	74	SILT with SAND (ML/A-7-6)
○	C3C-B5	45.0	56	25	31	84	FAT CLAY with SAND (CH/A-7-6)
△	C3C-B5	60.0	NP	NP	NP	37	SILTY SAND (SM/A-4)

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1369	**DATE REQUESTED:**	4/25/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	CR/TE	**DATE OF TESTING:**	4/25/2024
WEIGHED BY:	TW	**DATE OF WEIGHING:**	4/26/2024

BORING NO.	C3C-B6	C3C-B6	C3C-B6	C3C-B6	C3C-B6
SAMPLE NO.	SS-2	SS-4	SS-5	SS-6	SS-7
SAMPLE DEPTH	10.5 - 12.5	14.5 - 16.5	16.5 - 18.5	22.0 - 23.5	27.0 - 28.5
WATER CONTENT, W%	13.0	14.9	12.1	18.9	18.8

BORING NO.	C3C-B6	C3C-B6			
SAMPLE NO.	SS-9	SS-12			
SAMPLE DEPTH	37.0 - 38.5	52.0 - 53.5			
WATER CONTENT, W%	19.9	20.5			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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GRAIN SIZE DISTRIBUTION

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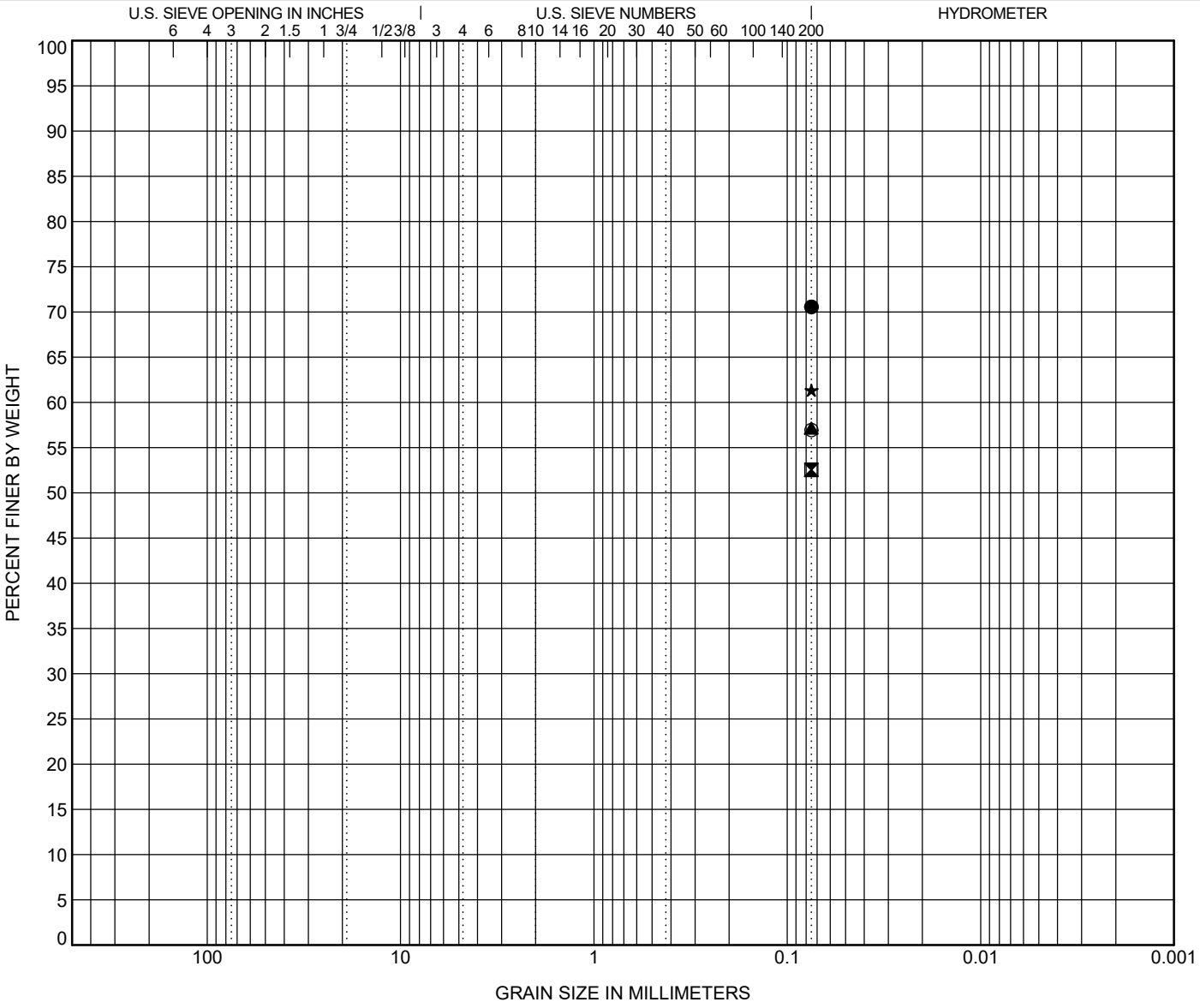
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-B6	12.5	SILT with SAND (ML/A-6)	39	26	13		
⊠	C3C-B6	16.5	SANDY SILT (ML/A-4)	35	26	9		
▲	C3C-B6	18.5	SANDY SILT (ML/A-4)	30	27	3		
★	C3C-B6	23.5	SANDY SILT (ML/A-4)	31	26	5		
⊙	C3C-B6	28.5	SANDY LEAN CLAY (CL/A-6)	37	21	16		

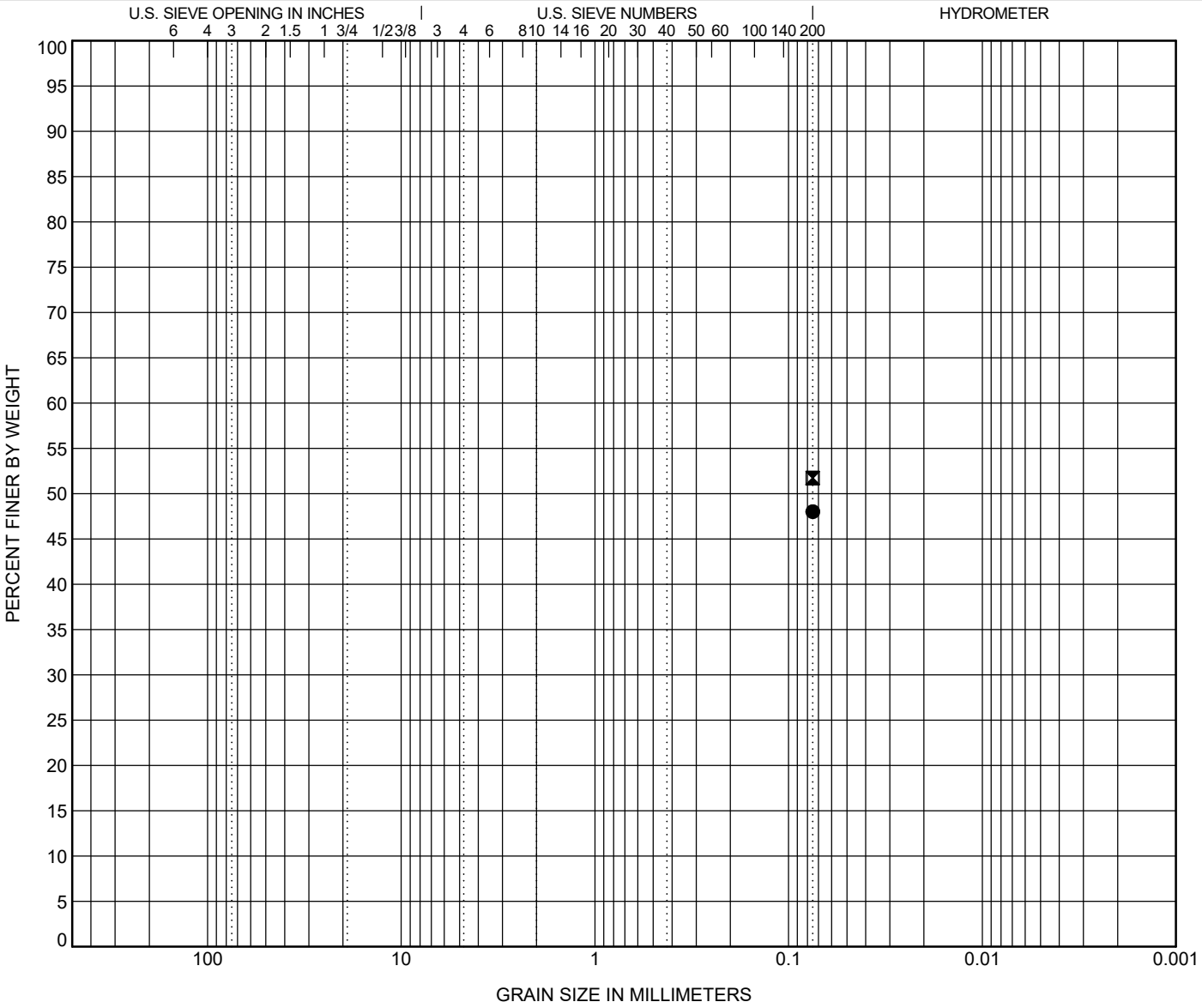
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-B6	12.5	0.075						70.6	
⊠	C3C-B6	16.5	0.075						52.5	
▲	C3C-B6	18.5	0.075						57.2	
★	C3C-B6	23.5	0.075						61.3	
⊙	C3C-B6	28.5	0.075						56.9	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-B6**	**38.5**	**CLAYEY SAND (SC/A-6)**	**35**	**24**	**11**		
⊠	**C3C-B6**	**53.5**	**SANDY SILT (ML/A-4)**	**NP**	**NP**	**NP**		

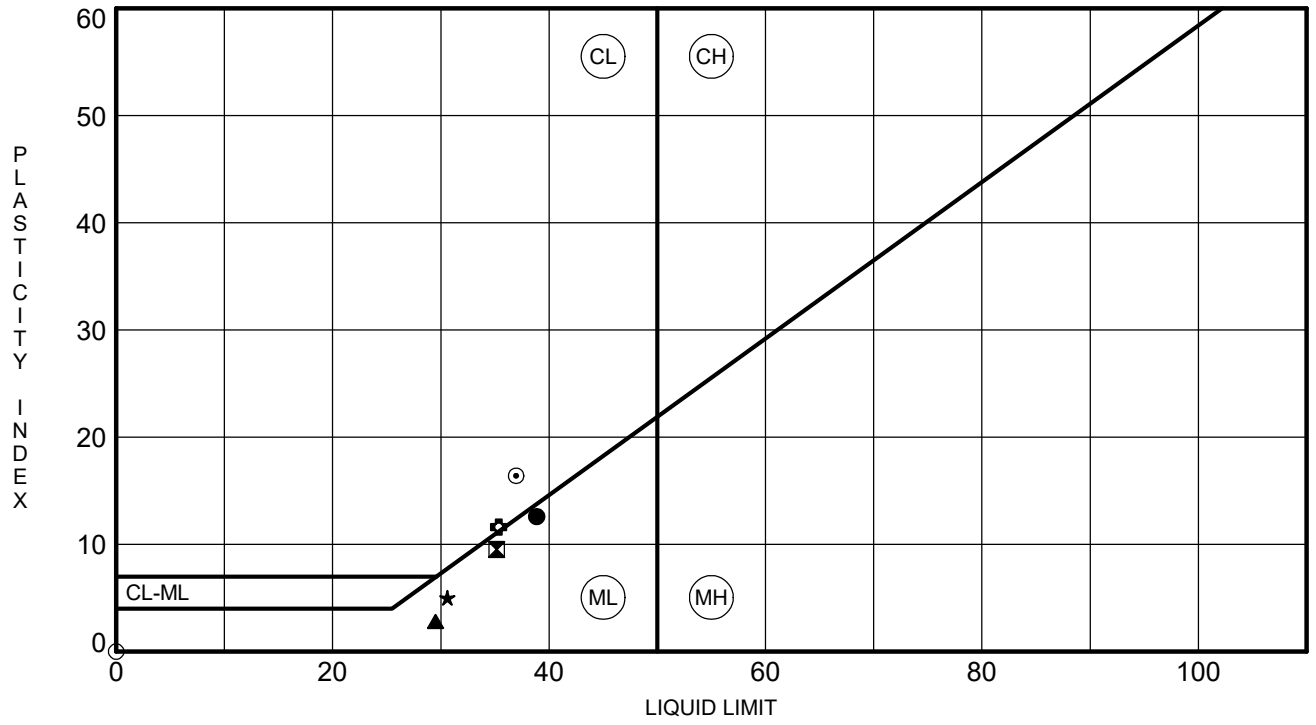
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-B6**	**38.5**	**0.075**						**48.0**	
⊠	**C3C-B6**	**53.5**	**0.075**						**51.7**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	C3C-B6	12.5	39	26	13	71	SILT with SAND (ML/A-6)
⊠	C3C-B6	16.5	35	26	9	53	SANDY SILT (ML/A-4)
▲	C3C-B6	18.5	30	27	3	57	SANDY SILT (ML/A-4)
★	C3C-B6	23.5	31	26	5	61	SANDY SILT (ML/A-4)
⊙	C3C-B6	28.5	37	21	16	57	SANDY LEAN CLAY (CL/A-6)
✿	C3C-B6	38.5	35	24	11	48	CLAYEY SAND (SC/A-6)
○	C3C-B6	53.5	NP	NP	NP	52	SANDY SILT (ML/A-4)

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1370	**DATE REQUESTED:**	4/25/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	CR/TE	**DATE OF TESTING:**	4/25/2024
WEIGHED BY:	TW	**DATE OF WEIGHING:**	4/26/2024

BORING NO.	C3C-B7	C3C-B7	C3C-B7	C3C-B7	C3C-B7
SAMPLE NO.	SS-2	SS-4	SS-6	SS-8	SS-11
SAMPLE DEPTH	2.0 - 4.0	6.0 - 8.0	13.5 - 15.0	23.5 - 25.0	38.5 - 40.0
WATER CONTENT, W%	16.6	17.3	20.5	24.5	26.7

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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GRAIN SIZE DISTRIBUTION

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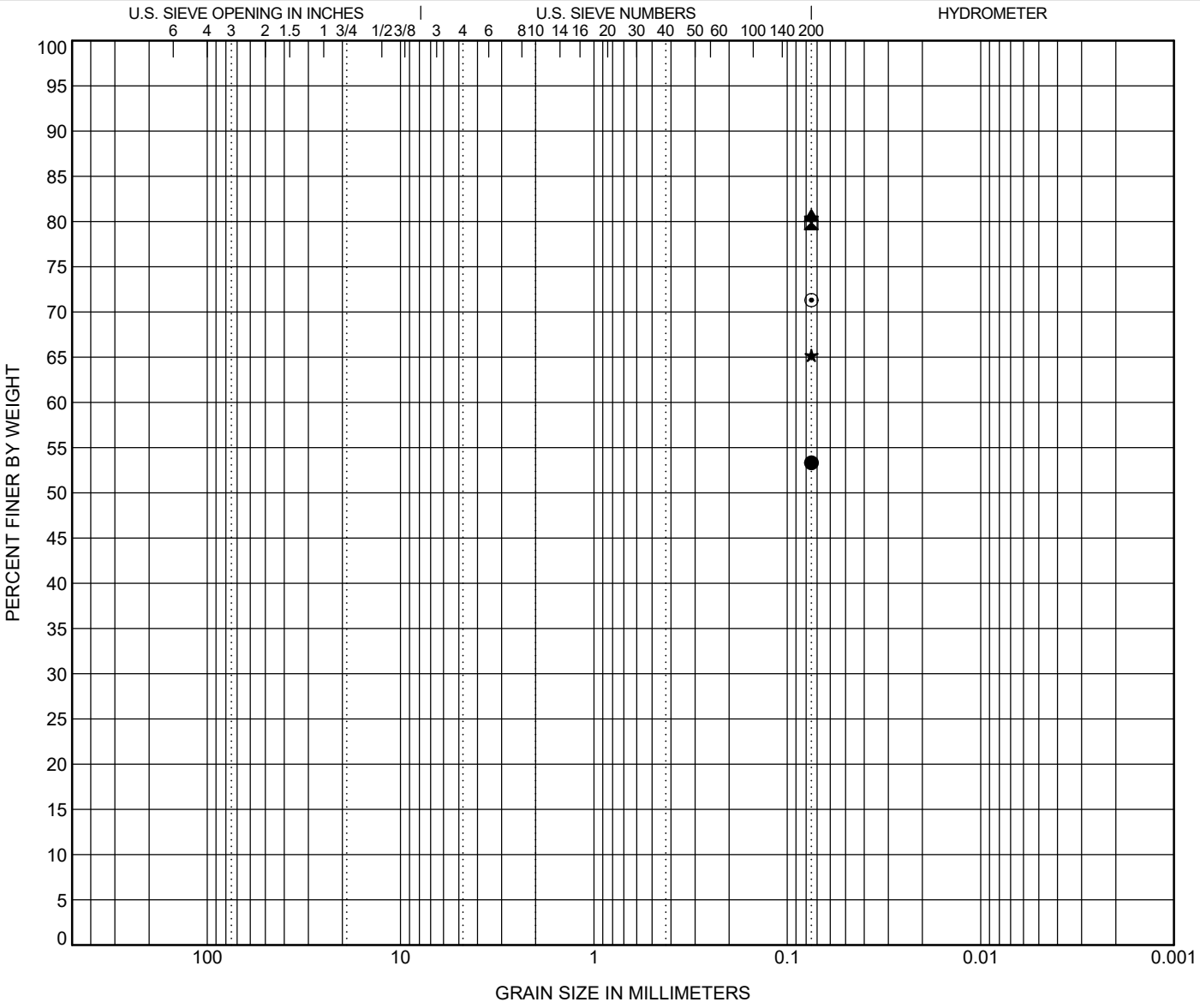
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-B7	4.0	SANDY SILT (ML/A-4)	NP	NP	NP		
⊠	C3C-B7	8.0	SILT with SAND (ML/A-4)	NP	NP	NP		
▲	C3C-B7	15.0	SILT with SAND (ML/A-5)	41	31	10		
★	C3C-B7	25.0	SANDY SILT (ML/A-4)	35	28	7		
⊙	C3C-B7	40.0	SILT with SAND (ML/A-4)	40	32	8		

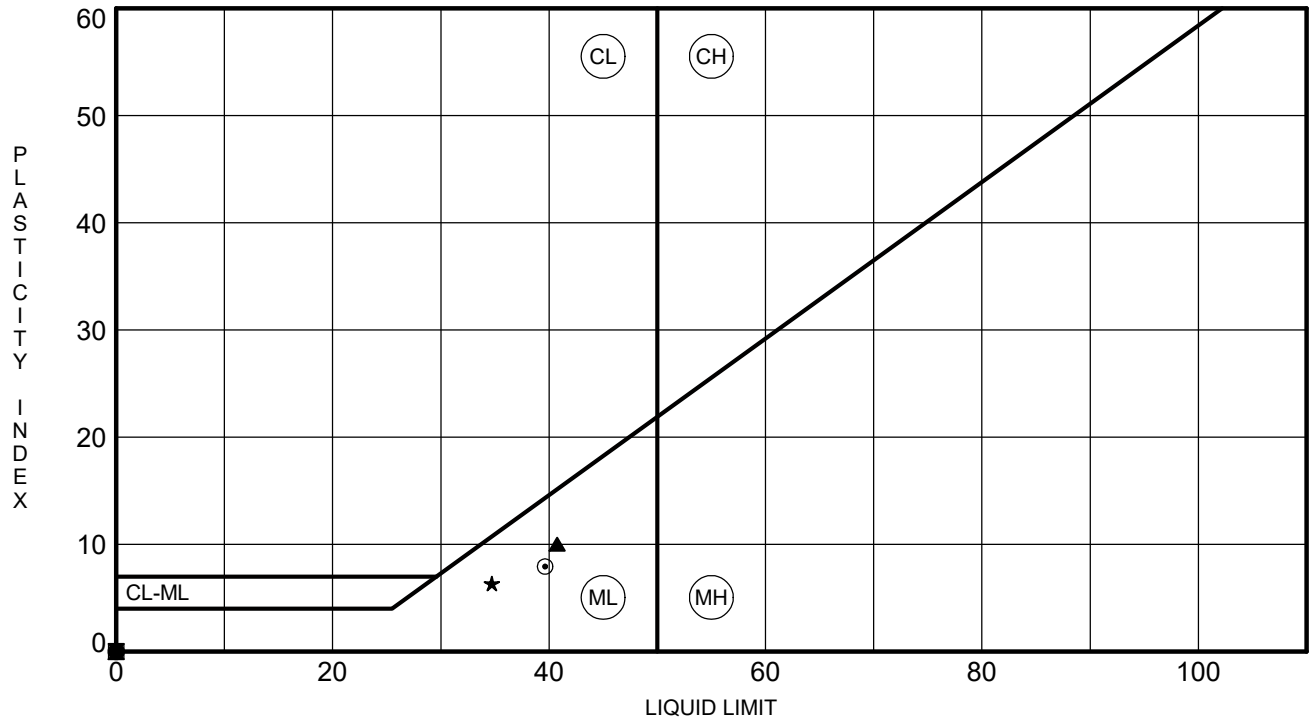
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-B7	4.0	0.075						53.3	
⊠	C3C-B7	8.0	0.075						79.9	
▲	C3C-B7	15.0	0.075						80.7	
★	C3C-B7	25.0	0.075						65.2	
⊙	C3C-B7	40.0	0.075						71.3	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-B7**	**4.0**	**NP**	**NP**	**NP**	**53**	**SANDY SILT (ML/A-4)**
⊠	**C3C-B7**	**8.0**	**NP**	**NP**	**NP**	**80**	**SILT with SAND (ML/A-4)**
▲	**C3C-B7**	**15.0**	**41**	**31**	**10**	**81**	**SILT with SAND (ML/A-5)**
★	**C3C-B7**	**25.0**	**35**	**28**	**7**	**65**	**SANDY SILT (ML/A-4)**
⊙	**C3C-B7**	**40.0**	**40**	**32**	**8**	**71**	**SILT with SAND (ML/A-4)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1539	**DATE REQUESTED:**	5/14/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AAB	**DATE OF TESTING:**	5/14/2024
WEIGHED BY:	AAB	**DATE OF WEIGHING:**	5/15/2024

BORING NO.	C3C-U1	C3C-U1	C3C-U1	C3C-U1	C3C-U1
SAMPLE NO.	SS-6	SS-4	SS-6	SS-7	SS-10
SAMPLE DEPTH	4.0 - 6.0	6.0 - 8.0	13.5 - 15.0	18.5 - 20.0	33.5 - 35.0
WATER CONTENT, W%	14.8	22.9	10.6	18.6	14.6

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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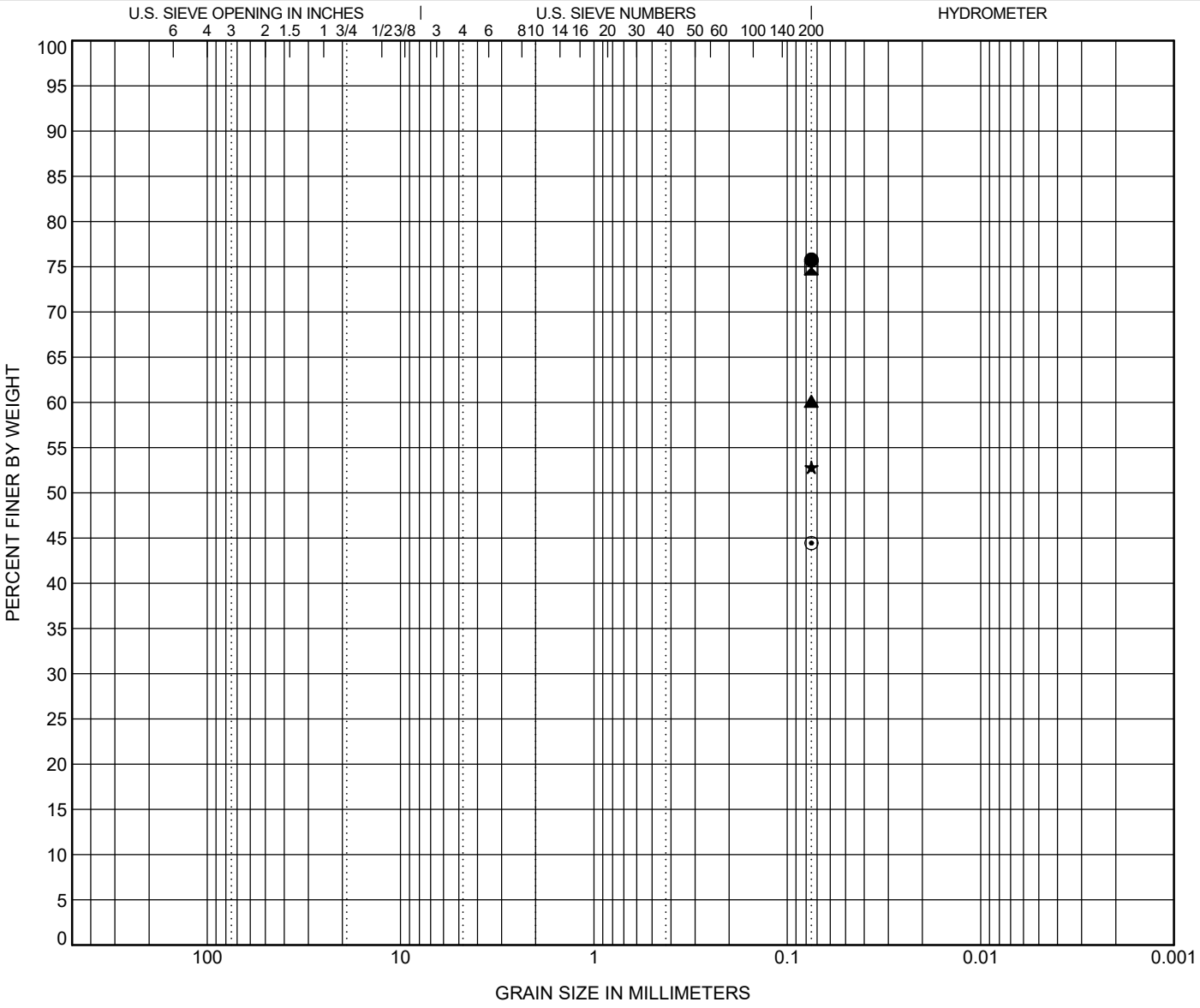
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-U1	6.0	SILT with SAND (ML/A-4)	34	31	3		
⊠	C3C-U1	8.0	SILT with SAND (ML/A-4)	NP	NP	NP		
▲	C3C-U1	15.0	SANDY LEAN CLAY (CL/A-6)	35	23	12		
★	C3C-U1	20.0	SANDY LEAN CLAY (CL/A-7-6)	43	24	19		
⊙	C3C-U1	35.0	CLAYEY SAND (SC/A-6)	37	14	23		

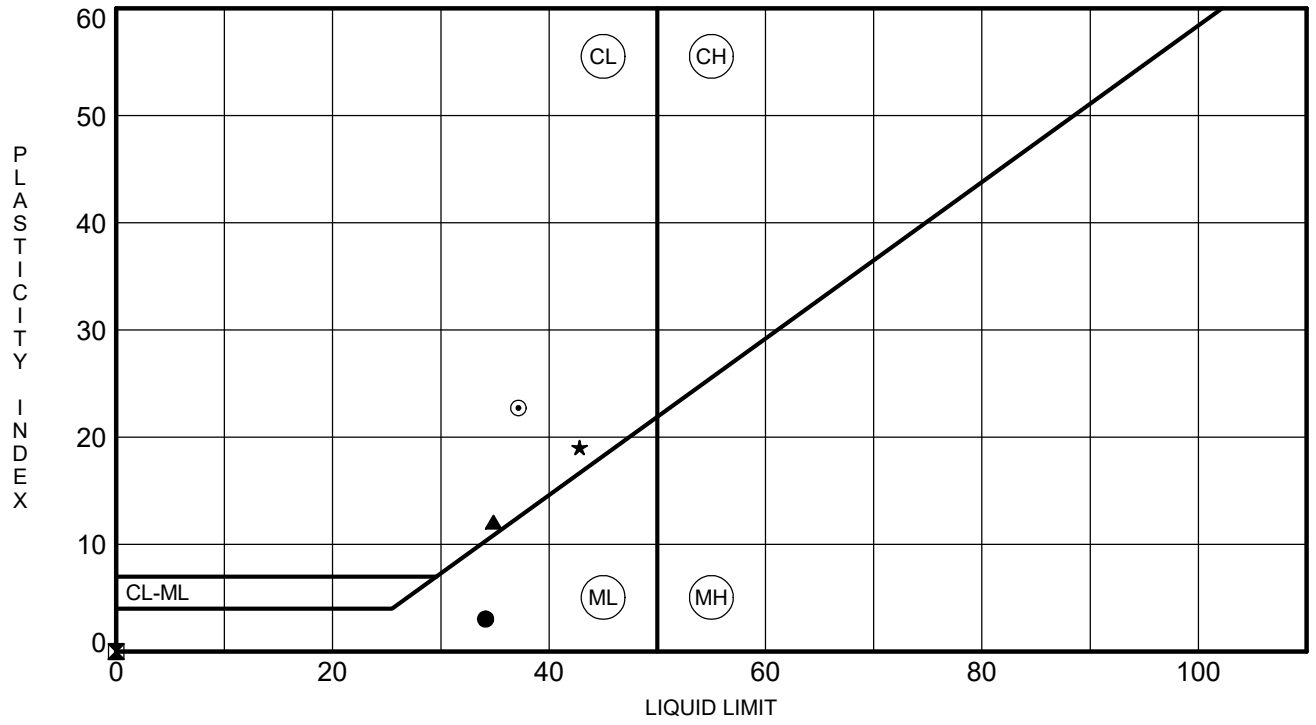
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-U1	6.0	0.075						75.8	
⊠	C3C-U1	8.0	0.075						74.8	
▲	C3C-U1	15.0	0.075						60.1	
★	C3C-U1	20.0	0.075						52.8	
⊙	C3C-U1	35.0	0.075						44.4	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-U1**	**6.0**	**34**	**31**	**3**	**76**	**SILT with SAND (ML/A-4)**
⊠	**C3C-U1**	**8.0**	**NP**	**NP**	**NP**	**75**	**SILT with SAND (ML/A-4)**
▲	**C3C-U1**	**15.0**	**35**	**23**	**12**	**60**	**SANDY LEAN CLAY (CL/A-6)**
★	**C3C-U1**	**20.0**	**43**	**24**	**19**	**53**	**SANDY LEAN CLAY (CL/A-7-6)**
⊙	**C3C-U1**	**35.0**	**37**	**14**	**23**	**44**	**CLAYEY SAND (SC/A-6)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/17/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1336	**DATE REQUESTED:**	4/22/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	CJ/CR	**DATE OF TESTING:**	4/22/2024
WEIGHED BY:	AGB	**DATE OF WEIGHING:**	4/23/2024

BORING NO.	C3C-U2	C3C-U2	C3C-U2	C3C-U2	C3C-U2
SAMPLE NO.	SS-2	SS-3	SS-4	SS-6	SS-8
SAMPLE DEPTH	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	13.5 - 15.0	23.0 - 25.0
WATER CONTENT, W%	17.2	11.8	16.1	19.7	20.0

BORING NO.	C3C-U2	C3C-U2	C3C-U2		
SAMPLE NO.	SS-9	SS-11	SS-13		
SAMPLE DEPTH	28.5 - 30.0	38.5 - 40.0	48.5 - 50.0		
WATER CONTENT, W%	27.5	16.6	30.7		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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GRAIN SIZE DISTRIBUTION

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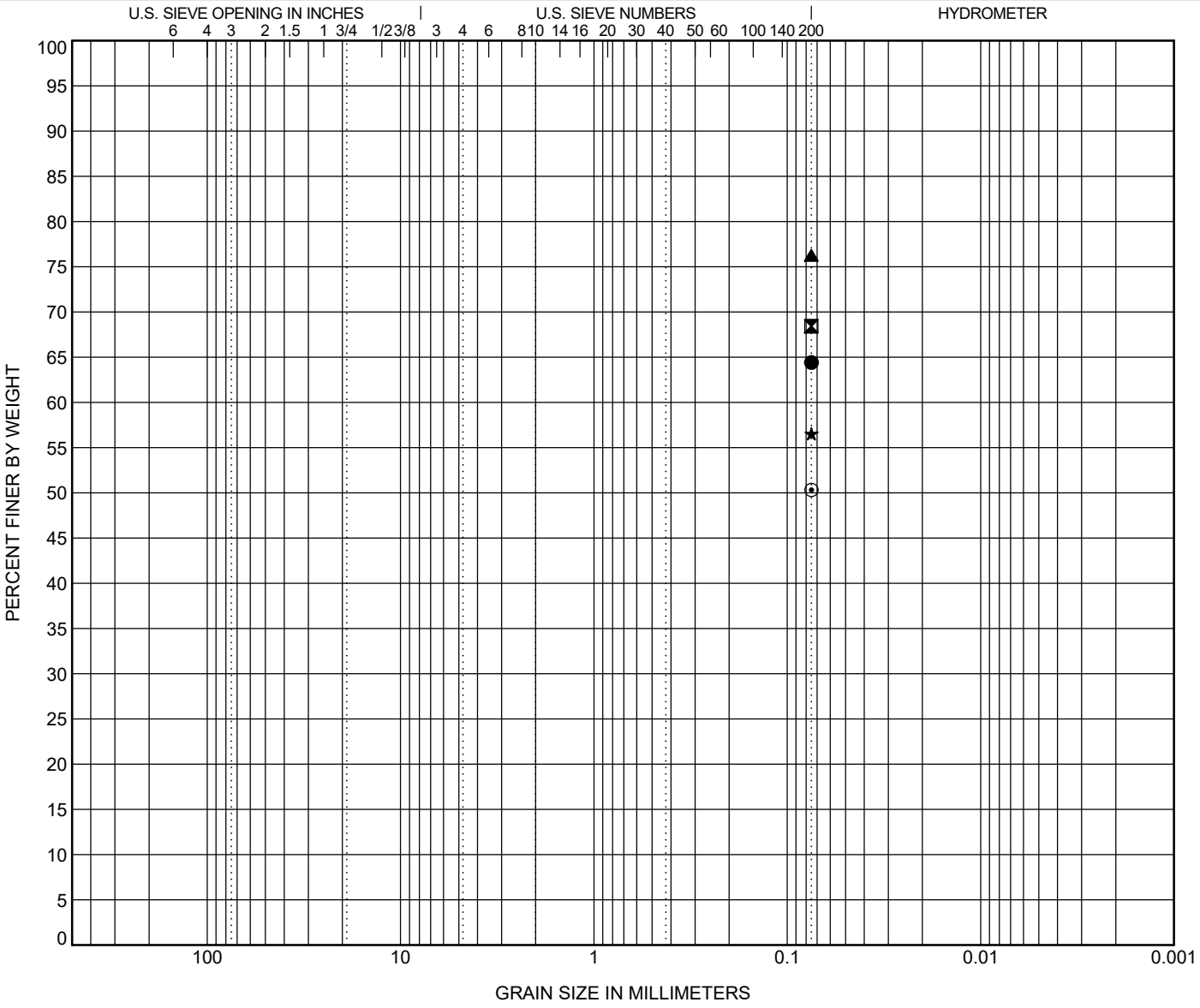
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE		DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-U2	4.0	SANDY SILT (ML/A-4)	NP	NP	NP		
⊠	C3C-U2	6.0	SANDY SILT (ML/A-4)	NP	NP	NP		
▲	C3C-U2	8.0	SILT with SAND (ML/A-4)	NP	NP	NP		
★	C3C-U2	15.0	SANDY SILT (ML/A-4)	NP	NP	NP		
⊙	C3C-U2	25.0	SANDY LEAN CLAY (CL/A-6)	38	18	20		

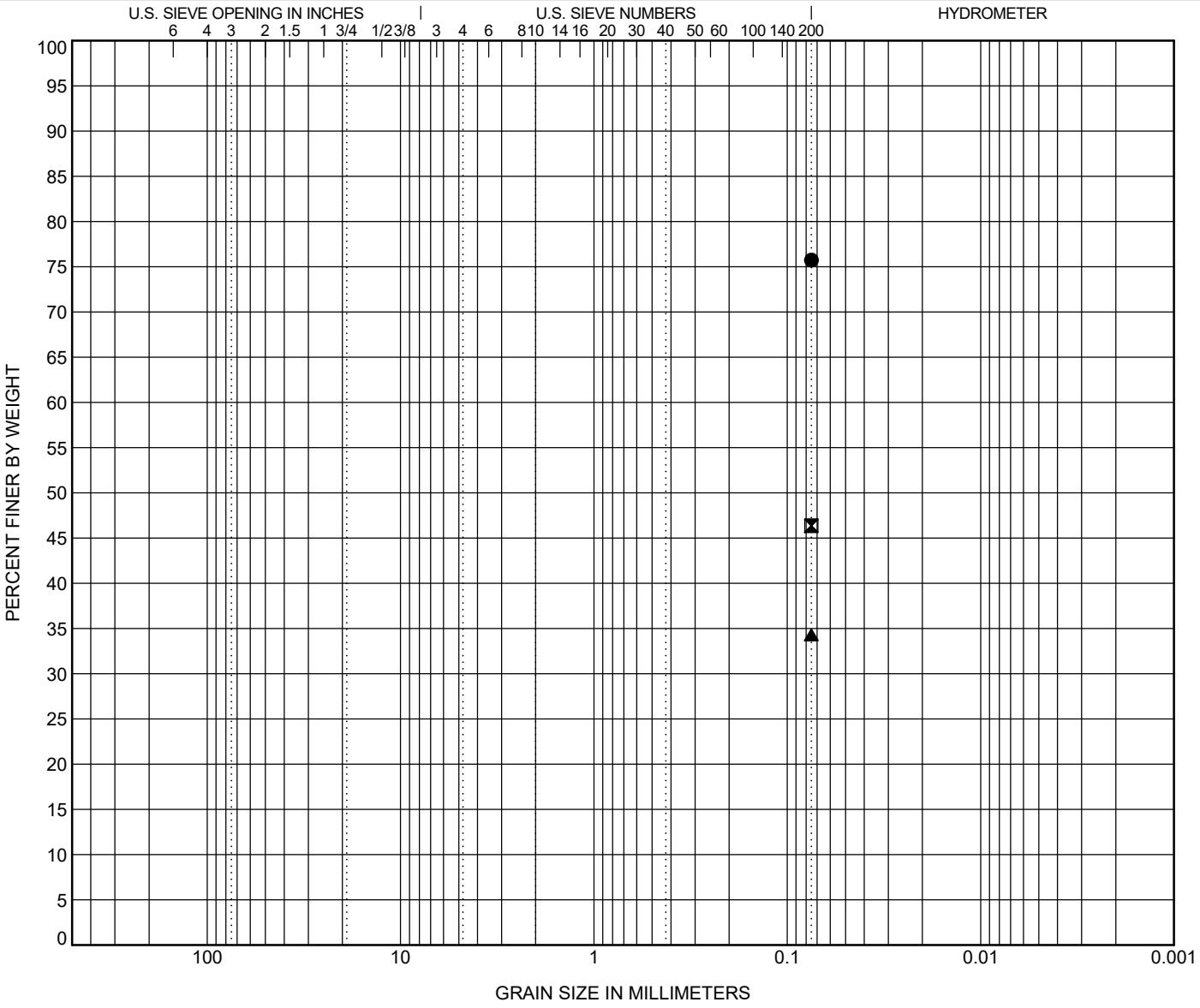
BOREHOLE		DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-U2	4.0	0.075						64.4	
⊠	C3C-U2	6.0	0.075						68.4	
▲	C3C-U2	8.0	0.075						76.3	
★	C3C-U2	15.0	0.075						56.5	
⊙	C3C-U2	25.0	0.075						50.3	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-U2**	**30.0**	**ELASTIC SILT with SAND (MH/A-7-6)**	**51**	**29**	**22**		
⊠	**C3C-U2**	**40.0**	**SILTY SAND (SM/A-4)**	**NP**	**NP**	**NP**		
▲	**C3C-U2**	**50.0**	**SILTY SAND (SM/A-2-4)**	**NP**	**NP**	**NP**		

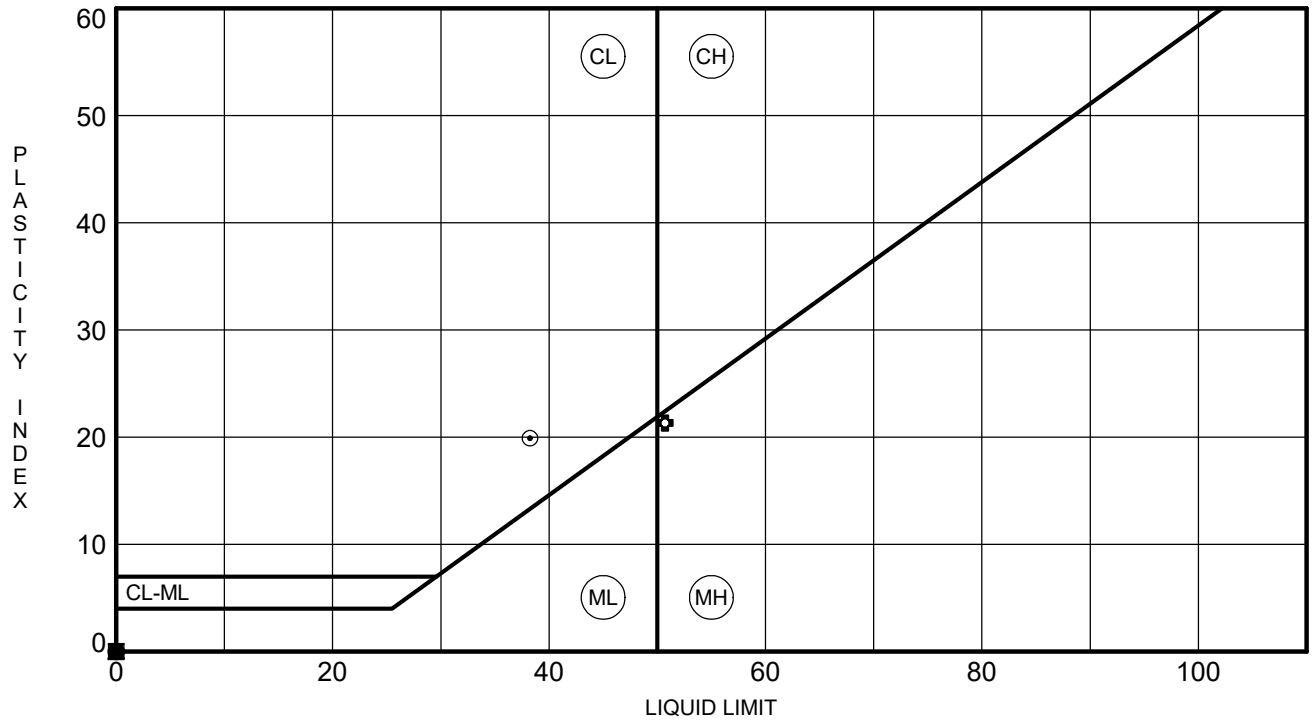
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-U2**	**30.0**	**0.075**						**75.7**	
⊠	**C3C-U2**	**40.0**	**0.075**						**46.4**	
▲	**C3C-U2**	**50.0**	**0.075**						**34.3**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	C3C-U2	4.0	NP	NP	NP	64	SANDY SILT (ML/A-4)
⊠	C3C-U2	6.0	NP	NP	NP	68	SANDY SILT (ML/A-4)
▲	C3C-U2	8.0	NP	NP	NP	76	SILT with SAND (ML/A-4)
★	C3C-U2	15.0	NP	NP	NP	57	SANDY SILT (ML/A-4)
⊙	C3C-U2	25.0	38	18	20	50	SANDY LEAN CLAY (CL/A-6)
✿	C3C-U2	30.0	51	29	22	76	ELASTIC SILT with SAND (MH/A-7-6)
○	C3C-U2	40.0	NP	NP	NP	46	SILTY SAND (SM/A-4)
△	C3C-U2	50.0	NP	NP	NP	34	SILTY SAND (SM/A-2-4)

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/2/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1508	**DATE REQUESTED:**	5/10/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AAB	**DATE OF TESTING:**	5/10/2024
WEIGHED BY:	AAB	**DATE OF WEIGHING:**	5/13/2024

BORING NO.	C3C-U3	C3C-U3	C3C-U3	C3C-U3	C3C-U3
SAMPLE NO.	SS-2	SS-6	SS-7	SS-8	SS-10
SAMPLE DEPTH	2.0 - 4.0	13.5 - 15.0	18.5 - 20.0	23.5 - 25.0	33.5 - 35.0
WATER CONTENT, W%	15.8	15.5	21.1	22.3	19.2

BORING NO.	C3C-U3	C3C-U3			
SAMPLE NO.	SS-11	SS-12			
SAMPLE DEPTH	38.5 - 40.0	43.5 - 45.0			
WATER CONTENT, W%	25.9	27.6			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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GRAIN SIZE DISTRIBUTION

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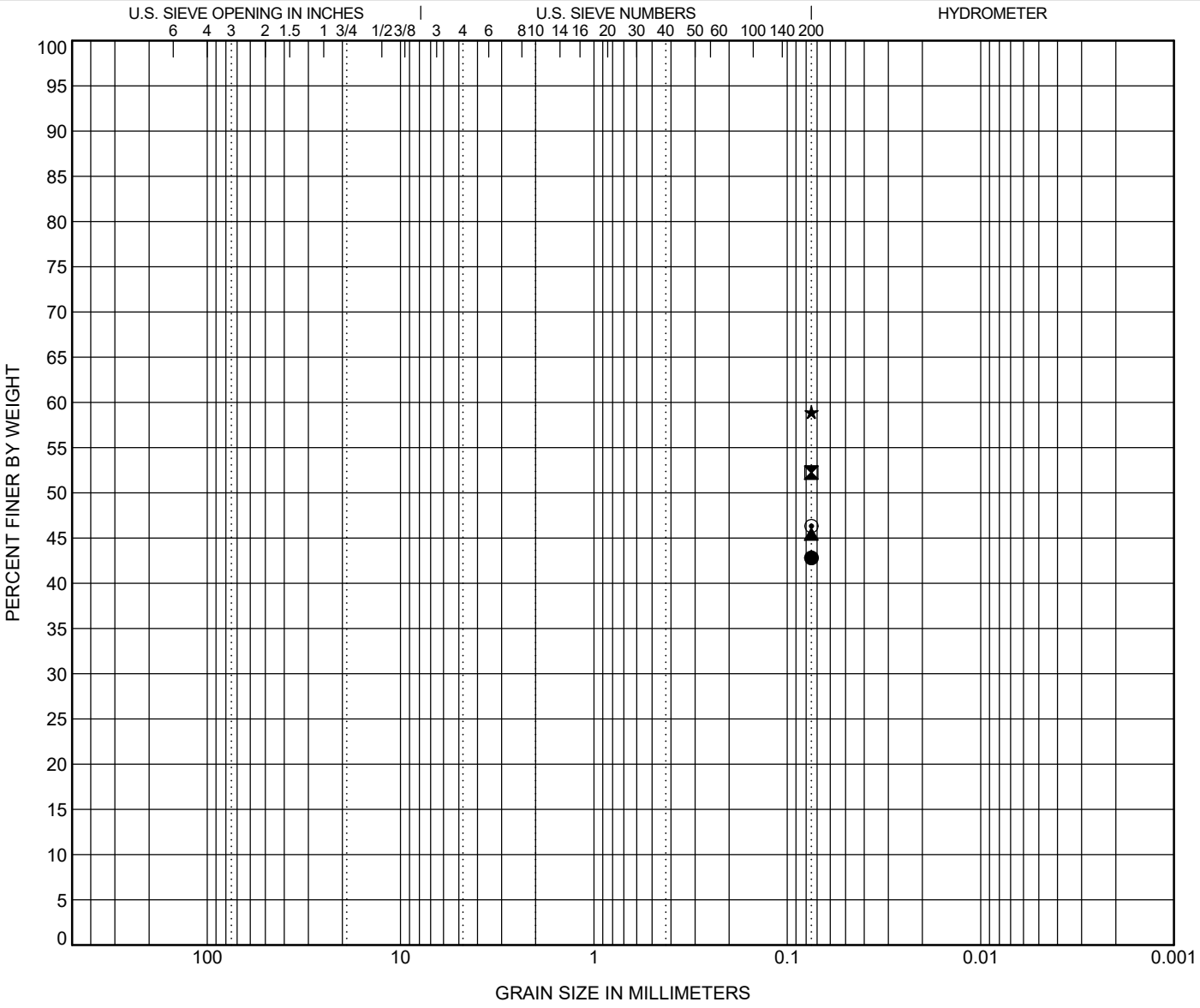
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	C3C-U3	4.0	CLAYEY SAND (SC/A-6)	39	17	22		
⊠	C3C-U3	15.0	SANDY SILT (ML/A-4)	33	31	2		
▲	C3C-U3	20.0	CLAYEY SAND (SC/A-7-6)	50	28	22		
★	C3C-U3	25.0	SANDY LEAN CLAY (CL/A-6)	37	23	14		
⊙	C3C-U3	35.0	CLAYEY SAND (SC/A-7-6)	41	14	27		

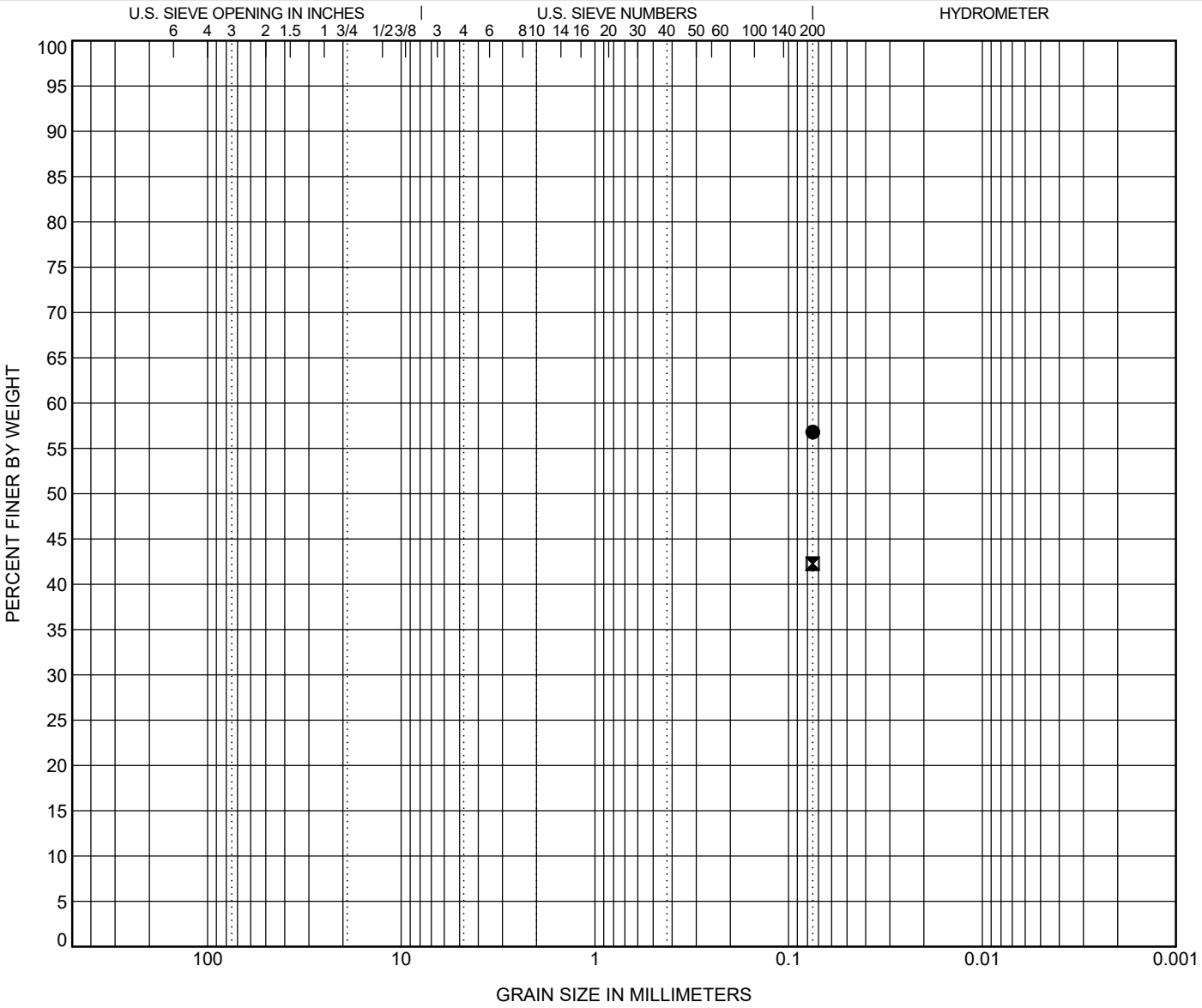
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	C3C-U3	4.0	0.075						42.8	
⊠	C3C-U3	15.0	0.075						52.2	
▲	C3C-U3	20.0	0.075						45.4	
★	C3C-U3	25.0	0.075						58.9	
⊙	C3C-U3	35.0	0.075						46.3	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/15/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-U3**	**40.0**	**SANDY LEAN CLAY (CL/A-7-6)**	**46**	**19**	**27**		
⊠	**C3C-U3**	**45.0**	**CLAYEY SAND (SC/A-6)**	**33**	**13**	**20**		

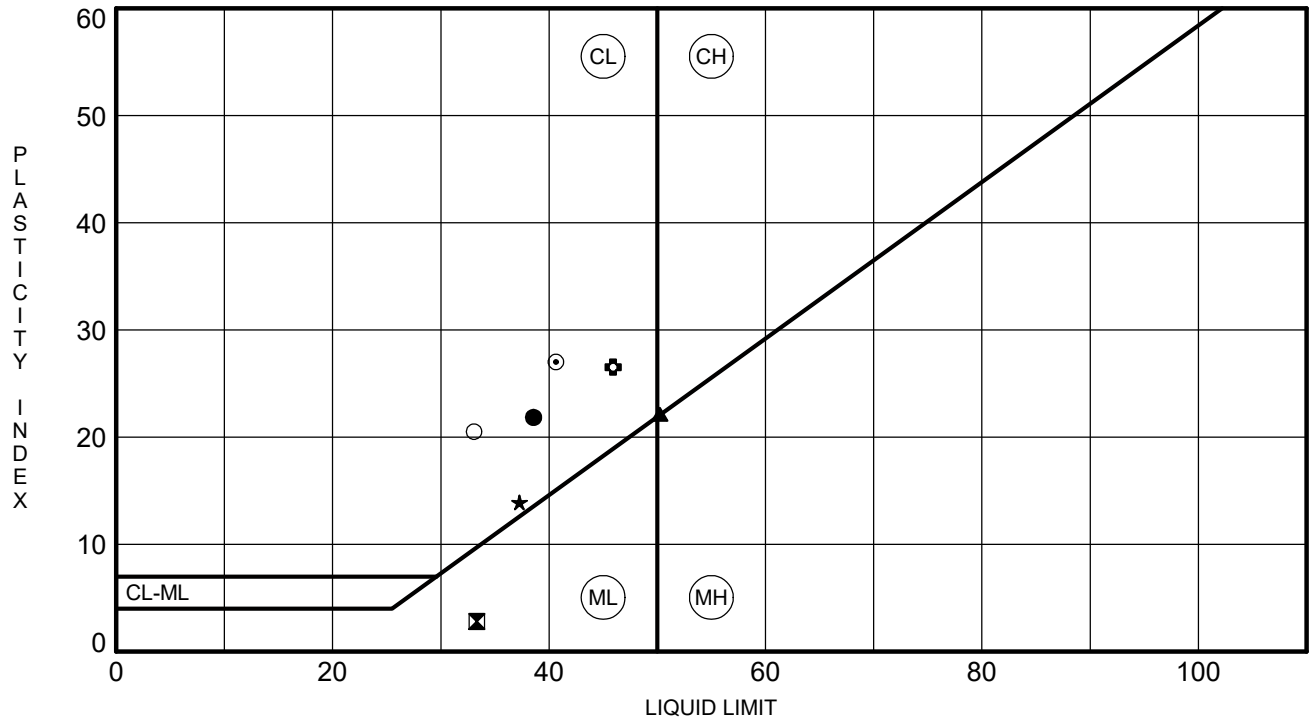
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-U3**	**40.0**	**0.075**						**56.8**	
⊠	**C3C-U3**	**45.0**	**0.075**						**42.3**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/15/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	C3C-U3	4.0	39	17	22	43	CLAYEY SAND (SC/A-6)
⊠	C3C-U3	15.0	33	31	2	52	SANDY SILT (ML/A-4)
▲	C3C-U3	20.0	50	28	22	45	CLAYEY SAND (SC/A-7-6)
★	C3C-U3	25.0	37	23	14	59	SANDY LEAN CLAY (CL/A-6)
⊙	C3C-U3	35.0	41	14	27	46	CLAYEY SAND (SC/A-7-6)
✿	C3C-U3	40.0	46	19	27	57	SANDY LEAN CLAY (CL/A-7-6)
○	C3C-U3	45.0	33	13	20	42	CLAYEY SAND (SC/A-6)

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 5/15/24

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-1301	**DATE REQUESTED:**	4/12/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	TP	**DATE OF TESTING:**	4/15/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	4/16/2024

BORING NO.	C3C-W1	C3C-W1	C3C-W1	C3C-W1	C3C-W1
SAMPLE NO.	SS-2	SS-3	SS-4	SS-5	SS-6
SAMPLE DEPTH	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	13.5 - 15.0
WATER CONTENT, W%	13.7	14.6	18.3	22.0	21.3

BORING NO.	C3C-W1	C3C-W1			
SAMPLE NO.	SS-8	SS-10			
SAMPLE DEPTH	23.5 - 25.0	33.5 - 35.0			
WATER CONTENT, W%	36.4	27.5			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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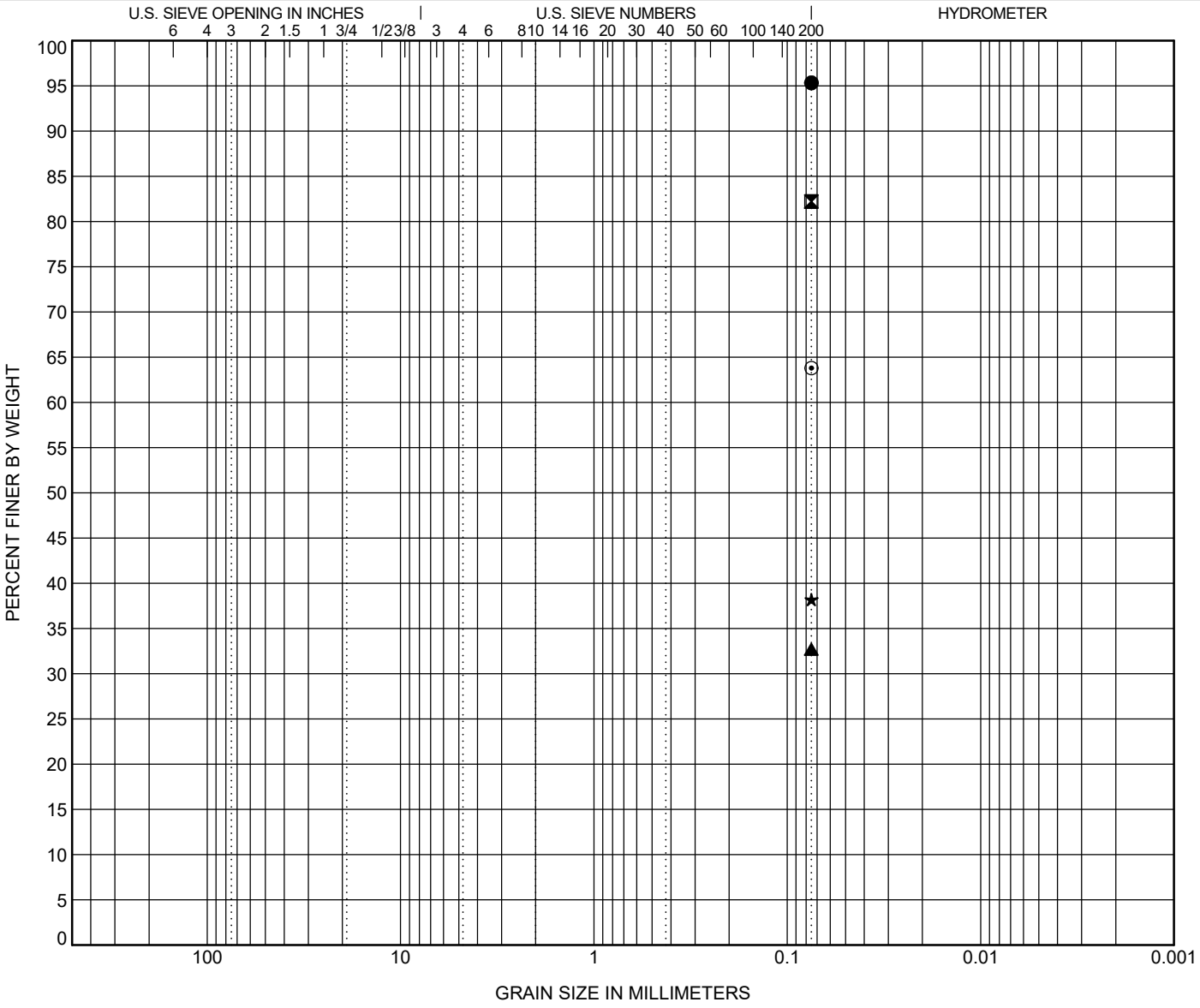
PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W1**	**4.0**	**LEAN CLAY (CL/A-6)**	**39**	**15**	**24**		
⊠	**C3C-W1**	**6.0**	**LEAN CLAY with SAND (CL/A-7-6)**	**45**	**19**	**26**		
▲	**C3C-W1**	**8.0**	**CLAYEY SAND (SC/A-2-6)**	**34**	**21**	**13**		
★	**C3C-W1**	**10.0**	**SILTY SAND (SM/A-4)**	**32**	**26**	**6**		
⊙	**C3C-W1**	**15.0**	**SANDY LEAN CLAY (CL/A-6)**	**35**	**22**	**13**		

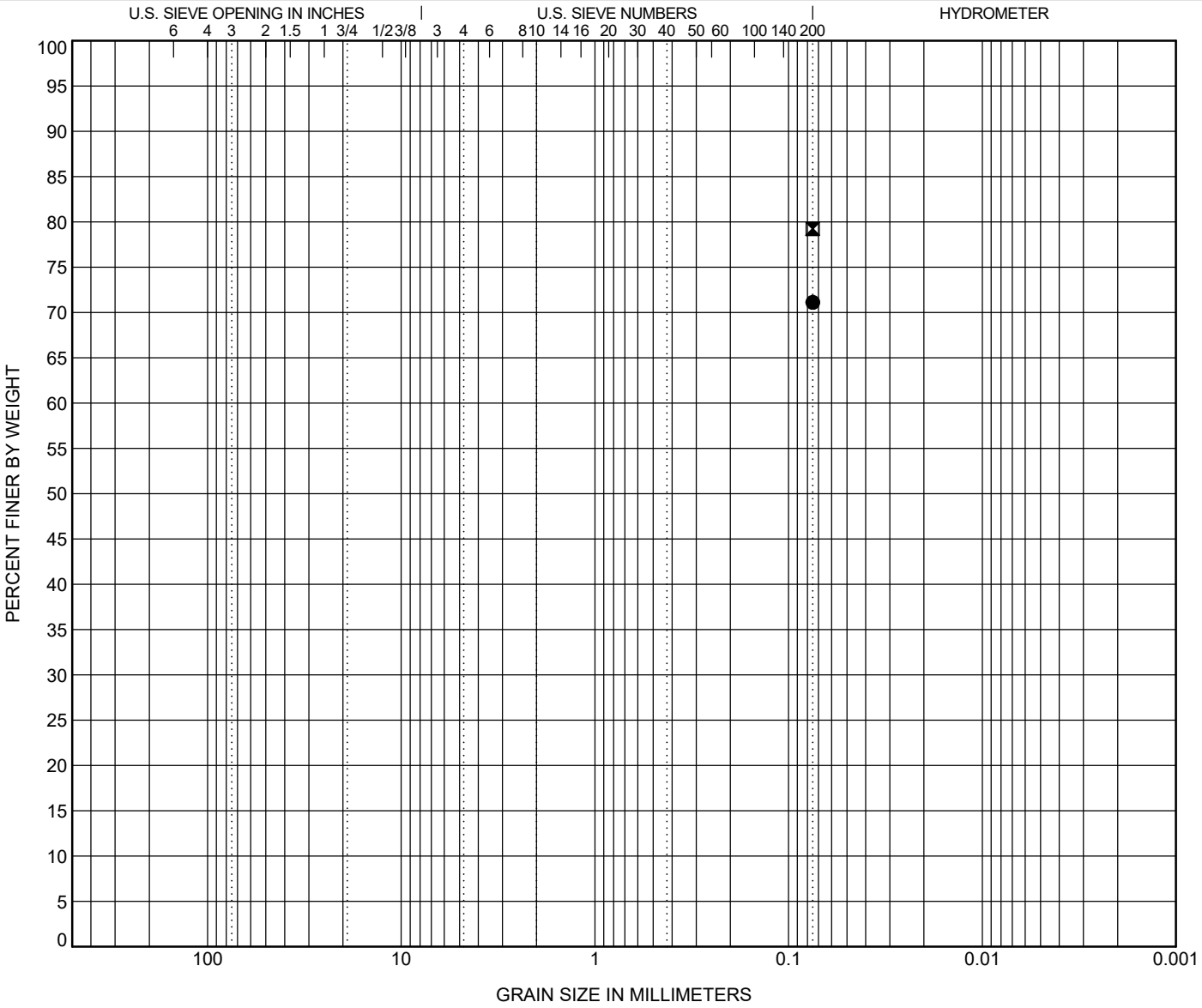
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W1**	**4.0**	**0.075**						**95.3**	
⊠	**C3C-W1**	**6.0**	**0.075**						**82.2**	
▲	**C3C-W1**	**8.0**	**0.075**						**32.7**	
★	**C3C-W1**	**10.0**	**0.075**						**38.4**	
⊙	**C3C-W1**	**15.0**	**0.075**						**63.8**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/23/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W1**	**25.0**	**ELASTIC SILT with SAND (MH/A-7-5)**	**53**	**37**	**16**		
⊠	**C3C-W1**	**35.0**	**SILT with SAND (ML/A-7-6)**	**48**	**29**	**19**		

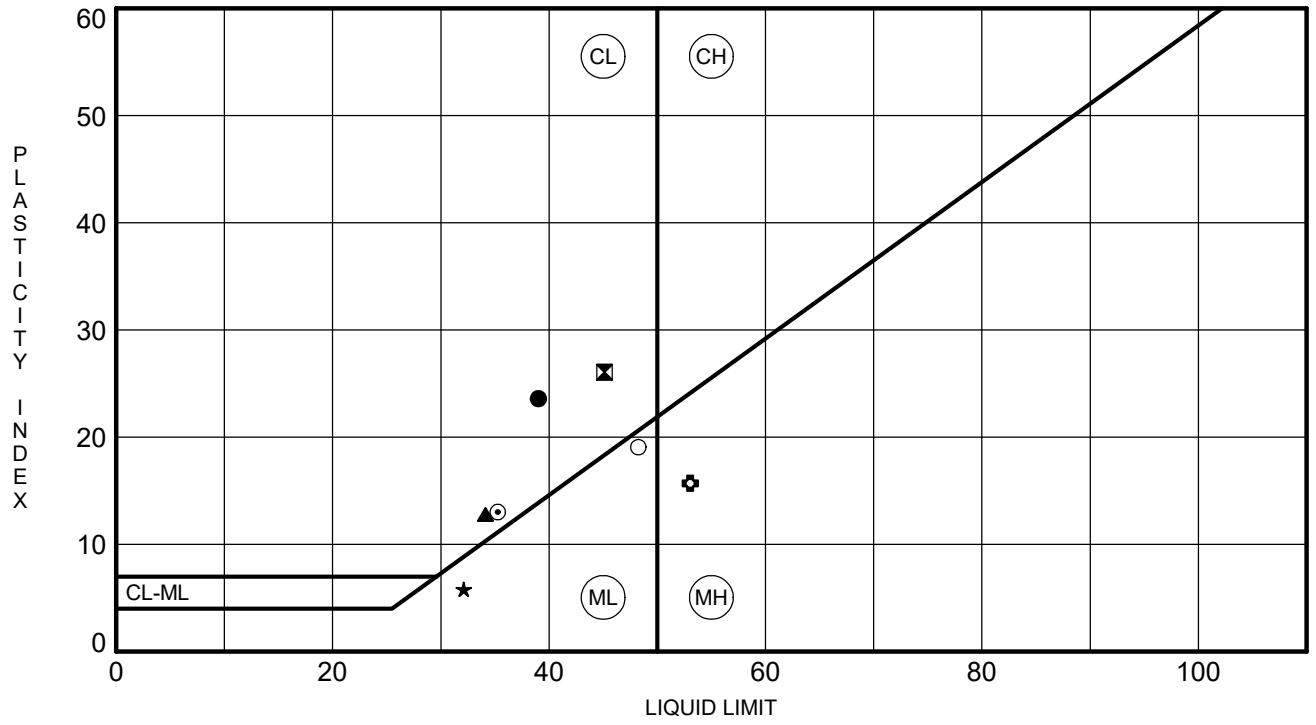
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W1**	**25.0**	**0.075**						**71.1**	
⊠	**C3C-W1**	**35.0**	**0.075**						**79.2**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/23/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	C3C-W1	4.0	39	15	24	95	LEAN CLAY (CL/A-6)
⊠	C3C-W1	6.0	45	19	26	82	LEAN CLAY with SAND (CL/A-7-6)
▲	C3C-W1	8.0	34	21	13	33	CLAYEY SAND (SC/A-2-6)
★	C3C-W1	10.0	32	26	6	38	SILTY SAND (SM/A-4)
⊙	C3C-W1	15.0	35	22	13	64	SANDY LEAN CLAY (CL/A-6)
✿	C3C-W1	25.0	53	37	16	71	ELASTIC SILT with SAND (MH/A-7-5)
○	C3C-W1	35.0	48	29	19	79	SILT with SAND (ML/A-7-6)

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/23/24

REV 12/2023

F&ME CONSULTANTS
211 Business Park Blvd.
Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-0667	**DATE REQUESTED:**	3/28/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AC	**DATE OF TESTING:**	3/28/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	3/29/2024

BORING NO.	C3C-W2	C3C-W2	C3C-W2		
SAMPLE NO.	SS-1	SS-4	SS-6		
SAMPLE DEPTH	0.0 - 2.0	6.0 - 8.0	13.5 - 15.0		
WATER CONTENT, W%	3.9	24.7	37.8		

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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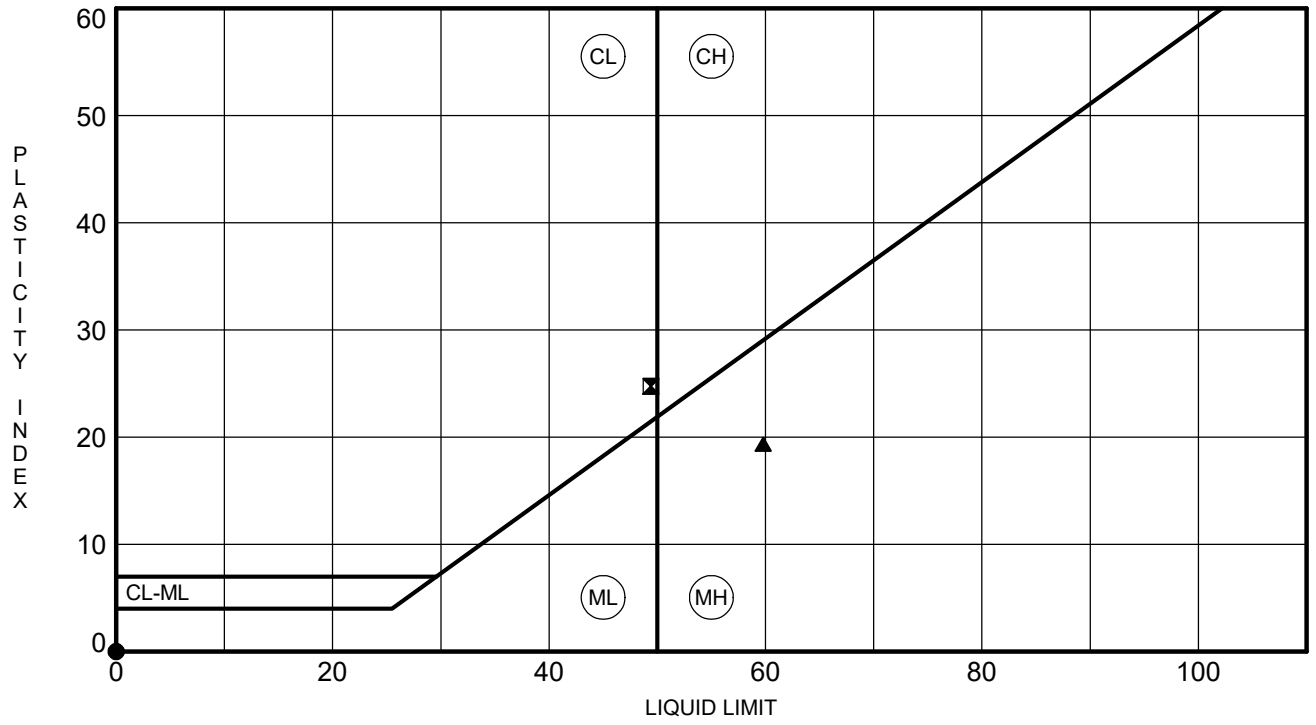
ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



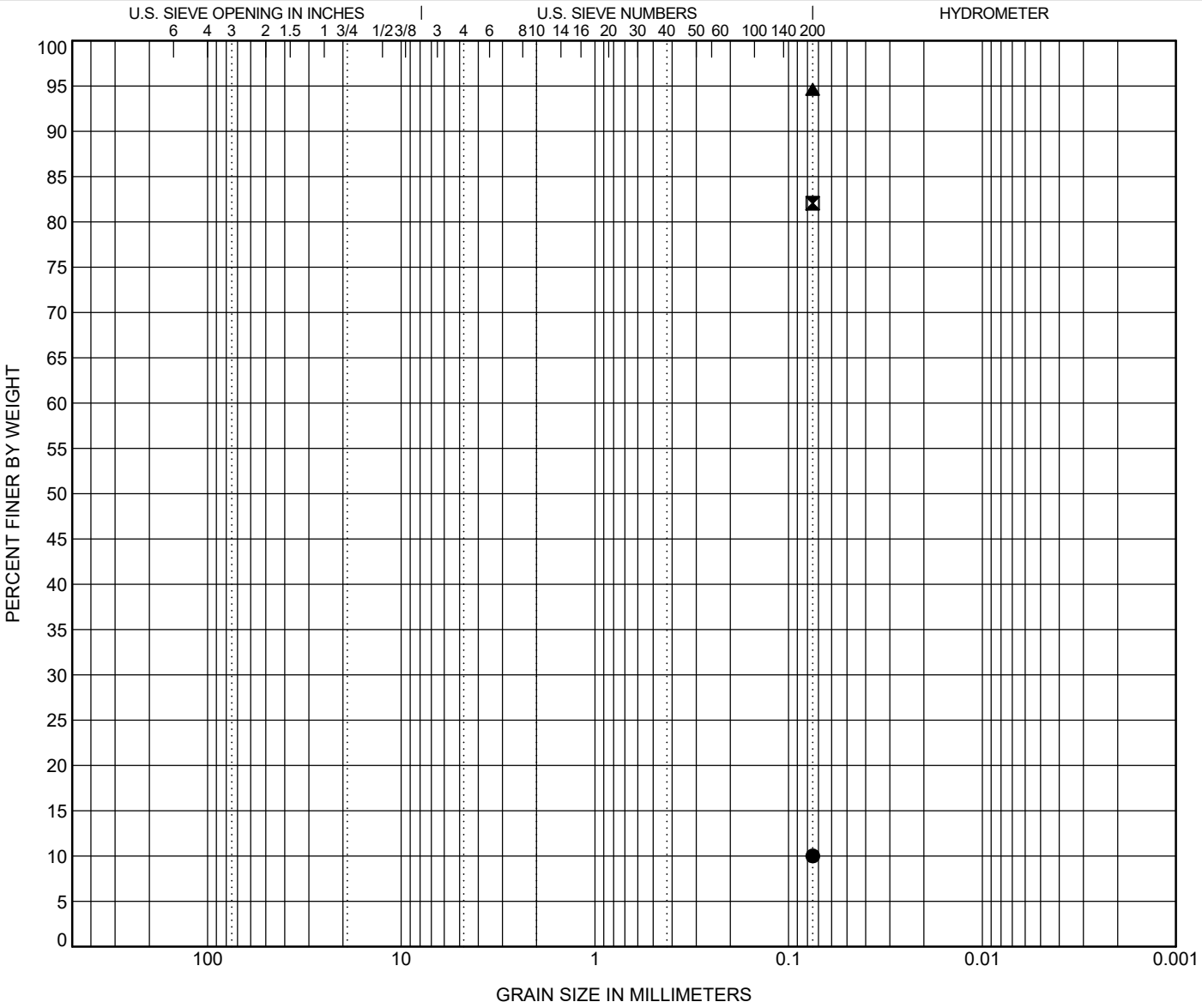
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-W2**	**2.0**	**NP**	**NP**	**NP**	**10**	**POORLY GRADED SAND (SP-SM/A-3) with SILT**
⧓	**C3C-W2**	**8.0**	**49**	**25**	**24**	**82**	**LEAN CLAY with SAND (CL/A-7-6)**
▲	**C3C-W2**	**15.0**	**60**	**40**	**20**	**95**	**ELASTIC SILT (MH/A-7-5)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W2**	**2.0**	**POORLY GRADED SAND (SP-SM/A-3) with SILT**	**NP**	**NP**	**NP**		
⊠	**C3C-W2**	**8.0**	**LEAN CLAY with SAND (CL/A-7-6)**	**49**	**25**	**24**		
▲	**C3C-W2**	**15.0**	**ELASTIC SILT (MH/A-7-5)**	**60**	**40**	**20**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W2**	**2.0**	**0.075**						**10.0**	
⊠	**C3C-W2**	**8.0**	**0.075**						**82.0**	
▲	**C3C-W2**	**15.0**	**0.075**						**94.6**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

REV 12/2023

F&ME CONSULTANTS
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Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-0972	**DATE REQUESTED:**	3/28/2024
DESCRIPTION OF SOIL:	LEAN CLAY (CL/A-6)		
TESTED BY:	AC	**DATE OF TESTING:**	3/28/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	3/29/2024

BORING NO.	C3C-W3				
SAMPLE NO.	SS-2				
SAMPLE DEPTH	2.0 - 4.0				
WATER CONTENT, W%	25.9				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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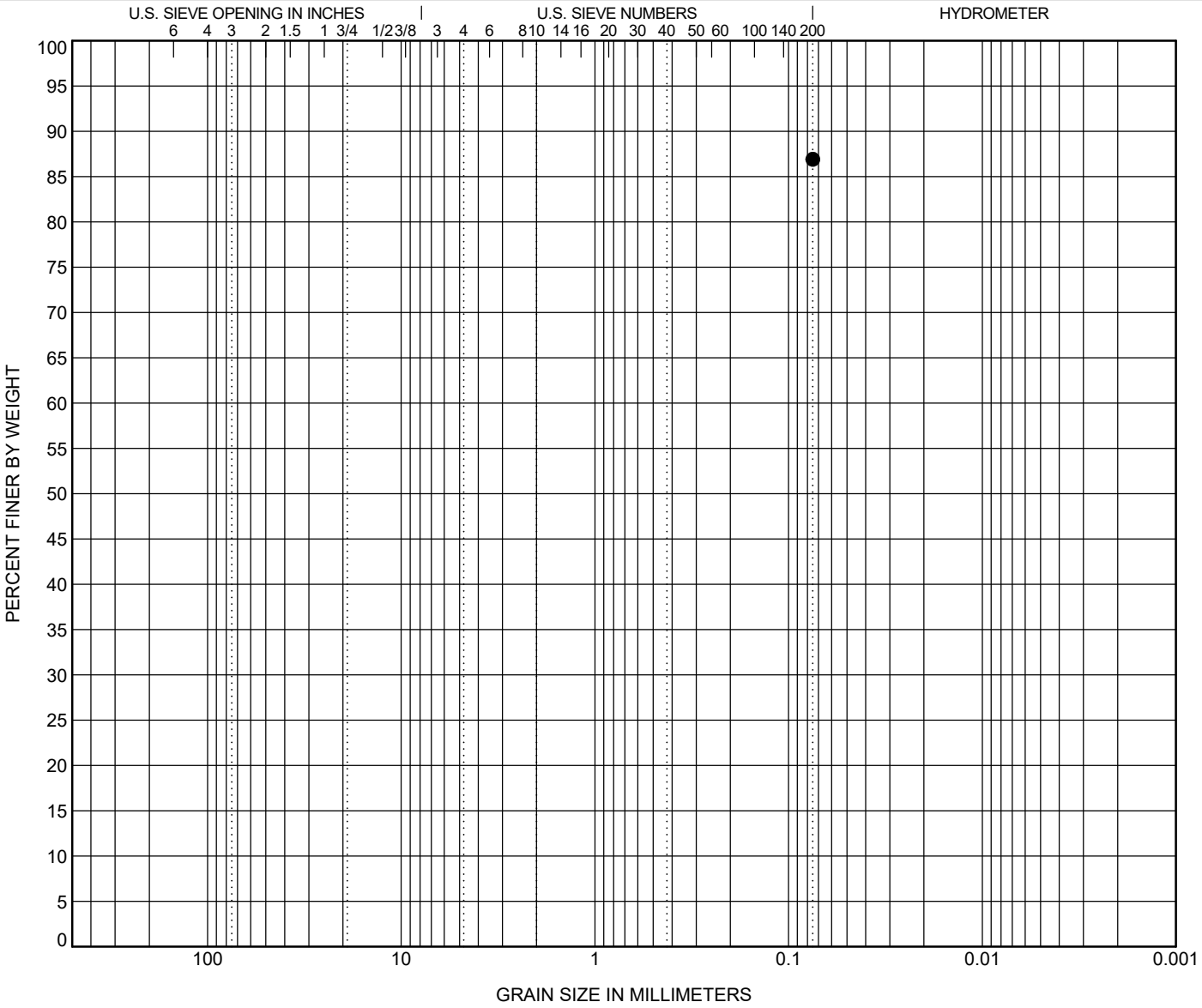
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W3**	**4.0**	**LEAN CLAY (CL/A-6)**	**39**	**23**	**16**		

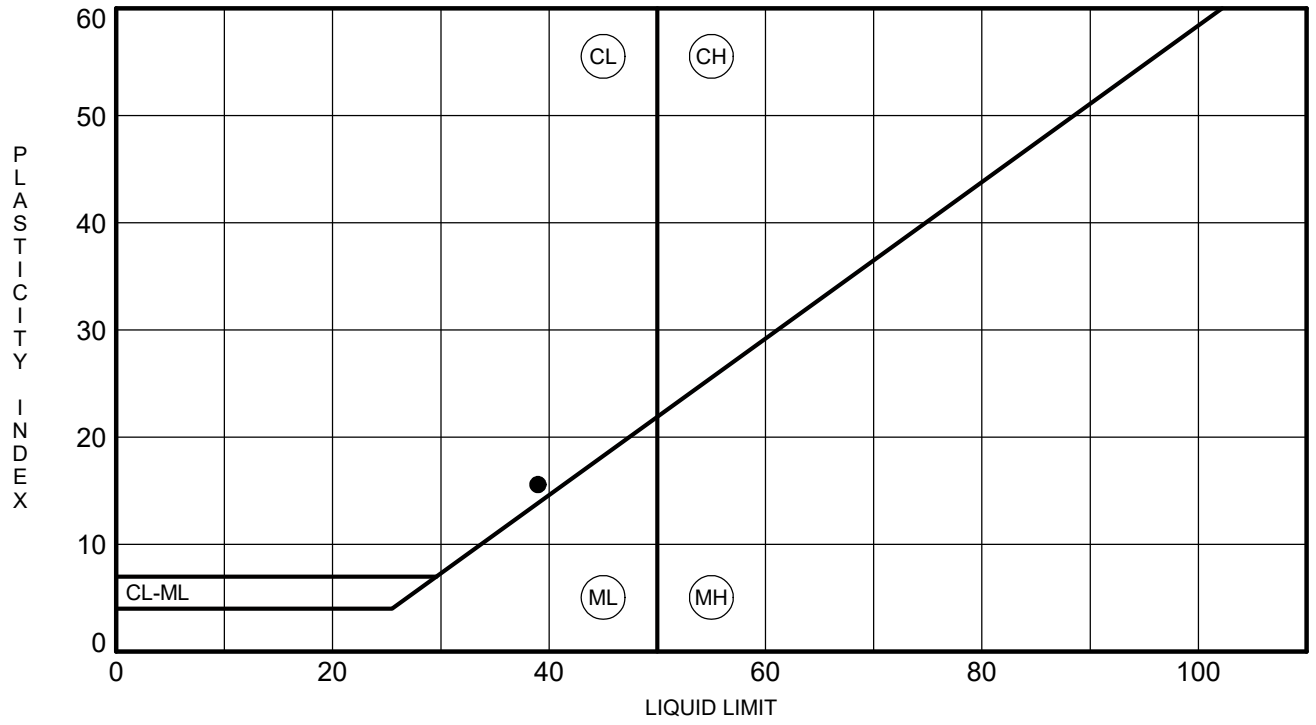
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W3**	**4.0**	**0.075**						**86.9**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-W3**	**4.0**	**39**	**23**	**16**	**87**	**LEAN CLAY (CL/A-6)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

REV 12/2023

F&ME CONSULTANTS
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Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-0973	**DATE REQUESTED:**	3/28/2024
DESCRIPTION OF SOIL:	LEAN CLAY (CL/A-7-6)		
TESTED BY:	AC	**DATE OF TESTING:**	3/28/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	3/29/2024

BORING NO.	C3C-W4				
SAMPLE NO.	SS-2				
SAMPLE DEPTH	2.0 - 4.0				
WATER CONTENT, W%	19.9				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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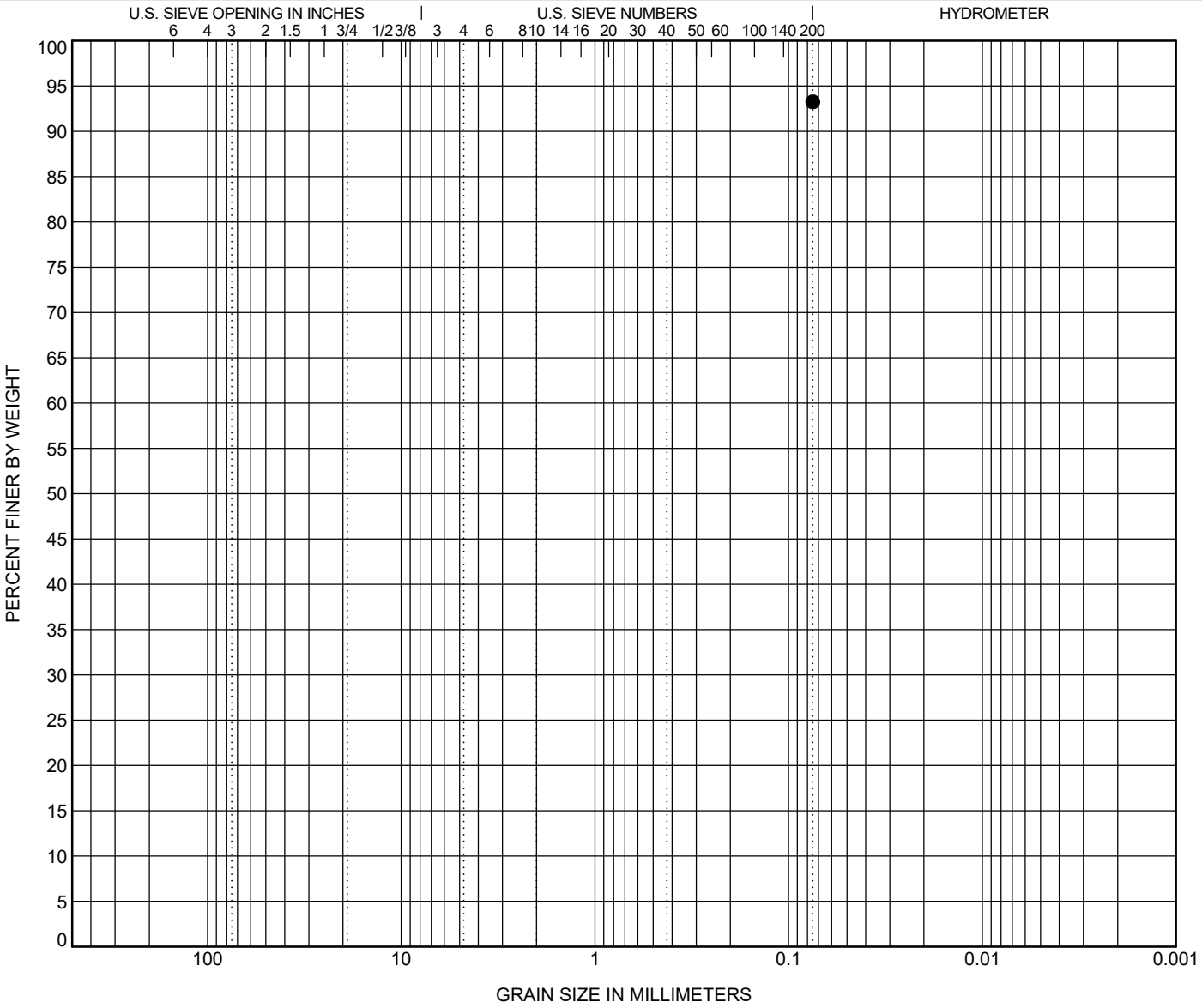
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W4**	**4.0**	**LEAN CLAY (CL/A-7-6)**	**41**	**25**	**16**		

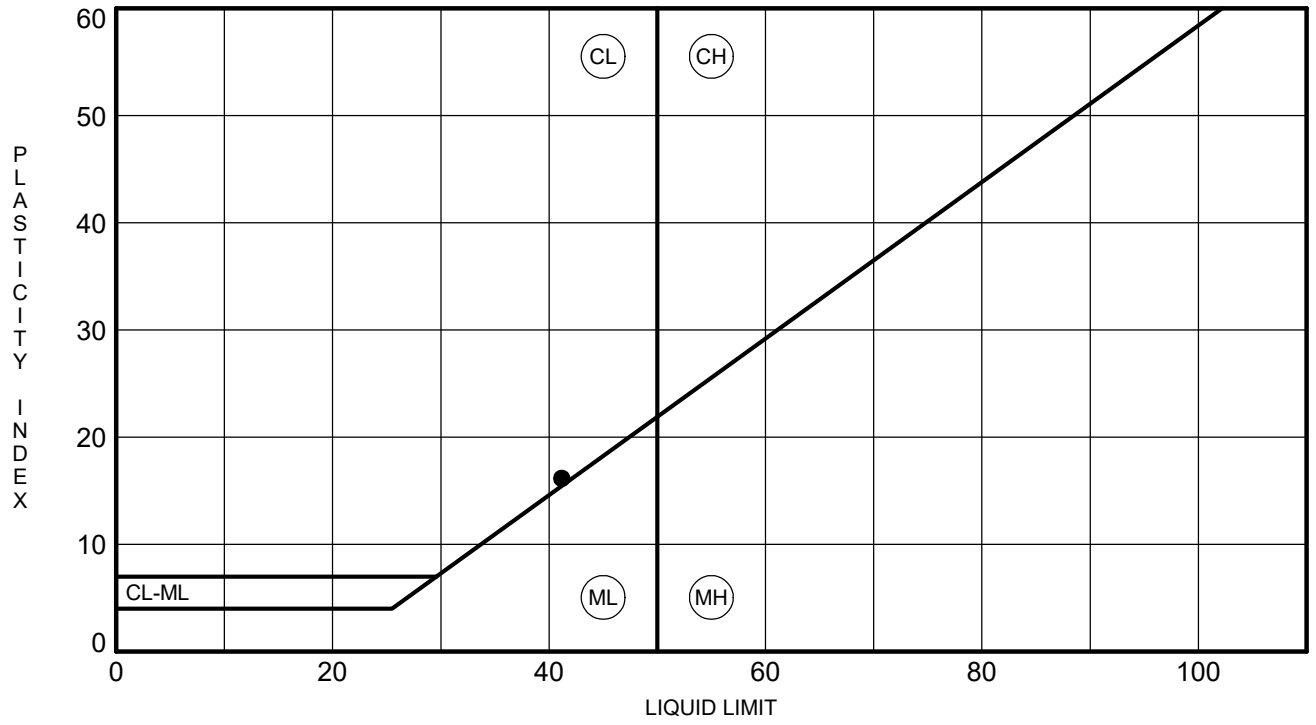
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W4**	**4.0**	**0.075**						**93.2**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-W4**	**4.0**	**41**	**25**	**16**	**93**	**LEAN CLAY (CL/A-7-6)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

REV 12/2023

F&ME CONSULTANTS
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Columbia, SC 29203

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	Carolina Cross Roads Corridor Improvement Phase 2A-CM1 (Contract Mod 8-CM8)	**SCDOT PROJECT ID:**	P039720
SAMPLE NUMBER:	24-0974	**DATE REQUESTED:**	3/28/2024
DESCRIPTION OF SOIL:	VARIOUS		
TESTED BY:	AC	**DATE OF TESTING:**	3/28/2024
WEIGHED BY:	AB	**DATE OF WEIGHING:**	3/29/2024

BORING NO.	C3C-W5	C3C-W5	C3C-W5	C3C-W5	
SAMPLE NO.	SS-3	SS-4	SS-6.1	SS-6.2	
SAMPLE DEPTH	4.0 - 6.0	6.0 - 8.0	13.5 - 14.0	14.0 - 15.0	
WATER CONTENT, W%	14.8	21.4	6.1	15.7	

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH					
WATER CONTENT, W%					

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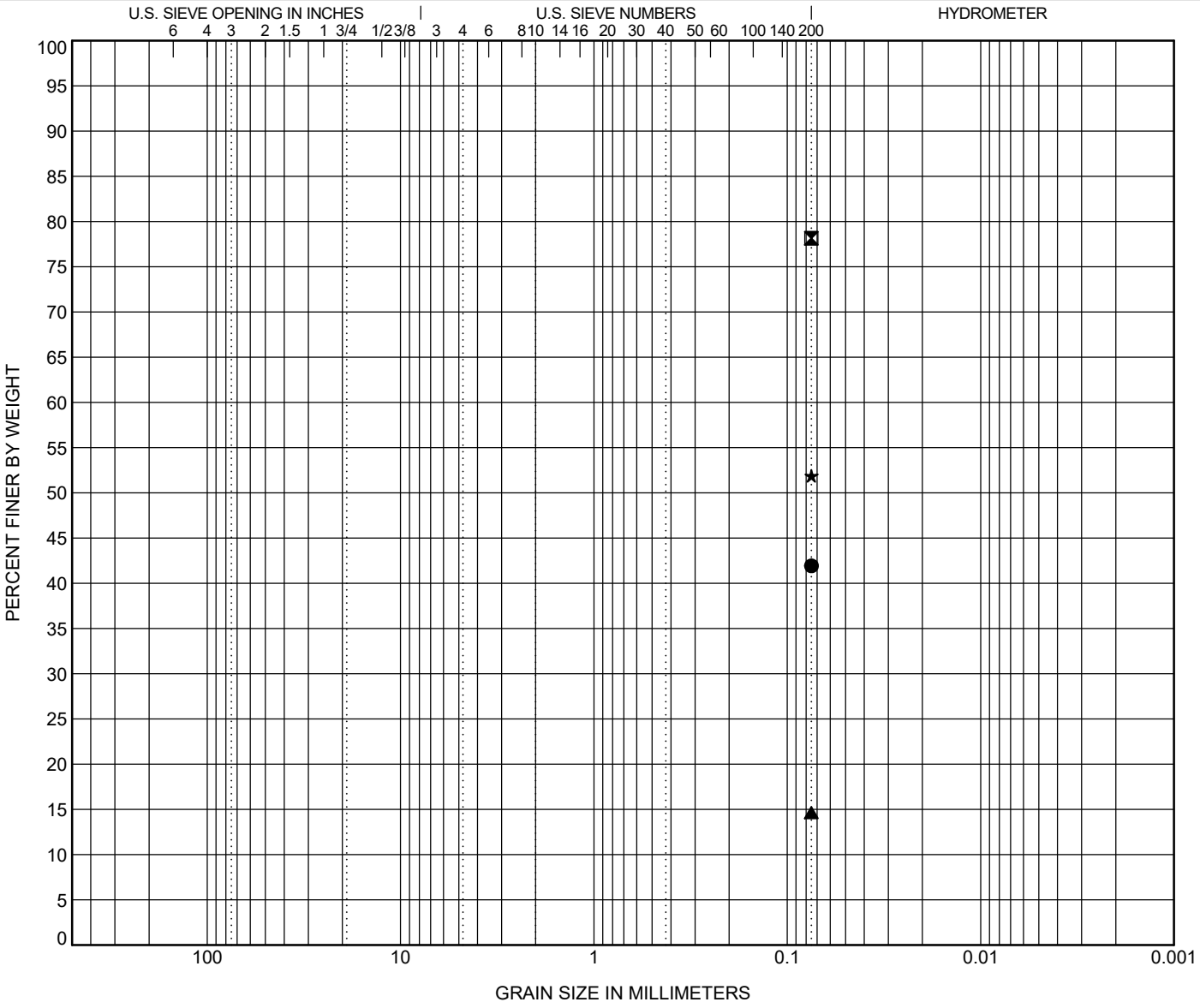
GRAIN SIZE DISTRIBUTION

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**C3C-W5**	**6.0**	**CLAYEY SAND (SC/A-7-6)**	**42**	**16**	**26**		
⊠	**C3C-W5**	**8.0**	**LEAN CLAY with SAND (CL/A-7-6)**	**49**	**24**	**25**		
▲	**C3C-W5**	**14.0**	**SILTY SAND (SM/A-2-4)**					
★	**C3C-W5**	**15.0**	**SANDY FAT CLAY (CH/A-7-6)**	**60**	**15**	**45**		

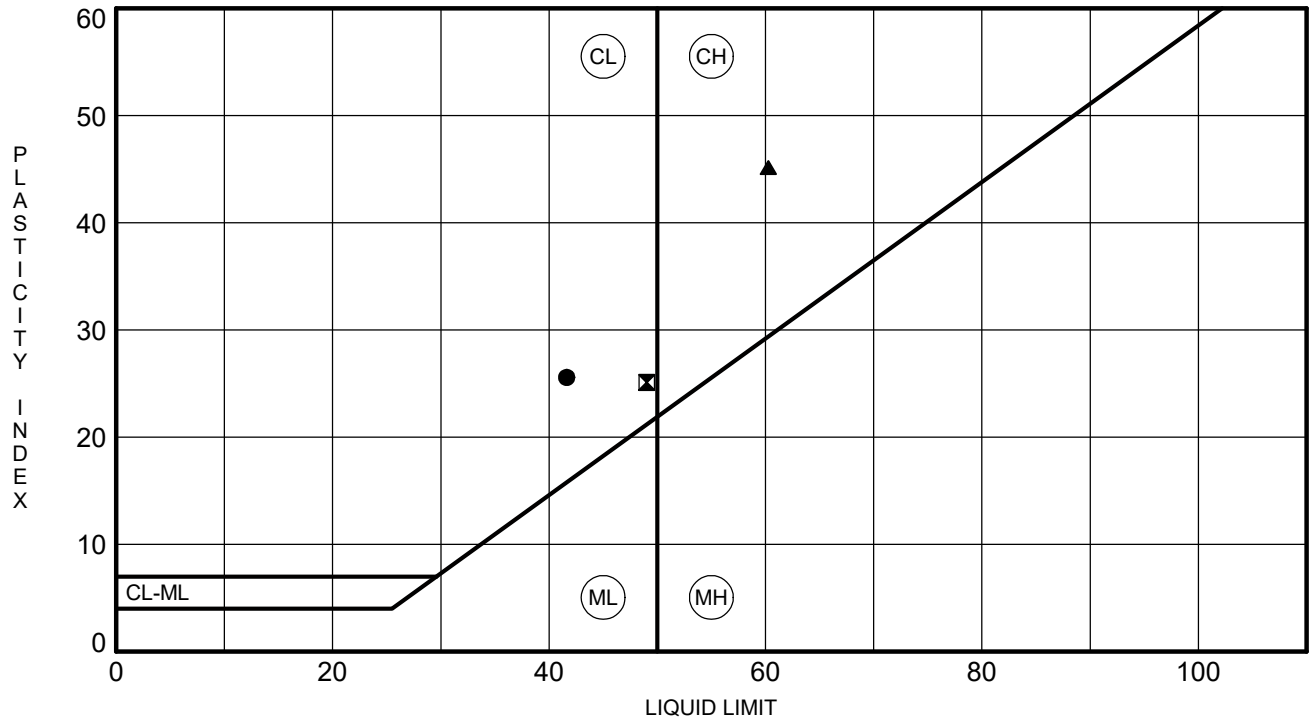
	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**C3C-W5**	**6.0**	**0.075**						**41.9**	
⊠	**C3C-W5**	**8.0**	**0.075**						**78.2**	
▲	**C3C-W5**	**14.0**	**0.075**						**14.6**	
★	**C3C-W5**	**15.0**	**0.075**						**51.9**	

GRAIN SIZE G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

ATTERBERG LIMITS' RESULTS

PROJECT ID P039720 **PROJECT NAME** Carolina Crossroads I-20/26/126 Corridor Improvements

PROJECT COUNTY Richland/Lexington



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**C3C-W5**	**6.0**	**42**	**16**	**26**	**42**	**CLAYEY SAND (SC/A-7-6)**
⊠	**C3C-W5**	**8.0**	**49**	**24**	**25**	**78**	**LEAN CLAY with SAND (CL/A-7-6)**
▲	**C3C-W5**	**15.0**	**60**	**15**	**45**	**52**	**SANDY FAT CLAY (CH/A-7-6)**

ATTERBERG LIMITS G5662.03- CAROLINA CROSSROADS PH 3C.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 4/9/24

Form No: TR-D2216-T265-2
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-16-047.2B	Report Date:	2/22/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/20 - 2/22/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	1/29 - 2/14/18
Sampling Method:	Split-spoon	Drill Rig:	CME 55/Diedrich D-50

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 7536 Calibration Date: 1/31/18 Oven ID. 7621 Calibration Date: 7/28/17

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
B-29	SS-1	1.0 - 3.0	300	0.00	55.71	49.45	6.26	12.7%
B-29	SS-5	9.0 - 11.0	306	0.00	27.46	22.20	5.26	23.7%
B-29	SS-8	24.5 - 26.0	312	0.00	54.59	37.47	17.12	45.7%
B-29	SS-12	44.5 - 46.0	319	0.00	69.45	56.65	12.80	22.6%
B-34	SS-2	3.0 - 5.0	320	0.00	36.34	28.16	8.18	29.0%
B-34	SS-5	9.0 - 11.0	324	0.00	41.63	35.12	6.51	18.5%
B-34	SS-10	33.5 - 35.0	329	0.00	54.46	43.73	10.73	24.5%
B-34	SS-11	38.5 - 40.0	331	0.00	62.29	47.59	14.70	30.9%
B-40	SS-3	4.8 - 6.8	332	0.00	48.56	42.98	5.58	13.0%
B-40	SS-5	8.8 - 10.8	336	0.00	28.97	23.80	5.17	21.7%
B-40	SS-7	18.5 - 20.0	346	0.00	12.06	8.75	3.31	37.8%
B-40	SS-8	23.5 - 25.0	349	0.00	28.02	22.39	5.63	25.1%
B-45	SS-1	0.8 - 2.8	350	0.00	31.53	28.40	3.13	11.0%
B-47	SS-1	1.0 - 3.0	365	0.00	50.72	43.99	6.73	15.3%
B-47	SS-4	7.0 - 9.0	367	0.00	41.83	35.55	6.28	17.7%
B-47	SS-8	24.5 - 26.0	374	0.00	49.80	40.33	9.47	23.5%

Notes / Deviations / References Tare #'s were zeroed prior to recording Wet Weights

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Matt Jacobs	NICET Lab Level III / 118202	2/22/18
Technician Name	*Certification Type / No.*	*Date*
Matthew F. Cooke, P.G.	Project Manager	2/22/18
Technical Responsibility	*Position*	*Date*

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Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

Quality Assurance *ASTM D 2216* ☑ *AASHTO T 265* ☐

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	1461-16-047.2B	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s):	4/24/2018
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave. North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	Various
Sampling Method:	Split Spoon	Log # :	43-2321

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 18435 Calibration Date: 4/10/2018 Oven ID. 12872 Calibration Date: 3/17/2018

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft		grams	grams	grams	grams	%	
B-46	SS-1	0.0 - 2.0	C-7	30.80	121.77	101.48	20.29	28.7%	
B-46	SS-2	2.0 - 4.0	C-11	30.37	120.71	105.22	15.49	20.7%	
B-48	SS-1	0.0 - 2.0	C-24	29.90	120.88	110.40	10.48	13.0%	
B-48	SS-2	2.0 - 4.0	C-51	31.32	120.76	100.47	20.29	29.3%	
B-48	SS-4	6.0 - 8.0	C-70	31.53	165.48	146.01	19.47	17.0%	
B-54	SS-1	0.4 - 2.4	C-8	30.37	121.74	105.07	16.67	22.3%	
B-54	SS-2	2.4 - 4.4	C-26	31.39	121.46	103.13	18.33	25.6%	
B-54	SS-10	33.9 - 35.4	C-37	31.01	122.65	99.40	23.25	34.0%	
B-58	SS-1	0.0 - 2.0	C-34	30.74	105.52	96.93	8.59	13.0%	
B-58	SS-6	13.5 - 15.0	C-30	31.29	116.75	102.01	14.74	20.8%	
B-58	SS-8	23.5 - 25.0	C-41	31.04	107.48	95.77	11.71	18.1%	
B-58	SS-10	33.5 - 35.0	C-72	31.97	110.24	96.06	14.18	22.1%	
B-58	SS-13	48.5 - 50.0	C-28	30.86	102.21	86.60	15.61	28.0%	
B-60	SS-1	0.0 - 2.0	C-69	30.75	103.91	92.11	11.80	19.2%	
B-60	SS-2	2.0 - 4.0	C-19	30.22	100.60	93.60	7.00	11.0%	
B-60	SS-3	4.0 - 6.0	C-35	30.86	102.05	91.63	10.42	17.1%	

Notes / Deviations / References

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Derek Baker — *Technician Name* — 4/24/2018 *Date*

Michael D. Kelso, E.I. — *Technical Responsibility* — _____ *Signature* — Staff Professional *Position* — 5/23/2018 *Date*

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Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/16/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/15 - 3/16/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	Varies
Sampling Method:	Split-spoon	Drill Rig:	CME 55/Diedrich D-50

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 13942 Calibration Date: 8/18/17 Oven ID. 13978 Calibration Date: 10/07/17

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft.		grams	grams	grams	grams	%	
B-49	SS-1	24.5 - 26.5	H	0.00	53.61	43.24	10.37	24.0%	
B-49	SS-2	26.5 - 28.5	R	0.00	59.93	48.71	11.22	23.0%	
B-49	SS-4	30.5 - 32.5	F	0.00	59.59	40.00	19.59	49.0%	
B-49	SS-5	32.5 - 34.5	26	0.00	73.99	50.35	23.64	47.0%	
B-50	SS-4	7.0 - 9.0	D-13	0.00	60.88	53.18	7.70	14.5%	
B-50	SS-6	13.5 - 15.0	D-1	0.00	57.59	50.56	7.03	13.9%	
B-50	SS-8	23.5 - 25.0	T-2	0.00	63.48	53.49	9.99	18.7%	
B-50	SS-10	33.5 - 35.0	D-117	0.00	58.53	45.46	13.07	28.8%	
B-50	SS-14	53.5 - 55.0	JJ	0.00	74.06	57.86	16.20	28.0%	
B-55	SS-1	1.2 - 3.2	A-2	0.00	62.19	49.45	12.74	25.8%	
B-55	SS-5	9.2 - 11.2	D-3	0.00	53.41	45.84	7.57	16.5%	
B-55	SS-9	28.5 - 30.0	T-1	0.00	60.87	50.46	10.41	20.6%	

Notes / Deviations / References

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Lab Level III/117226	3/16/18
Technician Name	*Signature*	*Certification Type / No.*	*Date*
Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/16/18
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/16/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/08 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	2/08/18
Sampling Method:	Split-spoon	Drill Rig:	Diedrich D-50

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 13942 Calibration Date: 8/18/17 Oven ID. 13978 Calibration Date: 10/07/17

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft.		grams	grams	grams	grams	%	
B-51	SS-1	0.0 - 2.0	PC-1	0.00	74.22	62.78	11.44	18.2%	
B-51	SS-6	13.5 - 15.0	BK-2	0.00	78.84	67.69	11.15	16.5%	
B-51	SS-9	28.5 - 30.0	G-4	0.00	73.26	59.36	13.90	23.4%	

Notes / Deviations / References

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Lab Level III/117226	3/16/18
Technician Name	*Signature*	*Certification Type / No.*	*Date*
Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/16/18
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐

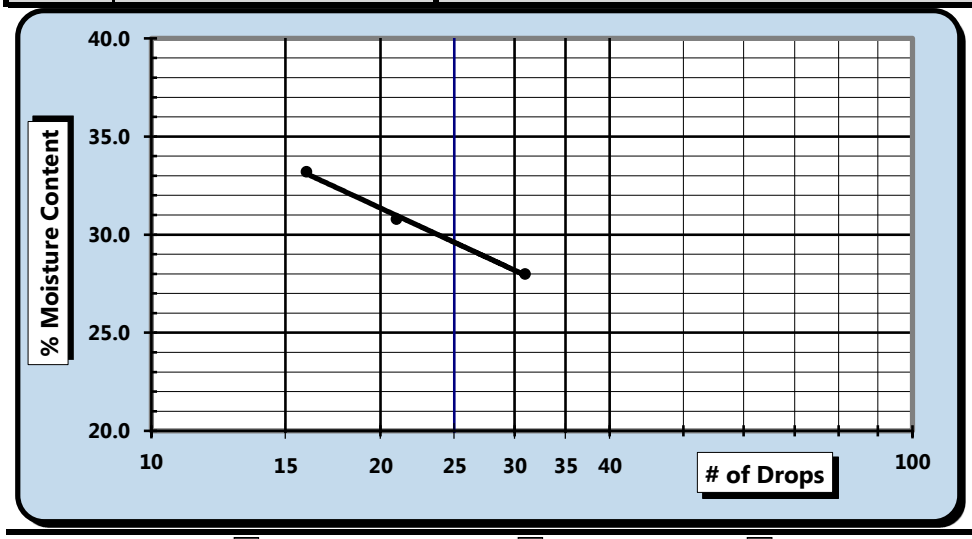
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date:	5/10/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-47	Sample #:	SS-1	Sample Date:	2/12/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	1.0' - 3.0'
Sample Description:	Sandy Lean Clay (CL, A-6(5))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2018	Grooving tool	14185	9/12/2017
LL Apparatus	13859	9/12/2017			
Oven	7313	7/28/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Y-1	Y-2	Y-3				5	6	
A	Tare Weight	16.43	16.47	17.00				12.10	12.29	
B	Wet Soil Weight + A	39.04	39.03	38.42				19.27	19.11	
C	Dry Soil Weight + A	34.10	33.72	33.08				18.21	18.12	
D	Water Weight (B-C)	4.94	5.31	5.34				1.06	0.99	
E	Dry Soil Weight (C-A)	17.67	17.25	16.08				6.11	5.83	
F	% Moisture (D/E)*100	28.0%	30.8%	33.2%				17.3%	17.0%	
N	# OF DROPS	31	21	16				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							17.2%		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**30**
Plastic Limit	**17**
Plastic Index	**13**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Matt Jacobs	NICET 118202	Matthew F. Cooke, P.G.	5/11/18
Technician Name	*Certification#*	*Technical Responsibility*	*Date*

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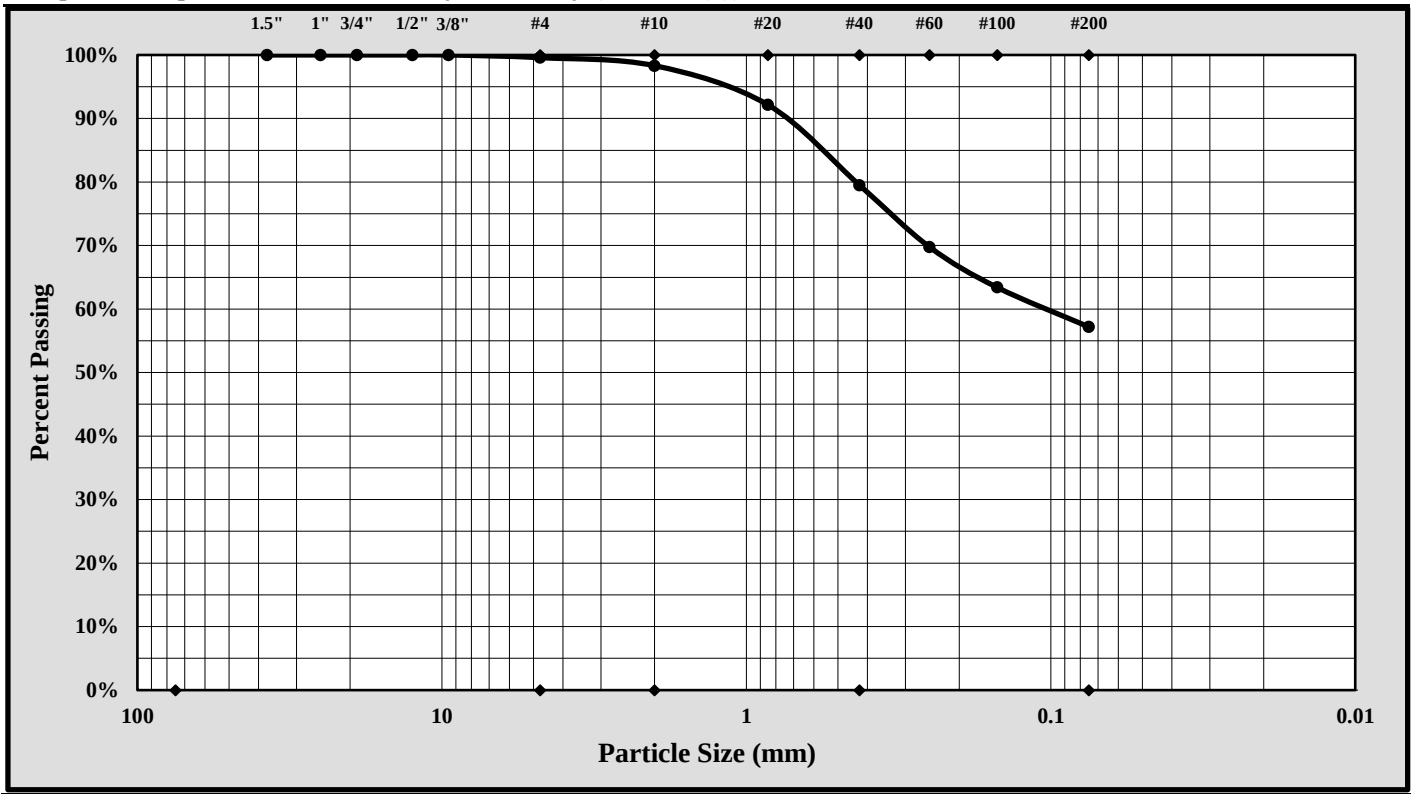
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. - Spartanburg 301 Zima Park Dr. Spartanburg, SC 29301

S&ME Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/21 - 2/28/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-47	Sample #: SS-1	Sample Date: 2/12/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 1.0' - 3.0'
Sample Description:	Sandy Lean Clay (CL, A-6(5))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	4.75 mm	Gravel:	0.4%
Silt & Clay (% Passing #200):	57.2%	Total Sand:	42.4%

Liquid Limit	30	Plastic Limit	17	Plastic Index	13
Coarse Sand:	1.3%	Medium Sand:	18.8%	Fine Sand:	22.3%

Description of Sand and Gravel — Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
5/11/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐

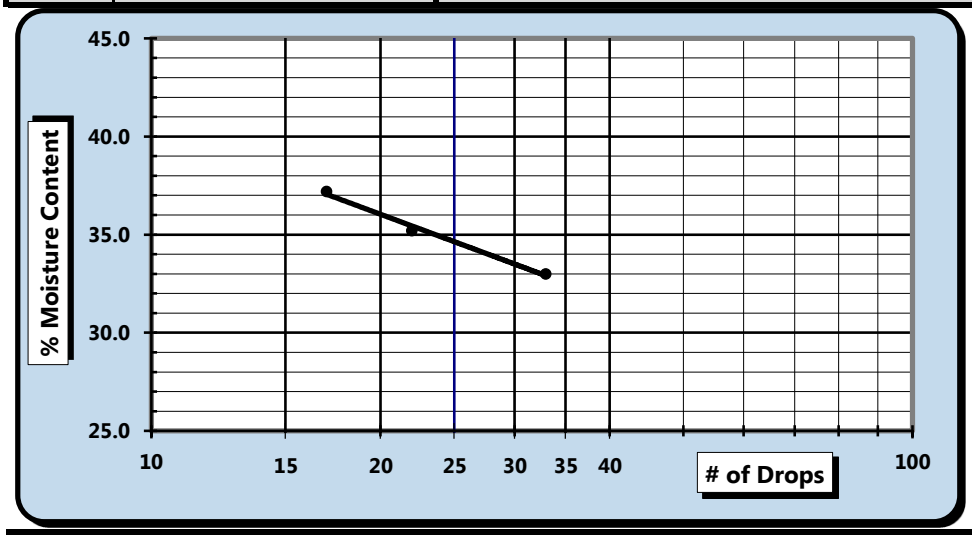
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date:	5/10/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-47	Sample #:	SS-4	Sample Date:	2/12/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	7.0' - 9.0'
Sample Description:	Silt With Sand (ML, A-4(6))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2018	Grooving tool	14185	9/12/2017
LL Apparatus	13859	9/12/2017			
Oven	7313	7/28/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Z-1	Z-2	Z-3				7	9	
A	Tare Weight	15.92	16.62	16.77				12.00	12.24	
B	Wet Soil Weight + A	39.27	38.76	39.03				18.53	18.89	
C	Dry Soil Weight + A	33.48	33.00	32.99				17.18	17.53	
D	Water Weight (B-C)	5.79	5.76	6.04				1.35	1.36	
E	Dry Soil Weight (C-A)	17.56	16.38	16.22				5.18	5.29	
F	% Moisture (D/E)*100	33.0%	35.2%	37.2%				26.1%	25.7%	
N	# OF DROPS	33	22	17				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							25.9%		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**35**
Plastic Limit	**26**
Plastic Index	**9**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Matt Jacobs	NICET 118202	Matthew F. Cooke, P.G.	5/11/18
Technician Name	*Certification#*	*Technical Responsibility*	*Date*

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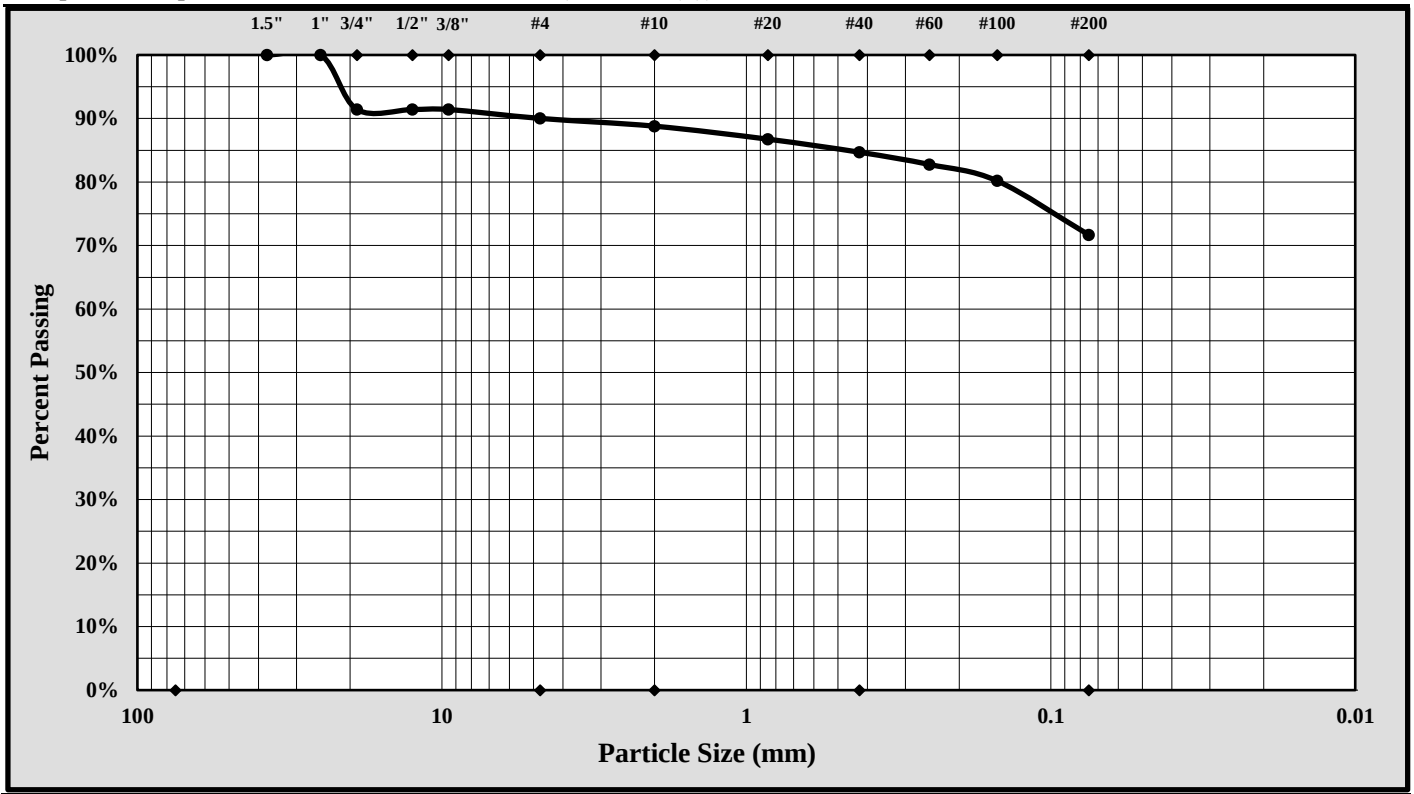
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. - Spartanburg 301 Zima Park Dr. Spartanburg, SC 29301

S&ME Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/21 - 2/28/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-47	Sample #: SS-4	Sample Date: 2/12/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 7.0' - 9.0'
Sample Description:	Silt with Sand (ML, A-4(6))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	25.00 mm	Gravel:	10.0%
Silt & Clay (% Passing #200):	71.7%	Total Sand:	18.3%

Liquid Limit	35	Plastic Limit	26	Plastic Index	9
Coarse Sand:	1.2%	Medium Sand:	4.1%	Fine Sand:	13.0%

Description of Sand and Gravel — Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
5/11/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ *AASHTO T 89* ☐ *AASHTO T 90* ☐

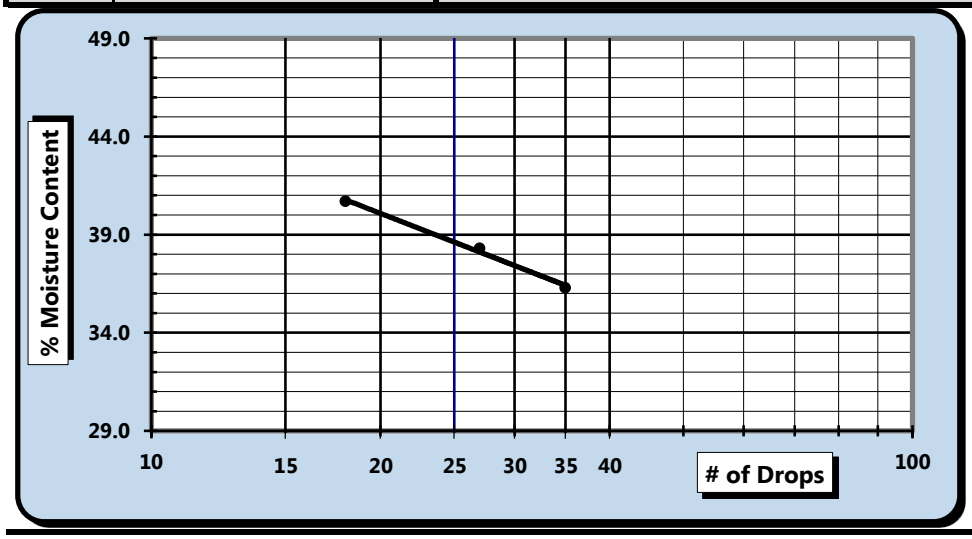
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date:	5/10/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-47	Sample #:	SS-8	Sample Date:	2/12/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	24.5' - 26.0'
Sample Description:	Clayey Sand With Gravel (SC, A-6(2))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2018	Grooving tool	14185	9/12/2017
LL Apparatus	13859	9/12/2017			
Oven	7313	7/28/2017			

	Pan # / Tare #:	Liquid Limit P-4	P-5	P-6				Plastic Limit 12	13	
A	Tare Weight	16.62	16.61	15.95				11.16	12.11	
B	Wet Soil Weight + A	39.30	37.89	37.56				18.12	19.24	
C	Dry Soil Weight + A	33.26	32.00	31.31				16.75	17.83	
D	Water Weight (B-C)	6.04	5.89	6.25				1.37	1.41	
E	Dry Soil Weight (C-A)	16.64	15.39	15.36				5.59	5.72	
F	% Moisture (D/E)*100	36.3%	38.3%	40.7%				24.5%	24.7%	
N	# OF DROPS	35	27	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							24.6%		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**39**
Plastic Limit	**25**
Plastic Index	**14**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Matt Jacobs	NICET 118202	Matthew F. Cooke, P.G.	5/11/18
Technician Name	*Certification#*	*Technical Responsibility*	*Date*

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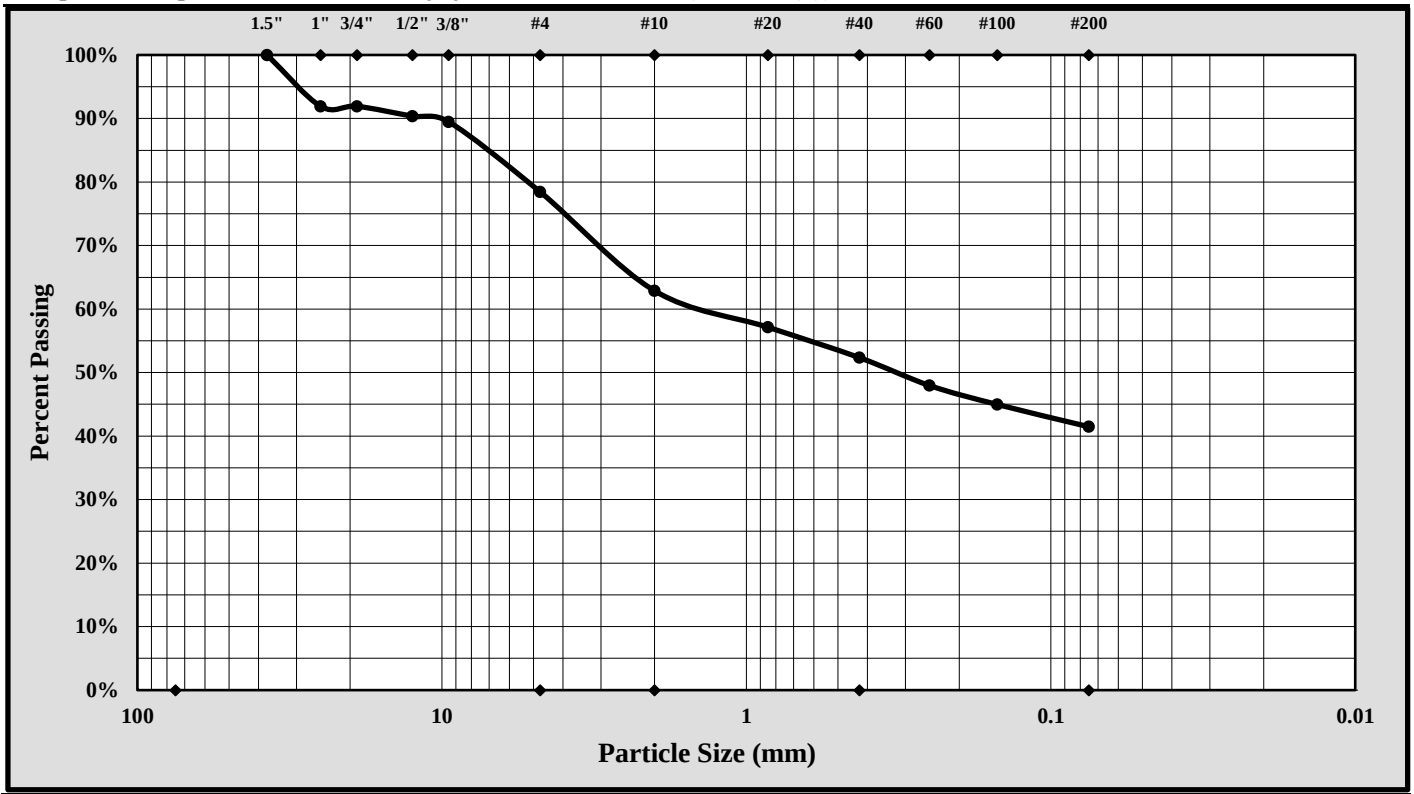
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. - Spartanburg 301 Zima Park Dr. Spartanburg, SC 29301

S&ME Project #:	1461-16-047.2B	Report Date:	5/11/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/21 - 2/28/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-47	Sample #: SS-8	Sample Date: 2/12/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 24.5'- 26.0'
Sample Description:	Clayey Sand with Gravel (SC, A-6(2))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	31.25 mm	Gravel:	21.6%
Silt & Clay (% Passing #200):	41.5%	Total Sand:	37.0%

Liquid Limit	39	Plastic Limit	25	Plastic Index	14
Coarse Sand:	15.6%	Medium Sand:	10.5%	Fine Sand:	10.9%

Description of Sand and Gravel — Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
5/11/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

Quality Assurance ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

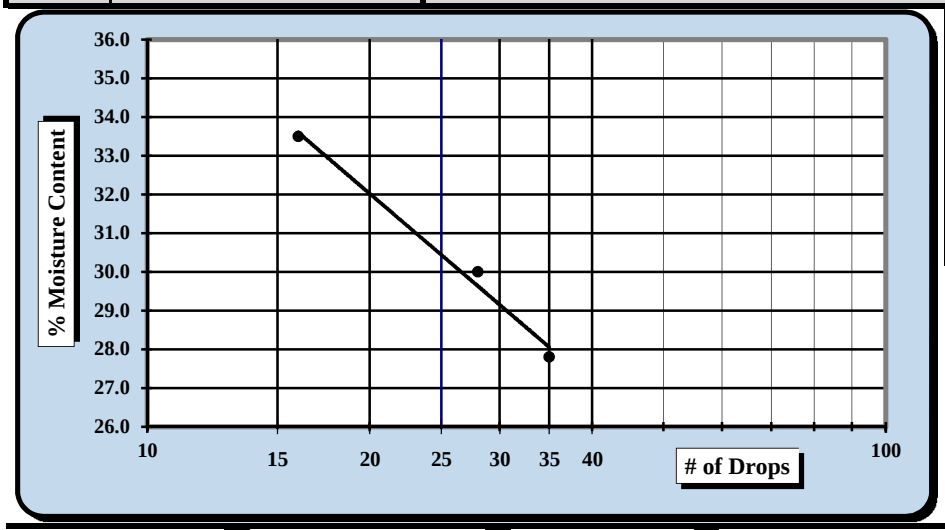
S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	1461-16-047.2B	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s)	4/30/2018
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-48	Sample #: SS-1	Sample Date: Various
Log #:	43-2321		Depth: 0.0' - 2.0'
Sample Description:	Sandy lean clay (CL, A-6 (4))		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	18435	4/10/2018	Grooving tool	32239	2/16/2018
LL Apparatus	18414	10/6/2017	No. 40 Sieve	31434	4/7/2018
Oven	12872	3/17/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	6	18				15	16	
A	Tare Weight	15.34	15.45	15.42				15.32	15.64	
B	Wet Soil Weight + A	25.71	26.40	27.57				25.45	24.27	
C	Dry Soil Weight + A	23.11	23.87	24.93				23.93	22.98	
D	Water Weight (B-C)	2.60	2.53	2.64				1.52	1.29	
E	Dry Soil Weight (C-A)	7.77	8.42	9.51				8.61	7.34	
F	% Moisture (D/E)*100	33.5%	30.0%	27.8%				17.7%	17.6%	
N	# OF DROPS	16	28	35				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**17.7%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**30**
Plastic Limit	**18**
Plastic Index	**12**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Group symbol is for minus No. 40 portion only.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Derek Baker	4/30/2018	Michael D. Kelso, E.I.	5/23/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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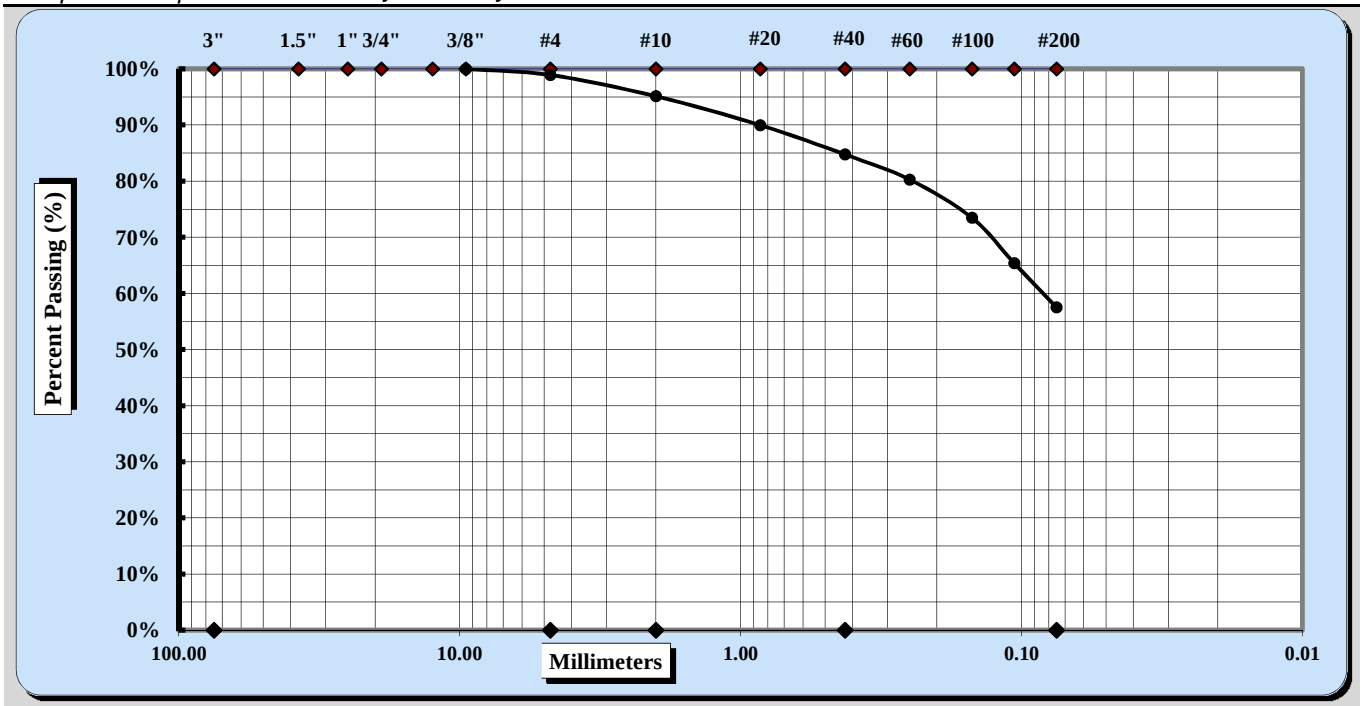
Sieve Analysis of Soils

Quality Assurance | *ASTM D6913 Method A*

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	**1461-16-047.2B**	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s):	5/21/18 - 5/22/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID: B-48	Type: Split Spoon	Sample Date:	Various
Sample Log No.: 43-2321	Sample: 1	Depth:	0.0' - 2.0'
Sample Description:	Sandy lean clay (CL, A-6 (4))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Coarse Sand	4%	Fine Sand	27%
Gravel	1%	Medium Sand	10%	Silt & Clay	57%
Liquid Limit	30	Plastic Limit	18	Plastic Index	12

Coarse Sand	4%	Medium Sand	10%	Fine Sand	27%
Description of Sand & Gravel Particles:		Rounded	☒	Angular	☒
Hard & Durable	☒	Soft	☐	Weathered & Friable	☒

Notes / Deviations / References:

Michael D. Kelso, E.I.		Staff Professional	5/23/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

Quality Assurance ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	1461-16-047.2B	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s)	4/30/2018
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-48	Sample #: SS-2	Sample Date: Various
Log #:	43-2321		Depth: 2.0' - 4.0'
Sample Description:	Lean clay with sand (CL, A-6 (14))		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	18435	4/10/2018	Grooving tool	32239	2/16/2018
LL Apparatus	18414	10/6/2017	No. 40 Sieve	31434	4/7/2018
Oven	12872	3/17/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	20	2				3	21	
A	Tare Weight	15.39	15.46	15.55				15.49	15.51	
B	Wet Soil Weight + A	26.68	27.65	28.14				24.75	24.55	
C	Dry Soil Weight + A	23.32	24.18	24.69				22.94	22.77	
D	Water Weight (B-C)	3.36	3.47	3.45				1.81	1.78	
E	Dry Soil Weight (C-A)	7.93	8.72	9.14				7.45	7.26	
F	% Moisture (D/E)*100	42.4%	39.8%	37.7%				24.3%	24.5%	
N	# OF DROPS	16	25	35				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**24.4%**		

One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**40**
Plastic Limit	**24**
Plastic Index	**16**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Group symbol is for minus No. 40 portion only.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Derek Baker	4/30/2018	Michael D. Kelso, E.I.	5/23/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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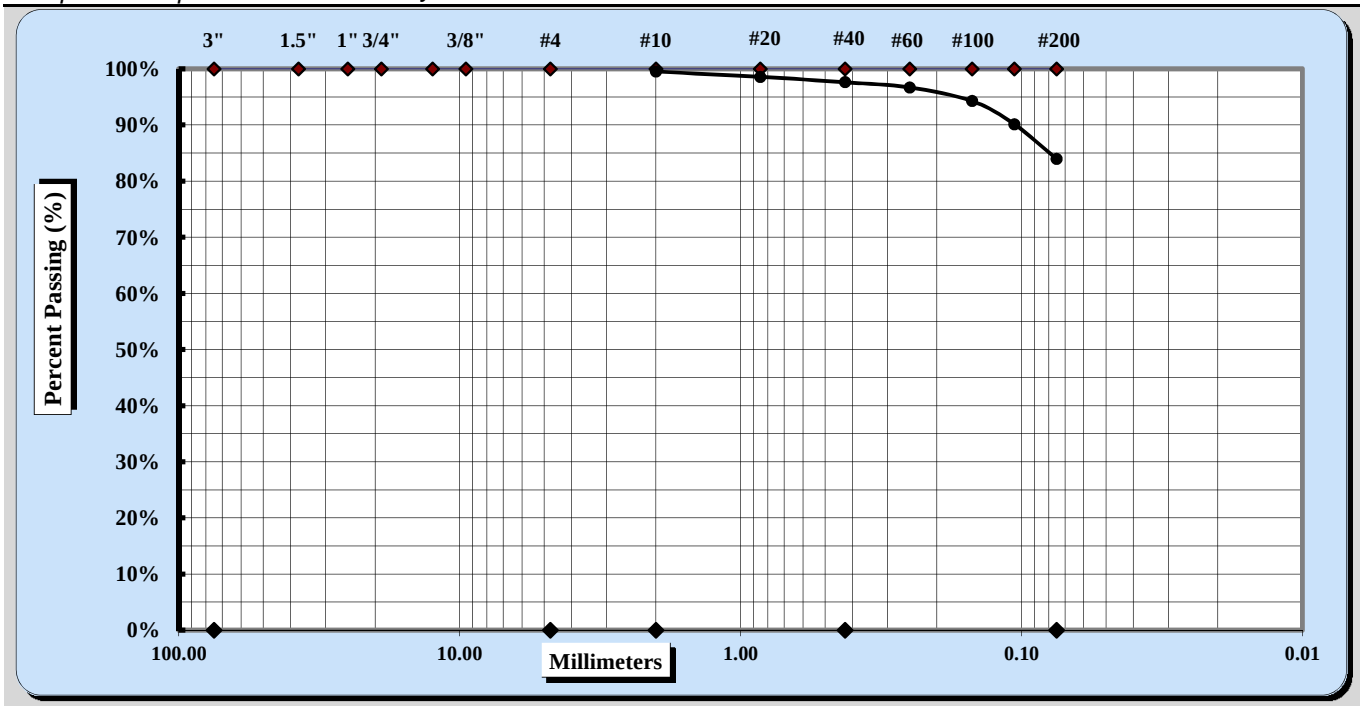
Sieve Analysis of Soils

Quality Assurance | *ASTM D6913 Method A*

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	**1461-16-047.2B**	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s):	5/21/18 - 5/22/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID: B-48	Type: Split Spoon	Sample Date:	Various
Sample Log No.: 43-2321	Sample: 2	Depth:	2.0' - 4.0'
Sample Description:	Lean clay with sand (CL, A-6 (14))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	No. 10	Coarse Sand	0%	Fine Sand	14%
Gravel	0%	Medium Sand	2%	Silt & Clay	84%
Liquid Limit	40	Plastic Limit	24	Plastic Index	16

Coarse Sand	0%	Medium Sand	2%	Fine Sand	14%
Description of Sand & Gravel Particles:			Rounded ☒	Angular ☒	
Hard & Durable ☒		Soft ☐		Weathered & Friable ☒	

Notes / Deviations / References:

Michael D. Kelso, E.I.		Staff Professional	5/23/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

Quality Assurance ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	1461-16-047.2B	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s)	4/30/2018
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-48	Sample #: SS-4	Sample Date: Various
Log #:	43-2321		Elevation: 6.0' - 8.0'
Sample Description:	Silty sand (SM, A-4 (0))		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	18435	4/10/2018	Grooving tool	32239	2/16/2018
LL Apparatus	18414	10/6/2017	No. 40 Sieve	31434	4/7/2018
Oven	12872	3/17/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	22	23				4	28-B	
A	Tare Weight	15.42	15.39	15.44				15.44	17.69	
B	Wet Soil Weight + A	25.74	26.50	27.77				25.14	26.97	
C	Dry Soil Weight + A	23.11	23.81	24.88				23.31	25.22	
D	Water Weight (B-C)	2.63	2.69	2.89				1.83	1.75	
E	Dry Soil Weight (C-A)	7.69	8.42	9.44				7.87	7.53	
F	% Moisture (D/E)*100	34.2%	31.9%	30.6%				23.3%	23.2%	
N	# OF DROPS	16	26	35				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.3%**		

One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**32**
Plastic Limit	**23**
Plastic Index	**9**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑

Notes / Deviations / References: Group symbol is for minus No. 40 portion only.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Derek Baker	4/30/2018	Michael D. Kelso, E.I.	5/23/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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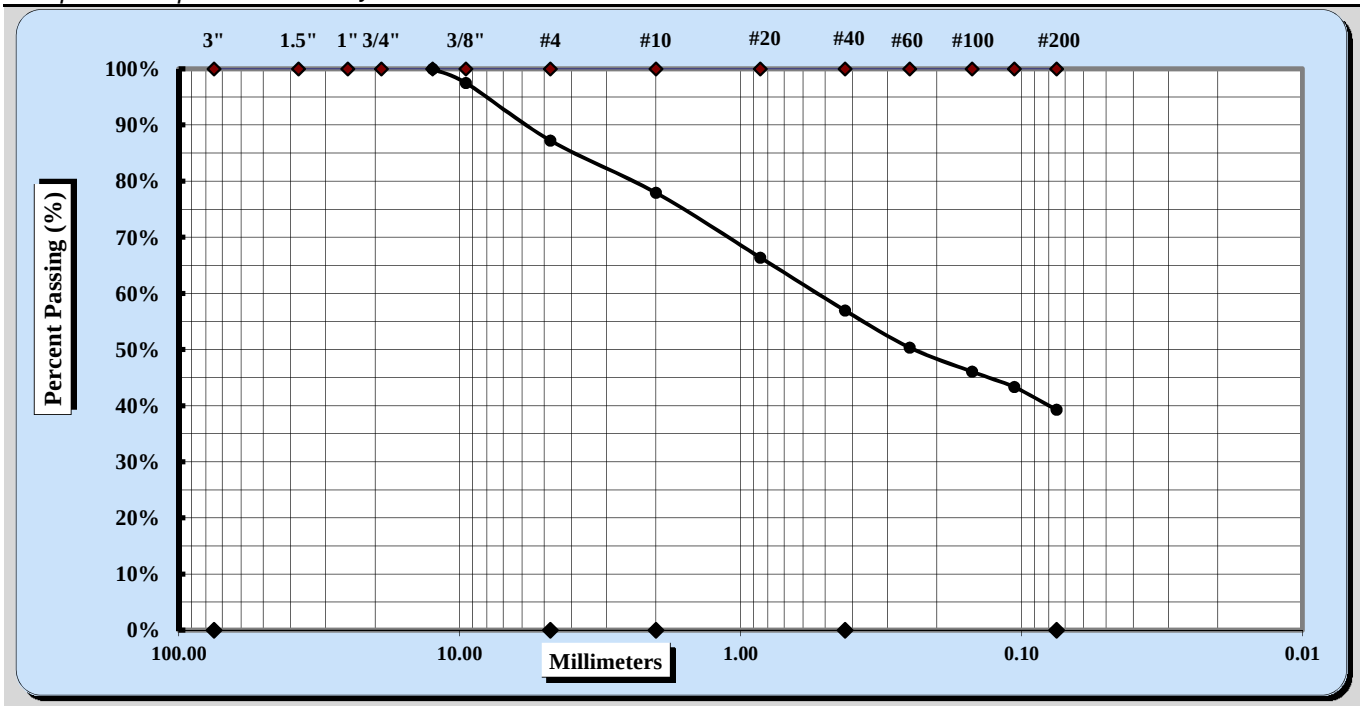
Sieve Analysis of Soils

Quality Assurance *ASTM D6913 Method A*

S&ME, Inc. - Knoxville: 1413 Topside Road, Louisville, TN 37777

Project #:	**1461-16-047.2B**	Report Date:	5/23/2018
Project Name:	Carolina Crossroads Project	Test Date(s):	5/21/18 - 5/22/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID: B-48	Type: Split Spoon	Sample Date:	Various
Sample Log No.: 43-2321	Sample: 4	Depth:	6.0' - 8.0'
Sample Description:	Silty sand (SM, A-4 (0))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Coarse Sand	9%	Fine Sand	18%
Gravel	13%	Medium Sand	21%	Silt & Clay	39%
Liquid Limit	32	Plastic Limit	23	Plastic Index	9

Coarse Sand	9%	Medium Sand	21%	Fine Sand	18%
Description of Sand & Gravel Particles:		Rounded	☒	Angular	☒
Hard & Durable	☒	Soft	☐	Weathered & Friable	☒

Notes / Deviations / References:

Michael D. Kelso, E.I.		Staff Professional	5/23/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

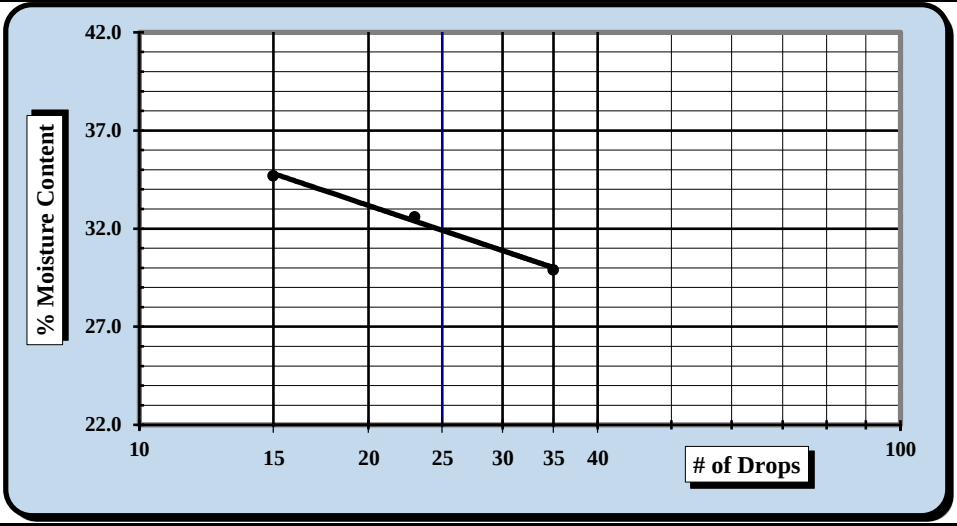
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-49	Sample #:	SS-1	Sample Date:	2/22/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	24.5' - 26.5'
Sample Description:	Clayey Sand with Gravel (SC, A-2-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	26.70	26.48	26.32				25.93	26.94	
B	Wet Soil Weight + A	41.95	44.54	41.93				33.05	33.65	
C	Dry Soil Weight + A	38.44	40.10	37.91				31.73	32.39	
D	Water Weight (B-C)	3.51	4.44	4.02				1.32	1.26	
E	Dry Soil Weight (C-A)	11.74	13.62	11.59				5.80	5.45	
F	% Moisture (D/E)*100	29.9%	32.6%	34.7%				22.8%	23.1%	
N	# OF DROPS	35	23	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.0%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**32**
Plastic Limit	**23**
Plastic Index	**9**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D2974-1
Revision No. 1
Revision Date: 08/26/17

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-49 Sample #: SS-1	Sample Date:	2/22/18
Location:	Bridge Boring Type: Split-spoon	Depth:	24.5' - 26.5'
Sample Description:	Clayey Sand with Gravel (SC, A-2-4)		

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*
Balance: *S&ME ID #:* *13942* *Cal. Date:* *8/19/17* *Due:* *8/19/18*

Method A: Moisture Content Determination *Required Oven Temperature: 105 ± 5 °C*

	Oven Temperature: 105 °C	*Tare #*	
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	
w	Water Weight	*(a-b)*	
A	Mass of As-Received Specimen	*(a-t)*	
B	Mass of Oven Dry Specimen	*(b-t)*	
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	

Oven *S&ME ID #:* *Cal. Date:* *Due:*

Method C (440 ° C) or D (750 ° C): Ash Content and Organic Matter Determination

	Muffle Furnace: 440 °C	*Tare #*	B
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	56.78
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	87.83
c	Ash Weight + Tare Wt.	*grams*	86.89
C	Ash Weight	*c-t*	30.11
B	Mass of Oven Dry Specimen	*(b-t)*	31.05
D	***% Ash Content***	*(C/B)*100*	**97.0%**
	% Organic Matter	*100-D*	**3.0%**

Muffle Furnace: *S&ME ID #:* *23123* *Cal. Date:* *N/A* *Due:* *N/A*

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Level III/117226	4/10/18
Technician Name	*Signature*	*Level/Certification*	*Date*
Matthew F. Cooke, P.G.		Project Manager	4/10/18
Technical Responsibility		*Position*	*Date*

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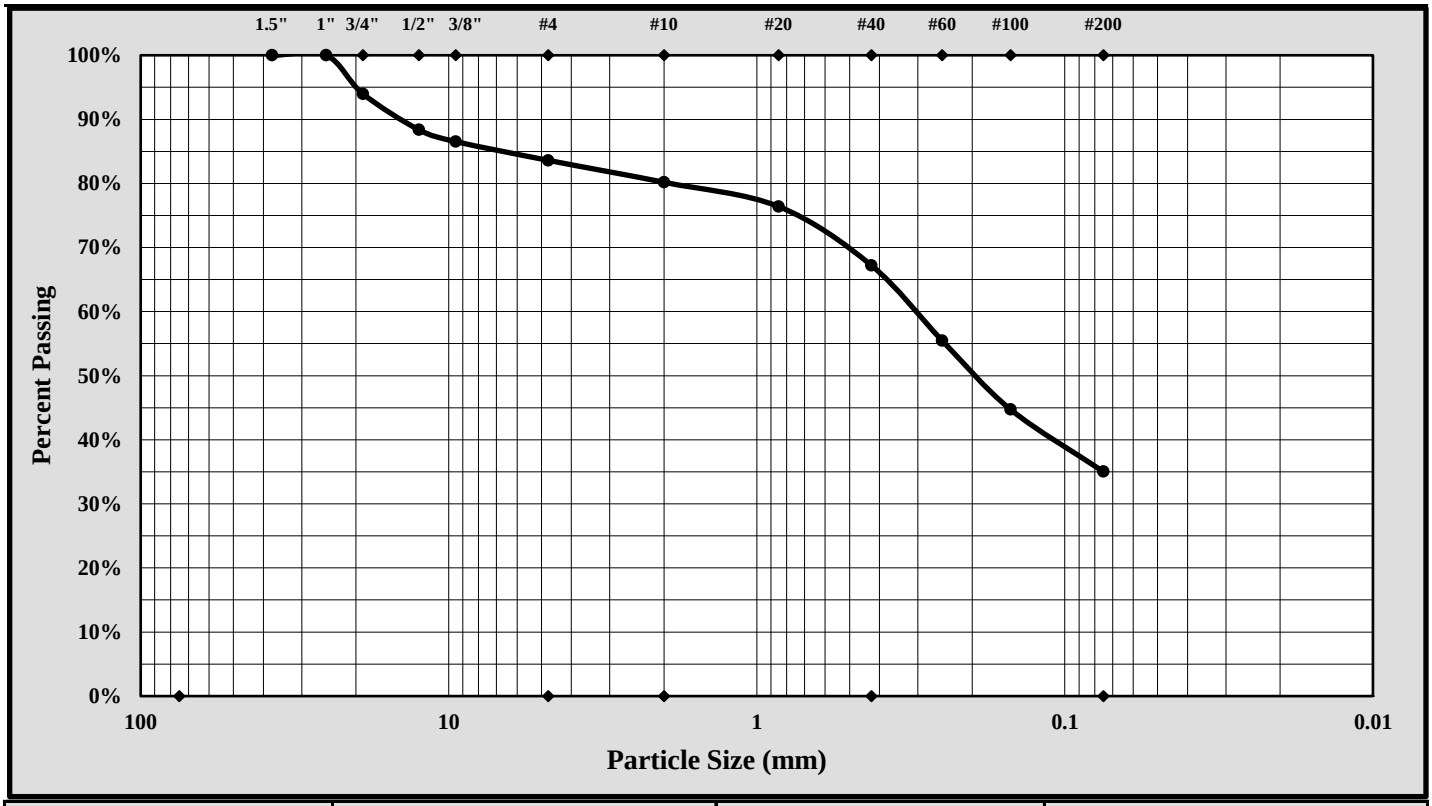
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-49 Sample #: SS-1	Sample Date:	2/22/18
Location:	Bridge Boring Type: Split-spoon	Depth:	24.5' - 26.5'
Sample Description:	Clayey Sand with Gravel (SC, A-2-4)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	25.0 mm	Gravel:	16.4%
Silt & Clay (% Passing #200):	35.0%	Total Sand:	48.6%

Liquid Limit	32	Plastic Limit	23	Plastic Index	9
Coarse Sand:	3.4%	Medium Sand:	13.0%	Fine Sand:	32.2%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

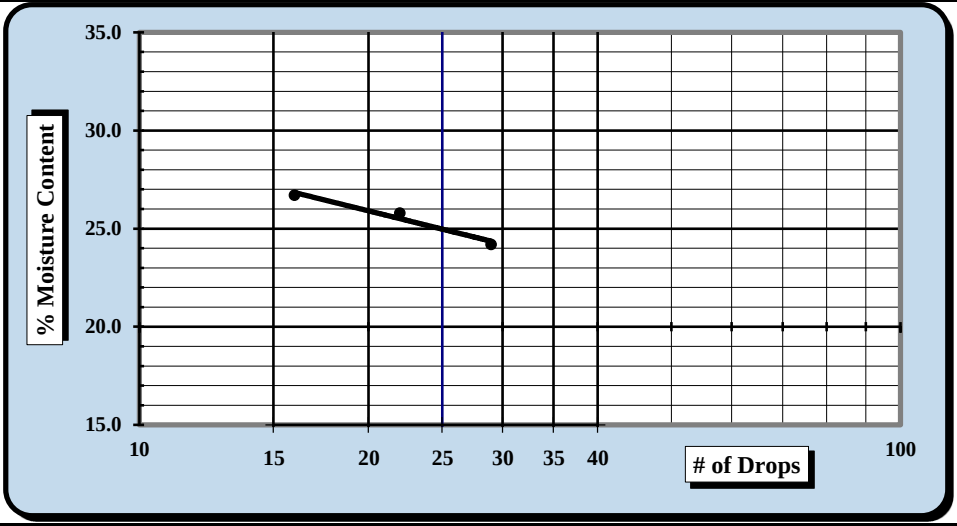
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-49	Sample #:	SS-2	Sample Date:	2/22/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	26.5' - 28.5'
Sample Description:	Clayey Sand (SC, A-4(0))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9	10	
A	Tare Weight	27.76	26.32	27.30				26.85	26.75	
B	Wet Soil Weight + A	47.64	45.50	46.48				34.55	33.87	
C	Dry Soil Weight + A	43.77	41.57	42.44				33.40	32.82	
D	Water Weight (B-C)	3.87	3.93	4.04				1.15	1.05	
E	Dry Soil Weight (C-A)	16.01	15.25	15.14				6.55	6.07	
F	% Moisture (D/E)*100	24.2%	25.8%	26.7%				17.6%	17.3%	
N	# OF DROPS	29	22	16				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**17.5%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**25**
Plastic Limit	**17**
Plastic Index	**8**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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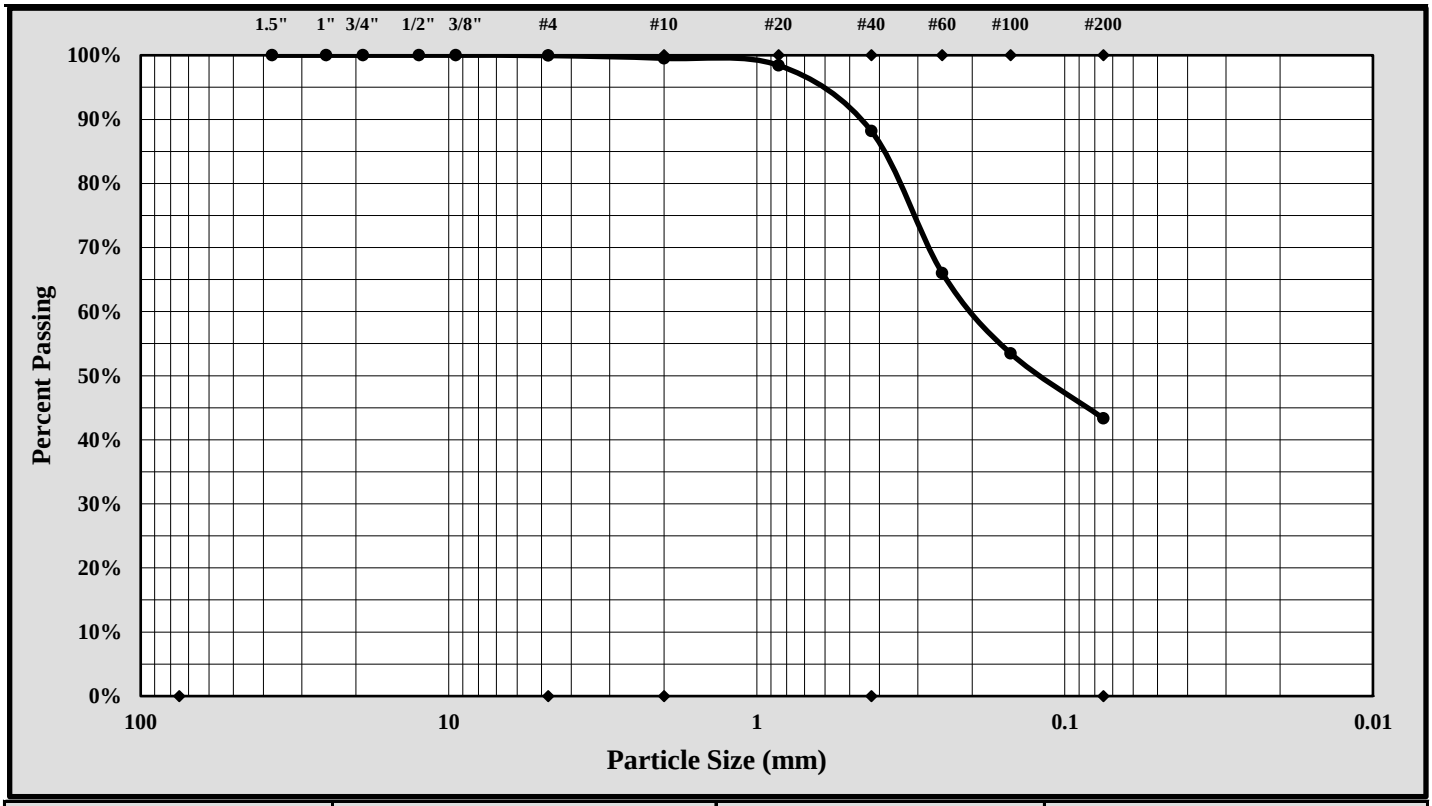
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-49 Sample #: SS-2	Sample Date:	2/22/18
Location:	Bridge Boring Type: Split-spoon	Depth:	26.5' - 28.5'
Sample Description:	Clayey Sand (SC, A-4(0))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	2.00 mm	Gravel:	0.1%
Silt & Clay (% Passing #200):	43.3%	Total Sand:	56.6%

Liquid Limit	25	Plastic Limit	17	Plastic Index	8
Coarse Sand:	0.4%	Medium Sand:	11.3%	Fine Sand:	44.8%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

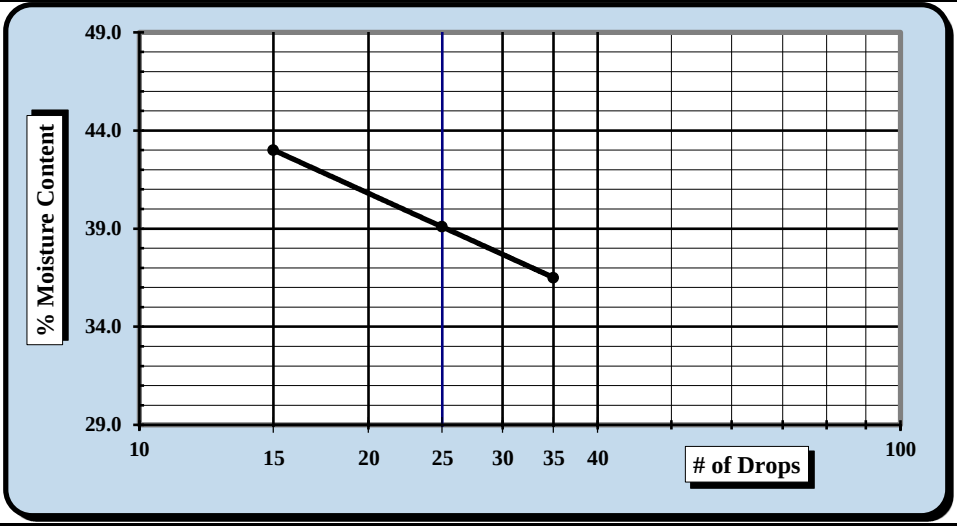
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-49	Sample #:	SS-4	Sample Date:	2/22/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	30.5' - 32.5'
Sample Description:	Lean Clay with Sand ([CL, A-6(10))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14	15	
A	Tare Weight	26.66	26.65	26.75				26.65	27.60	
B	Wet Soil Weight + A	47.52	45.76	43.28				33.12	35.54	
C	Dry Soil Weight + A	41.94	40.39	38.31				31.80	33.94	
D	Water Weight (B-C)	5.58	5.37	4.97				1.32	1.60	
E	Dry Soil Weight (C-A)	15.28	13.74	11.56				5.15	6.34	
F	% Moisture (D/E)*100	36.5%	39.1%	43.0%				25.6%	25.2%	
N	# OF DROPS	35	25	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **39**
Plastic Limit **25**
Plastic Index **14**
Group Symbol **CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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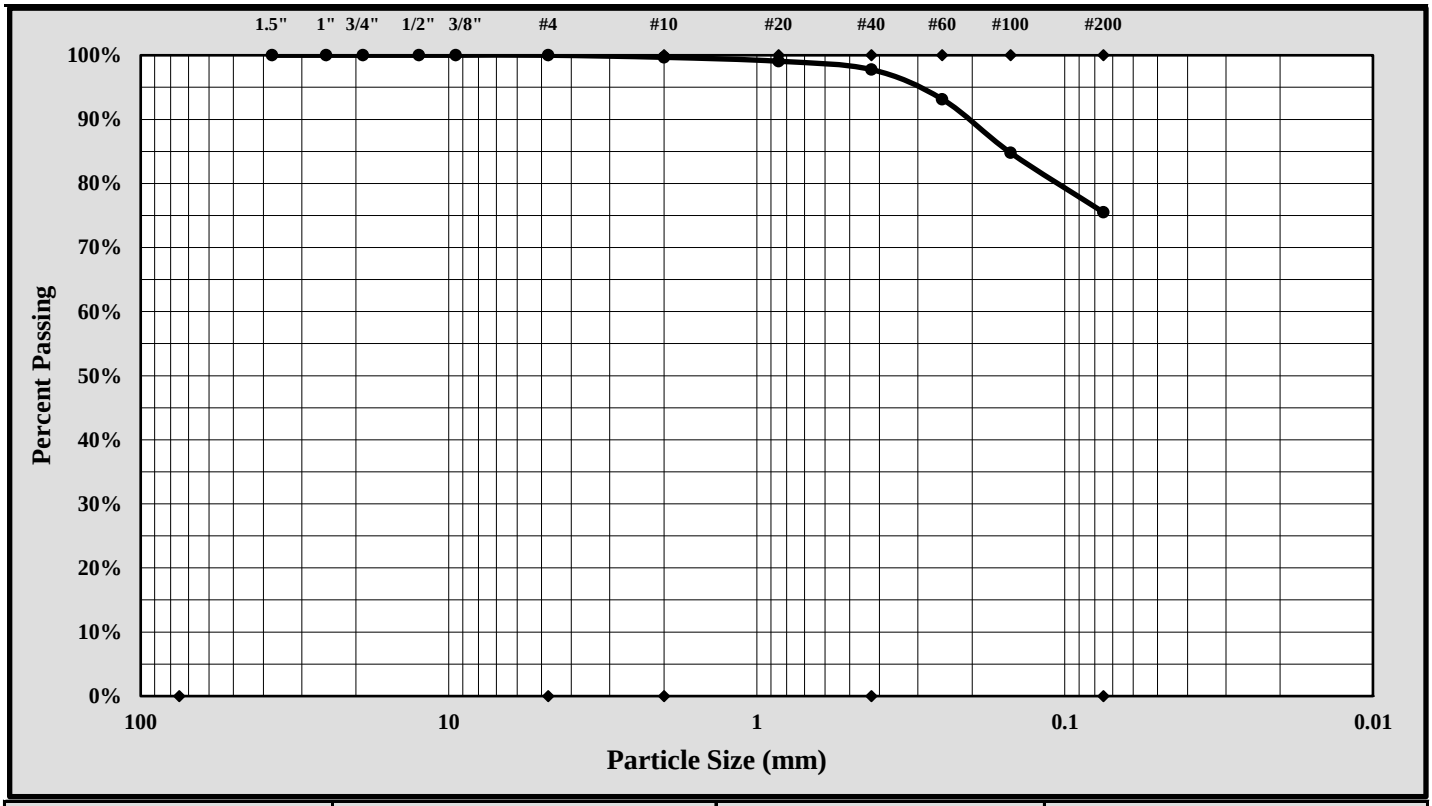
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-49 Sample #: SS-4	Sample Date:	2/22/18
Location:	Bridge Boring Type: Split-spoon	Depth:	30.5' - 32.5'
Sample Description:	Lean Clay with Sand (CL, A-6(10))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	0.85 mm	Gravel:	0.0%
Silt & Clay (% Passing #200):	75.5%	Total Sand:	24.5%

Liquid Limit	39	Plastic Limit	25	Plastic Index	14
Coarse Sand:	0.3%	Medium Sand:	1.9%	Fine Sand:	22.3%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

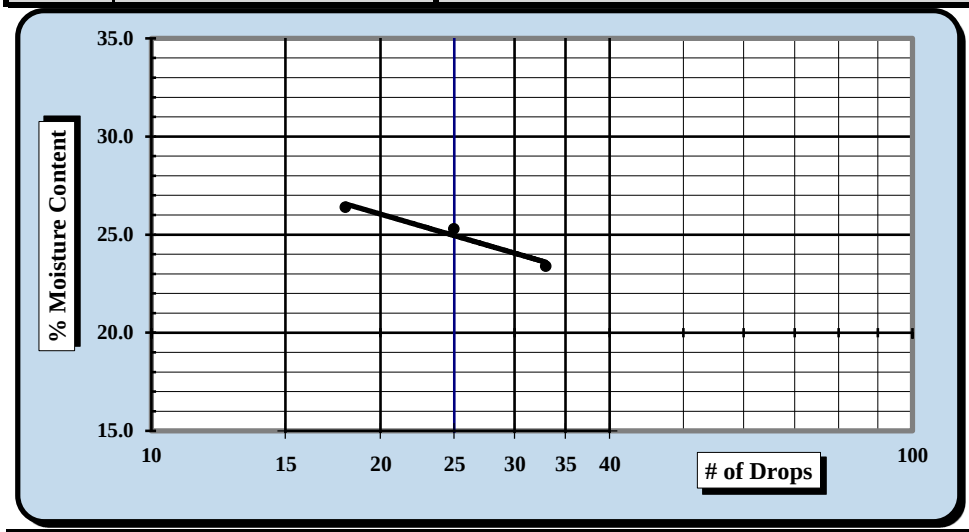
Boring #:	B-49	Sample #:	SS-5	Sample Date:	2/22/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	32.5' - 34.5'

Sample Description: Silty Sand (SM, A-4(0))

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	16	17	18						
A	Tare Weight	26.58	26.64	26.82						
B	Wet Soil Weight + A	45.29	44.81	46.11						
C	Dry Soil Weight + A	41.74	41.14	42.08						
D	Water Weight (B-C)	3.55	3.67	4.03						
E	Dry Soil Weight (C-A)	15.16	14.50	15.26						
F	% Moisture (D/E)*100	23.4%	25.3%	26.4%						
N	# OF DROPS	33	25	18						
LL	LL = **F** * FACTOR									
Ave.	*Average*									

Moisture Contents determined by ASTM D 2216



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☒

Liquid Limit	**25**
Plastic Limit	**NP**
Plastic Index	**NP**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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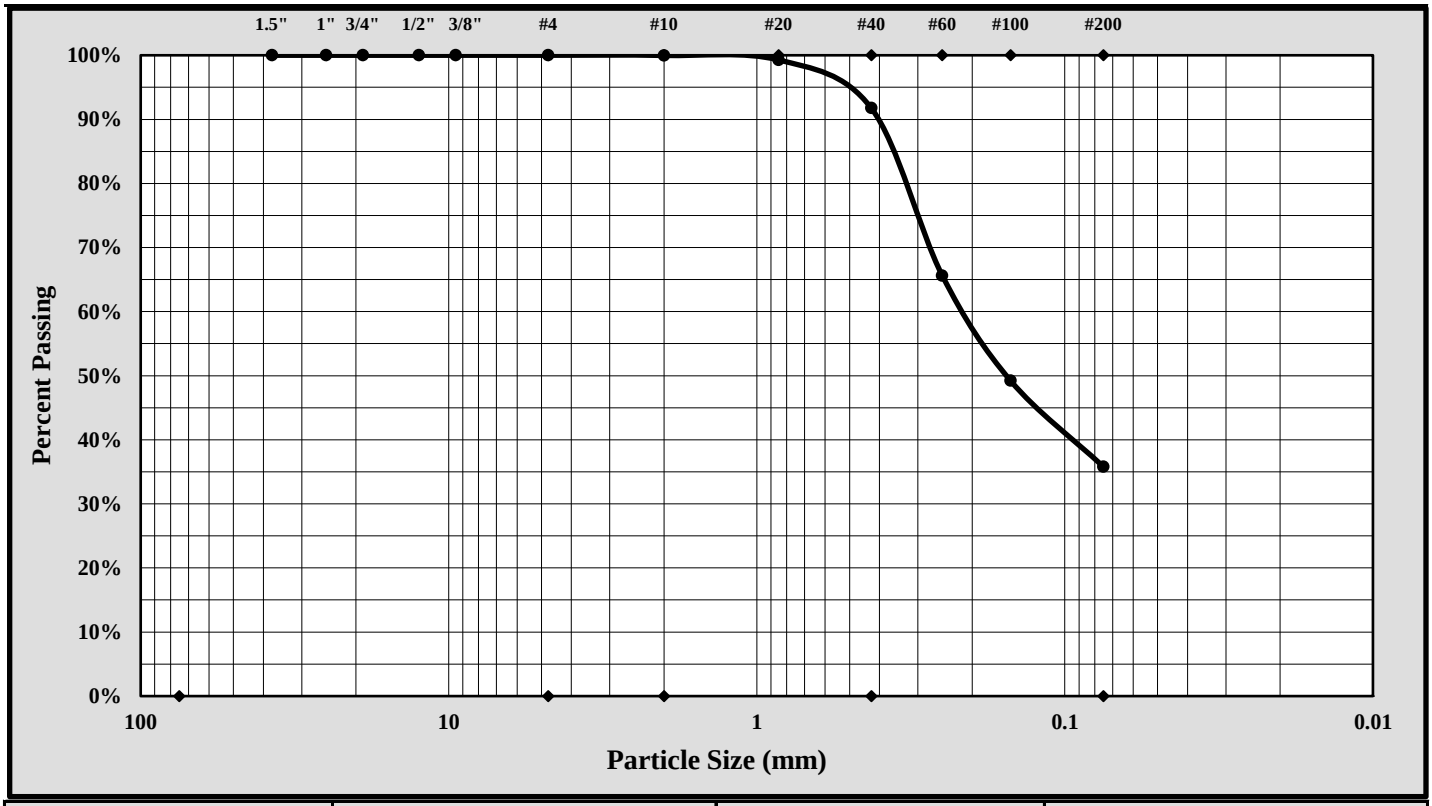
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-49 Sample #: SS-5	Sample Date:	2/22/18
Location:	Bridge Boring Type: Split-spoon	Depth:	32.5' - 34.5'
Sample Description:	Silty Sand (SM, A-4(0))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	0.85 mm	Gravel:	0.0%
Silt & Clay (% Passing #200):	35.8%	Total Sand:	64.2%

Liquid Limit	25	Plastic Limit	NP	Plastic Index	NP
Coarse Sand:	0.0%	Medium Sand:	8.2%	Fine Sand:	56.0%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G.	Project Manager	4/10/18
Technical Responsibility	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

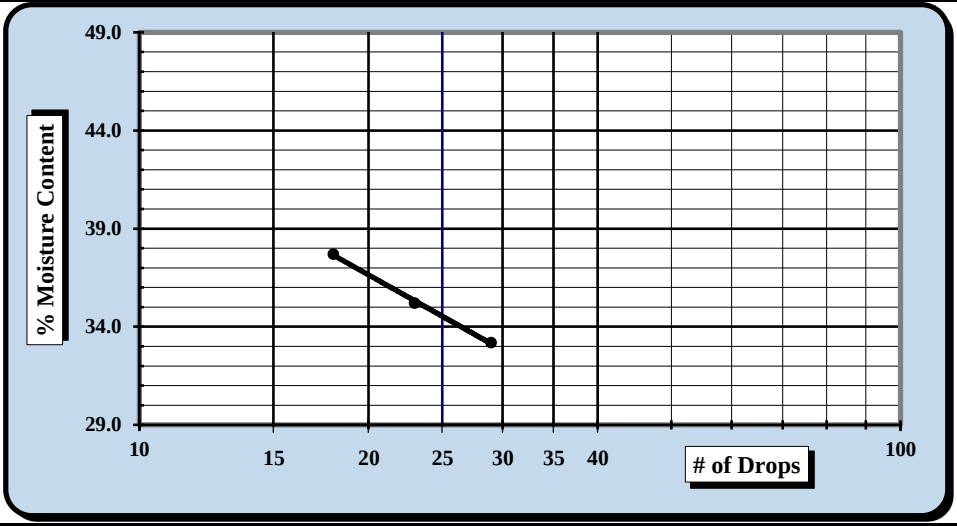
Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	SS-4	Sample Date:	2/18/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	7.0' - 9.0'

Sample Description: Silt with Sand (ML, A-4(6))

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24	25	
A	Tare Weight	28.08	25.67	27.24				25.99	26.80	
B	Wet Soil Weight + A	46.33	43.32	44.30				32.06	34.40	
C	Dry Soil Weight + A	41.78	38.72	39.63				30.74	32.77	
D	Water Weight (B-C)	4.55	4.60	4.67				1.32	1.63	
E	Dry Soil Weight (C-A)	13.70	13.05	12.39				4.75	5.97	
F	% Moisture (D/E)*100	33.2%	35.2%	37.7%				27.8%	27.3%	
N	# OF DROPS	29	23	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**27.6%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **35**
Plastic Limit **28**
Plastic Index **7**
Group Symbol **ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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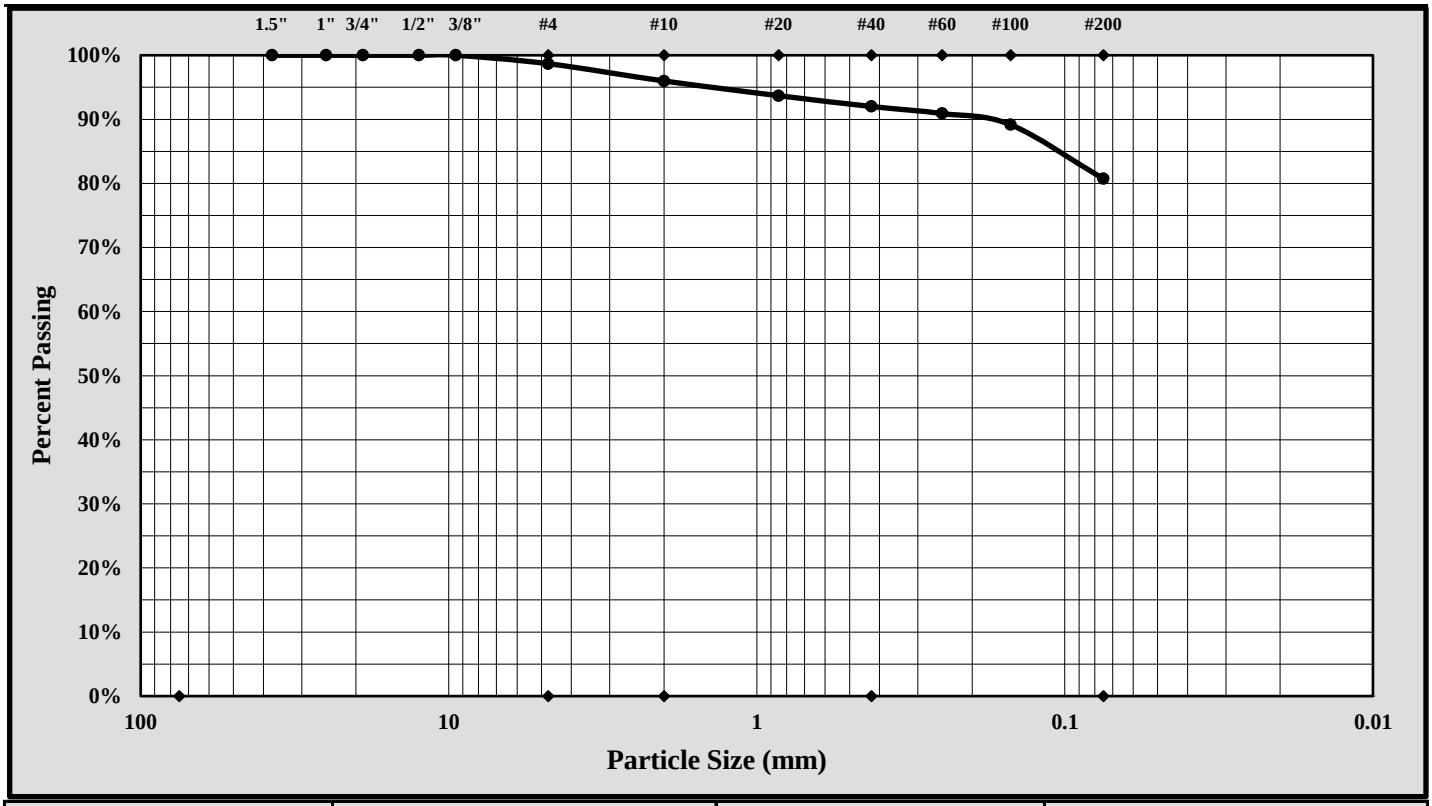
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: SS-4	Sample Date: 2/22/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 7.0' - 9.0'
Sample Description:	Silt with Sand (ML, A-4(6))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	9.50 mm	Gravel:	1.3%
Silt & Clay (% Passing #200):	80.7%	Total Sand:	18.0%

Liquid Limit	35	Plastic Limit	28	Plastic Index	7
Coarse Sand:	2.7%	Medium Sand:	4.0%	Fine Sand:	11.3%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

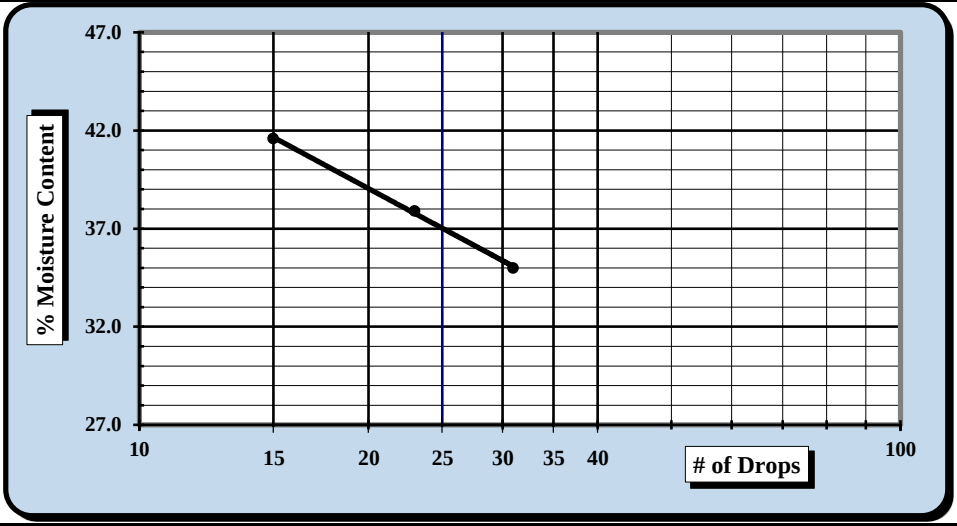
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	SS-6	Sample Date:	2/18/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	13.5' - 15.0'
Sample Description:	Sandy Lean Clay (CL, A-6(8))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	26	27	28				29	30	
A	Tare Weight	27.34	27.01	26.81				27.00	27.38	
B	Wet Soil Weight + A	44.85	42.59	42.30				34.98	34.55	
C	Dry Soil Weight + A	40.31	38.31	37.75				33.48	33.20	
D	Water Weight (B-C)	4.54	4.28	4.55				1.50	1.35	
E	Dry Soil Weight (C-A)	12.97	11.30	10.94				6.48	5.82	
F	% Moisture (D/E)*100	35.0%	37.9%	41.6%				23.1%	23.2%	
N	# OF DROPS	31	23	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.2%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **37**
Plastic Limit **23**
Plastic Index **14**
Group Symbol **CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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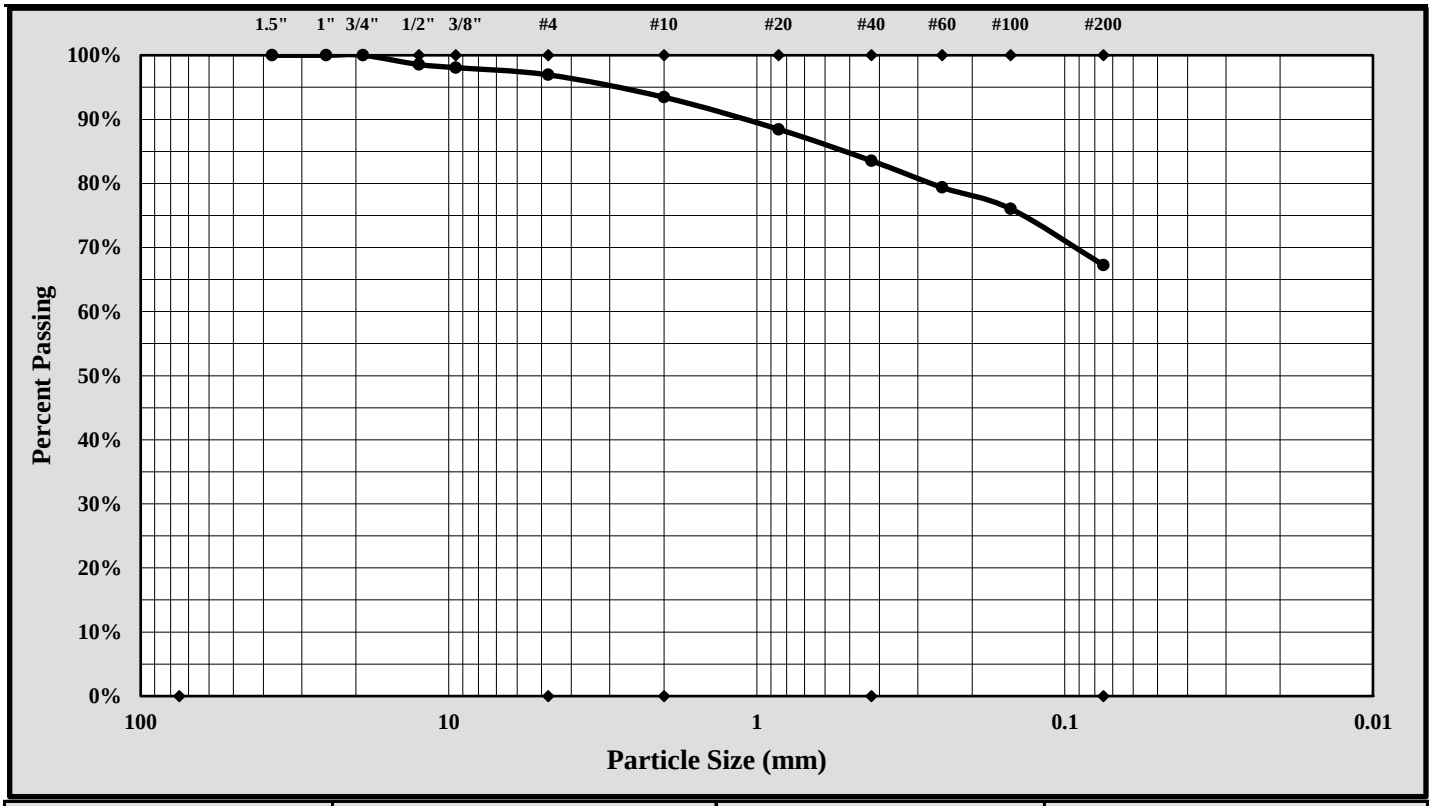
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: SS-6	Sample Date: 2/18/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 13.5' - 15.0'
Sample Description:	Sandy Lean Clay (CL, A-6(8))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	19.0 mm	Gravel:	3.1%
Silt & Clay (% Passing #200):	67.3%	Total Sand:	29.7%

Liquid Limit	37	Plastic Limit	23	Plastic Index	14
Coarse Sand:	3.5%	Medium Sand:	9.9%	Fine Sand:	16.3%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

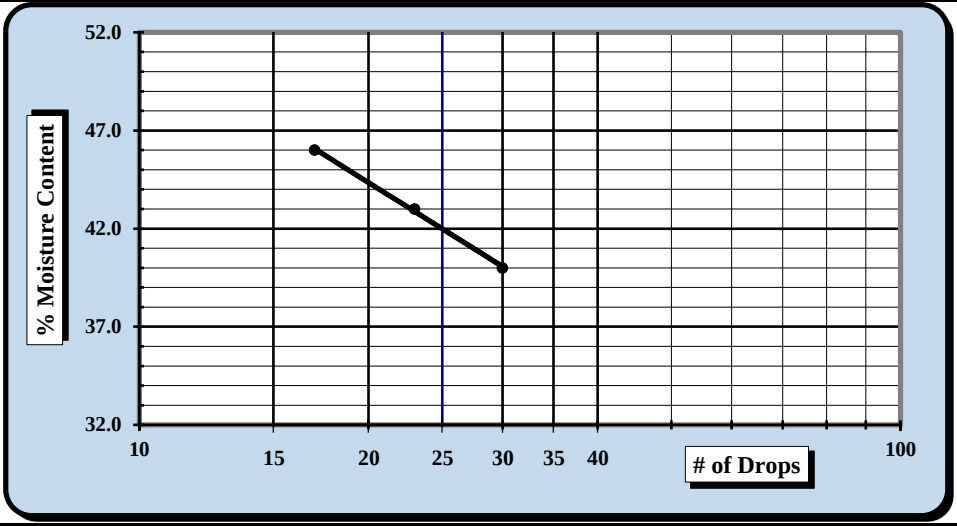
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	SS-8	Sample Date:	2/18/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	23.5' - 25.0'
Sample Description:	Sandy Silt (ML, A-7-6(8))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	31	32	33				34	35	
A	Tare Weight	28.61	27.65	26.68				28.25	26.95	
B	Wet Soil Weight + A	45.73	41.38	42.80				34.98	34.41	
C	Dry Soil Weight + A	40.84	37.25	37.72				33.48	32.77	
D	Water Weight (B-C)	4.89	4.13	5.08				1.50	1.64	
E	Dry Soil Weight (C-A)	12.23	9.60	11.04				5.23	5.82	
F	% Moisture (D/E)*100	40.0%	43.0%	46.0%				28.7%	28.2%	
N	# OF DROPS	30	23	17				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.5%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**42**
Plastic Limit	**28**
Plastic Index	**14**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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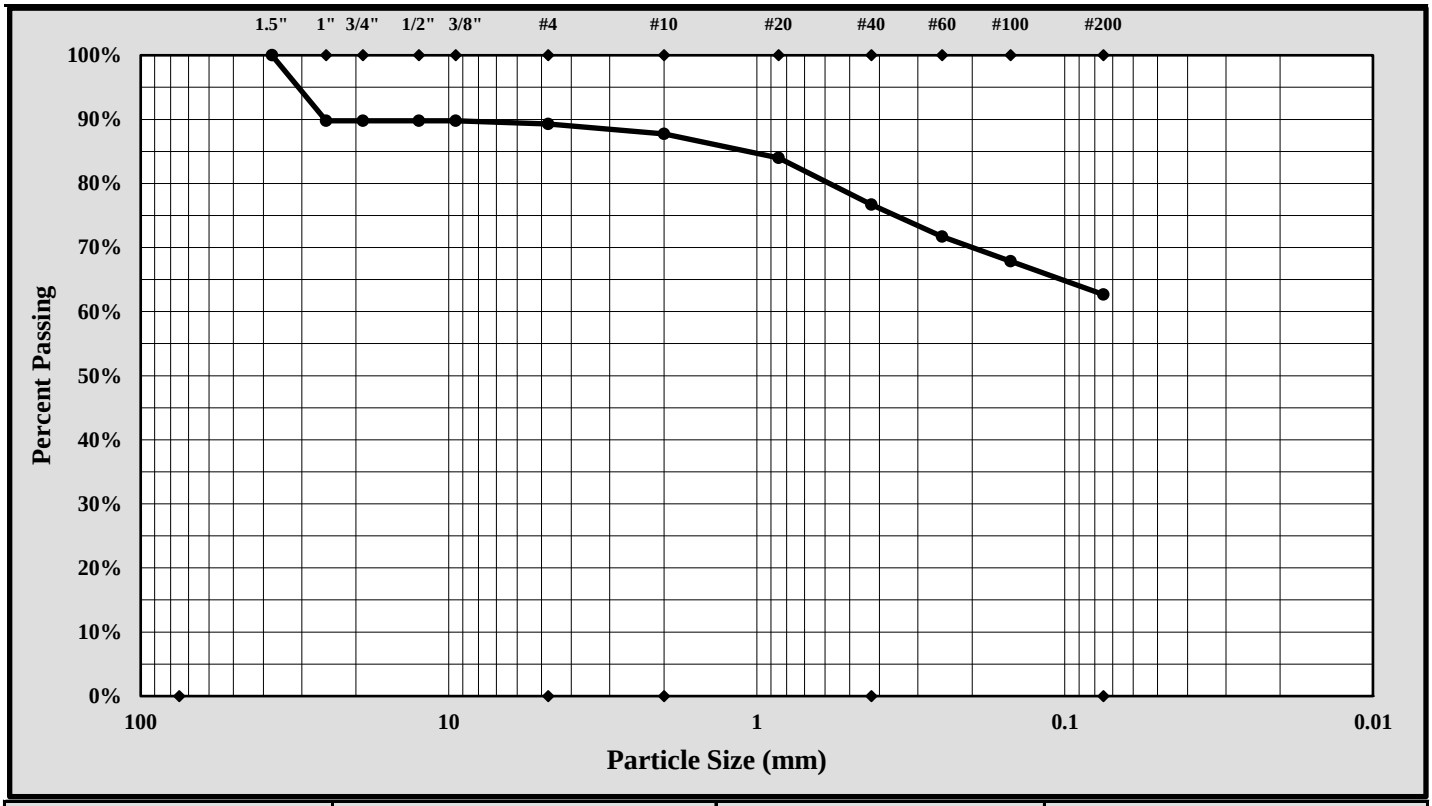
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: SS-8	Sample Date: 2/18/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 23.5' - 25.0'
Sample Description:	Sandy Silt (ML, A-7-6(8))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	37.5 mm	Gravel:	10.7%
Silt & Clay (% Passing #200):	62.7%	Total Sand:	26.6%

Liquid Limit	42	Plastic Limit	28	Plastic Index	14
Coarse Sand:	1.5%	Medium Sand:	11.0%	Fine Sand:	14.0%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

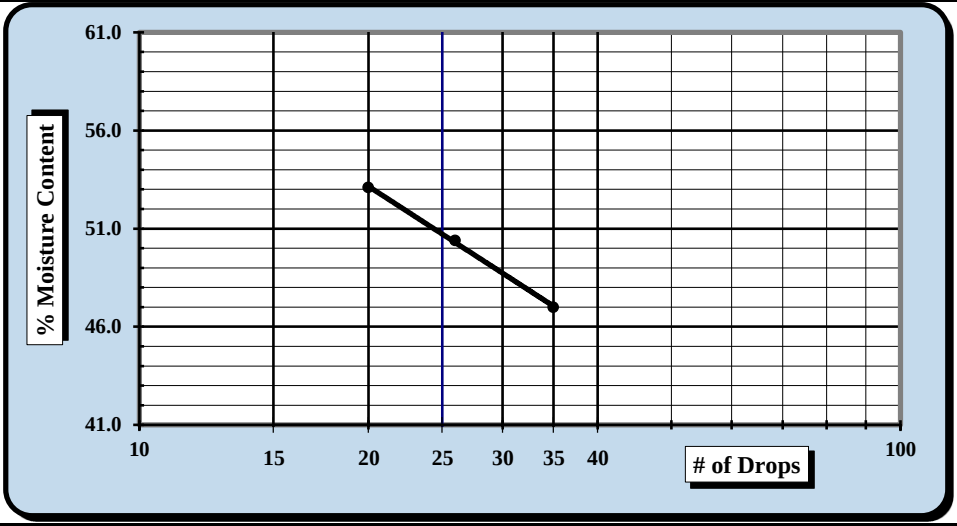
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	SS-10	Sample Date:	2/18/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	33.5' - 35.0'
Sample Description:	Elastic Silt with Sand (MH, A-7-5(16))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	36	37	38				39	40	
A	Tare Weight	25.68	26.21	26.29				25.90	26.28	
B	Wet Soil Weight + A	36.47	37.93	39.46				32.77	34.17	
C	Dry Soil Weight + A	33.02	34.00	34.89				31.07	32.26	
D	Water Weight (B-C)	3.45	3.93	4.57				1.70	1.91	
E	Dry Soil Weight (C-A)	7.34	7.79	8.60				5.17	5.98	
F	% Moisture (D/E)*100	47.0%	50.4%	53.1%				32.9%	31.9%	
N	# OF DROPS	35	26	20				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**32.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **51**
Plastic Limit **32**
Plastic Index **19**
Group Symbol **MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D2974-1
Revision No. 1
Revision Date: 08/26/17

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: SS-10	Sample Date: 2/18/18
Location:	Bridge Boring	Type: Split-spoon	Depth: 33.5' - 35.0'
Sample Description:	Elastic Silt with Sand (MH, A-7-5(6))		

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*
Balance: *S&ME ID #:* *13942* *Cal. Date:* *8/19/17* *Due:* *8/19/18*

Method A: Moisture Content Determination *Required Oven Temperature: 105 ± 5 °C*

Oven Temperature: 105 °C		*Tare #*	
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	
w	Water Weight	*(a-b)*	
A	Mass of As-Received Specimen	*(a-t)*	
B	Mass of Oven Dry Specimen	*(b-t)*	
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	

Oven *S&ME ID #:* *Cal. Date:* *Due:*

Method C (440 ° C) or D (750 ° C): Ash Content and Organic Matter Determination

Muffle Furnace: 440 °C		*Tare #*	D
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	55.72
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	75.96
c	Ash Weight + Tare Wt.	*grams*	75.54
C	Ash Weight	*c-t*	19.82
B	Mass of Oven Dry Specimen	*(b-t)*	20.24
D	***% Ash Content***	*(C/B)*100*	**97.9%**
	% Organic Matter	*100-D*	**2.1%**

Muffle Furnace: *S&ME ID #:* *23123* *Cal. Date:* *N/A* *Due:* *N/A*

Notes / Deviations / References: ASTM D2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Level III/117226	4/10/18
Technician Name	*Signature*	*Level/Certification*	*Date*
Matthew F. Cooke, P.G.		Project Manager	4/10/18
Technical Responsibility		*Position*	*Date*

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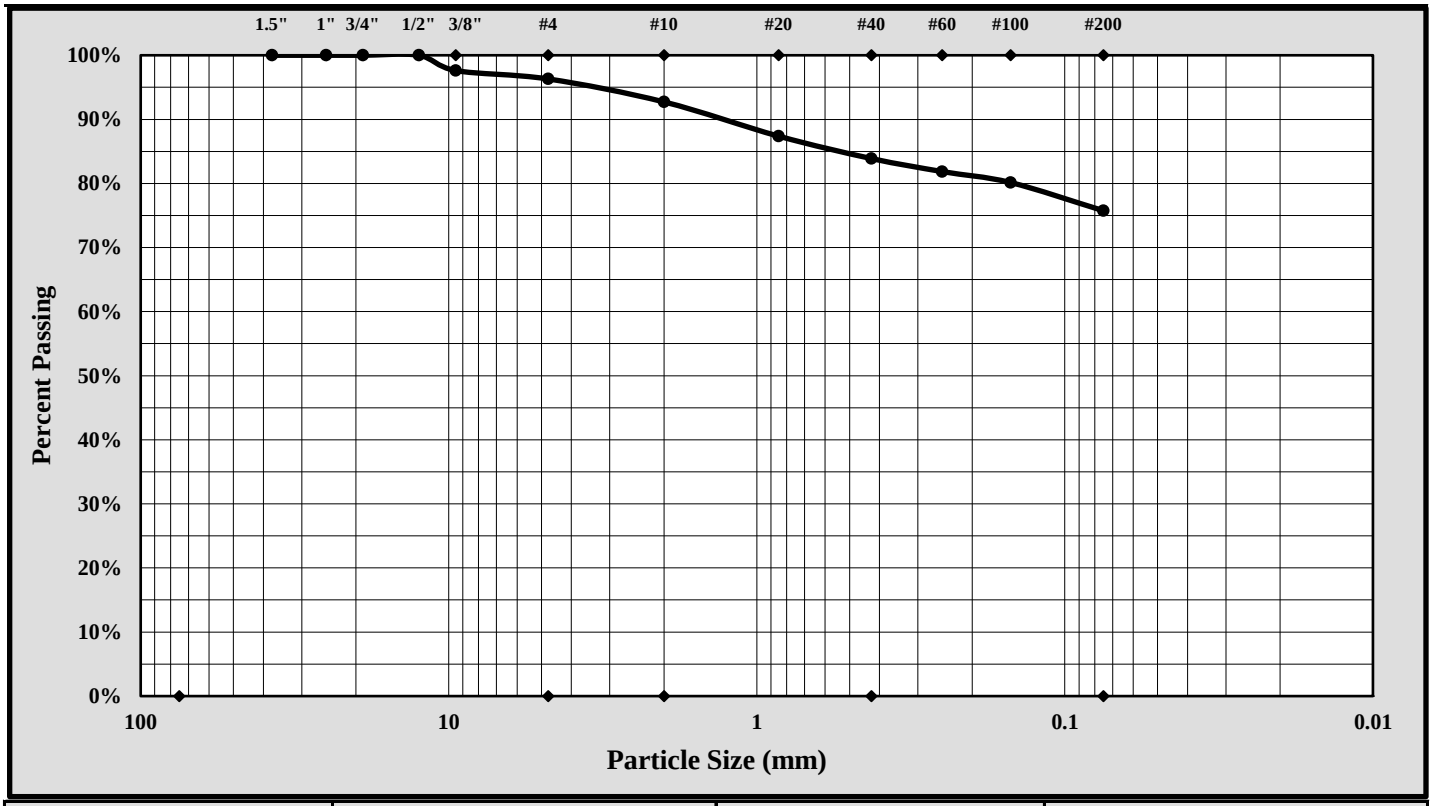
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50 Sample #: SS-10	Sample Date:	2/18/18
Location:	Bridge Boring Type: Split-spoon	Depth:	33.5' - 35.0'
Sample Description:	Elastic Silt with Sand (MH, A-7-5(16))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	12.5 mm	Gravel:	3.7%
Silt & Clay (% Passing #200):	75.8%	Total Sand:	20.6%

Liquid Limit	51	Plastic Limit	32	Plastic Index	19
Coarse Sand:	3.6%	Medium Sand:	8.8%	Fine Sand:	8.1%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

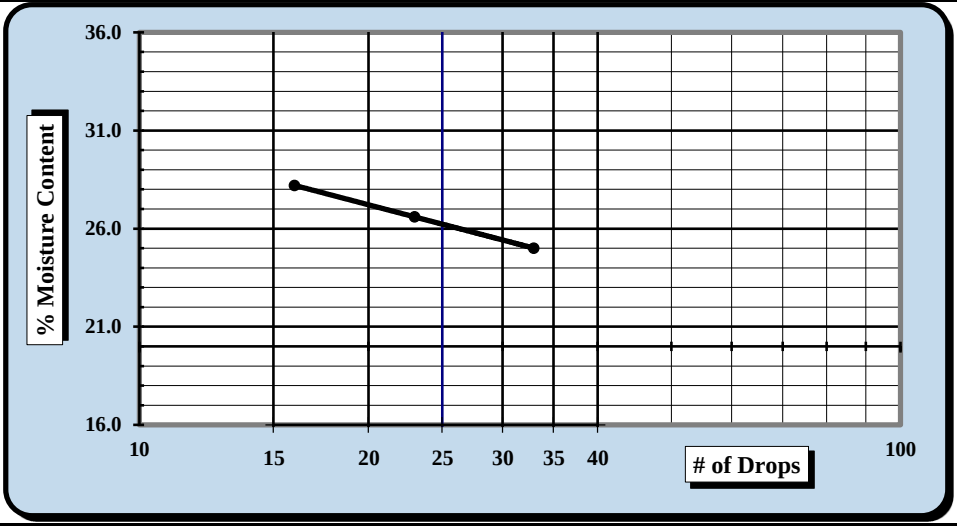
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date:	4/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	SS-14	Sample Date:	2/18/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	53.5' - 55.0'
Sample Description:	Silty Clayey Sand (SC-SM, A-2-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	41	42	43				44	45	
A	Tare Weight	28.74	28.64	28.38				25.78	25.10	
B	Wet Soil Weight + A	46.75	47.37	48.68				32.03	31.90	
C	Dry Soil Weight + A	43.15	43.44	44.22				30.89	30.67	
D	Water Weight (B-C)	3.60	3.93	4.46				1.14	1.23	
E	Dry Soil Weight (C-A)	14.41	14.80	15.84				5.11	5.57	
F	% Moisture (D/E)*100	25.0%	26.6%	28.2%				22.3%	22.1%	
N	# OF DROPS	33	23	16				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.2%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**26**
Plastic Limit	**22**
Plastic Index	**4**
Group Symbol	**CL-ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/10/18	Matthew F. Cooke, P.G.	4/10/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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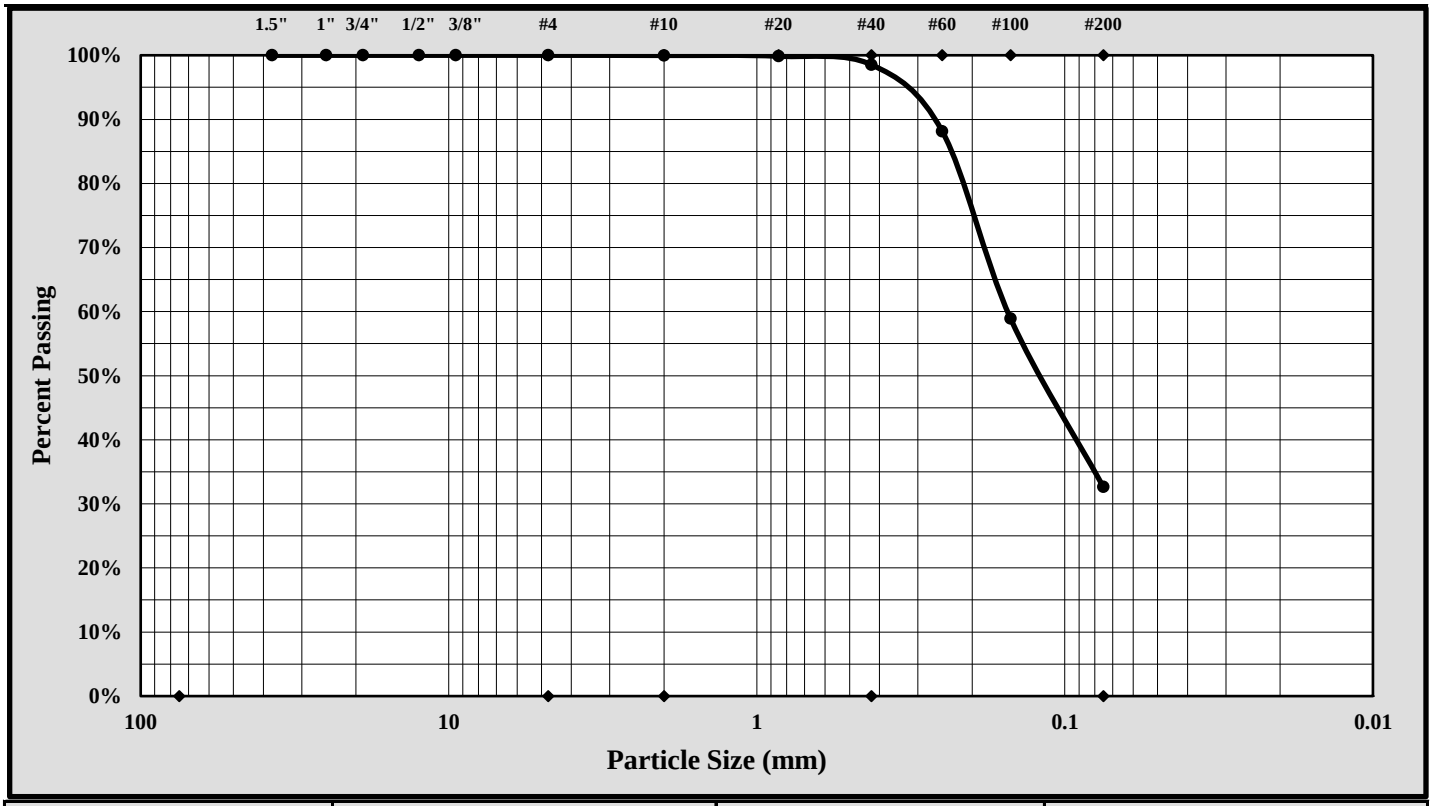
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/10/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/27 - 4/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50 Sample #: SS-14	Sample Date:	2/18/18
Location:	Bridge Boring Type: Split-spoon	Depth:	53.5' - 55.0'
Sample Description:	Silty Clayey Sand (SC-SM, A-2-4)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	0.85 mm	Gravel:	0.0%
Silt & Clay (% Passing #200):	32.6%	Total Sand:	67.4%

Liquid Limit	26	Plastic Limit	22	Plastic Index	4
Coarse Sand:	0.0%	Medium Sand:	1.4%	Fine Sand:	65.9%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/10/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

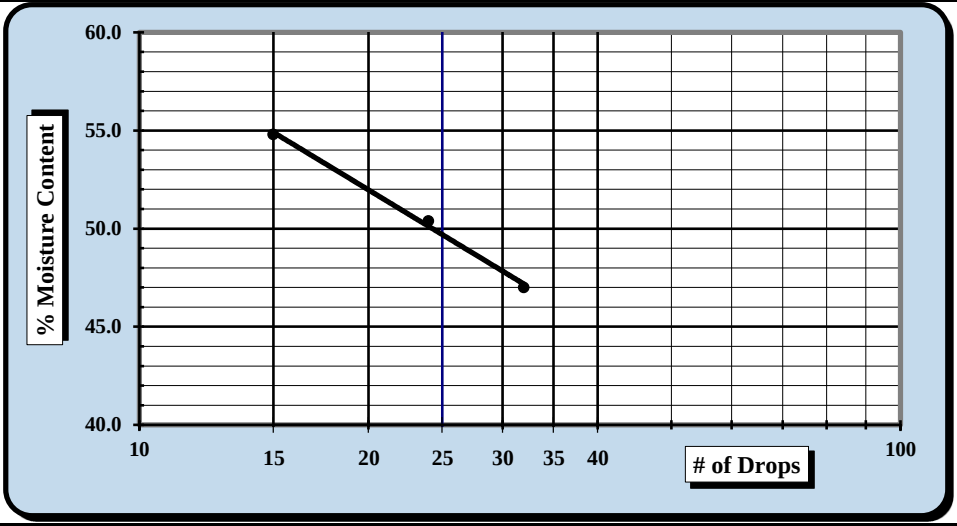
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date:	4/02/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-51	Sample #:	SS-1	Sample Date:	2/08/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	0.0' - 2.0'
Sample Description:	Clayey Sand (SC, A-7-6(7))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	26	27	28				29	30	
A	Tare Weight	27.37	27.00	26.80				27.00	27.36	
B	Wet Soil Weight + A	41.85	41.23	41.71				33.57	35.09	
C	Dry Soil Weight + A	37.22	36.46	36.43				32.22	33.47	
D	Water Weight (B-C)	4.63	4.77	5.28				1.35	1.62	
E	Dry Soil Weight (C-A)	9.85	9.46	9.63				5.22	6.11	
F	% Moisture (D/E)*100	47.0%	50.4%	54.8%				25.9%	26.5%	
N	# OF DROPS	32	24	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**26.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**50**
Plastic Limit	**26**
Plastic Index	**24**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/03/18	Matthew F. Cooke, P.G.	4/03/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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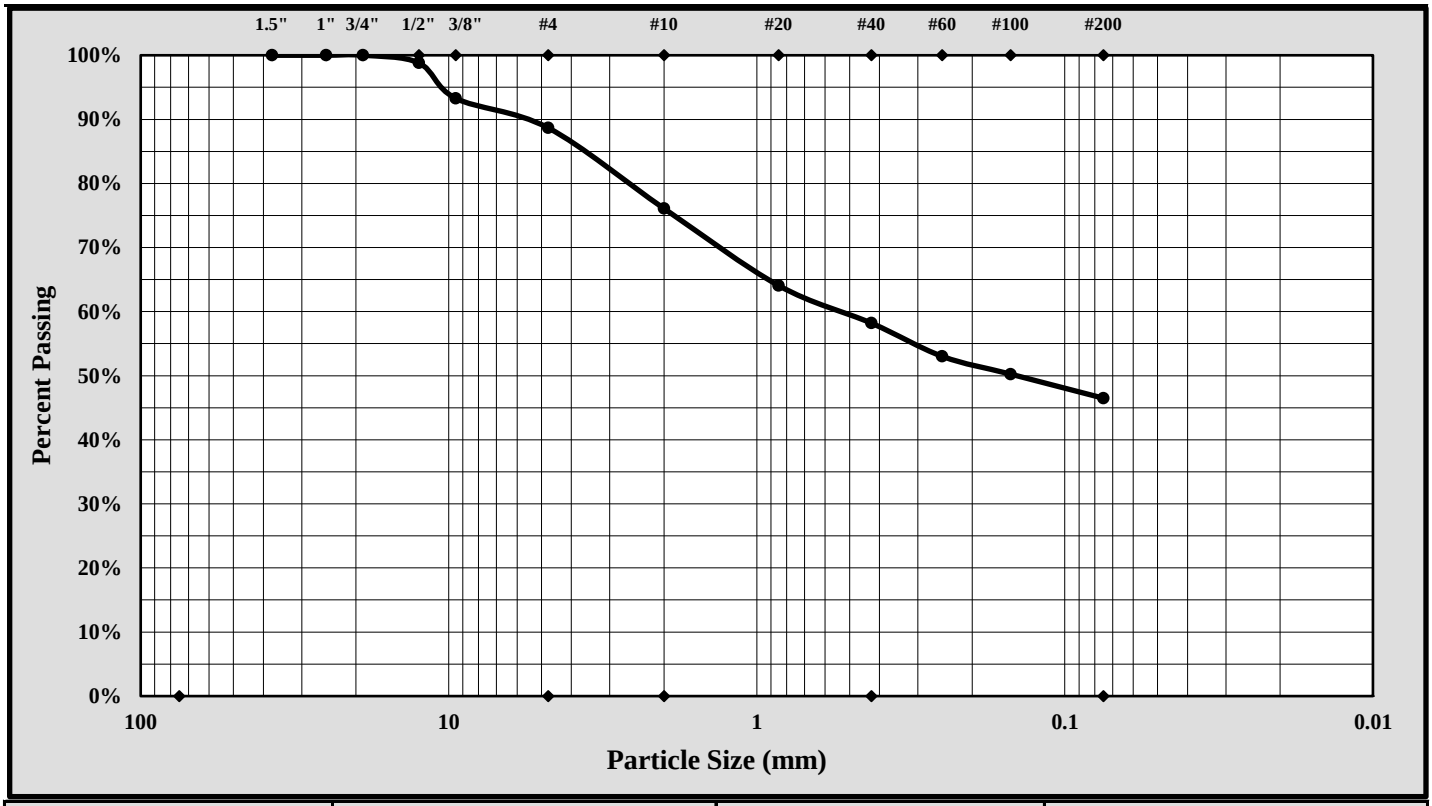
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/23 - 4/02/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-51 Sample #: SS-1	Sample Date:	2/08/18
Location:	Bridge Boring Type: Split-spoon	Depth:	0.0' - 2.0'
Sample Description:	Clayey Sand (SC, A-7-6(7))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	19.0 mm	Gravel:	11.3%
Silt & Clay (% Passing #200):	46.5%	Total Sand:	42.2%

Liquid Limit	50	Plastic Limit	26	Plastic Index	24
Coarse Sand:	12.6%	Medium Sand:	17.9%	Fine Sand:	11.7%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/2018 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

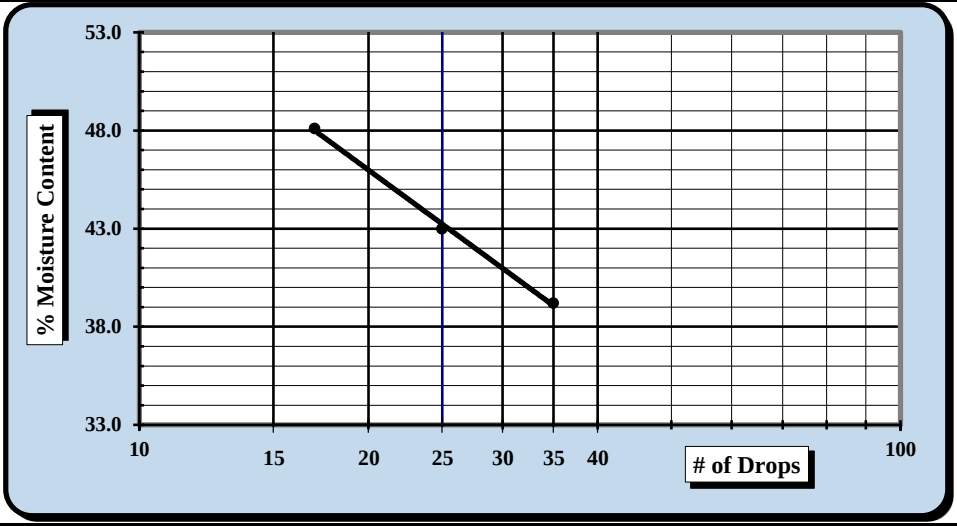
Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date:	4/02/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-51	Sample #:	SS-6	Sample Date:	2/08/18
Location:	Bridge Boring	Type:	Split-spoon	Depth:	13.5' - 15.0'

Sample Description: Silty Gravel with Sand (GM, A-7-6(4))

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	31	32	33				34	35	
A	Tare Weight	28.62	27.70	26.70				28.25	26.96	
B	Wet Soil Weight + A	44.46	44.50	41.98				34.52	33.98	
C	Dry Soil Weight + A	40.00	39.45	37.02				33.17	32.45	
D	Water Weight (B-C)	4.46	5.05	4.96				1.35	1.53	
E	Dry Soil Weight (C-A)	11.38	11.75	10.32				4.92	5.49	
F	% Moisture (D/E)*100	39.2%	43.0%	48.1%				27.4%	27.9%	
N	# OF DROPS	35	25	17				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**27.7%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**43**
Plastic Limit	**28**
Plastic Index	**15**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/03/18	Matthew F. Cooke, P.G.	4/03/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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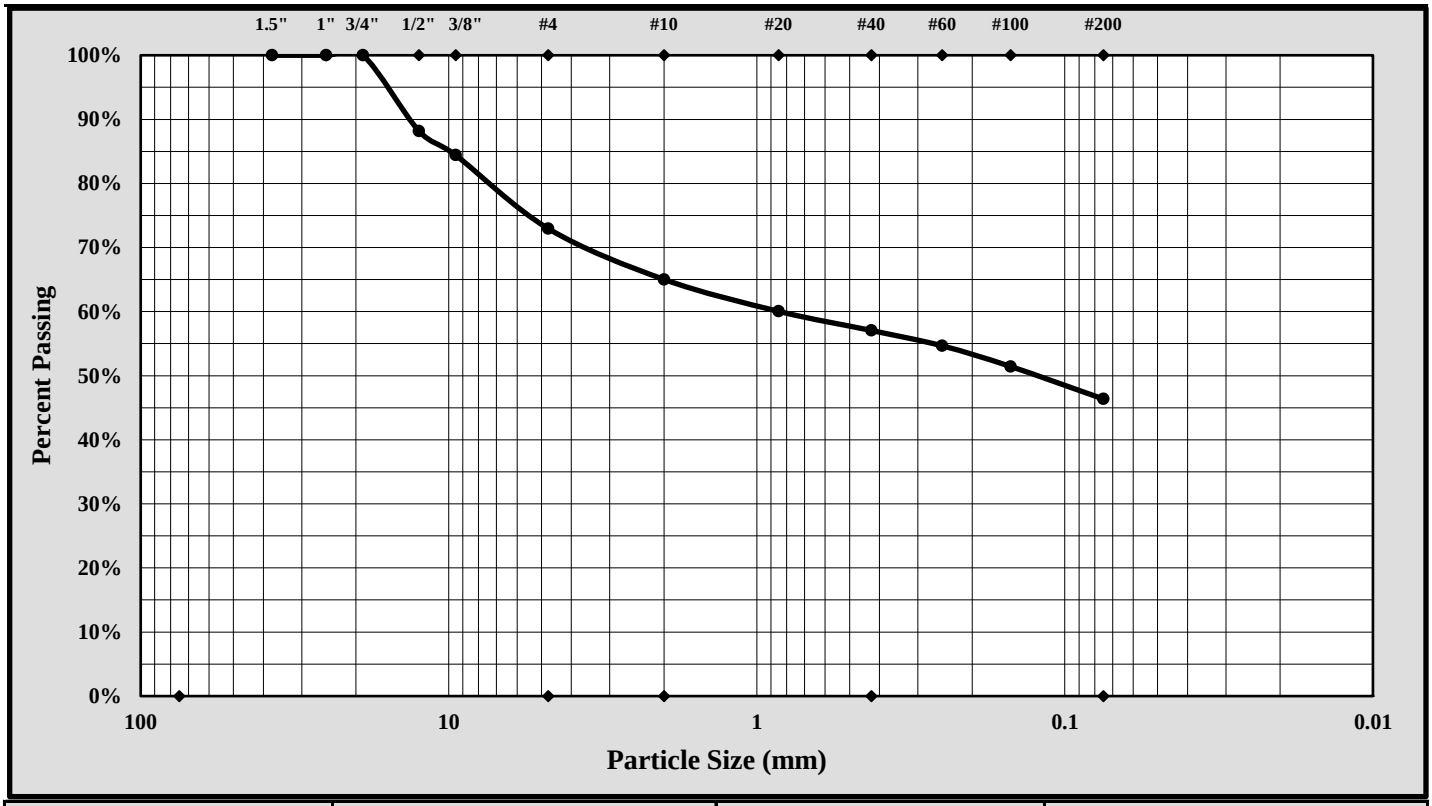
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/23 - 4/02/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-51 Sample #: SS-6	Sample Date:	2/08/18
Location:	Bridge Boring Type: Split-spoon	Depth:	13.5' - 15.0'
Sample Description:	Silty Gravel with Sand (GM, A-7-6(4))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	19.0 mm	Gravel:	27.1%
Silt & Clay (% Passing #200):	46.4%	Total Sand:	26.6%

Liquid Limit	43	Plastic Limit	28	Plastic Index	15
Coarse Sand:	7.9%	Medium Sand:	8.0%	Fine Sand:	10.7%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

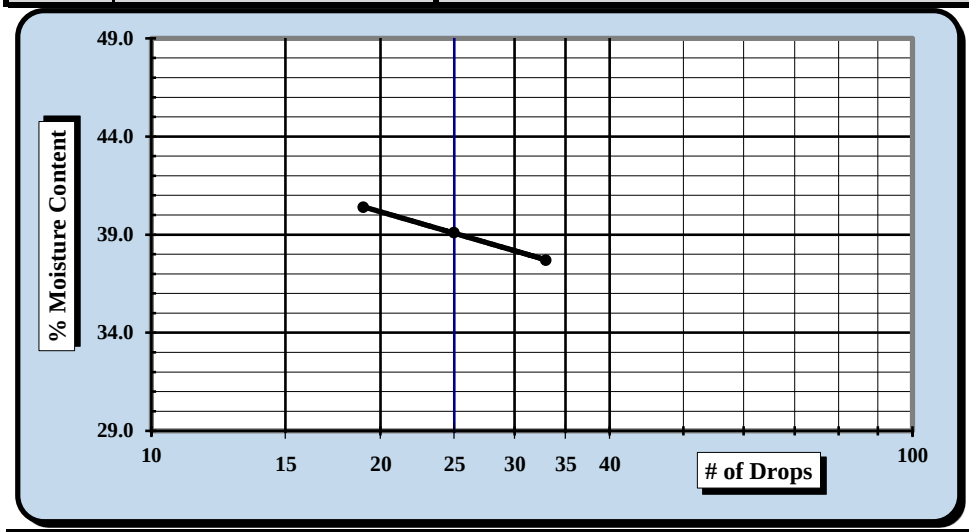
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date:	4/02/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-51	Sample #:	SS-9	Sample Date:	2/08/18
Location:	Bridge boring	Type:	Split-spoon	Depth:	28.5' - 30.0'
Sample Description:	Silt with Sand (ML, A-6(11))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	36	37	38				39	40	
A	Tare Weight	25.69	26.19	26.28				25.90	26.27	
B	Wet Soil Weight + A	42.35	43.26	43.90				32.87	33.20	
C	Dry Soil Weight + A	37.79	38.46	38.83				31.41	31.78	
D	Water Weight (B-C)	4.56	4.80	5.07				1.46	1.42	
E	Dry Soil Weight (C-A)	12.10	12.27	12.55				5.51	5.51	
F	% Moisture (D/E)*100	37.7%	39.1%	40.4%				26.5%	25.8%	
N	# OF DROPS	33	25	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**26.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **39**
Plastic Limit **26**
Plastic Index **13**
Group Symbol **ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/03/18	Matthew F. Cooke, P.G.	4/03/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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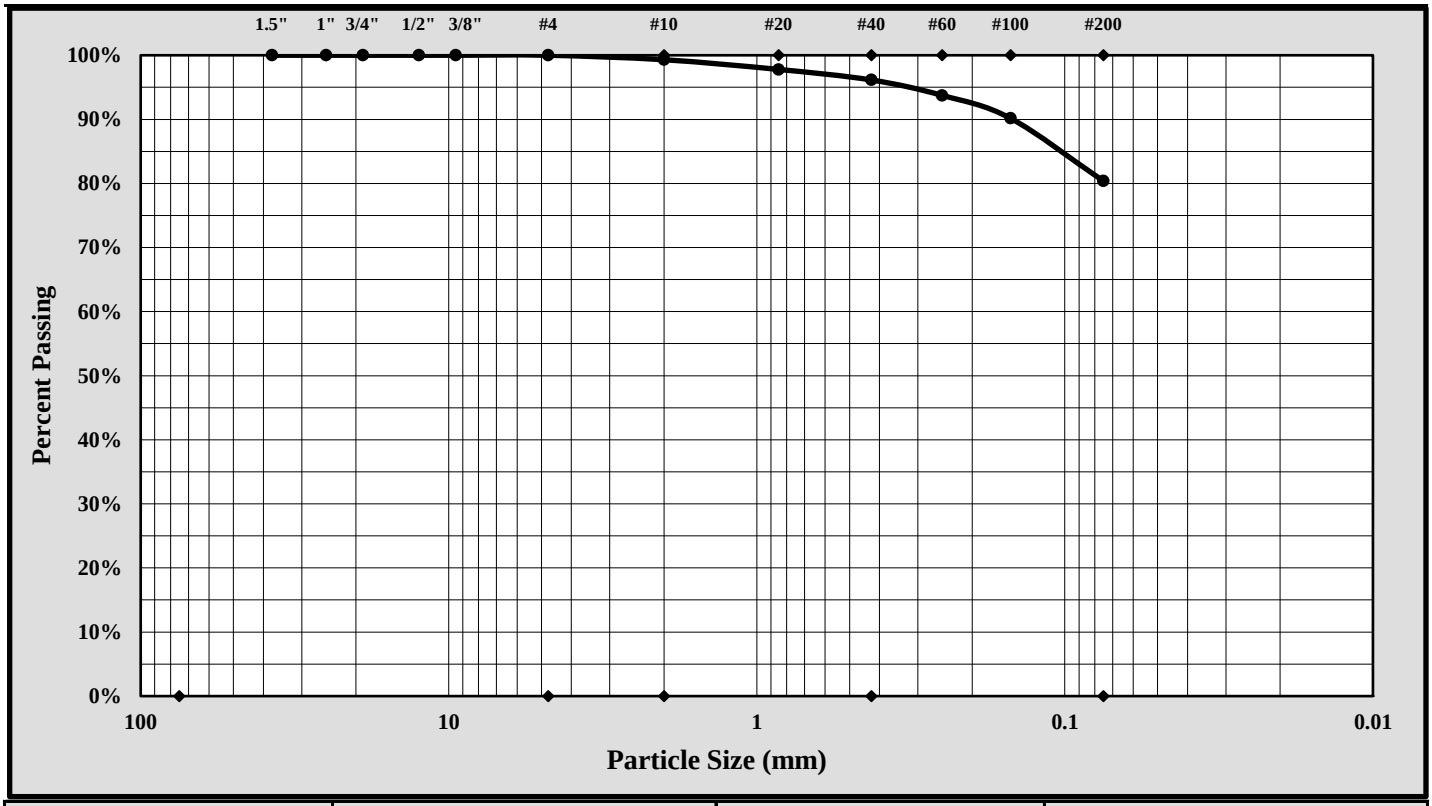
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/23 - 4/02/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-51	Sample #: SS-9	Sample Date: 2/08/18
Location:	Bridge boring	Type: Split-spoon	Depth: 28.5 - 30.0'
Sample Description:	Silt with Sand (ML, A-6(11))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	2.00 mm	Gravel:	0.0%
Silt & Clay (% Passing #200):	80.4%	Total Sand:	19.6%

Liquid Limit	39	Plastic Limit	26	Plastic Index	13
Coarse Sand:	0.7%	Medium Sand:	3.2%	Fine Sand:	15.8%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	2/14/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/12 - 2/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	Varies
Sampling Method:	Split-spoon	Drill Rig:	CME 750/Diedrich D-50

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 13942 Calibration Date: 8/18/17 Oven ID. 13978 Calibration Date: 10/07/17

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft.		grams	grams	grams	grams	%	
DH-4	SS-1	0.0 - 2.0	WX-Z	0.00	71.20	64.42	6.78	10.5%	
DH-4	SS-2	2.0 - 4.0	D-5	0.00	50.95	43.48	7.47	17.2%	
DH-4	SS-4	6.0 - 8.0	YM-5	0.00	52.42	44.92	7.50	16.7%	
DH-4	SS-6	13.5 - 15.0	D-12	0.00	54.02	41.18	12.84	31.2%	
DH-5	SS-1	0.0 - 2.0	D-22	0.00	72.35	63.67	8.68	13.6%	
DH-5	SS-2	2.0 - 4.0	YM-7	0.00	73.44	58.17	15.27	26.3%	
DH-5	SS-3	4.0 - 6.0	YM-6	0.00	73.42	61.16	12.26	20.0%	
DH-5	SS-4	6.0 - 8.0	D-21	0.00	72.14	63.77	8.37	13.1%	
DH-6	SS-1	0.0 - 2.0	D-7	0.00	70.54	59.07	11.47	19.4%	
DH-6	SS-2	2.0 - 4.0	D-9	0.00	71.96	61.42	10.54	17.2%	
DH-6	SS-3	4.0 - 6.0	D-3A	0.00	73.49	60.80	12.69	20.9%	

Notes / Deviations / References

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Lab Level III/117226	2/14/18
Technician Name	*Signature*	*Certification Type / No.*	*Date*
Brian Vaughan, P.E.	Brian Vaughan	Group Leader	2/14/18
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

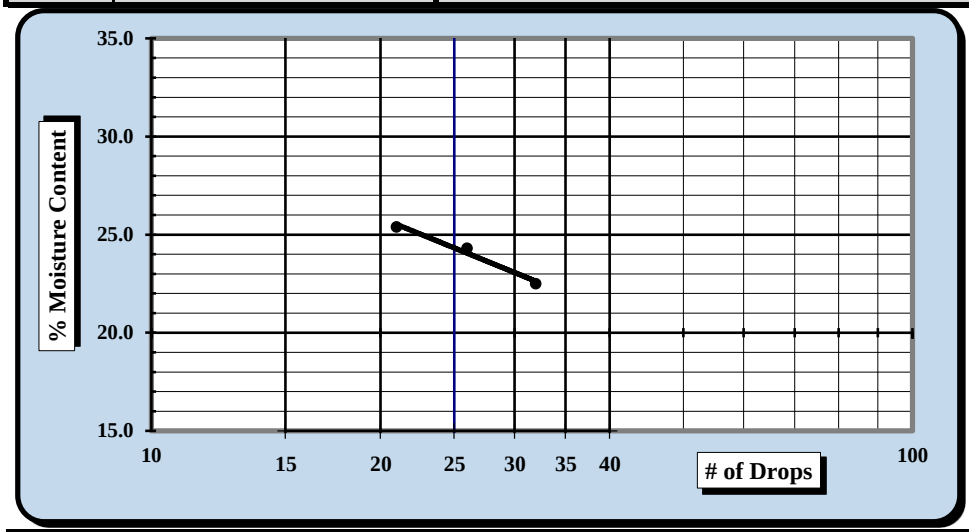
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/14/18
Project Name:	Carolina Crossroads Project	Test Date:	3/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	DH-4	Sample #:	SS-1	Sample Date:	1/04/18
Location:	Seismic Boring	Type:	Split-spoon	Depth:	0.0' - 2.0'
Sample Description:	Clayey Sand (SC, A-2-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	26.99	26.46	26.37				25.93	26.95	
B	Wet Soil Weight + A	46.06	43.64	43.43				31.95	33.15	
C	Dry Soil Weight + A	42.56	40.28	39.97				31.21	32.38	
D	Water Weight (B-C)	3.50	3.36	3.46				0.74	0.77	
E	Dry Soil Weight (C-A)	15.57	13.82	13.60				5.28	5.43	
F	% Moisture (D/E)*100	22.5%	24.3%	25.4%				14.0%	14.2%	
N	# OF DROPS	32	26	21				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**14.1%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**24**
Plastic Limit	**14**
Plastic Index	**10**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 28.4%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	3/14/18	Brian Vaughn	3/14/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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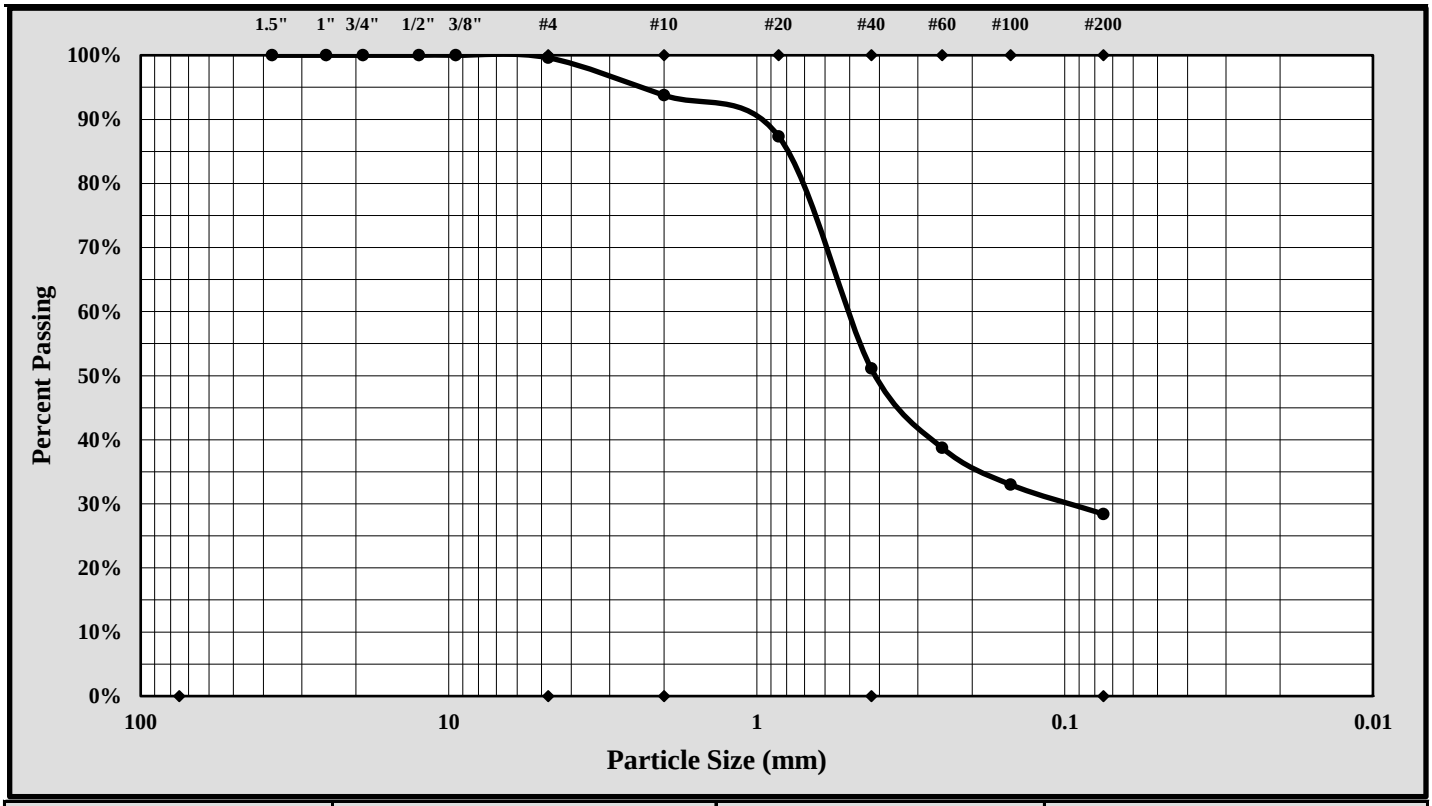
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/13/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/01 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	DH-4	Sample #: SS-1	Sample Date: 1/04/18
Location:	Seismic Boring	Type: Split-spoon	Depth: 0.0' - 2.0'
Sample Description:	Clayey Sand (SC, A-2-4)		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	4.75 mm	Gravel:	0.4%
Silt & Clay (% Passing #200):	28.4%	Total Sand:	71.2%

Liquid Limit	24	Plastic Limit	14	Plastic Index	10
Coarse Sand:	5.8%	Medium Sand:	42.6%	Fine Sand:	22.7%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/13/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

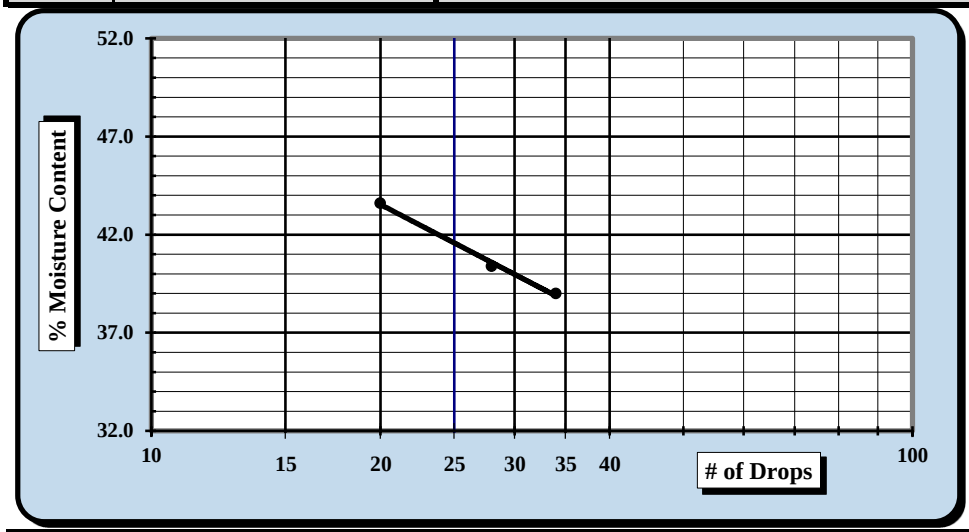
Project #:	1461-16-047.2B	Report Date:	3/14/18
Project Name:	Carolina Crossroads Project	Test Date:	3/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	DH-4	Sample #:	SS-2	Sample Date:	1/04/18
Location:	Seismic Boring	Type:	Split-spoon	Depth:	2.0' - 4.0'

Sample Description: Sandy Lean Clay (CL, A-7-6(11))

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9	10	
A	Tare Weight	27.76	26.30	27.32				26.86	26.76	
B	Wet Soil Weight + A	42.69	40.66	42.21				33.55	34.84	
C	Dry Soil Weight + A	38.50	36.53	37.69				32.28	33.32	
D	Water Weight (B-C)	4.19	4.13	4.52				1.27	1.52	
E	Dry Soil Weight (C-A)	10.74	10.23	10.37				5.42	6.56	
F	% Moisture (D/E)*100	39.0%	40.4%	43.6%				23.4%	23.2%	
N	# OF DROPS	34	28	20				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.3%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **42**
Plastic Limit **23**
Plastic Index **19**
Group Symbol **CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 65.6%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	3/14/18		3/14/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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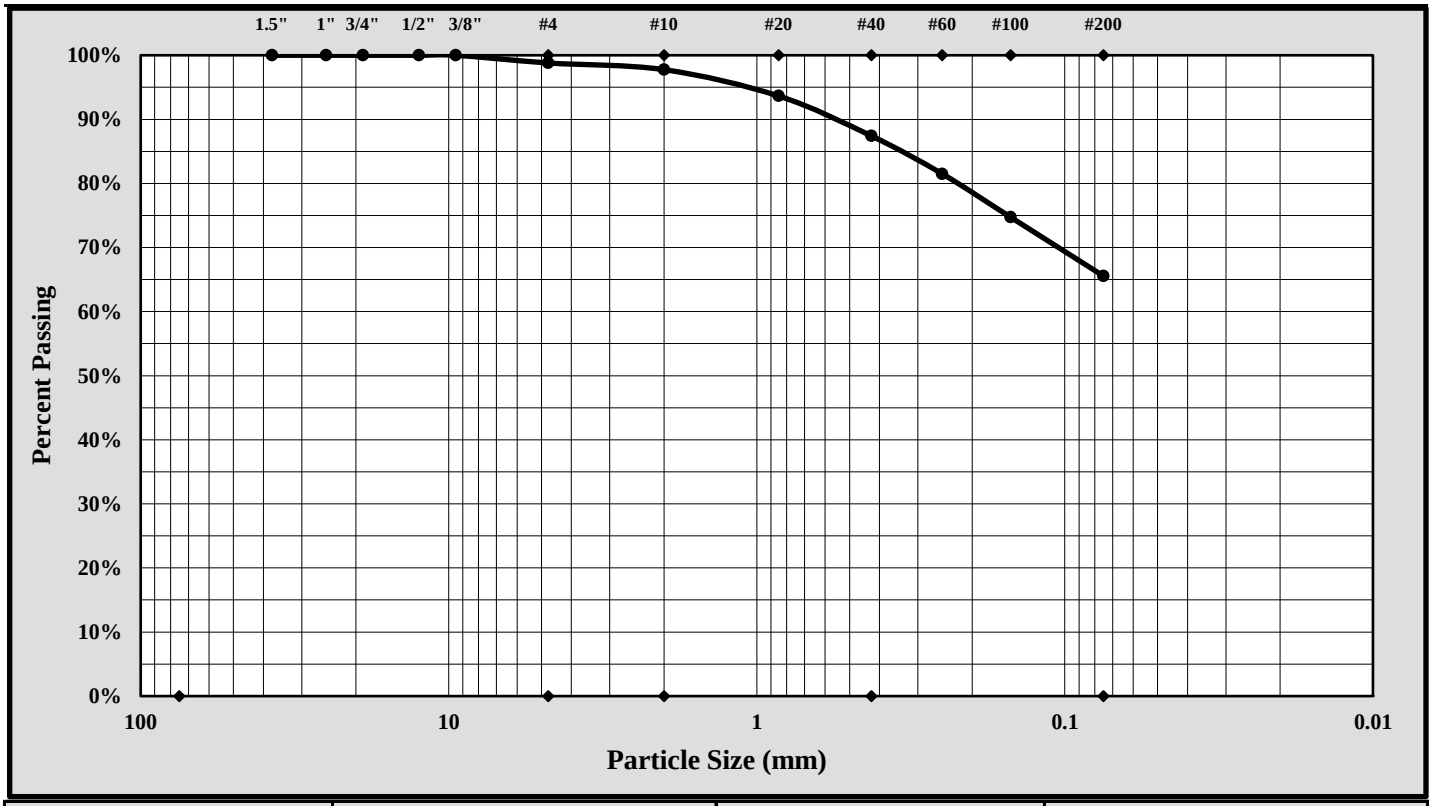
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/13/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/01 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	DH-4	Sample #: SS-2	Sample Date: 1/04/18
Location:	Seismic Boring	Type: Split-spoon	Depth: 2.0' - 4.0'
Sample Description:	Sandy Lean Clay (CL, A-7-6(11))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	9.50 mm	Gravel:	1.2%
Silt & Clay (% Passing #200):	65.6%	Total Sand:	33.2%

Liquid Limit	42	Plastic Limit	23	Plastic Index	19
Coarse Sand:	1.0%	Medium Sand:	10.3%	Fine Sand:	21.9%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/13/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

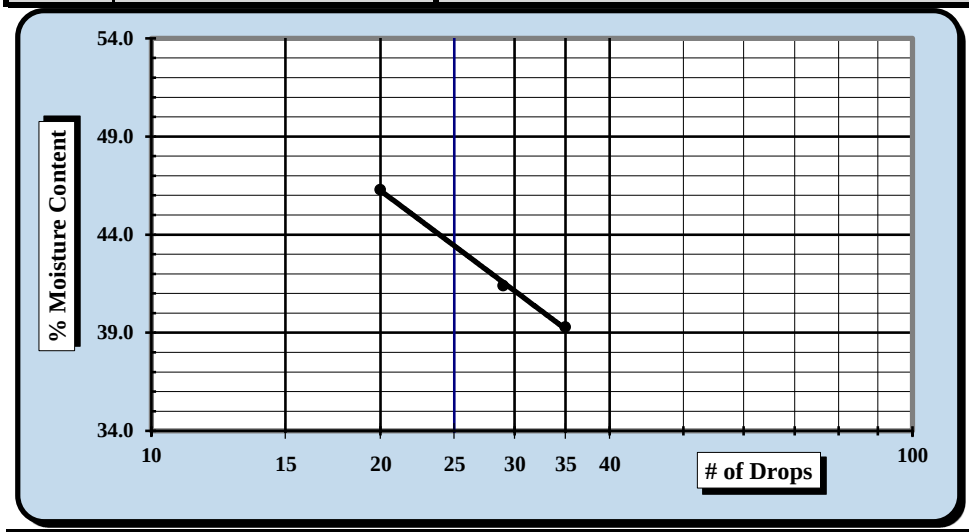
Project #:	1461-16-047.2B	Report Date:	3/14/18
Project Name:	Carolina Crossroads Project	Test Date:	3/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	DH-4	Sample #:	SS-4	Sample Date:	1/04/18
Location:	Seismic Boring	Type:	Split-spoon	Depth:	6.0' - 8.0'

Sample Description: Clayey Sand with Gravel (SC, A-2-7(2))

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14	15	
A	Tare Weight	26.67	26.66	26.79				26.66	27.61	
B	Wet Soil Weight + A	41.14	43.58	42.47				32.66	33.61	
C	Dry Soil Weight + A	37.06	38.63	37.51				31.62	32.59	
D	Water Weight (B-C)	4.08	4.95	4.96				1.04	1.02	
E	Dry Soil Weight (C-A)	10.39	11.97	10.72				4.96	4.98	
F	% Moisture (D/E)*100	39.3%	41.4%	46.3%				21.0%	20.5%	
N	# OF DROPS	35	29	20				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**20.8%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**44**
Plastic Limit	**21**
Plastic Index	**23**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 27.1%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	3/14/18		3/14/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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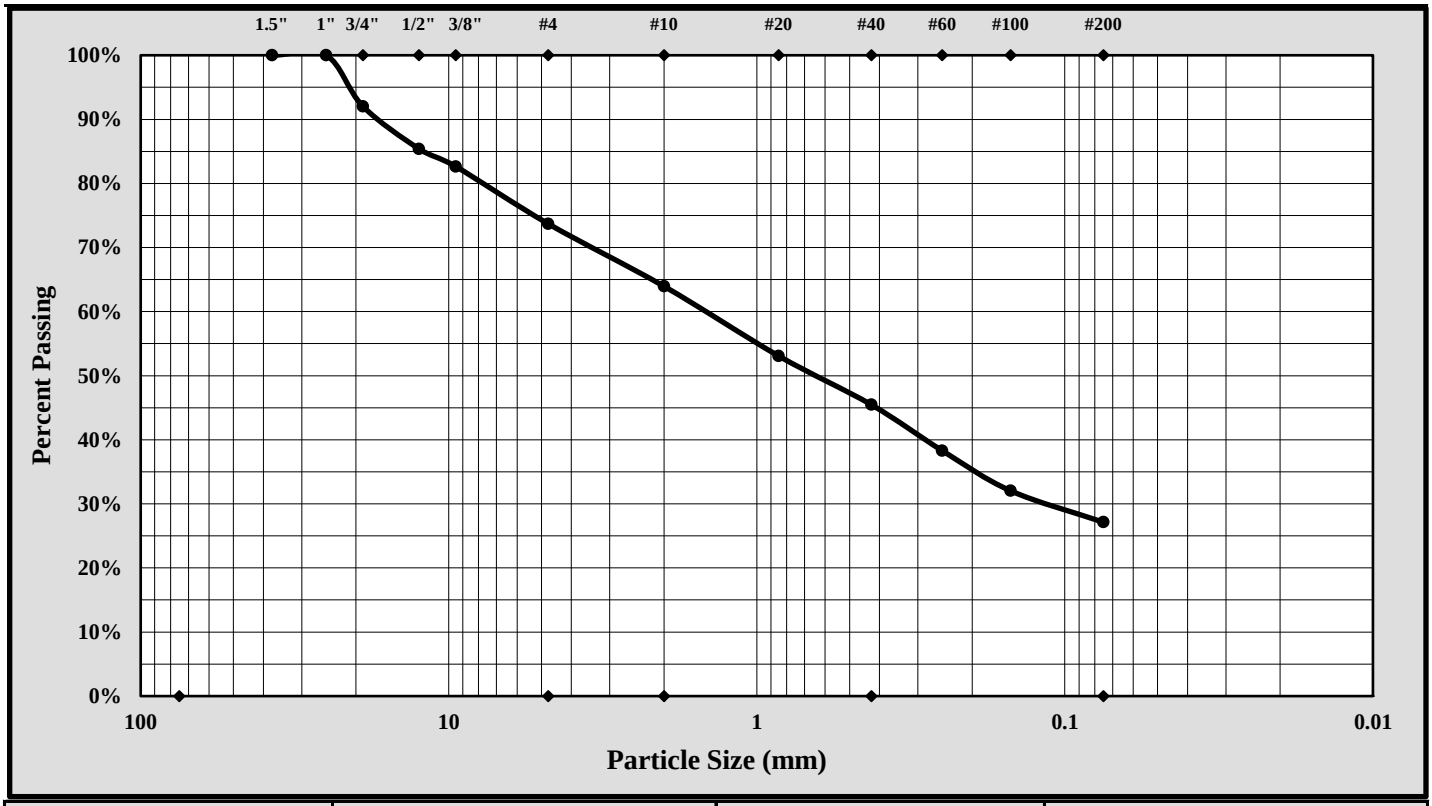
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/13/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/01 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	DH-4	Sample #: SS-4	Sample Date: 1/04/18
Location:	Seismic Boring	Type: Split-spoon	Depth: 6.0' - 8.0'
Sample Description:	Clayey Sand with Gravel (SC, A-2-7(2))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	25.00 mm	Gravel:	26.3%
Silt & Clay (% Passing #200):	27.1%	Total Sand:	46.6%

Liquid Limit	44	Plastic Limit	21	Plastic Index	23
Coarse Sand:	9.7%	Medium Sand:	18.5%	Fine Sand:	18.3%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/13/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

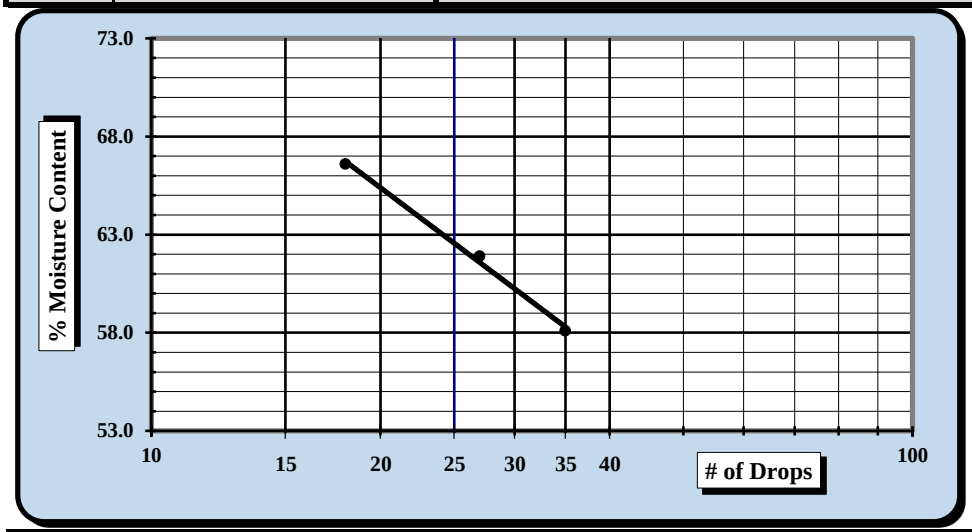
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/14/18
Project Name:	Carolina Crossroads Project	Test Date:	3/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	DH-4	Sample #:	SS-6	Sample Date:	1/04/18
Location:	Seismic Boring	Type:	Split-spoon	Depth:	13.5' - 15.0'
Sample Description:	Elastic Silt with Sand (MH, A-7-5(24))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	16	17	18				19	20	
A	Tare Weight	26.57	26.63	26.79				26.68	26.83	
B	Wet Soil Weight + A	43.80	39.66	41.32				32.68	33.13	
C	Dry Soil Weight + A	37.47	34.68	35.51				31.02	31.40	
D	Water Weight (B-C)	6.33	4.98	5.81				1.66	1.73	
E	Dry Soil Weight (C-A)	10.90	8.05	8.72				4.34	4.57	
F	% Moisture (D/E)*100	58.1%	61.9%	66.6%				38.2%	37.9%	
N	# OF DROPS	35	27	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**38.1%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**63**
Plastic Limit	**38**
Plastic Index	**25**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 80.9%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	3/14/18	Brian Vaughn	3/14/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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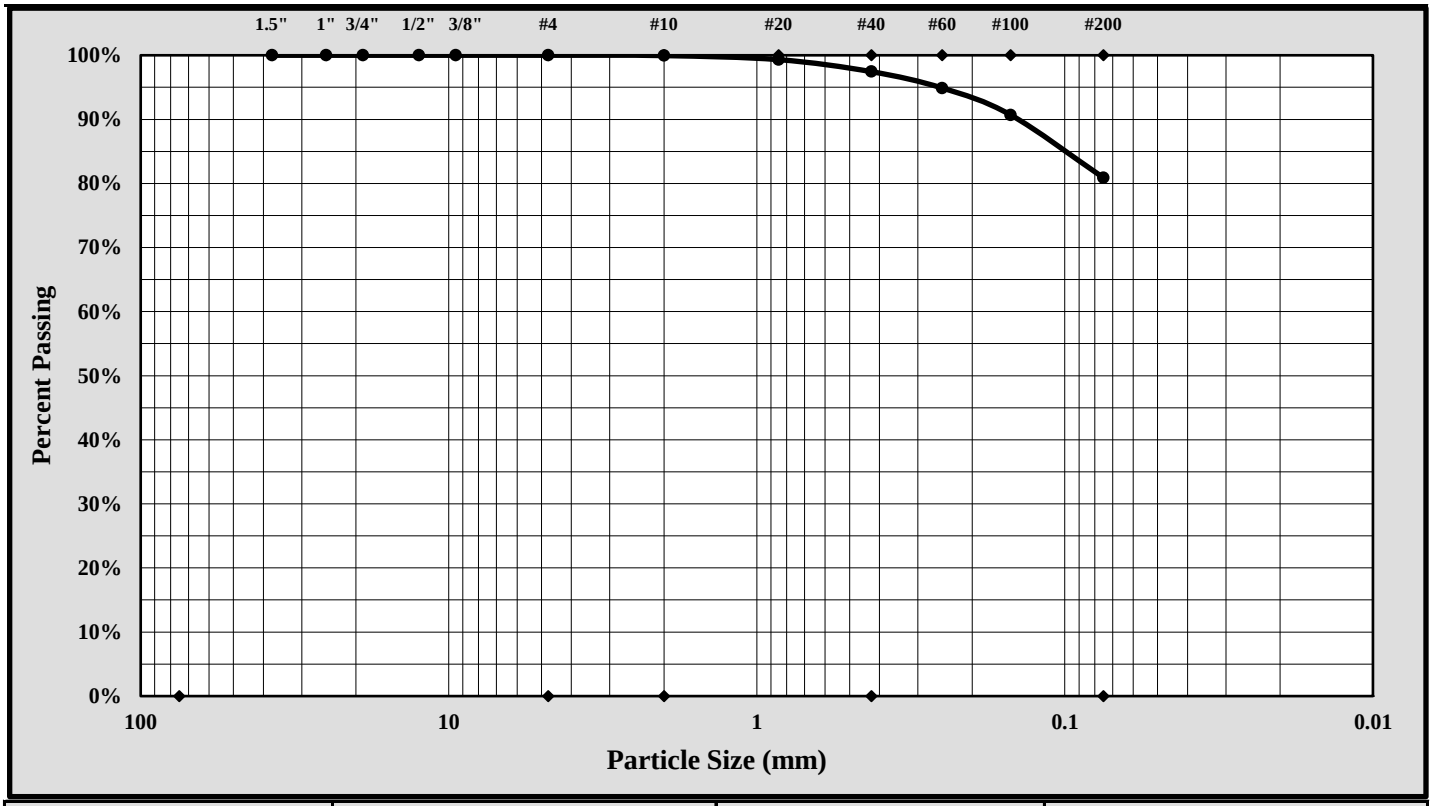
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/13/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/02 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	DH-4 Sample #: SS-6	Sample Date:	1/04/18
Location:	Seismic Boring Type: Split-spoon	Depth:	13.5' - 15.0'
Sample Description:	Elastic Silt with Sand (MH, A-7-5(24))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	.85 mm	Gravel:	0.0%
Silt & Clay (% Passing #200):	80.9%	Total Sand:	19.1%

Liquid Limit	63	Plastic Limit	38	Plastic Index	25
Coarse Sand:	0.1%	Medium Sand:	2.5%	Fine Sand:	16.5%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Signature	Group Leader	3/13/18
Technical Responsibility		*Position*	*Date*

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Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-16-047.2B	Report Date:	5/21/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/11-4/13/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample by:	S&ME	Sample Date(s):	Various
Sampling Method:	Split Spoon	Drill Rig :	N/A

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 25128 Calibration Date: 4/4/18 Oven ID. 31332 Calibration Date: 2/21/18

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft. or m.		grams	grams	grams	grams	%	
W-28	SS-6	13.5'-15'	TD-1	105.07	251.75	228.93	22.82	18.4%	
W-28	SS-2	2'-4'	J13	97.13	230.76	213.84	16.92	14.5%	
W-28	SS-8	23.5'-25'	NP3	107.07	234.31	212.85	21.46	20.3%	
W-28	SS-10	33.5'-35'	J11	98.19	327.14	277.53	49.61	27.7%	
W-28	SS-12	43.5'-45'	J7	90.51	223.96	190.88	33.08	33.0%	
W-28	SS-16	63.5'-65'	J9	89.84	224.77	198.94	25.83	23.7%	
W-30	SS-1	1.7'-3.7'	M-4	93.80	202.43	167.35	35.08	47.7%	
W-30	SS-4	7.7'-9.7'	J3	90.01	190.02	159.32	30.70	44.3%	
W-30	SS-9	28.5'-30'	J17	89.07	224.54	188.92	35.62	35.7%	
W-30	SS-11	38.5'-40'	J5	97.55	181.56	161.41	20.15	31.6%	
P-42	SS-1	0.8'-2.8'	NP2	107.05	258.64	235.96	22.68	17.6%	
P-44	SS-1	1.1'-3.1'	J2	90.23	218.73	189.03	29.70	30.1%	
P-45	SS-1	1'-3'	J12	95.74	285.64	262.85	22.79	13.6%	
P-47	SS-1	1.4'-3.4'	NP4	106.11	249.17	231.46	17.71	14.1%	
P-49	SS-1	1'-3'	J14	98.13	232.57	209.43	23.14	20.8%	
P-54	SS-1	0.7'-2.7'	G7	96.59	254.09	230.74	23.35	17.4%	

Notes / Deviations / References

Jimmy Hanson — *Technician Name* — 5/21/2018 — *Date*

Nathan Price — *Technical Responsibility* — *Signature* — Laboratory Manager — *Position* — 5/21/2018 — *Date*

Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #: 1461-16-047.2B Report Date: 4/25/2018

Project Name: Carolina Crossroads Project

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft.		grams	grams	grams	grams	%	
P-48	SS-1	1.0 - 3.0	3	20.80	41.06	37.80	3.26	19%	
P-50	SS-1	1.0 - 3.0	229	20.74	40.90	36.83	4.07	25%	
P-52	SS-1	1.2 - 3.2	36	20.94	42.37	39.10	3.27	18%	
P-53	SS-1	0.6 - 2.6	30	20.82	41.93	37.61	4.32	26%	
P-55	SS-1	0.9 - 2.9	4	20.53	43.24	39.54	3.70	19%	
P-57	SS-1	1.1 - 3.1	217	20.90	41.48	38.60	2.88	16%	
P-59	SS-1	1.4 - 3.4	19	20.57	44.50	40.57	3.93	20%	
P-61	SS-1	1.4 - 3.4	116	20.63	43.66	39.44	4.22	22%	
P-63	SS-1	1.3 - 3.3	39	20.81	41.75	39.68	2.07	11%	
P-67	SS-1	0.6 - 2.6	25	20.62	42.32	38.47	3.85	22%	
P-68	SS-1	1.1 - 3.1	6	20.58	44.94	43.09	1.85	8%	
P-69	SS-1	1.0 - 3.0	214	20.84	43.02	39.42	3.60	19%	
P-70	SS-1	0.6 - 2.6	7	20.82	43.32	39.96	3.36	18%	
P-71	SS-1	1.3 - 3.3	29	20.80	43.18	41.34	1.84	9%	

Notes / Deviations / References

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

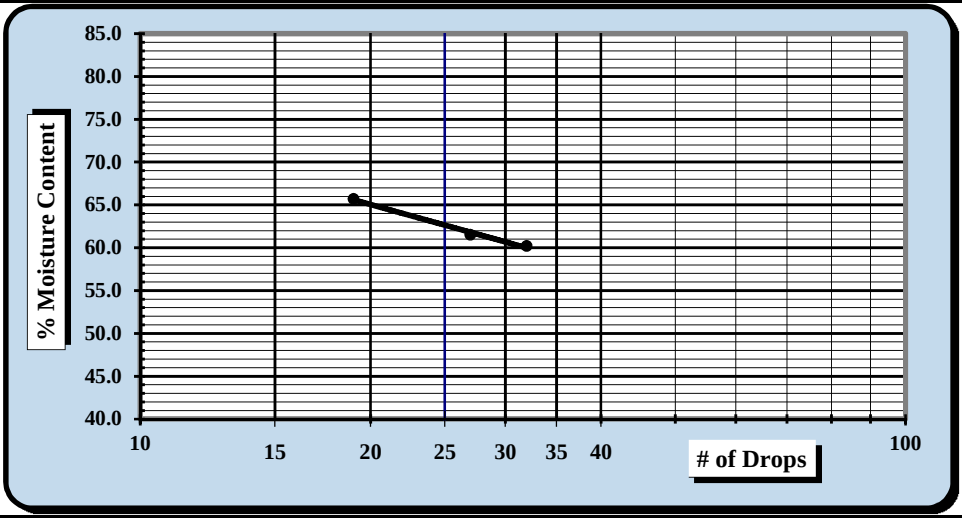
S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-16-047.2B	Report Date:	4/30/18
Project Name:	Carolina Crossroads Project	Test Date(s)	4/27-4/28/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-44	Sample #: SS-1		Sample Date: Various	
Location:	Pavement Boring	Offset: N/A		Depth: 1.1' - 3.1'	
Sample Description:	Fat Clay with Sand (CH, A-7-6 (34))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	3/17/2017	Grooving tool	26551	2/23/2018
LL Apparatus	31336	2/23/2018	Grooving tool		
Oven	31332	2/20/2018	Grooving tool		

Pan # 327		Liquid Limit						Plastic Limit		
	Tare #:	60	61	62				63	64	
A	Tare Weight	16.01	15.07	15.56				15.10	15.88	
B	Wet Soil Weight + A	27.98	27.12	27.19				22.25	22.67	
C	Dry Soil Weight + A	23.48	22.53	22.58				20.82	21.30	
D	Water Weight (B-C)	4.50	4.59	4.61				1.43	1.37	
E	Dry Soil Weight (C-A)	7.47	7.46	7.02				5.72	5.42	
F	% Moisture (D/E)*100	60.2%	61.5%	65.7%				25.0%	25.3%	
N	# OF DROPS	32	27	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**62**
Plastic Limit	**25**
Plastic Index	**37**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

Jimmy Hanson	4/28/2018		4/30/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D7928-3
Revision No.: 0
Revision Date: 02/21/17

Particle Size Analysis of Soils

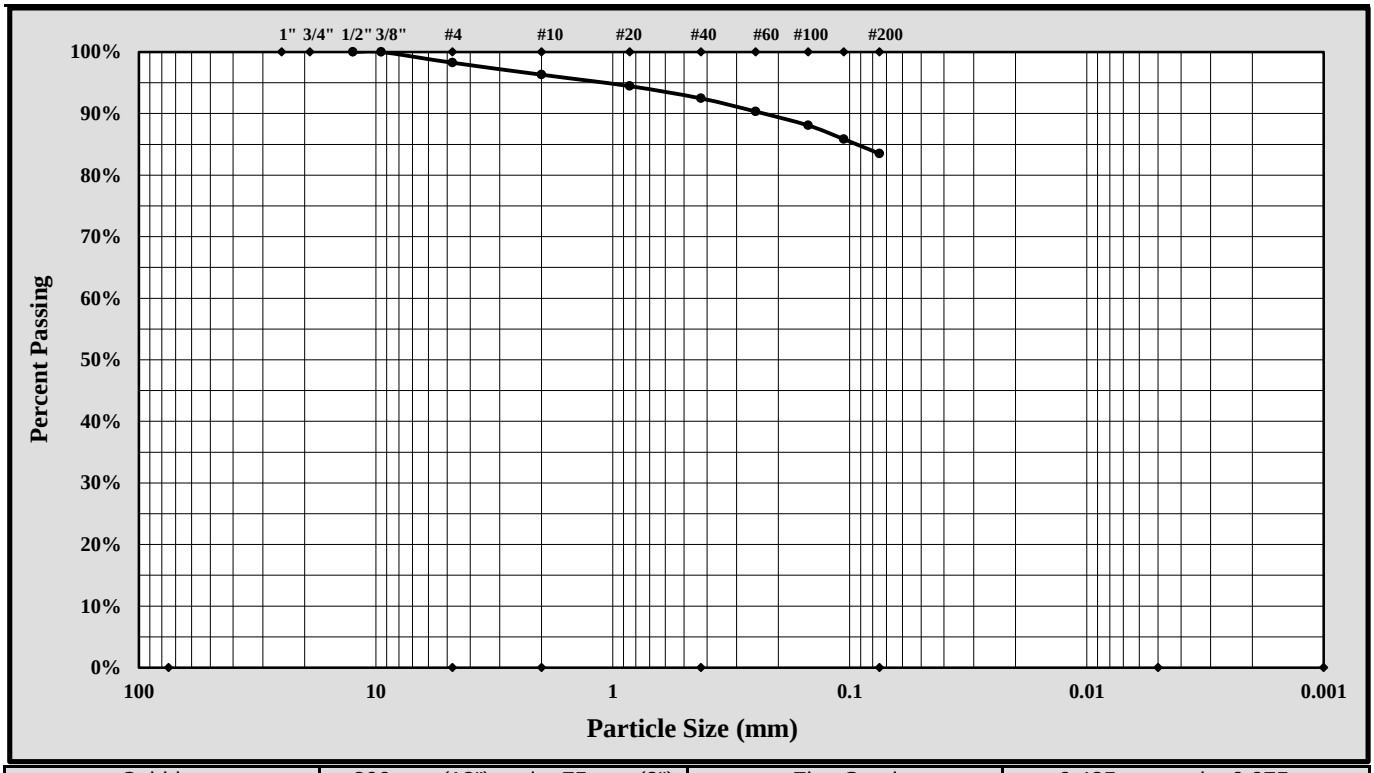
ASTM D6913/D7928

Sample Log No.:

Quality Assurance

S&ME, Inc., 4350 Rivergreen Parkway, Suite 200, Duluth, GA 30096

S&ME Project #:	1461-16-047.2B	Report Date:	4/23/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/19-4/20/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID:	P-44 Type: Split Spoon	Sample Date:	Various
Location:	Pavement Boring Sample No.: SS-1	Depth:	1.1' - 3.1'
Sample Description:	Fat Clay with Sand (CH, A-7-6 (34))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:		Gravel:	1.7%
Silt & Clay (% Passing #200):	83.5%	Total Sand:	14.8%
Assumed Specific Gravity:	2.65		

Liquid Limit	62	Plastic Limit	25	Plastic Index	37

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

Description of Sand and Gravel	Rounded ☐	Angular ☐	Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
Sample Prep Method: Moist Prep	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	50 g./ Liter

References / Comments / Deviations:

Nathan Price		Laboratory Group Leader	4/30/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

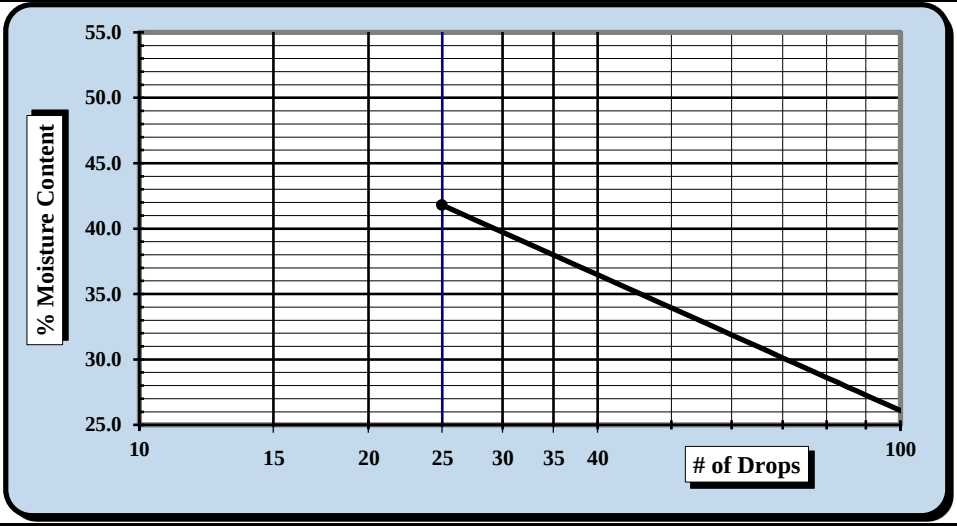
S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-16-047.2B	Report Date:	5-4-18
Project Name:	Carolina Crossroads Project	Test Date(s)	4/27-4/28/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-45	Sample #: SS-1	Sample Date: Various
Location:	Pavement Boring	Offset: N/A	Depth: 1.0' - 3.0'
Sample Description:	Clayey Sand with Gravel (SC, A-2-7 (2))		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	3/17/2017	Grooving tool	26551	2/23/2018
LL Apparatus	31336	2/23/2018	Grooving tool		
Oven	31332	2/20/2018	Grooving tool		

Pan # 189		Liquid Limit						Plastic Limit		
	Tare #:	66						77	79	
A	Tare Weight	26.68						29.17	29.31	
B	Wet Soil Weight + A	39.78						36.57	38.12	
C	Dry Soil Weight + A	35.92						35.37	36.69	
D	Water Weight (B-C)	3.86						1.20	1.43	
E	Dry Soil Weight (C-A)	9.24						6.20	7.38	
F	% Moisture (D/E)*100	41.8%						19.4%	19.4%	
N	# OF DROPS	25						*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**19.4%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**42**
Plastic Limit	**19**
Plastic Index	**23**
Group Symbol	**CL**

Multipoint Method ☐
One-point Method ☑

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

Jimmy Hanson	4/28/2018		4/30/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D7928-3
Revision No.: 0
Revision Date: 02/21/17

Particle Size Analysis of Soils

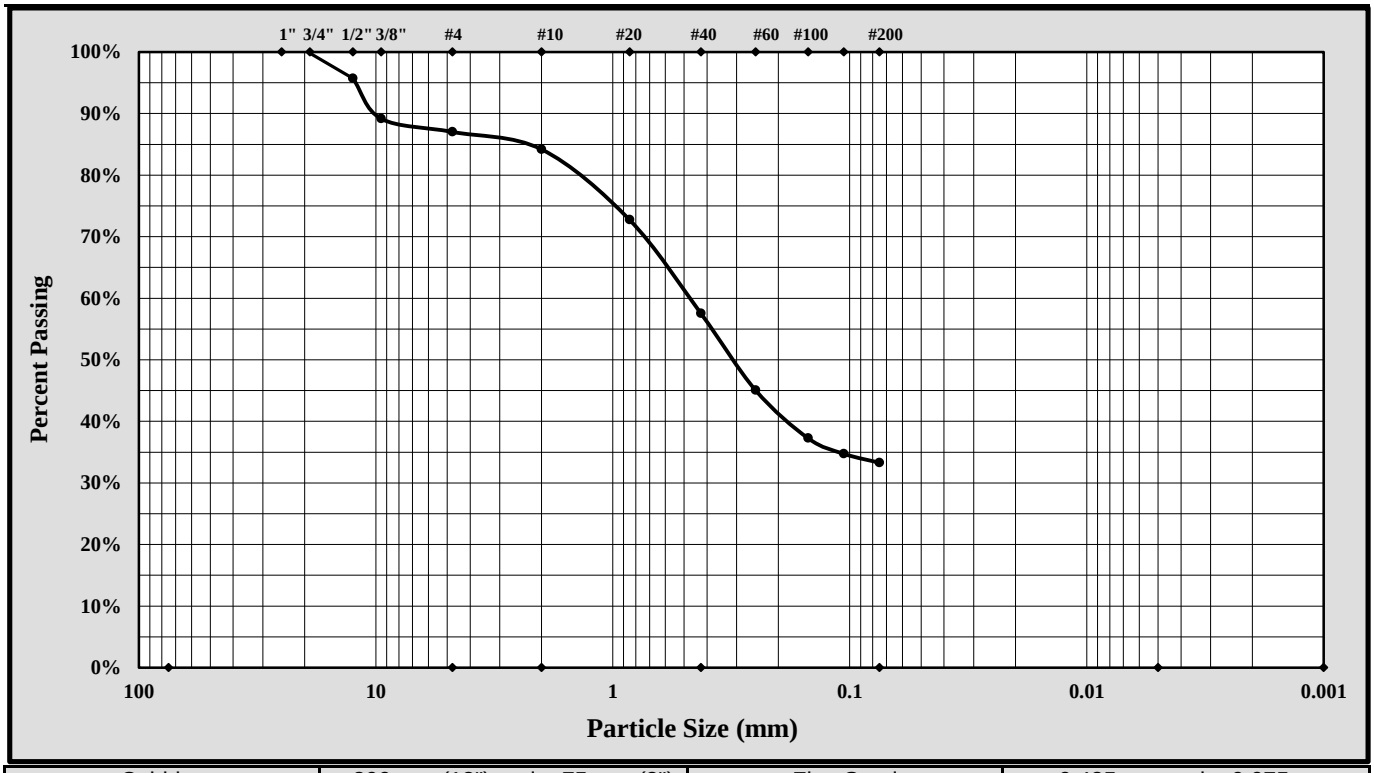
ASTM D6913/D7928

Sample Log No.:

Quality Assurance

S&ME, Inc., 4350 Rivergreen Parkway, Suite 200, Duluth, GA 30096

S&ME Project #:	1461-16-047.2B	Report Date:	4/23/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/19-4/20/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID:	P-45 Type: Split Spoon	Sample Date:	Various
Location:	Pavement Boring Sample No.: SS-1	Depth:	1.0' - 3.0'
Sample Description:	Clayey Sand with Gravel (SC, A-2-7 (2))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:		Gravel:	13.0%
Silt & Clay (% Passing #200):	33.3%	Total Sand:	53.7%
Assumed Specific Gravity:	2.65		

Liquid Limit	42	Plastic Limit	19	Plastic Index	23

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

Description of Sand and Gravel	Rounded ☐	Angular ☐	Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
Sample Prep Method: Moist Prep	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	50 g./ Liter

References / Comments / Deviations:

Nathan Price		Laboratory Group Leader	5/4/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

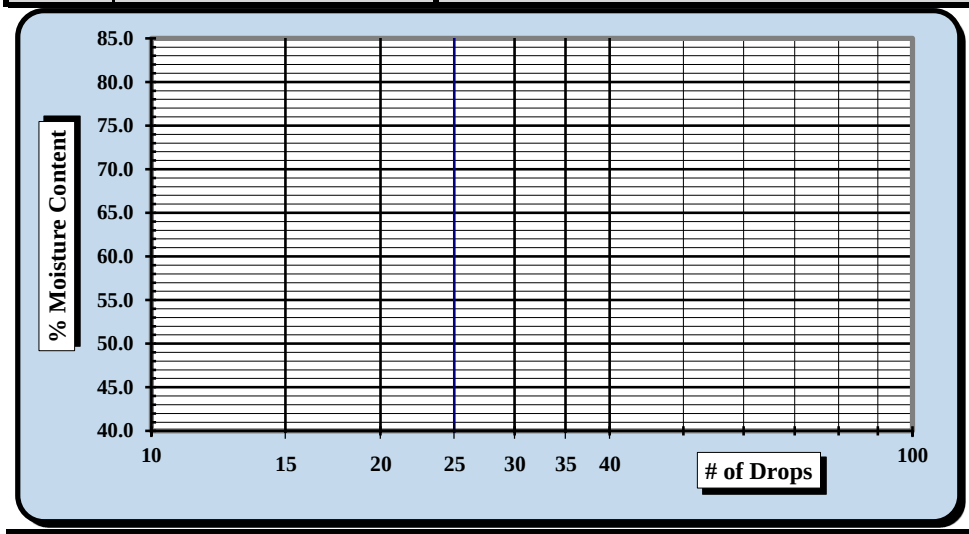
ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-16-047.2B	Report Date:	5-2-2018
Project Name:	Carolina Crossroads Project	Test Date(s)	4/27-4/28/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	P-47	Sample #: SS-1	Sample Date: Various
Location:	Pavement Boring	Offset: N/A	Depth: 1.4' - 3.4'
Sample Description:	Sandy Lean Clay (CL, A-6 (8))		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	3/17/2017	Grooving tool	26551	2/23/2018
LL Apparatus	31336	2/23/2018	Grooving tool		
Oven	31332	2/20/2018	Grooving tool		

Pan # 468		Liquid Limit						Plastic Limit		
	Tare #:	82						88	89	
A	Tare Weight	16.98						17.08	17.27	
B	Wet Soil Weight + A	27.80						23.58	23.45	
C	Dry Soil Weight + A	24.94						22.82	22.72	
D	Water Weight (B-C)	2.86						0.76	0.73	
E	Dry Soil Weight (C-A)	7.96						5.74	5.45	
F	% Moisture (D/E)*100	35.9%						13.2%	13.4%	
N	# OF DROPS	26						*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**13.3%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**36**
Plastic Limit	**13**
Plastic Index	**23**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

Jimmy Hanson	4/28/2018		5/2/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D7928-3
Revision No.: 0
Revision Date: 02/21/17

Particle Size Analysis of Soils

ASTM D6913/D7928

Quality Assurance

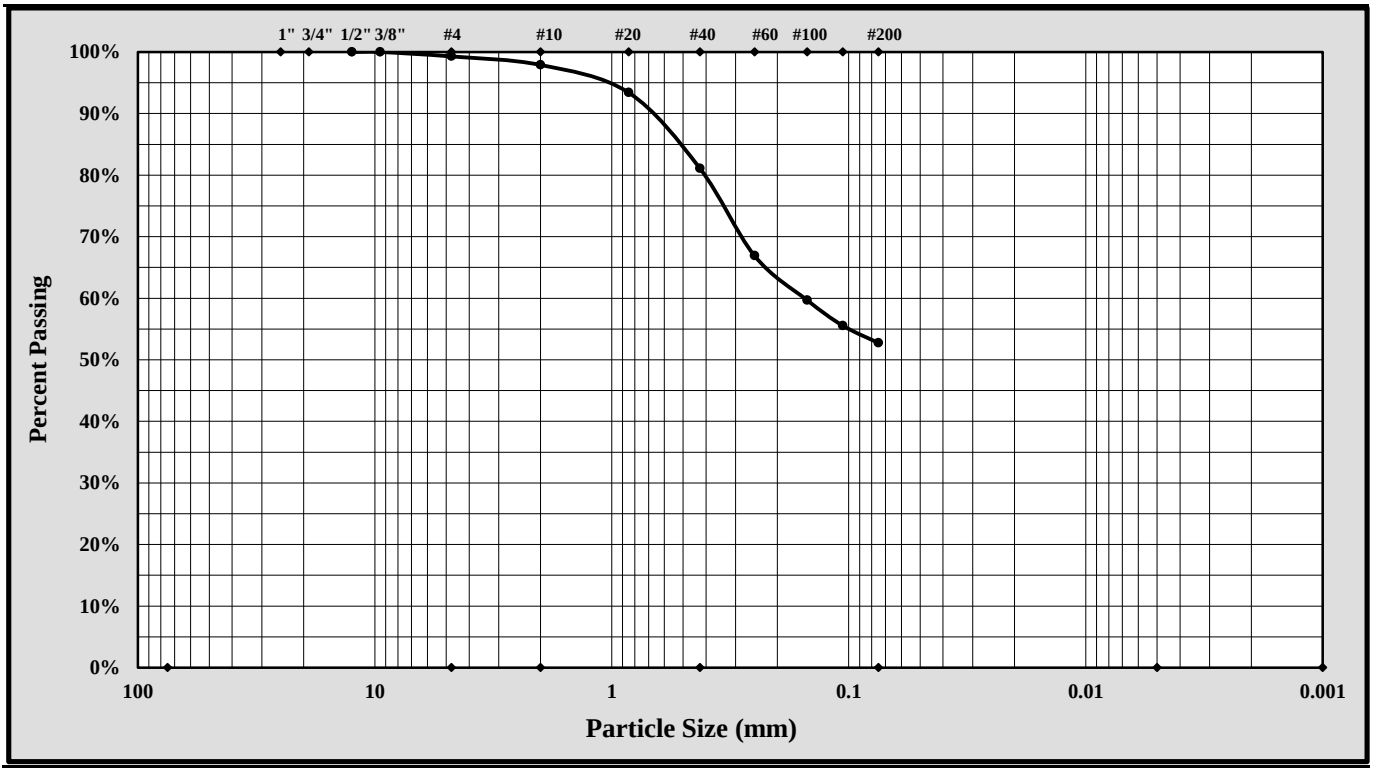
Sample Log No.:

S&ME, Inc., 4350 Rivergreen Parkway, Suite 200, Duluth, GA 30096

S&ME Project #:	1461-16-047.2B	Report Date:	4/23/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/19-4/20/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		

Sample ID:	P-47	Type:	Split Spoon	Sample Date:	Various
Location:	Pavement Boring	Sample No.:	SS-1	Depth:	1.4' - 3.4'

Sample Description: Sandy Lean Clay (CL, A-6 (8))



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:		Gravel:	0.7%
Silt & Clay (% Passing #200):	52.8%	Total Sand:	46.5%
Assumed Specific Gravity:	2.65		

Liquid Limit	36	Plastic Limit	13	Plastic Index	23

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

Description of Sand and Gravel	Rounded	☐	Angular	☐	Hard & Durable	☐	Soft	☐	Weathered & Friable ☐

Sample Prep Method: Moist Prep	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate: 50 g./ Liter

References / Comments / Deviations:

Nathan Price		Laboratory Group Leader	5/2/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

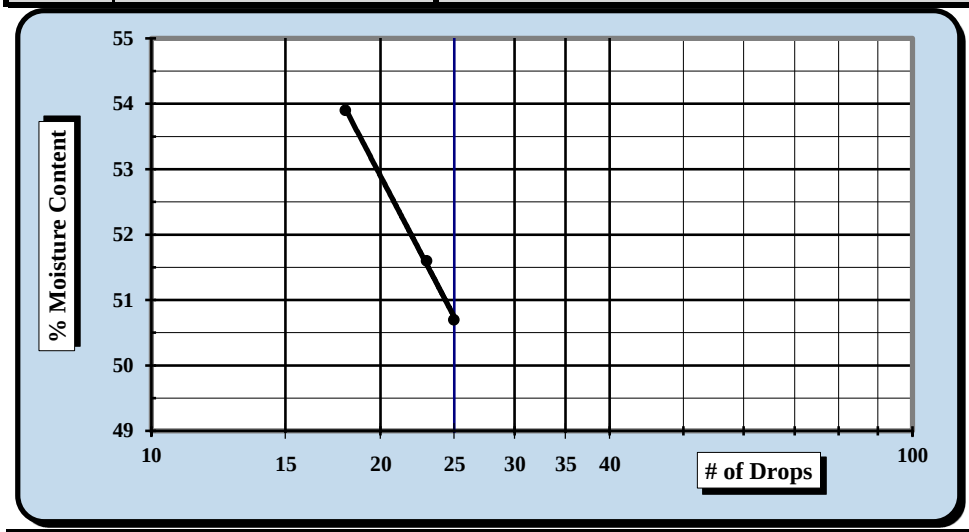
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-16-047.2B	Report Date:	4/25/2018
Project Name:	Carolina Crossroads Project	Test Date(s)	3/7-3/26/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-48	Sample #: SS-1		Sample Date: 2/7/18	
Location:	Pavement Boring	Offset: N/A		Depth: 1.0' - 3.0'	
Sample Description:	Sandy Elastic Silt (MH, A-7-5(8))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/30/2017	Flat Grooving tool	28574	11/10/2017
LL Apparatus	28562	5/12/2017			
Oven	25722	8/18/2017	No. 40 Sieve	21775	1/8/2018

Pan # 602		Liquid Limit						Plastic Limit		
	Tare #:	6	235	31				210	227	
A	Tare Weight	20.56	20.76	20.81				20.92	20.81	
B	Wet Soil Weight + A	29.36	28.16	29.26				28.82	27.28	
C	Dry Soil Weight + A	26.40	25.64	26.30				26.99	25.80	
D	Water Weight (B-C)	2.96	2.52	2.96				1.83	1.48	
E	Dry Soil Weight (C-A)	5.84	4.88	5.49				6.07	4.99	
F	% Moisture (D/E)*100	50.7%	51.6%	53.9%				30.1%	29.7%	
N	# OF DROPS	25	23	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.9%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**51**
Plastic Limit	**30**
Plastic Index	**21**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group Symbol for minus No. 40 sieve portion only.

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Matthew Wolfe	NICET 123218	Matthew F. Cooke, P.G.	5/3/2018
Technician Name	*Certification*	*Technical Responsibility*	*Date*

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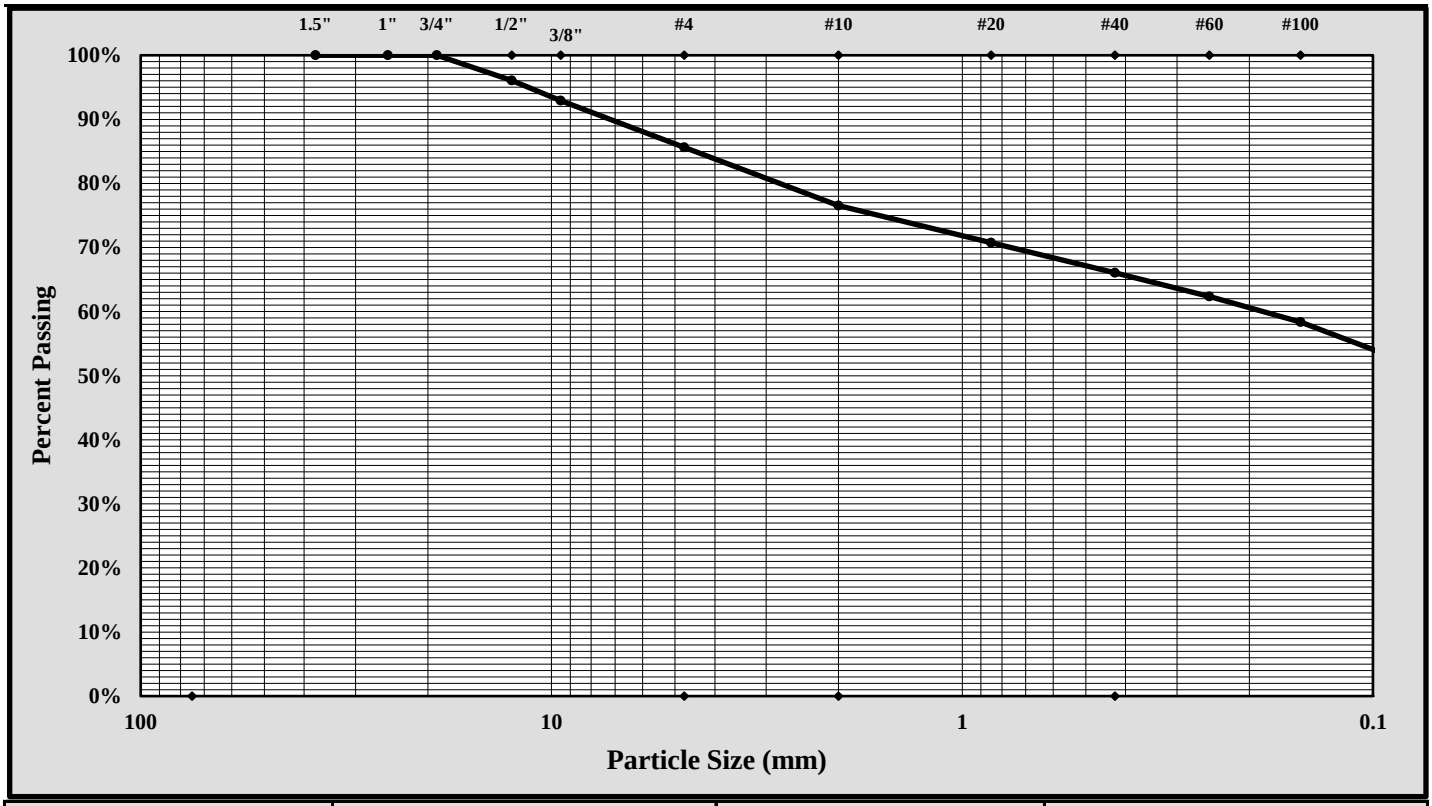
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-16-047.2B	Report Date:	4/25/2018
Project Name:	Carolina Crossroads Project	Test Date(s):	3/1-3/7/2018
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	P-48 Sample #: SS-1	Sample Date:	2/7/18
Location:	Pavement Boring Offset: N/A	Depth:	1.0' - 3.0'
Sample Description:	Sandy Elastic Silt (MH, A-7-5(8))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	1/2-inch	Gravel:	14.4%
Silt & Clay (% Passing #200):	51.1%	Total Sand:	34.6%

Liquid Limit	51	Plastic Limit	30	Plastic Index	21
Coarse Sand:	9.1%	Medium Sand:	10.5%	Fine Sand:	15.0%

Description of Sand and Gravel	Rounded ☐	Angular ☒	Hard & Durable ☒	Soft ☐	Weathered & Friable ☒		

References / Comments / Deviations:

Matthew F. Cooke, P.G.	Project Manager	5/3/2018
Technical Responsibility	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

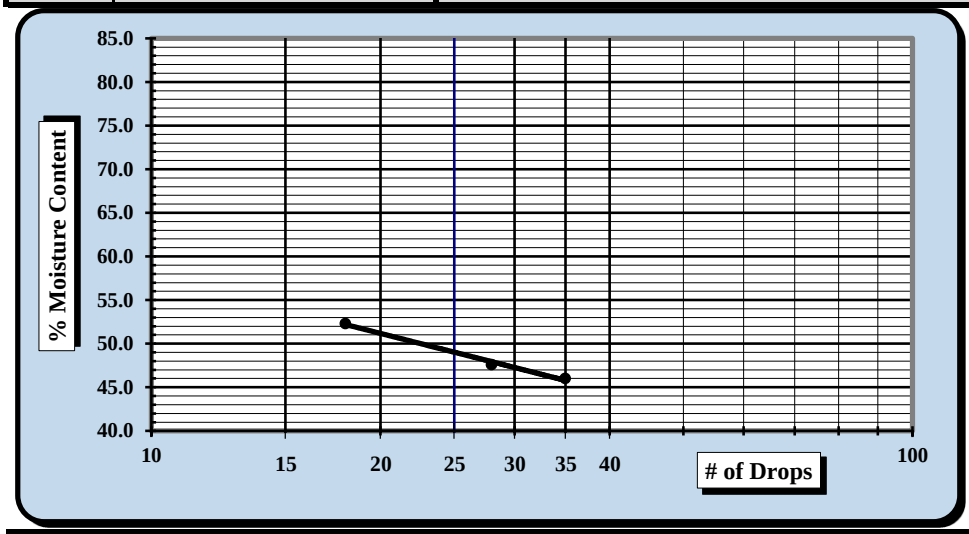
S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-16-047.2B	Report Date:	5-1-2018
Project Name:	Carolina Crossroads Project	Test Date(s)	4/27-4/28/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-49	Sample #: SS-1		Sample Date: Various	
Location:	Pavement Boring	Offset: N/A		Depth: 1.0' - 3.0'	
Sample Description:	Sandy Lean Clay (CL, A-7-6 (9))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	3/17/2017	Grooving tool	26551	2/23/2018
LL Apparatus	31336	2/23/2018	Grooving tool		
Oven	31332	2/20/2018	Grooving tool		

	Pan # 170	Liquid Limit						Plastic Limit		
	Tare #:	20	21	22				23	24	
A	Tare Weight	15.46	15.34	15.43				14.90	15.23	
B	Wet Soil Weight + A	27.40	26.00	26.70				21.91	21.57	
C	Dry Soil Weight + A	23.64	22.56	22.83				20.65	20.42	
D	Water Weight (B-C)	3.76	3.44	3.87				1.26	1.15	
E	Dry Soil Weight (C-A)	8.18	7.22	7.40				5.75	5.19	
F	% Moisture (D/E)*100	46.0%	47.6%	52.3%				21.9%	22.2%	
N	# OF DROPS	35	28	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.1%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**48**
Plastic Limit	**22**
Plastic Index	**26**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☐ Air Dried ☑

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

Jimmy Hanson	4/28/2018		5/1/2018
Technician Name	*Date*	*Technical Responsibility*	*Date*

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Form No: TR-D7928-3
Revision No.: 0
Revision Date: 02/21/17

Particle Size Analysis of Soils

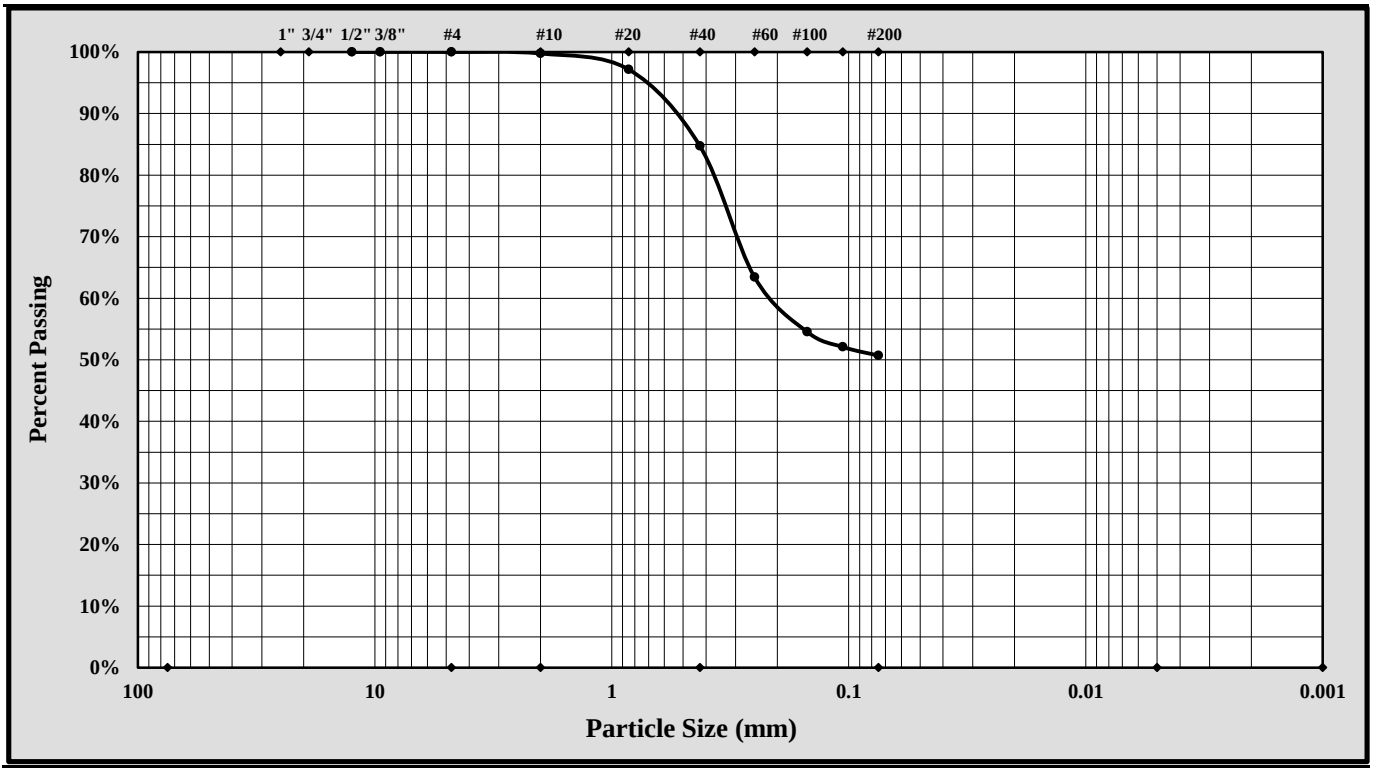
ASTM D6913/D7928

Quality Assurance

Sample Log No.:

S&ME, Inc., 4350 Rivergreen Parkway, Suite 200, Duluth, GA 30096

S&ME Project #:	1461-16-047.2B	Report Date:	4/23/18
Project Name:	Carolina Crossroads Project	Test Date(s):	4/19-4/20/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sample ID:	P-49 Type: Split Spoon	Sample Date:	Various
Location:	Pavement Boring Sample No.: SS-1	Depth:	1.0' - 3.0'
Sample Description:	Sandy Lean Clay (CL, A-7-6 (9))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:		Gravel:	0.0%
Silt & Clay (% Passing #200):	50.7%	Total Sand:	49.3%
Assumed Specific Gravity:	2.65		

Liquid Limit	Plastic Limit	Plastic Index
48	22	26

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

Description of Sand and Gravel	Rounded ☐	Angular ☐	Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
Sample Prep Method: Moist Prep	Dispersion Period:	1 min.	Dispersing Agent:	Sodium Hexametaphosphate:	50 g./ Liter

References / Comments / Deviations:

Nathan Price		Laboratory Group Leader	5/1/2018
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No: TR-D2216-T265-1
Revision No. 1
Revision Date: 08/16/17

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☑ *AASHTO T 265* ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/16/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/08 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Sampled by:	S&ME	Sample Date(s):	2/01 & 2/13/18
Sampling Method:	Split-spoon	Drill Rig:	CME 55/Diedrich D-50

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 13942 Calibration Date: 8/18/17 Oven ID. 13978 Calibration Date: 10/07/17

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture	Note
		ft.		grams	grams	grams	grams	%	
RW-39	SS-2	2.0 - 4.0	BK-5	0.00	63.81	56.43	7.38	13.1%	
RW-39	SS-11	6.0 - 8.0	BK-9	0.00	71.93	61.33	10.60	17.3%	
RW-39	SS-7	18.5 - 20.0	BK-1	0.00	74.21	60.78	13.43	22.1%	
RW-40	SS-2	2.0 - 4.0	BK-11	0.00	73.51	56.18	17.33	30.8%	

Notes / Deviations / References

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Benjamin Kovaleski	Benjamin J. Kovaleski	NICET Lab Level III/117226	3/16/18
Technician Name	*Signature*	*Certification Type / No.*	*Date*
Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/16/18
Technical Responsibility	*Signature*	*Position*	*Date*

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

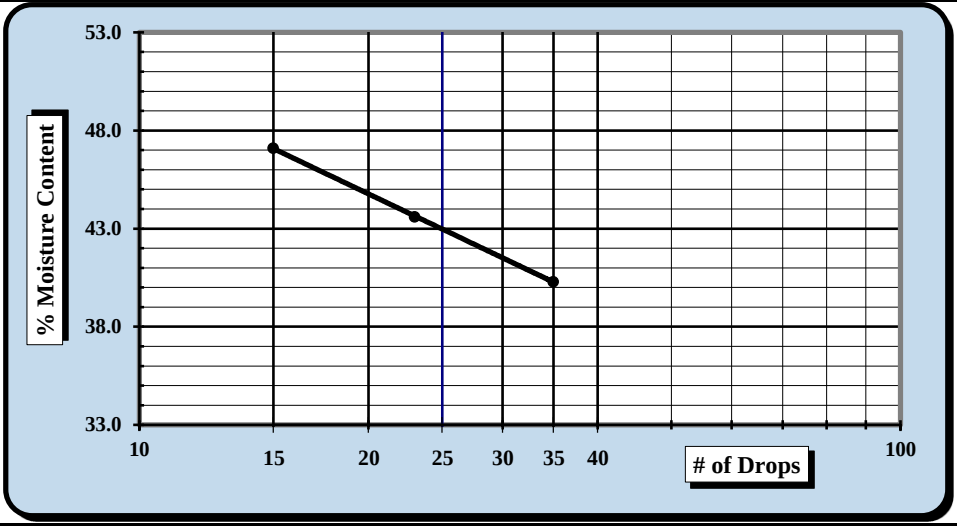
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date:	4/02/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	RW-40	Sample #:	SS-2	Sample Date:	2/13/18
Location:	Embankment Boring	Type:	Split-spoon	Depth:	2.0' - 4.0'
Sample Description:	Silt with Sand (ML, A-7-5(11))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24	25	
A	Tare Weight	28.09	25.67	27.24				25.99	26.81	
B	Wet Soil Weight + A	45.32	39.01	45.44				33.70	33.91	
C	Dry Soil Weight + A	40.37	34.96	39.61				31.84	32.18	
D	Water Weight (B-C)	4.95	4.05	5.83				1.86	1.73	
E	Dry Soil Weight (C-A)	12.28	9.29	12.37				5.85	5.37	
F	% Moisture (D/E)*100	40.3%	43.6%	47.1%				31.8%	32.2%	
N	# OF DROPS	35	23	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**32.0%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**43**
Plastic Limit	**32**
Plastic Index	**11**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/03/18	Matthew F. Cooke, P.G.	4/03/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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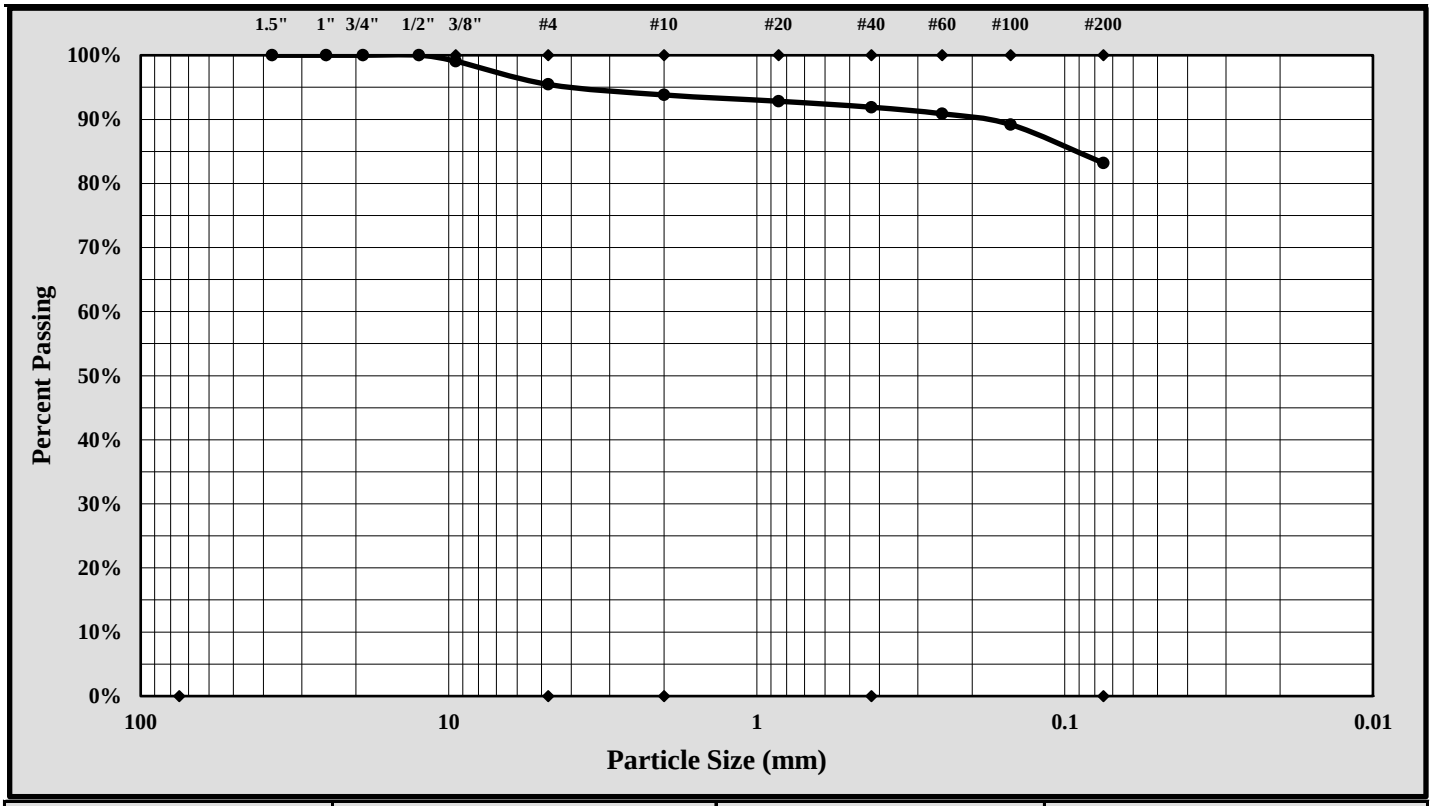
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/23 - 4/02/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	RW-40 Sample #: SS-2	Sample Date:	2/13/18
Location:	Embankment Boring Type: Split-spoon	Depth:	2.0' - 4.0'
Sample Description:	Silt with Sand (ML, A-7-5(11))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	9.50 mm	Gravel:	4.6%
Silt & Clay (% Passing #200):	83.2%	Total Sand:	12.3%

Liquid Limit	43	Plastic Limit	32	Plastic Index	11
Coarse Sand:	1.6%	Medium Sand:	1.9%	Fine Sand:	8.7%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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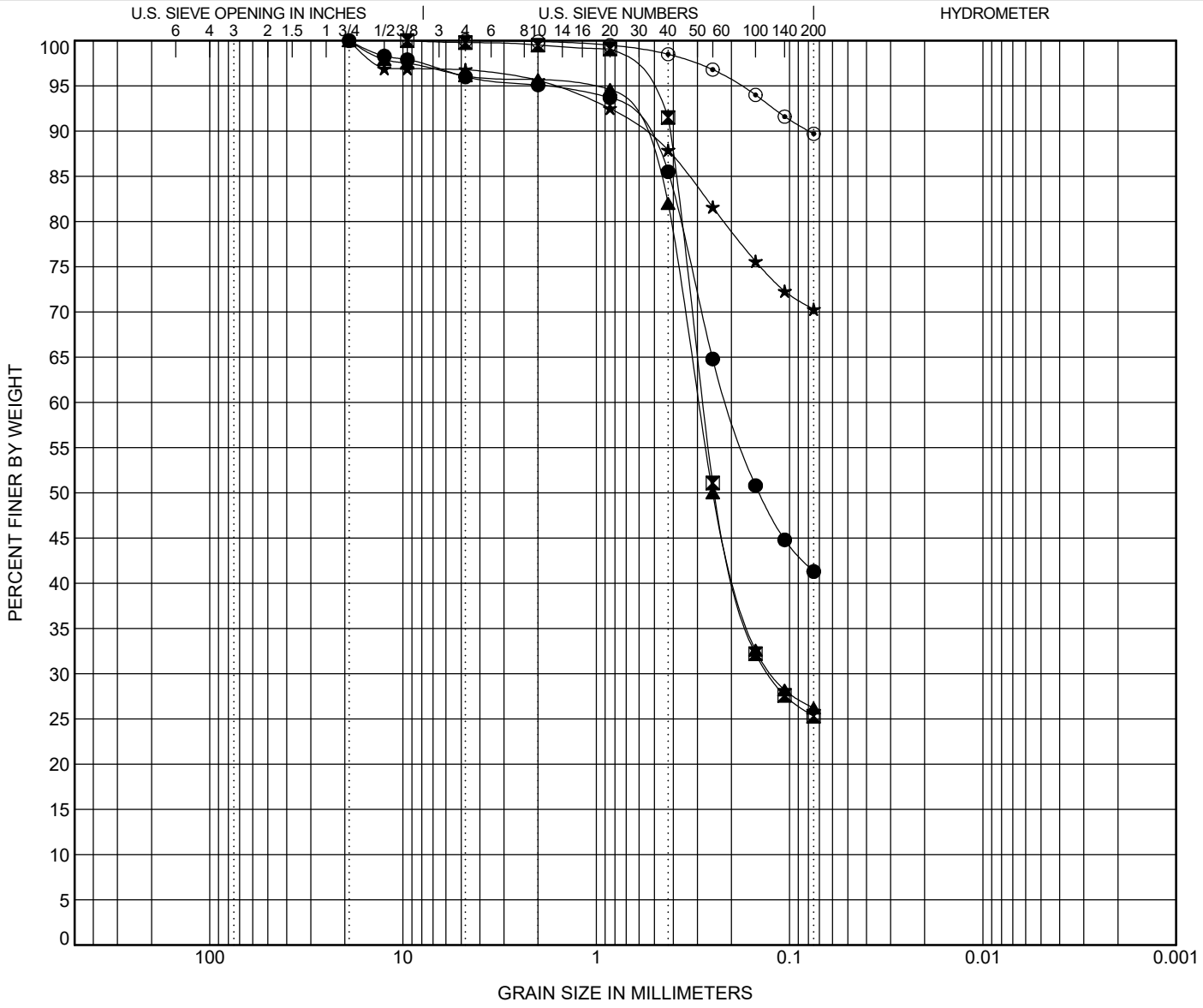
GRAIN SIZE DISTRIBUTION

INFRASTRUCTURE CONSULTING & ENGINEERING

PROJECT ID P027662 **PROJECT NAME** Carolina Crossroads Phase 3

PROJECT COUNTY Richland



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	G- 18A	0.0	SILTY SAND(SM)	NP	NP	NP		
⊠	G- 18A	6.0	SILTY SAND(SM)	NP	NP	NP		
▲	G- 18A	8.0	SILTY SAND(SM)	NP	NP	NP		
★	G- 27	28.0	SILT with SAND(ML)	NP	NP	NP		
⊙	G- 27	30.0	LEAN CLAY(CL)	25	16	9		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	G- 18A	0.0	19	0.21			4.0	54.7	41.3	
⊠	G- 18A	6.0	9.5	0.281	0.127		0.2	74.5	25.3	
▲	G- 18A	8.0	19	0.295	0.122		3.9	69.9	26.2	
★	G- 27	28.0	19				3.2	26.5	70.3	
⊙	G- 27	30.0	4.75				0.0	10.3	89.7	

GRAIN SIZE_CCR3_PURSUIT_BH.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 2/5/24

GRAIN SIZE DISTRIBUTION

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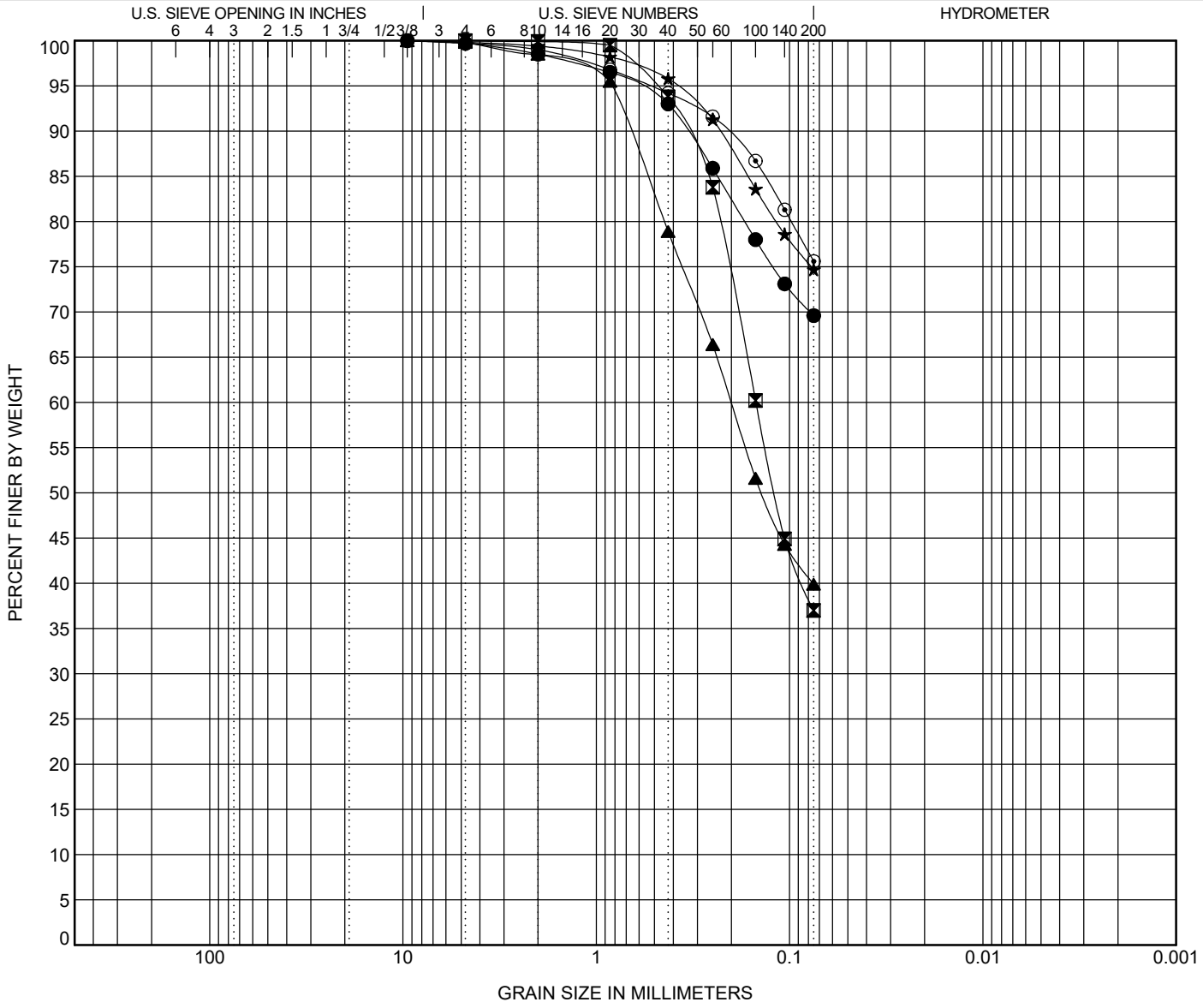
PROJECT COUNTY Richland



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	G- 44	2.0	SANDY SILT(ML)	NP	NP	NP		
⊠	G- 44	8.0	SILTY SAND(SM)	NP	NP	NP		
▲	G- 44	10.0	SILTY SAND(SM)	NP	NP	NP		
★	G- 46	2.0	LEAN CLAY with SAND(CL)	32	23	9		
⊙	G- 46	4.0	LEAN CLAY with SAND(CL)	34	18	16		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	G- 44	2.0	9.5				0.3	30.1	69.6	
⊠	G- 44	8.0	4.75	0.149			0.0	63.0	37.0	
▲	G- 44	10.0	9.5	0.2			0.2	59.9	39.9	
★	G- 46	2.0	9.5				0.2	25.1	74.7	
⊙	G- 46	4.0	9.5				0.3	24.1	75.6	

GRAIN SIZE_CCR3_PURSUIT_BH.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 2/5/24

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PROJECT ID P027662 **PROJECT NAME** Carolina Crossroads Phase 3

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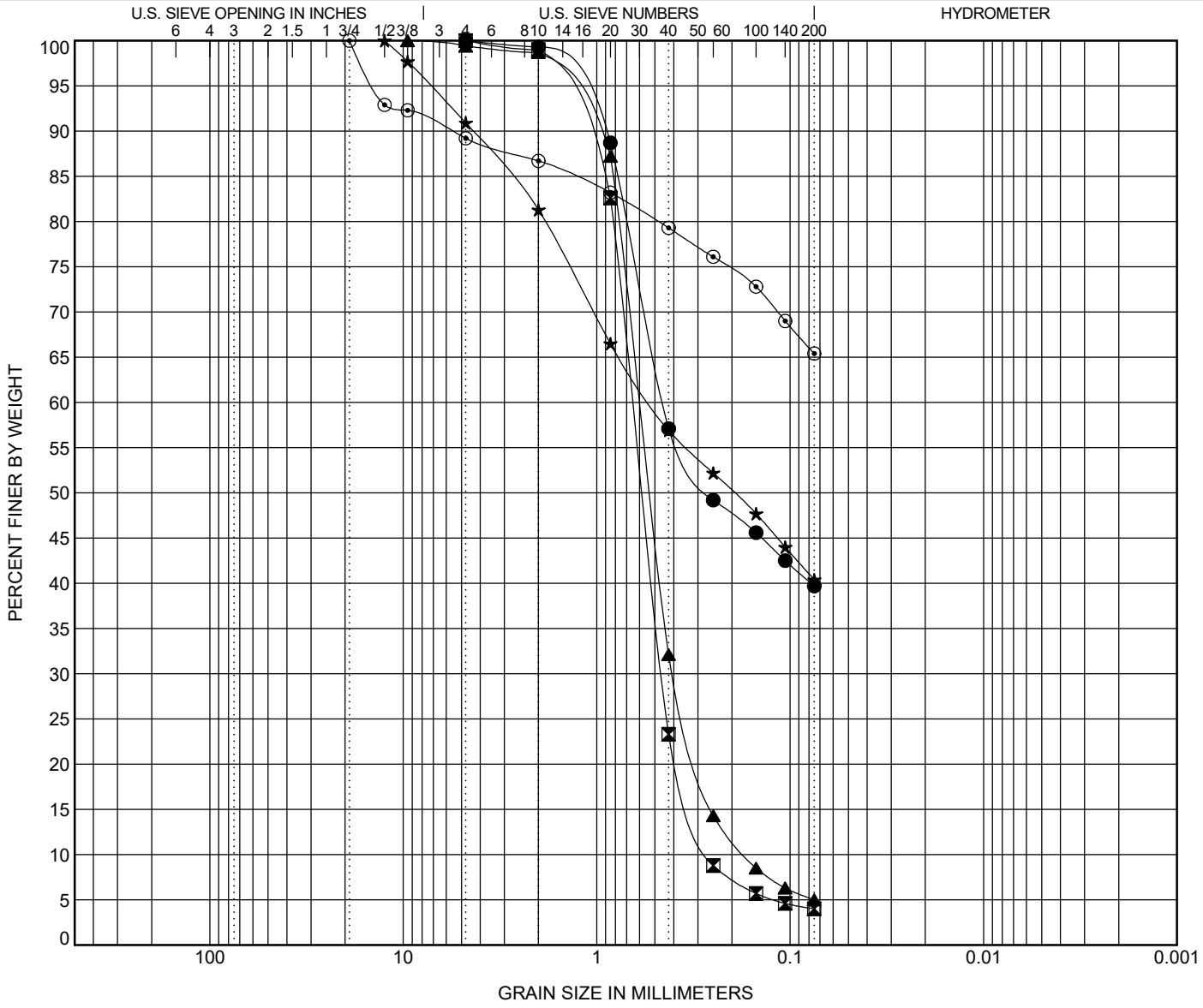

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	G- 46	8.0	CLAYEY SAND(SC)	28	18	10		
⊠	G- 46	10.0	POORLY GRADED SAND(SP)	NP	NP	NP	1.24	2.50
▲	G- 46	12.0	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.54	3.53
★	G- 46	16.0	SILTY SAND(SM)	NP	NP	NP		
⊙	G- 49	0.0	SANDY LEAN CLAY(CL)	39	21	18		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	G- 46	8.0	4.75	0.453			0.0	60.3	39.7	
⊠	G- 46	10.0	4.75	0.653	0.46	0.261	0.0	96.0	4.0	
▲	G- 46	12.0	9.5	0.604	0.399	0.171	0.6	94.4	5.0	
★	G- 46	16.0	12.5	0.532			9.1	50.5	40.4	
⊙	G- 49	0.0	19				10.8	23.8	65.4	

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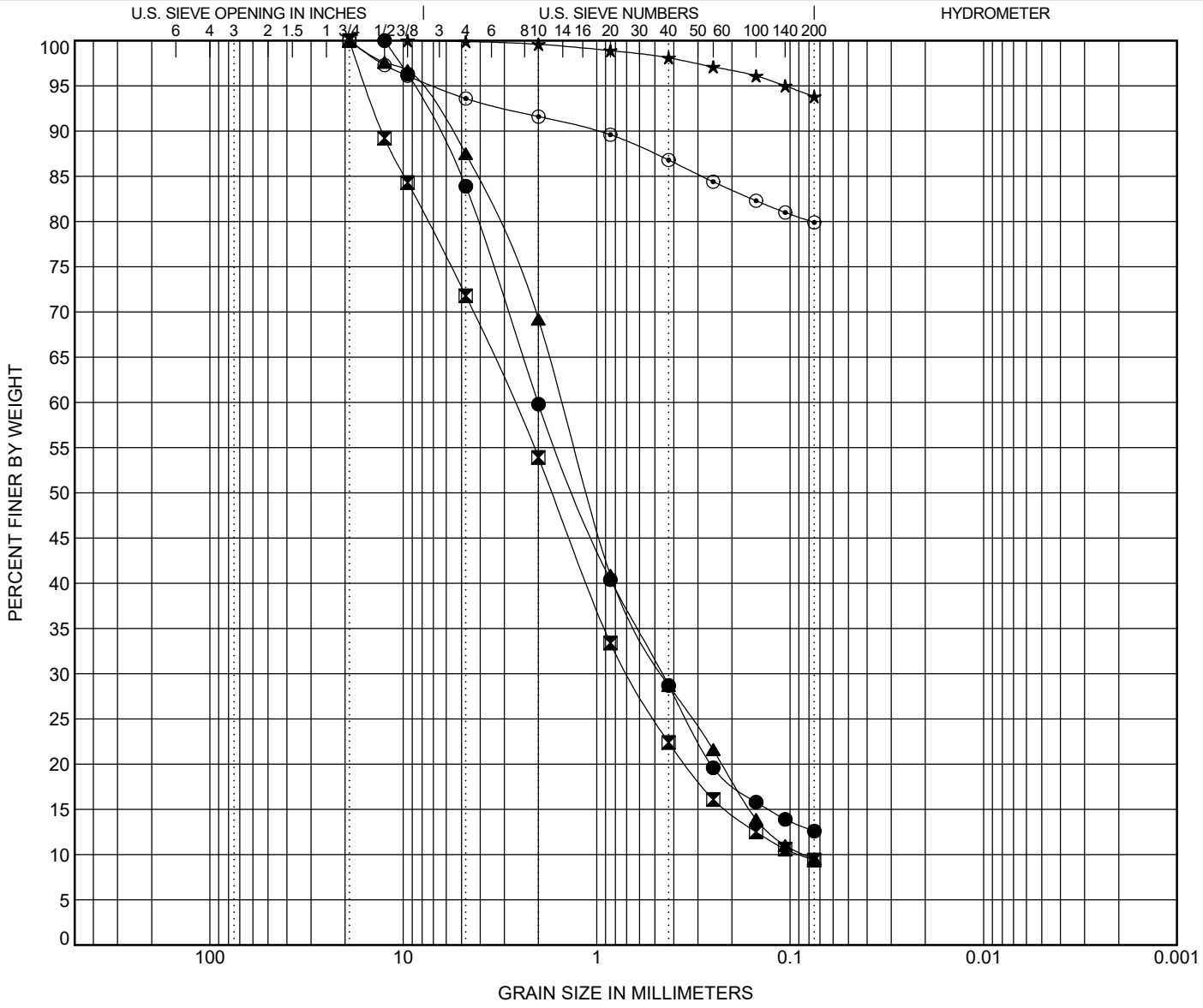


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	G- 49	6.0	SILTY SAND with GRAVEL(SM)	NP	NP	NP		
⊠	G- 49	8.0	WELL-GRADED SAND with SILT and GRAVEL(SW-SM)	NP	NP	NP	1.97	30.12
▲	G- 49	10.0	WELL-GRADED SAND with SILT(SW-SM)	NP	NP	NP	1.64	17.99
★	G- 56	8.0	FAT CLAY(CH)	75	26	49		
⊙	G- 56	10.0	FAT CLAY with SAND(CH)	70	24	46		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	G- 49	6.0	12.5	2.014	0.459		16.1	71.3	12.6	
⊠	G- 49	8.0	19	2.686	0.686	0.089	28.2	62.4	9.4	
▲	G- 49	10.0	19	1.514	0.458	0.084	12.5	78.0	9.5	
★	G- 56	8.0	9.5				0.1	6.1	93.8	
⊙	G- 56	10.0	19				6.4	13.7	79.9	

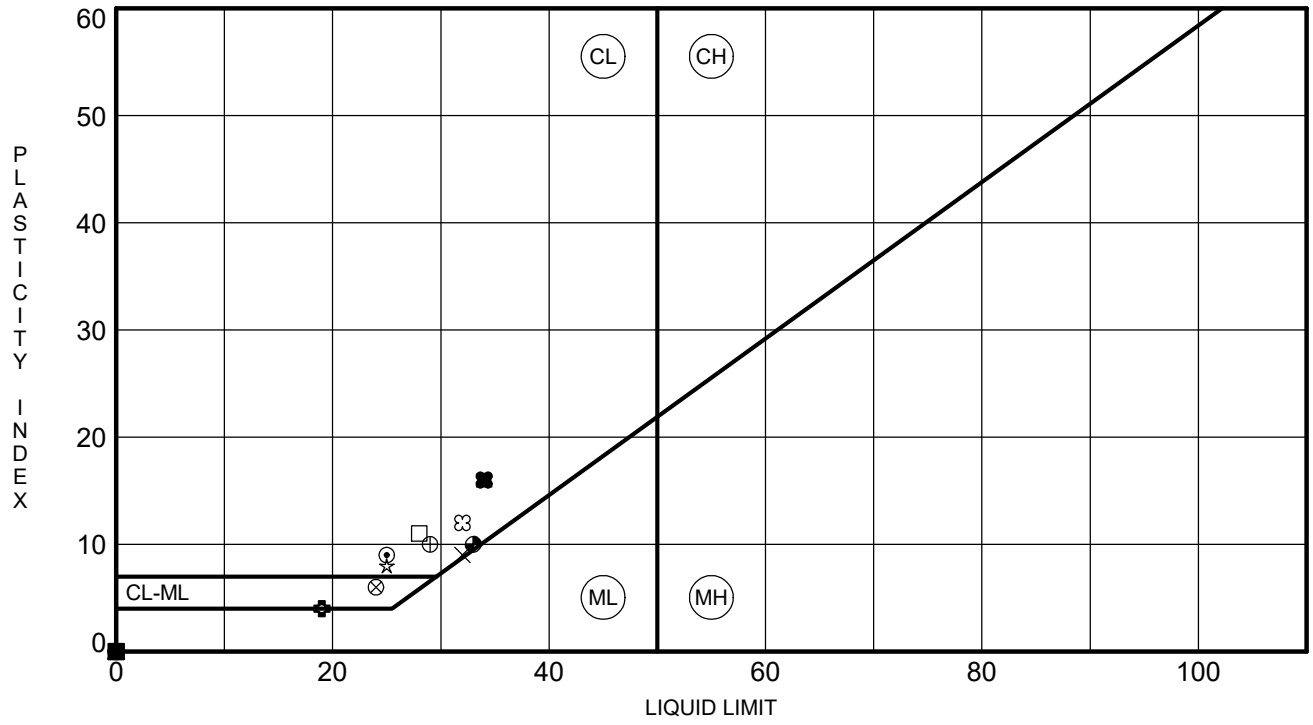
GRAIN SIZE_CCR3_PURSUIT_BH.GPJ_SCDOT DATA TEMPLATE_01_30_2015.GDT 2/5/24

ATTERBERG LIMITS' RESULTS

INFRASTRUCTURE CONSULTING & ENGINEERING

PROJECT ID P027662 **PROJECT NAME** Carolina Crossroads Phase 3

PROJECT COUNTY Richland



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	G- 18A	0.0	NP	NP	NP	41	SILTY SAND(SM)
⊠	G- 18A	6.0	NP	NP	NP	25	SILTY SAND(SM)
▲	G- 18A	8.0	NP	NP	NP	26	SILTY SAND(SM)
★	G- 27	28.0	NP	NP	NP	70	SILT with SAND(ML)
⊙	G- 27	30.0	25	16	9	90	LEAN CLAY(CL)
✿	G- 27	33.5	19	15	4	37	SILTY, CLAYEY SAND(SC-SM)
○	G- 31	4.0	NP	NP	NP	65	SANDY SILT(ML)
△	G- 31	6.0	34	18	16	54	SANDY LEAN CLAY(CL)
⊗	G- 36	8.0	24	18	6	73	SILTY CLAY with SAND(CL-ML)
⊕	G- 36	10.0	29	19	10	63	SANDY LEAN CLAY(CL)
□	G- 36	12.0	28	17	11	59	SANDY LEAN CLAY(CL)
❀	G- 36	14.0	NP	NP	NP	51	SANDY SILT(ML)
◕	G- 43	6.0	33	23	10	61	SANDY LEAN CLAY(CL)
☆	G- 43	8.0	25	17	8	61	SANDY LEAN CLAY(CL)
⊠	G- 43	10.0	32	20	12	64	SANDY LEAN CLAY(CL)
■	G- 44	2.0	NP	NP	NP	70	SANDY SILT(ML)
◆	G- 44	8.0	NP	NP	NP	37	SILTY SAND(SM)
◇	G- 44	10.0	NP	NP	NP	40	SILTY SAND(SM)
×	G- 46	2.0	32	23	9	75	LEAN CLAY with SAND(CL)
✖	G- 46	4.0	34	18	16	76	LEAN CLAY with SAND(CL)

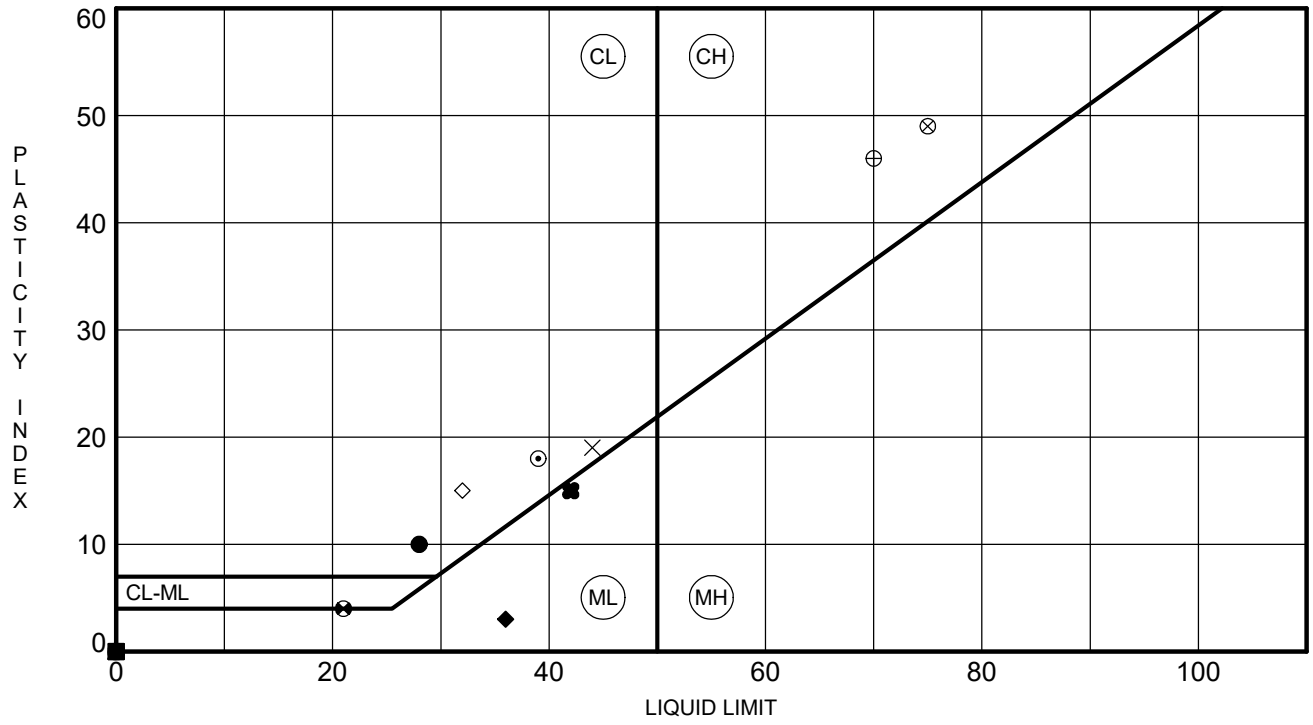
ATTERBERG LIMITS CCR3_PURSUIT_BH.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 2/5/24

ATTERBERG LIMITS' RESULTS

INFRASTRUCTURE CONSULTING & ENGINEERING

PROJECT ID P027662 **PROJECT NAME** Carolina Crossroads Phase 3

PROJECT COUNTY Richland



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	G- 46	8.0	28	18	10	40	CLAYEY SAND(SC)
⊠	G- 46	10.0	NP	NP	NP	4	POORLY GRADED SAND(SP)
▲	G- 46	12.0	NP	NP	NP	5	POORLY GRADED SAND with SILT(SP-SM)
★	G- 46	16.0	NP	NP	NP	40	SILTY SAND(SM)
⊙	G- 49	0.0	39	21	18	65	SANDY LEAN CLAY(CL)
✿	G- 49	6.0	NP	NP	NP	13	SILTY SAND with GRAVEL(SM)
○	G- 49	8.0	NP	NP	NP	9	WELL-GRADED SAND with SILT and GRAVEL(SW-SM)
△	G- 49	10.0	NP	NP	NP	10	WELL-GRADED SAND with SILT(SW-SM)
⊗	G- 56	8.0	75	26	49	94	FAT CLAY(CH)
⊕	G- 56	10.0	70	24	46	80	FAT CLAY with SAND(CH)
□	G- 94	8.0	NP	NP	NP	77	SILT with SAND(ML)
⊛	G- 94	10.0	21	17	4	88	SILTY CLAY(CL-ML)
◕	G- 94	14.0	NP	NP	NP	50	SILTY SAND with GRAVEL(SM)
☆	G-108	6.0	NP	NP	NP	62	SANDY SILT(ML)
⊠	G-108	8.0	NP	NP	NP	55	SANDY SILT(ML)
■	G-108	10.0	NP	NP	NP	58	SANDY SILT(ML)
◆	G-130	0.0	36	33	3	61	SANDY SILT(ML)
◇	G-130	2.0	32	17	15	58	SANDY LEAN CLAY(CL)
×	G-133	0.0	44	25	19	73	LEAN CLAY with SAND(CL)
✖	G-136	0.0	42	27	15	61	SANDY SILT(ML)

ATTERBERG LIMITS CCR3_PURSUIT_BH.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 2/5/24

Soil Analysis Lab Results

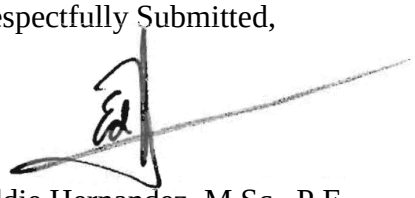
Client: S&ME, Inc
Job Name: Carolina Crossroads Project
Client Job Number: 1461-16-047
Project X Job Number: S180308B
March 13, 2018

	Method	ASTM G187		ASTM D516		ASTM D512B		ASTM G51
Bore# / Description	**Depth**	**Resistivity** As Rec'd	**Resistivity** Minimum	**Sulfates**		**Chlorides**		**pH**
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	
SS-3, SS-5 - DH-4	4.0-10.0	60,300	17,420	21	0.0021	9	0.0009	7.68
SS-5, SS-6, SS-7 - DH-5	8.2-20.0	4,154	3,953	60	0.0060	75	0.0075	7.34
SS-5, SS-6 - DH-6	8.3-15.0	30,820	8,710	30	0.0030	33	0.0033	7.12
SS-6, SS-7 - B-29	14.5-21.0	7,370	7,370	9	0.0009	12	0.0012	7.83
SS-11, SS-12 - B-30	38.5-45.0	1,943	1,943	120	0.0120	120	0.0120	7.87
SS-8, SS-9 - B-34	23.5-30.0	8,040	8,040	3	0.0003	9	0.0009	7.15
SS-11, SS-13 - B-36	38.5-50.0	3,752	3,484	18	0.0018	24	0.0024	7.18
SS-5, SS-6 - B-41	8.8-15.0	19,430	16,750	9	0.0009	24	0.0024	7.25
SS-3, SS-4 - B-43	18.8-22.8	3,417	3,283	90	0.0090	300	0.0300	6.75
SS-9, SS-10 - B-47	29.5-36.0	12,730	10,050	60	0.0060	138	0.0138	7.15
SS-11, SS-12 - B-50	38.5-45.0	54,270	50,920	15	0.0015	3	0.0003	7.18
SS-3, SS-4 - B-51	4.0-8.0	61,640	46,230	6	0.0006	12	0.0012	6.81
SS-10, SS-11 - B-52	33.5-40.0	50,920	36,180	21	0.0021	6	0.0006	6.57
SS-10, SS-11 - B-53	33.5-40.0	63,650	47,570	3	0.0003	6	0.0006	6.55
SS-7, SS-8 - B-55	18.5-25.0	33,500	30,150	12	0.0012	9	0.0009	6.31
SS-4, SS-5 - B-57	6.1-10.1	16,080	15,410	18	0.0018	6	0.0006	5.68
SS-5, SS-6 - B-59	8.3-15.0	120,600	87,100	15	0.0015	9	0.0009	5.86

Unk = Unknown
NT = Not Tested
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Respectfully Submitted,



Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

APPENDIX

SECTION 5 LABORATORY TEST RESULTS

SECTION 5B ROCK SAMPLES

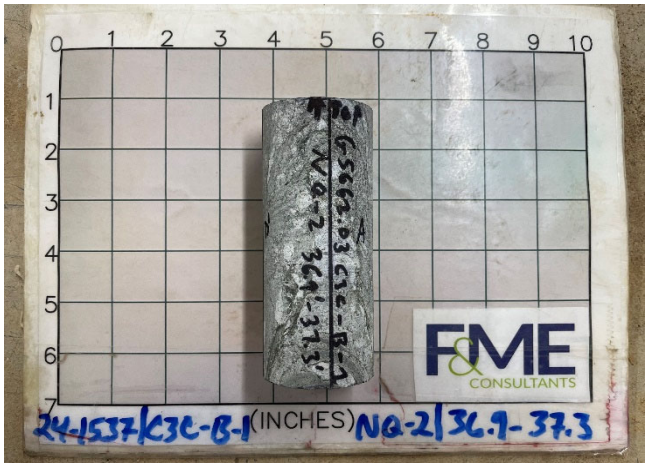
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	4.62	Reviewed By	WJG
Boring	C3C-B1	Unit Weight (pcf)	173.7	Core Size	NQ
Sample No.	NQ-2 / 24-1537	L/D Ratio	2.47	Recovery	91%
Depth	36.9' - 37.3'	Load Rate (psi/sec)	20	RQD	78%
Description	Black Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^6 (psi)	Poisson's Ratio
10%	-162	23	1,877	683	8.43	0.14
20%	-450	64	3,760	1,369	6.09	0.14
30%	-739	99	5,632	2,051	5.55	0.13
40%	-1072	141	7,510	2,735	5.10	0.13
50%	-1446	180	9,390	3,419	4.73	0.12
60%	-1905	229	11,258	4,099	4.30	0.12
70%	-2405	273	13,147	4,787	3.98	0.11
80%	-3840	369	15,019	5,469	2.85	0.10
90%	-6147	517	16,897	6,152	2.00	0.08
100%	-22582	396	18,774	6,836		

Sample Photos

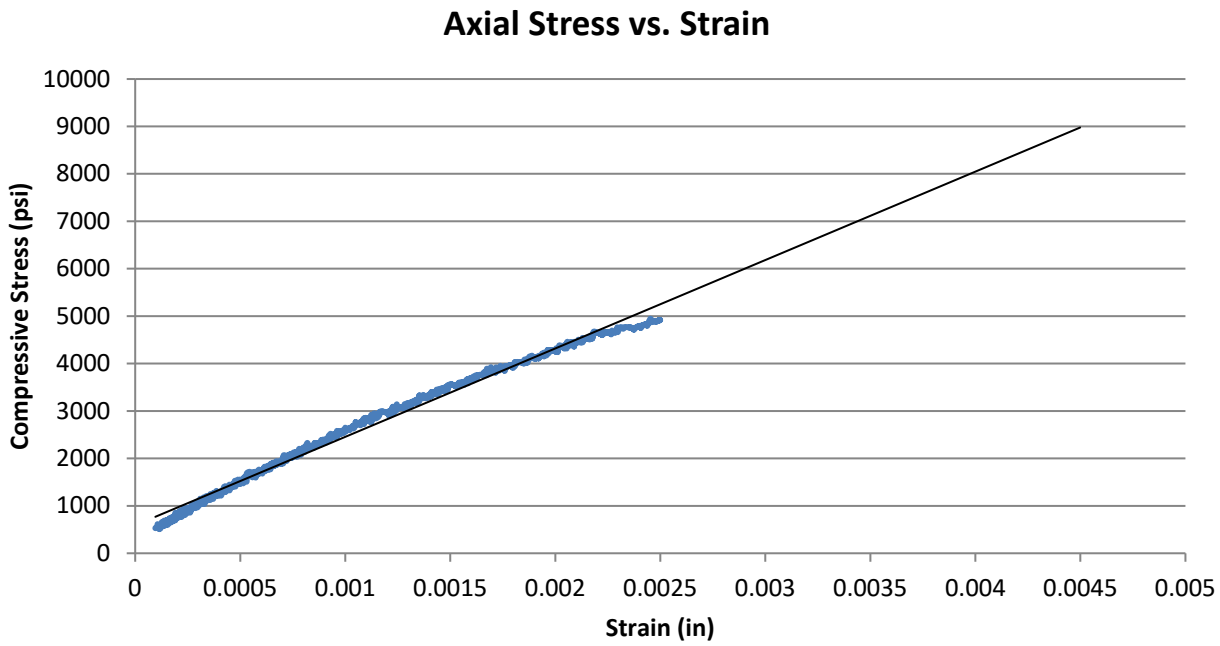


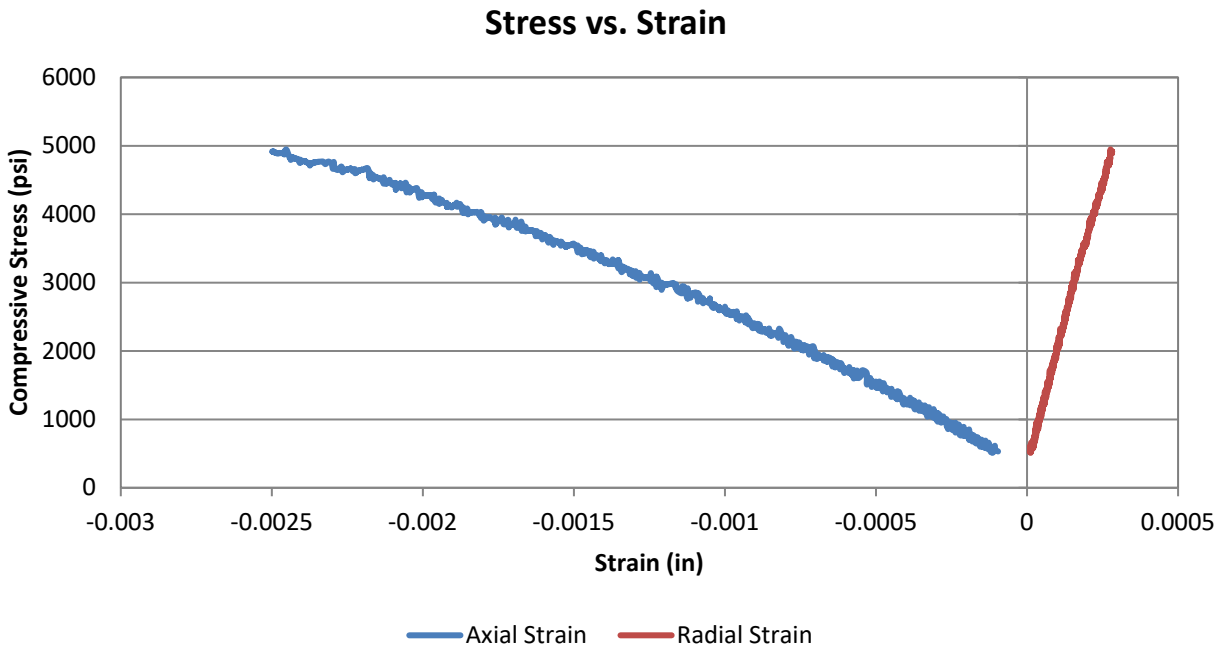
Test Results

Unconfined Compressive Strength (psi)	**6,840**	Elastic Modulus (psi)	5.02E+06
		Poisson's Ratio in Elastic Range	0.13
Comments	Elastic range was taken as between 0.0005 and 0.002 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	4.62	Reviewed By	WJG
Boring	C3C-B1	Unit Weight (pcf)	173.7	Core Size	NQ
Sample No.	NQ-2 / 24-1537	L/D Ratio	2.47	Recovery	91%
Depth	36.9' - 37.3'	Load Rate (psi/sec)	20	RQD	78%
Description	Black Phyllite				





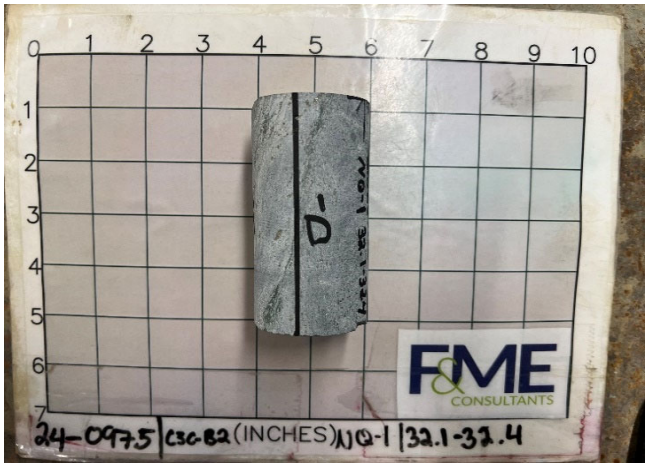
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

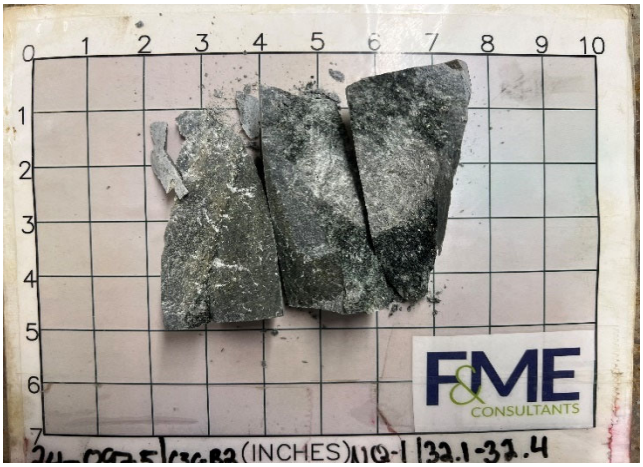
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.897	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.765	Reviewed By	WAP
Boring	C3C-B2	Unit Weight (pcf)	159.4	Core Size	NQ
Sample No.	NQ-1 / 24-0975	L/D Ratio	1.98	Recovery	61%
Depth	32.1' - 32.4'	Load Rate (psi/sec)	20	RQD	34%
Description	Dark Bluish Gray Phyllite w/ Quartz and Feldspar Xenoliths				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	-309	107	2,009	721	4.60	0.35
20%	-633	564	4,015	1,442	4.48	0.89
30%	-978	836	6,032	2,166	4.37	0.85
40%	-1284	1088	8,029	2,883	4.43	0.85
50%	-1679	1450	10,056	3,611	4.24	0.86
60%	-2171	1954	12,091	4,342	3.94	0.90
70%	-2834	2581	14,071	5,053	3.51	0.91
80%	-3298	3102	16,086	5,776	3.45	0.94
90%	-3789	3669	18,097	6,499	3.38	0.97
100%	-5352	5960	20,108	7,221		

Sample Photos





Test Results

Unconfined Compressive Strength (psi)	**7,220**	Elastic Modulus (psi)	4.20E+06
		Poisson's Ratio in Elastic Range	0.87
Comments	Elastic range was taken as between 0.001 and 0.0025 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range. Poisson's Ratio is outside the anticipated range and should be used with care.		

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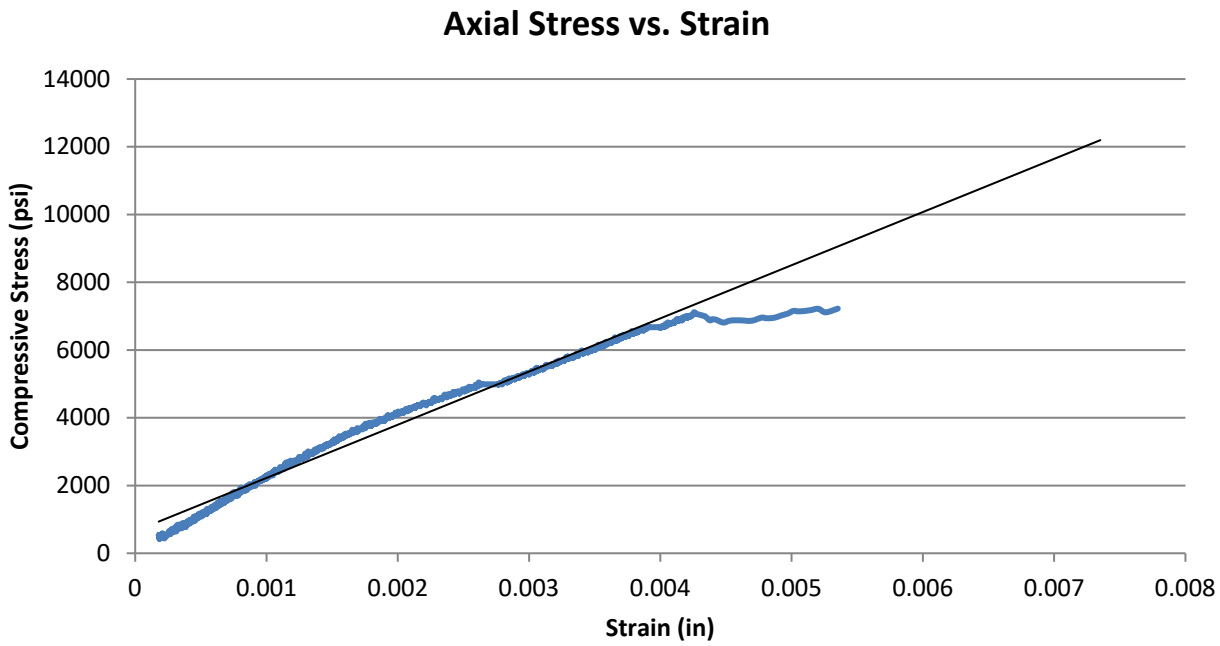
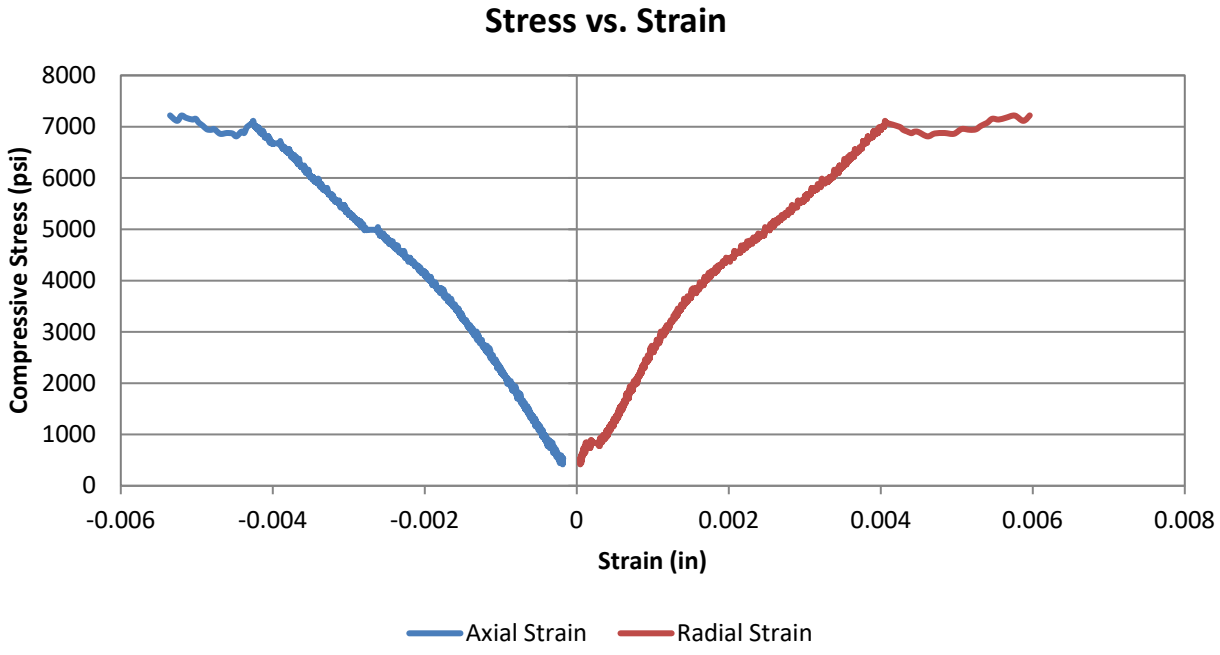
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.897	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.765	Reviewed By	WAP
Boring	C3C-B2	Unit Weight (pcf)	159.4	Core Size	NQ
Sample No.	NQ-1 / 24-0975	L/D Ratio	1.98	Recovery	61%
Depth	32.1' - 32.4'	Load Rate (psi/sec)	20	RQD	34%
Description	Dark Bluish Gray Phyllite w/ Quartz and Feldspar Xenoliths				





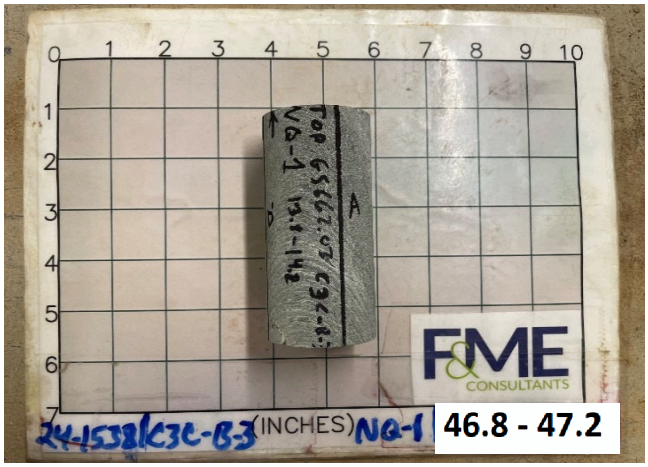
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

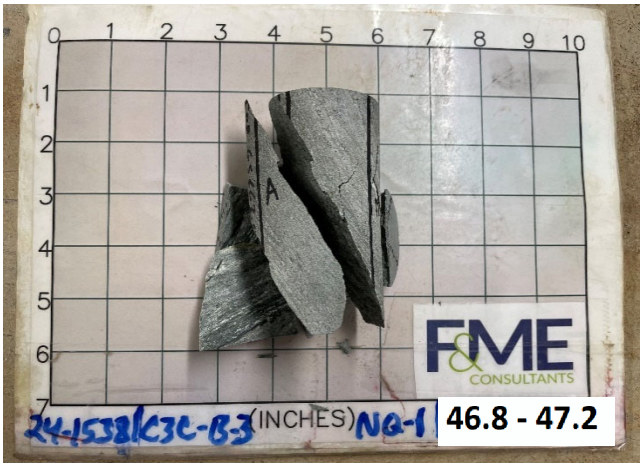
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.866	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	3.915	Reviewed By	WJG
Boring	C3C-B3	Unit Weight (pcf)	170.6	Core Size	NQ
Sample No.	NQ-1 / 24-1538	L/D Ratio	2.10	Recovery	86%
Depth	46.8' - 47.2'	Load Rate (psi/sec)	20	RQD	73%
Description	Black Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%	-456	51	2,355	861	3.78	0.11
30%	-817	97	3,524	1,289	3.15	0.12
40%	-1324	172	4,715	1,724	2.61	0.13
50%	-1827	260	5,886	2,152	2.36	0.14
60%	-2407	383	7,060	2,582	2.14	0.16
70%	-3118	577	8,241	3,013	1.93	0.18
80%	-3849	818	9,420	3,444	1.79	0.21
90%	-4717	1138	10,597	3,875	1.64	0.24
100%	-5671	1483	11,774	4,305		

Sample Photos



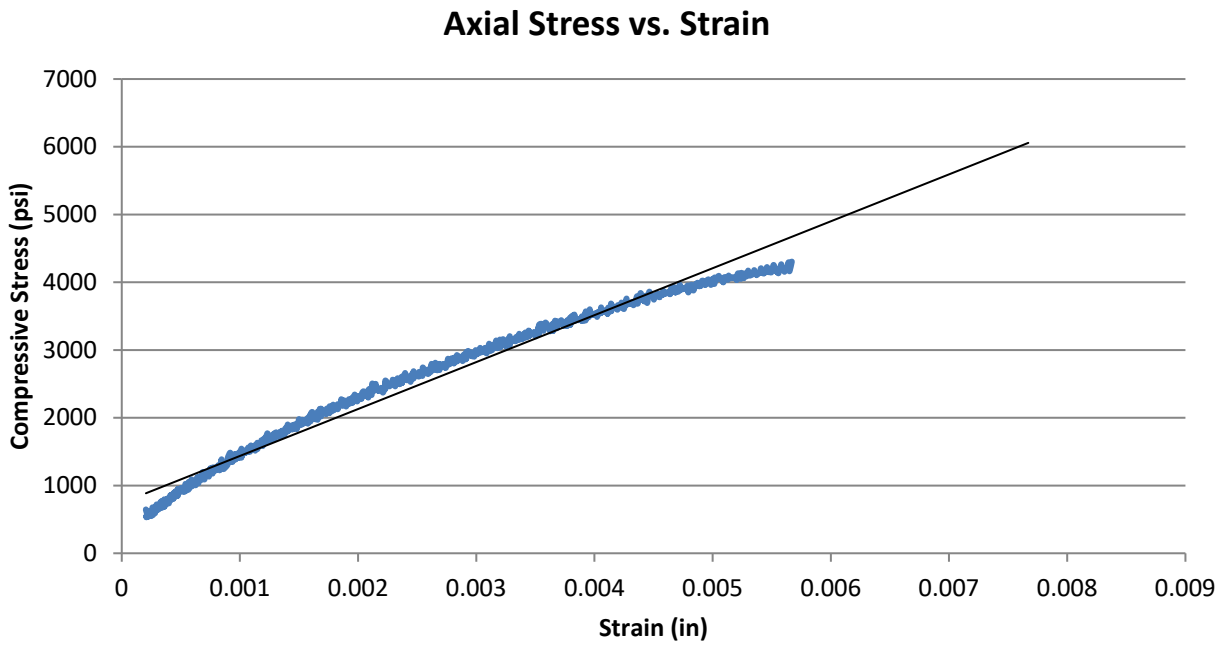


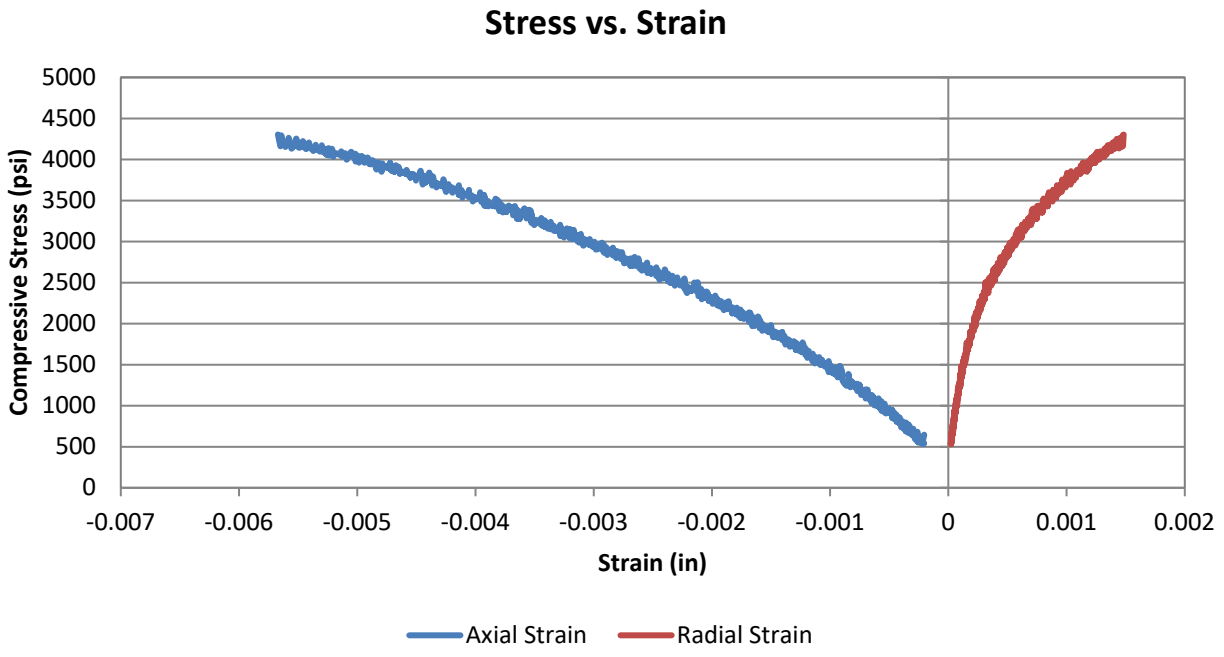
Test Results

Unconfined Compressive Strength (psi)	**4,310**	Elastic Modulus (psi)	2.36E+06
		Poisson's Ratio in Elastic Range	0.15
Comments	Elastic range was taken as between 0.001 and 0.003 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.866	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	3.915	Reviewed By	WJG
Boring	C3C-B3	Unit Weight (pcf)	170.6	Core Size	NQ
Sample No.	NQ-1 / 24-1538	L/D Ratio	2.10	Recovery	86%
Depth	46.8' - 47.2'	Load Rate (psi/sec)	20	RQD	73%
Description	Black Phyllite				





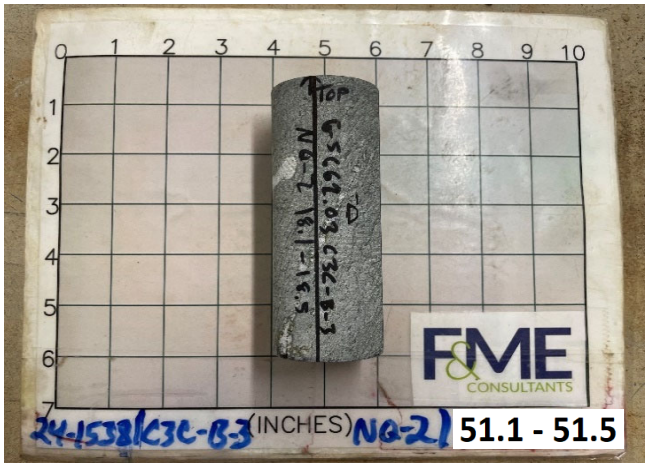
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.873	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	4.612	Reviewed By	WJG
Boring	C3C-B3	Unit Weight (pcf)	174.5	Core Size	NQ
Sample No.	NQ-2 / 24-1538	L/D Ratio	2.46	Recovery	100%
Depth	51.1' - 51.5'	Load Rate (psi/sec)	20	RQD	80%
Description	Black Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%	-403	42	2,759	1,002	4.97	0.10
30%	-613	60	4,126	1,498	4.88	0.10
40%	-885	82	5,519	2,003	4.53	0.09
50%	-1156	102	6,901	2,505	4.33	0.09
60%	-1427	125	8,291	3,009	4.22	0.09
70%	-1687	148	9,661	3,506	4.16	0.09
80%	-1969	174	11,039	4,007	4.07	0.09
90%	-2258	203	12,419	4,507	3.99	0.09
100%	-2549	237	13,799	5,008		

Sample Photos



Test Results

Unconfined Compressive Strength (psi)	**5,010**	Elastic Modulus (psi)	4.36E+06
		Poisson's Ratio in Elastic Range	0.09
Comments	Elastic range was taken as between 0.0005 and 0.002 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

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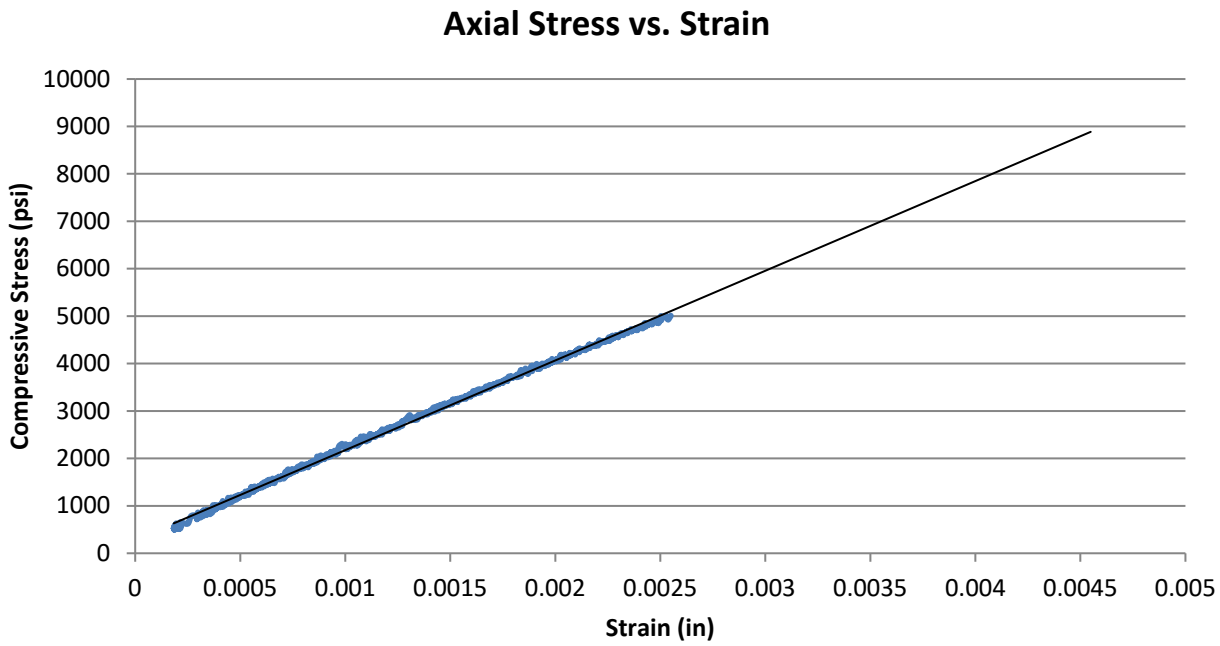
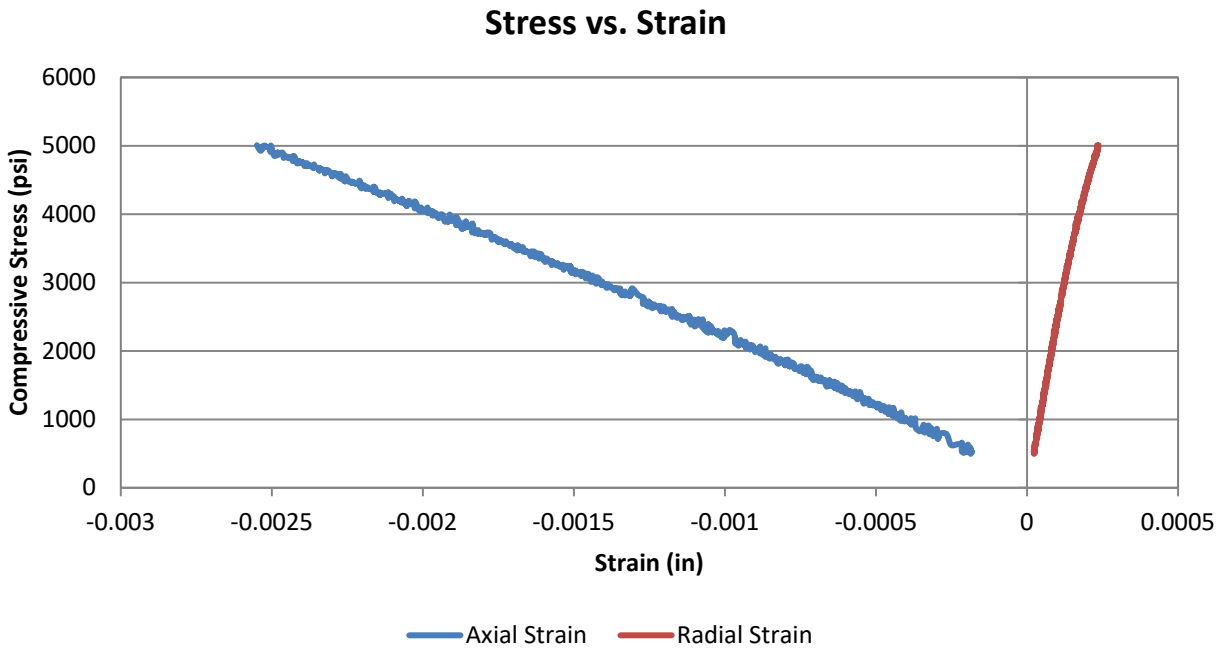
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/20/2024
Project No.	G5662.030	Sample Diameter (in.)	1.873	Tested By	WAP
SCDOT ID	P039720	Sample Length (in.)	4.612	Reviewed By	WJG
Boring	C3C-B3	Unit Weight (pcf)	174.5	Core Size	NQ
Sample No.	NQ-2 / 24-1538	L/D Ratio	2.46	Recovery	100%
Depth	51.1' - 51.5'	Load Rate (psi/sec)	20	RQD	80%
Description	Black Phyllite				





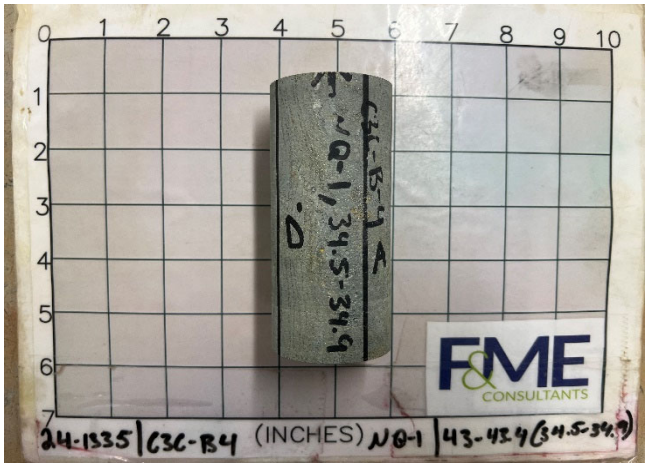
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.19	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	169.6	Core Size	NQ
Sample No.	NQ-1 / 24-1335	L/D Ratio	2.24	Recovery	98%
Depth	43.0' - 43.4'	Load Rate (psi/sec)	20	RQD	79%
Description	Green/Gray/White Metamorphic Slate				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%	-748	96	2,833	1,034	2.76	0.13
30%	-1264	172	4,250	1,551	2.45	0.14
40%	-1944	315	5,672	2,070	2.13	0.16
50%	-2675	531	7,085	2,585	1.93	0.20
60%	-3477	827	8,505	3,103	1.79	0.24
70%	-4229	1148	9,921	3,620	1.71	0.27
80%	-5348	1677	11,335	4,136	1.55	0.31
90%	-6914	2238	12,751	4,653	1.35	0.32
100%	-11071	3611	14,169	5,170		

Sample Photos



Test Results

Unconfined Compressive Strength (psi)	**5,170**	Elastic Modulus (psi)	1.81E+06
		Poisson's Ratio in Elastic Range	0.23
Comments	Elastic range was taken as between 0.002 and 0.005 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

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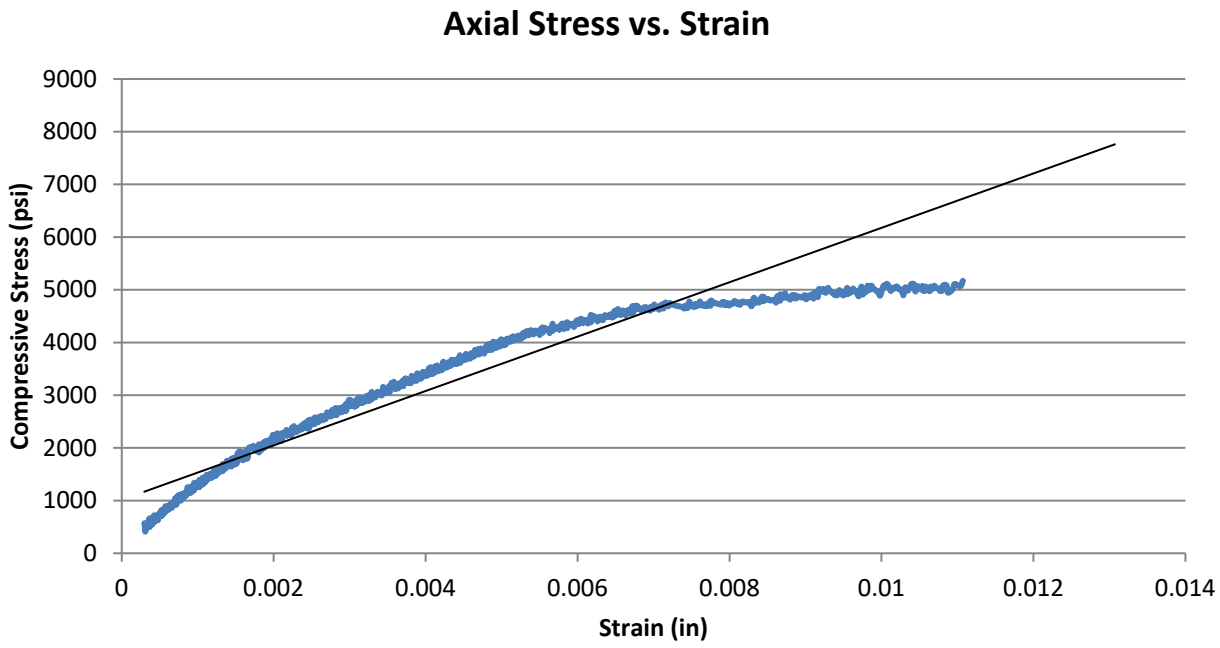
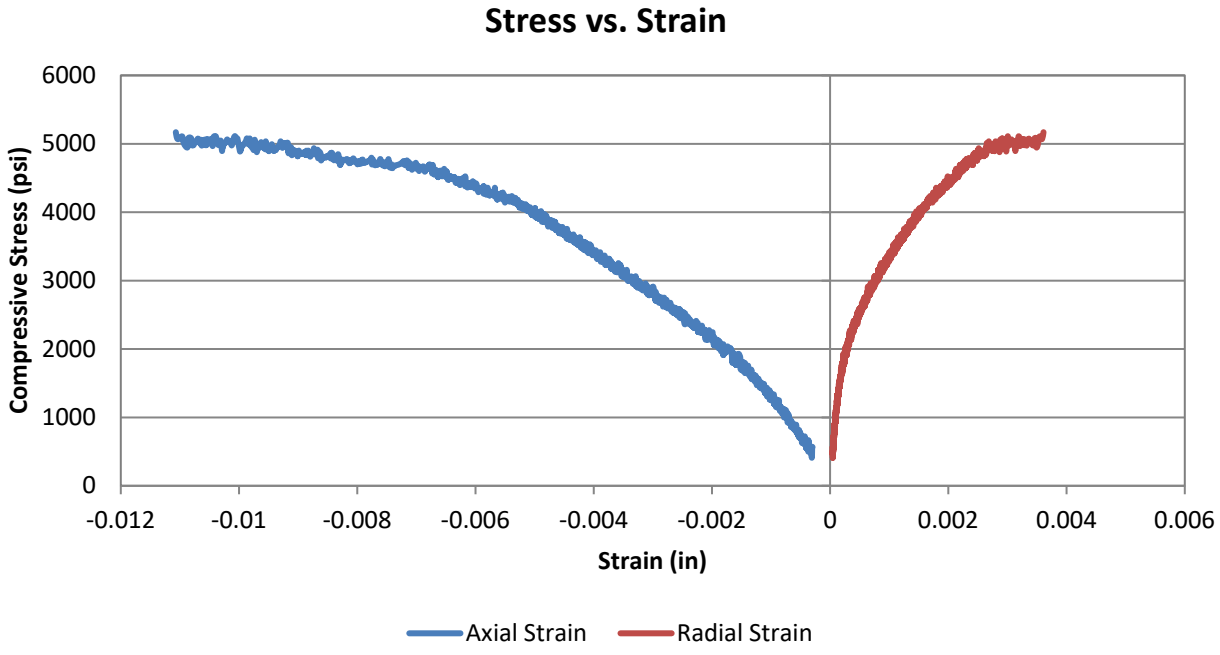
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.19	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	169.6	Core Size	NQ
Sample No.	NQ-1 / 24-1335	L/D Ratio	2.24	Recovery	98%
Depth	43.0' - 43.4'	Load Rate (psi/sec)	20	RQD	79%
Description	Green/Gray/White Metamorphic Slate				





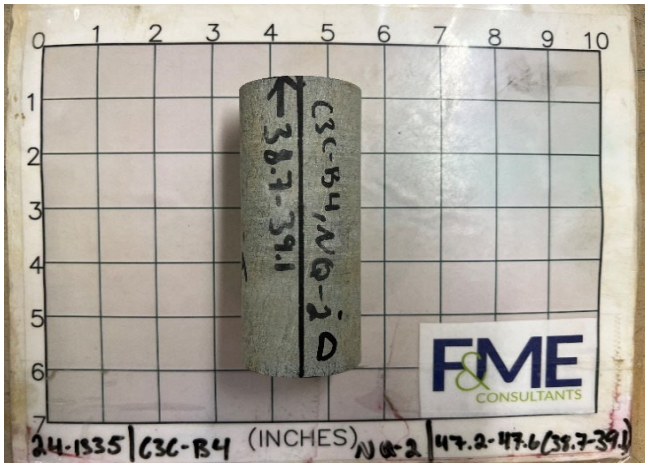
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

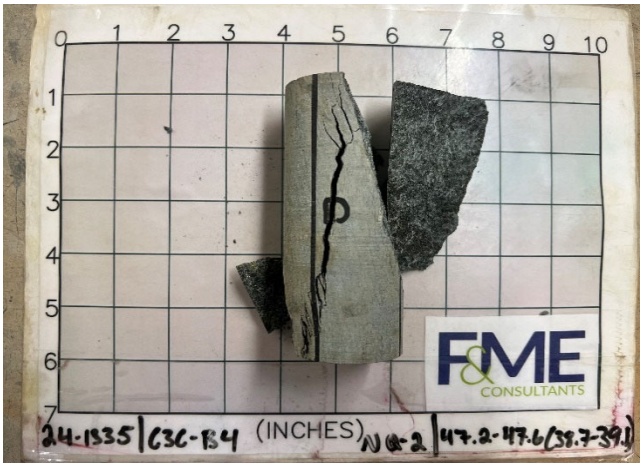
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.344	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	170.6	Core Size	NQ
Sample No.	NQ-2 / 24-1335	L/D Ratio	2.33	Recovery	100%
Depth	47.2' - 47.6'	Load Rate (psi/sec)	20	RQD	91%
Description	Green/Gray/White Metamorphic Slate				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%	-516	139	3,168	1,156	4.48	0.27
30%	-940	246	4,749	1,733	3.69	0.26
40%	-1431	382	6,336	2,312	3.23	0.27
50%	-1998	564	7,923	2,891	2.89	0.28
60%	-2538	753	9,506	3,469	2.73	0.30
70%	-3301	1026	11,089	4,046	2.45	0.31
80%	-5454	1257	12,660	4,619	1.69	0.23
90%	-6885	1526	14,254	5,201	1.51	0.22
100%	-10606	2075	15,839	5,780		

Sample Photos



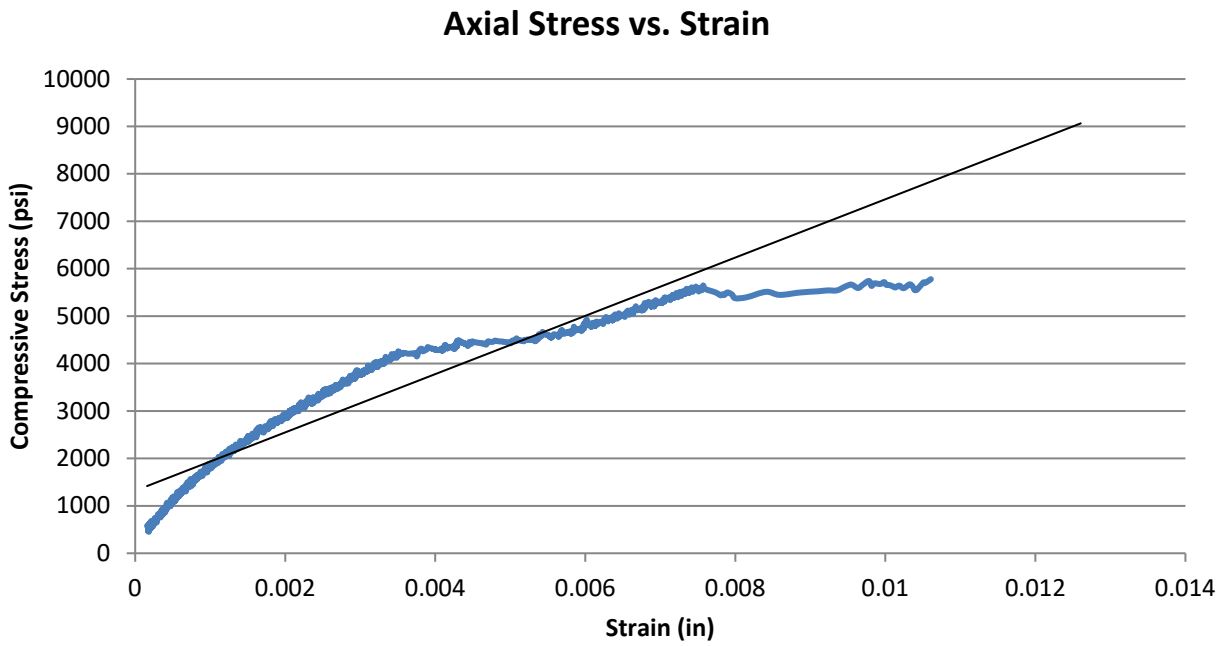


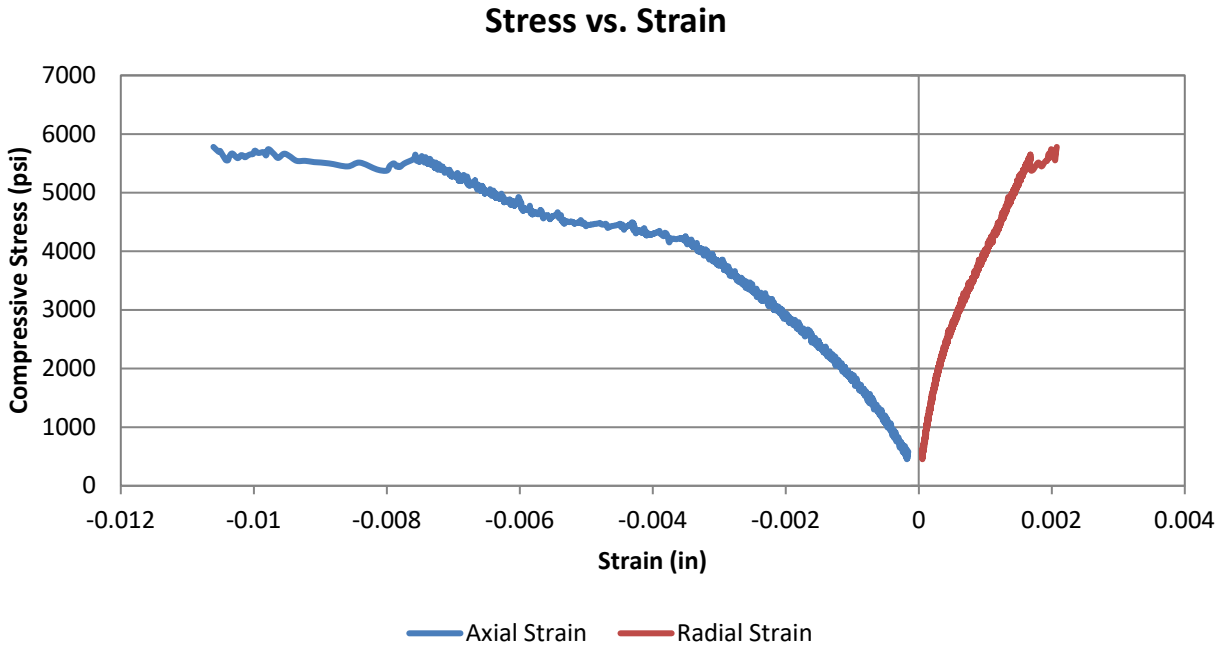
Test Results

Unconfined Compressive Strength (psi)	**5,780**	Elastic Modulus (psi)	3.00E+06
		Poisson's Ratio in Elastic Range	0.28
Comments	Elastic range was taken as between 0.001 and 0.003 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.344	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	170.6	Core Size	NQ
Sample No.	NQ-2 / 24-1335	L/D Ratio	2.33	Recovery	100%
Depth	47.2' - 47.6'	Load Rate (psi/sec)	20	RQD	91%
Description	Green/Gray/White Metamorphic Slate				





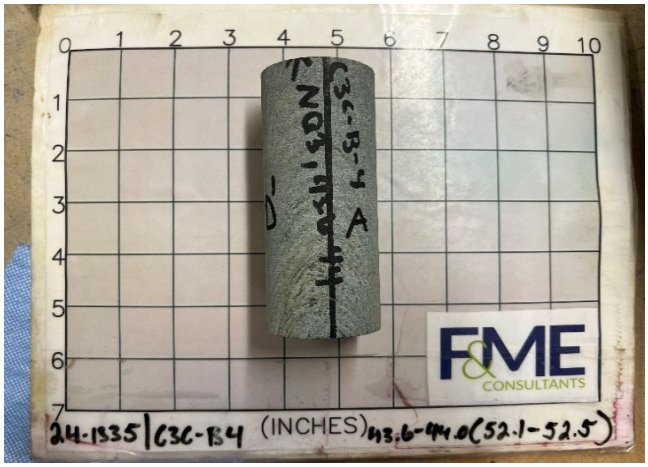
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.865	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.315	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	170.3	Core Size	NQ
Sample No.	NQ-3 / 24-1335	L/D Ratio	2.31	Recovery	88%
Depth	52.1' - 52.5'	Load Rate (psi/sec)	20	RQD	74%
Description	Green/Gray/White Metamorphic Slate				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%	-649	71	2,157	790	2.44	0.11
30%	-1054	120	3,233	1,183	2.25	0.11
40%	-1414	168	4,323	1,582	2.24	0.12
50%	-1788	219	5,414	1,982	2.22	0.12
60%	-2118	271	6,482	2,373	2.24	0.13
70%	-2498	334	7,575	2,773	2.22	0.13
80%	-2889	402	8,647	3,165	2.19	0.14
90%	-3246	535	9,728	3,561	2.19	0.16
100%	-3511	604	10,808	3,956		

Sample Photos



Test Results

Unconfined Compressive Strength (psi)	**3,960**	Elastic Modulus (psi)	3.31E+06
		Poisson's Ratio in Elastic Range	0.12
Comments	Elastic range was taken as between 0.001 and 0.0025 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

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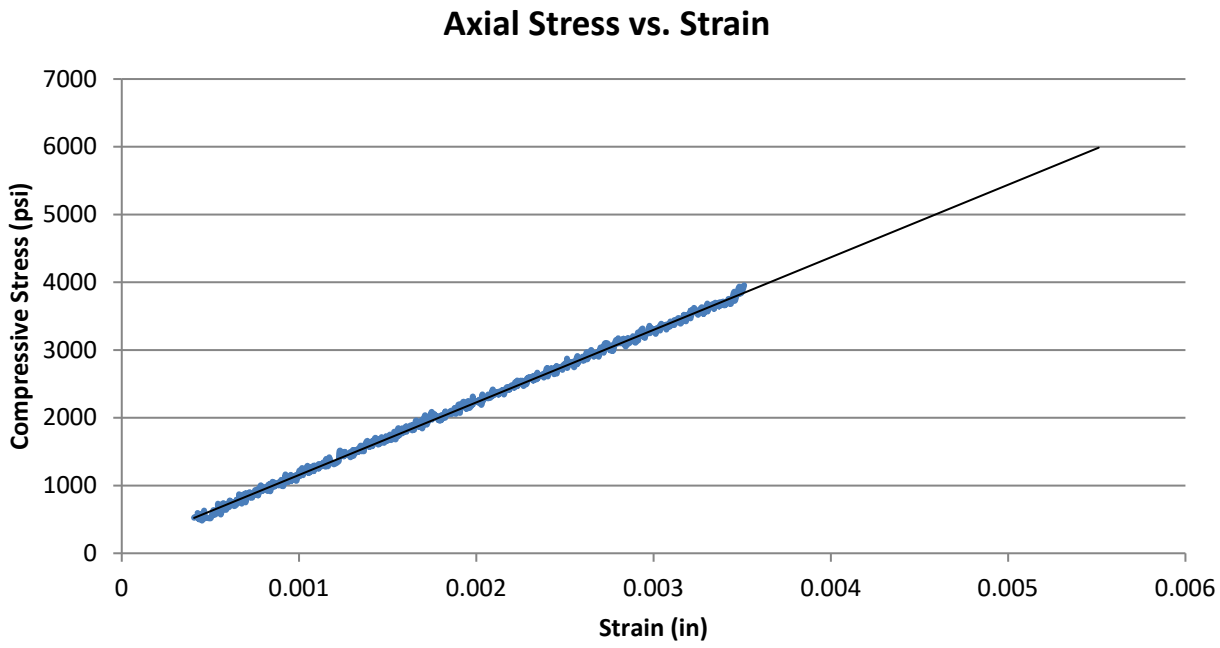
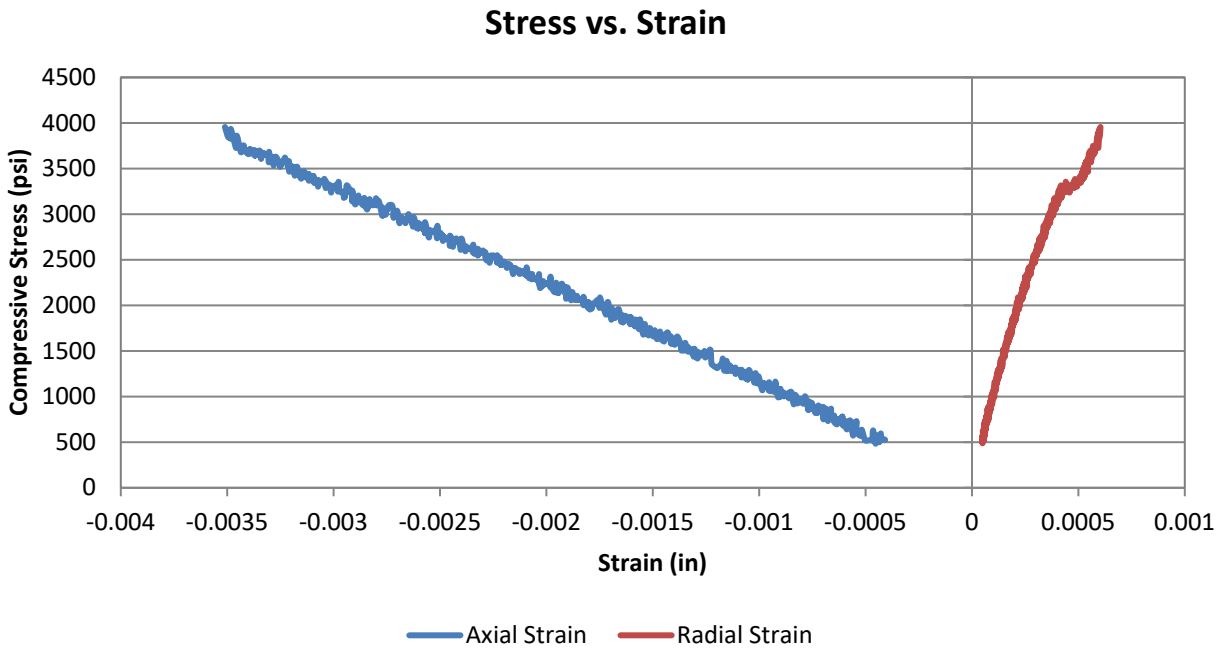
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/26/2024
Project No.	G5662.030	Sample Diameter (in.)	1.865	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.315	Reviewed By	WAP
Boring	C3C-B4	Unit Weight (pcf)	170.3	Core Size	NQ
Sample No.	NQ-3 / 24-1335	L/D Ratio	2.31	Recovery	88%
Depth	52.1' - 52.5'	Load Rate (psi/sec)	20	RQD	74%
Description	Green/Gray/White Metamorphic Slate				





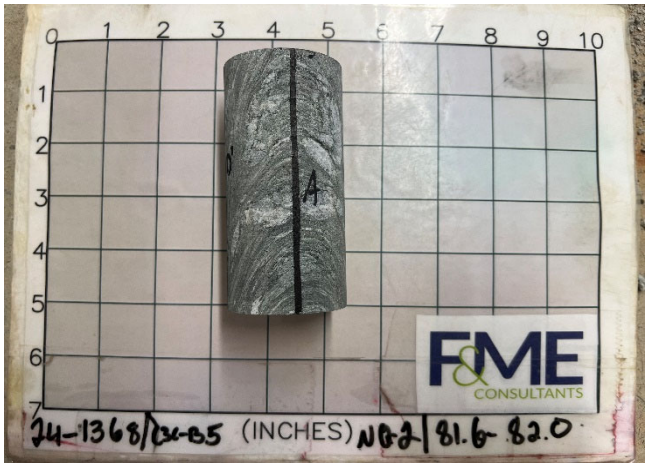
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

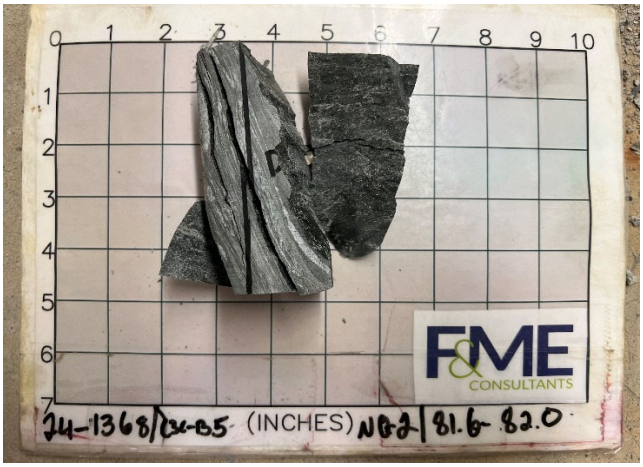
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.936	Reviewed By	WAP
Boring	C3C-B5	Unit Weight (pcf)	169.5	Core Size	NQ
Sample No.	NQ-2.1 / 24-1368	L/D Ratio	2.10	Recovery	100%
Depth	81.6' - 82.0'	Load Rate (psi/sec)	20	RQD	87%
Description	Gray/Green Clorite/Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%						
30%						
40%	-1158	24	2,123	773	1.34	0.02
50%	-1474	29	2,652	966	1.31	0.02
60%	-1782	36	3,182	1,159	1.30	0.02
70%	-2079	47	3,717	1,353	1.30	0.02
80%	-2372	62	4,243	1,545	1.30	0.03
90%	-2887	307	4,777	1,739	1.20	0.11
100%	-3202	463	5,303	1,931		

Sample Photos



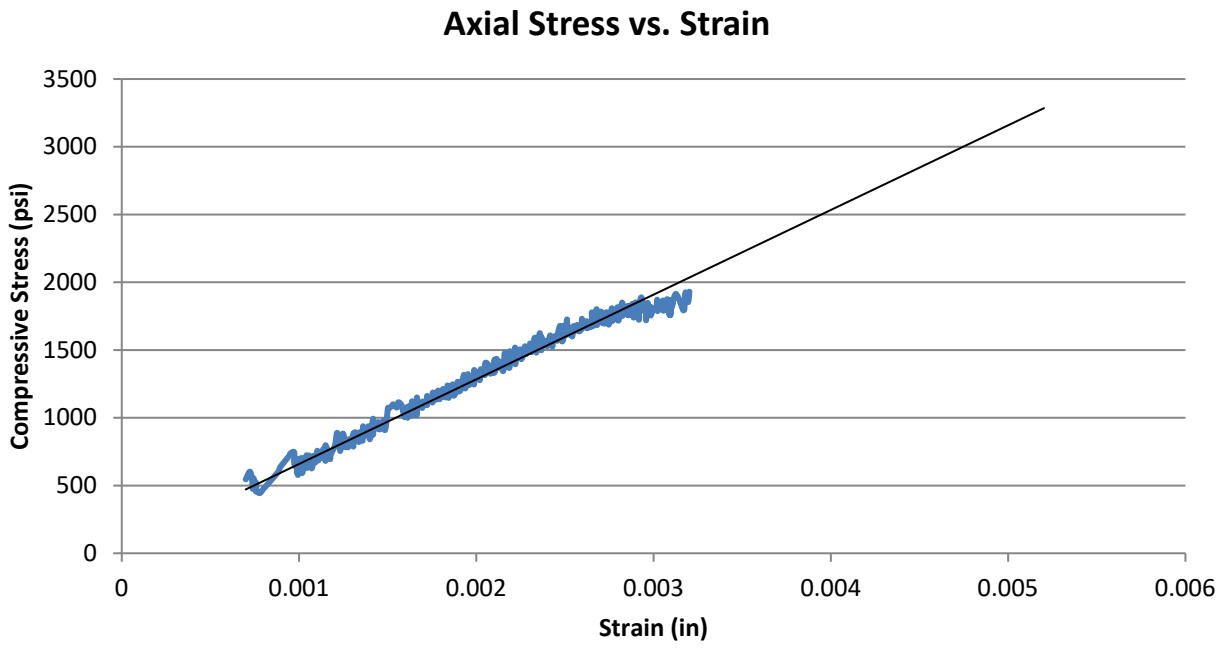


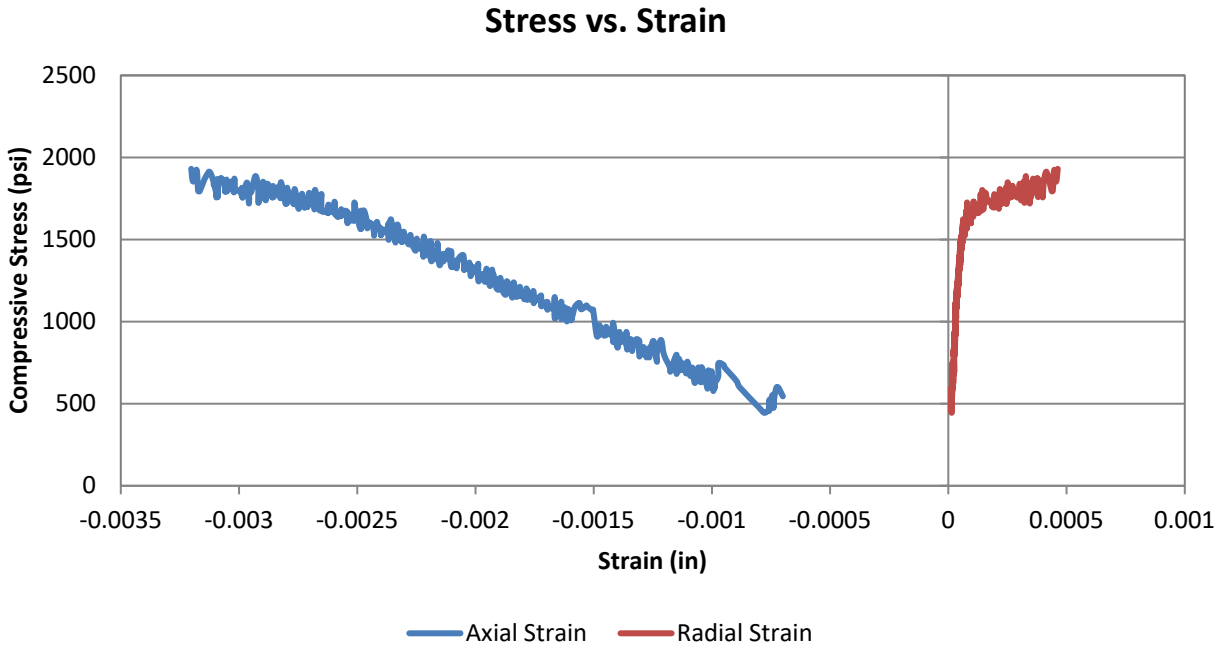
Test Results

Unconfined Compressive Strength (psi)	**1,930**	Elastic Modulus (psi)	1.29E+06
		Poisson's Ratio in Elastic Range	0.02
Comments	Elastic range was taken as between 0.001 and 0.002 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.936	Reviewed By	WAP
Boring	C3C-B5	Unit Weight (pcf)	169.5	Core Size	NQ
Sample No.	NQ-2.1 / 24-1368	L/D Ratio	2.10	Recovery	100%
Depth	81.6' - 82.0'	Load Rate (psi/sec)	20	RQD	87%
Description	Gray/Green Clorite/Phyllite				





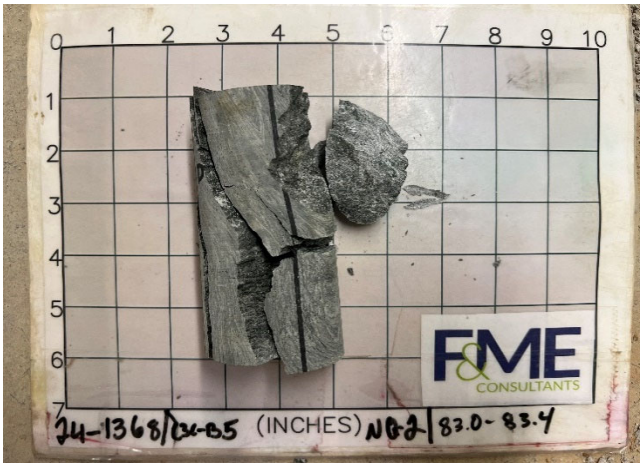
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.315	Reviewed By	WAP
Boring	C3C-B5	Unit Weight (pcf)	168.1	Core Size	NQ
Sample No.	NQ-2.2 / 24-1368	L/D Ratio	2.31	Recovery	100%
Depth	83.0' - 83.4'	Load Rate (psi/sec)	20	RQD	87%
Description	Gray/Green Clorite/Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%						
30%	-571	30	1,880	686	2.40	0.05
40%	-869	20	2,518	919	2.12	0.02
50%	-1108	32	3,149	1,149	2.07	0.03
60%	-1383	56	3,778	1,379	1.99	0.04
70%	-1673	115	4,402	1,606	1.92	0.07
80%	-2006	228	5,035	1,837	1.83	0.11
90%	-2370	424	5,664	2,067	1.74	0.18
100%	-2730	776	6,294	2,297		

Sample Photos



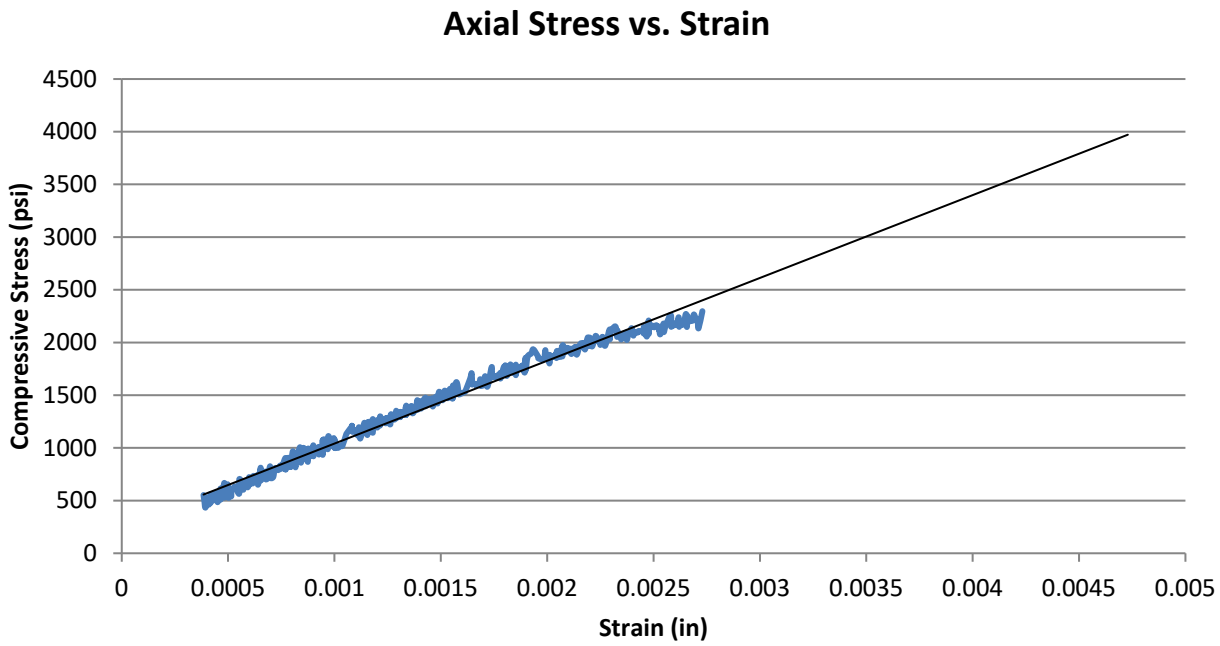
Test Results

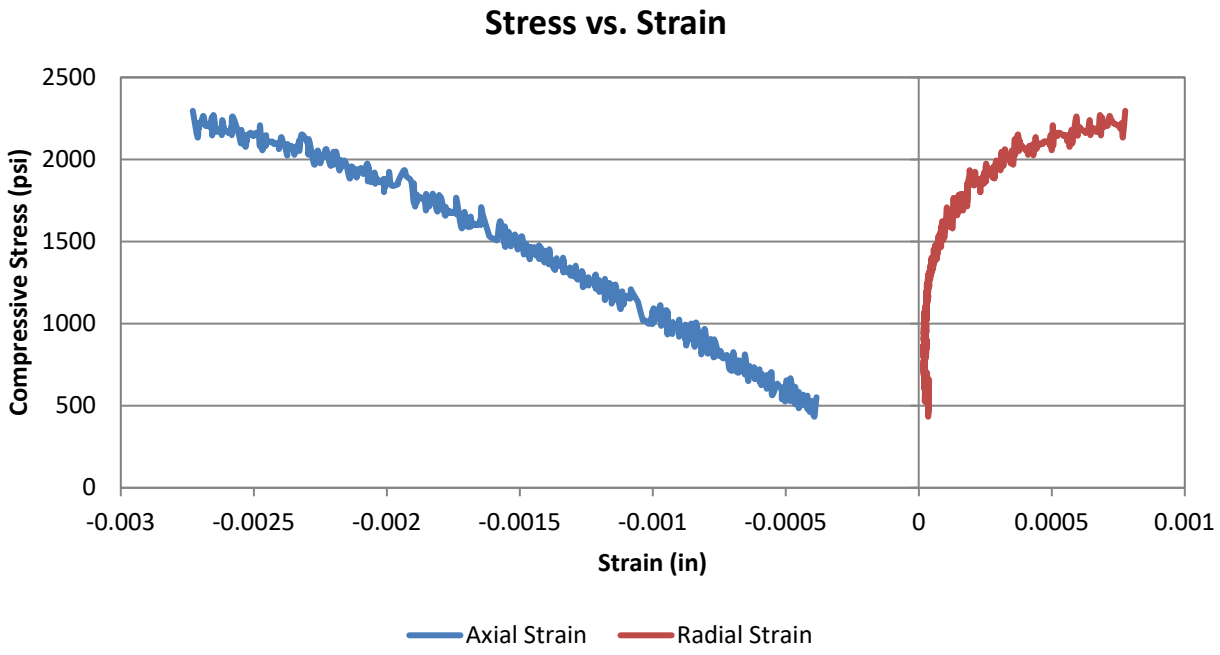
Unconfined Compressive Strength (psi)	**2,300**	Elastic Modulus (psi)	1.98E+06
		Poisson's Ratio in Elastic Range	0.05
Comments	Elastic range was taken as between 0.001 and 0.002 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

F&ME CONSULTANTS

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.315	Reviewed By	WAP
Boring	C3C-B5	Unit Weight (pcf)	168.1	Core Size	NQ
Sample No.	NQ-2.2 / 24-1368	L/D Ratio	2.31	Recovery	100%
Depth	83.0' - 83.4'	Load Rate (psi/sec)	20	RQD	87%
Description	Gray/Green Clorite/Phyllite				





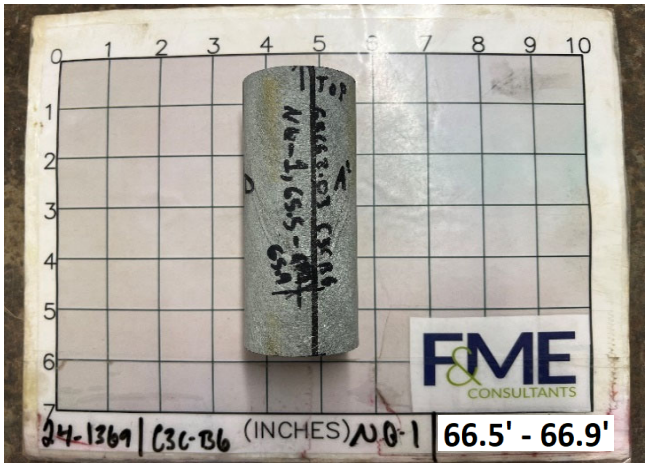
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

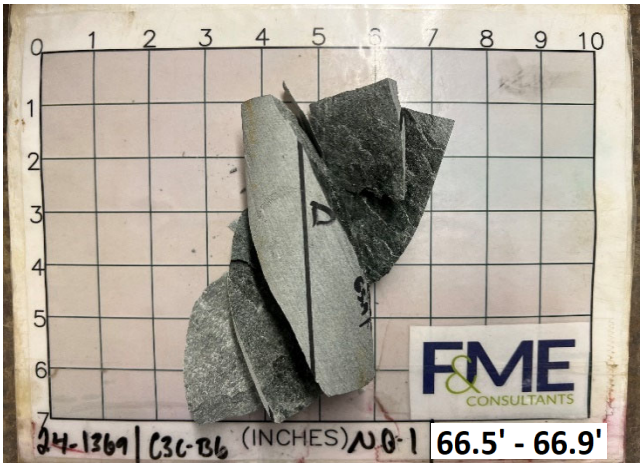
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.498	Reviewed By	WAP
Boring	C3C-B6	Unit Weight (pcf)	165.1	Core Size	NQ
Sample No.	NQ-1 / 24-1369	L/D Ratio	2.41	Recovery	67%
Depth	66.5' - 66.9'	Load Rate (psi/sec)	20	RQD	63%
Description	Gray, Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%						
30%	-386	8	1,722	628	3.26	0.02
40%	-536	18	2,310	843	3.15	0.03
50%	-701	30	2,881	1,051	3.00	0.04
60%	-891	43	3,459	1,262	2.83	0.05
70%	-1006	51	4,039	1,474	2.93	0.05
80%	-1195	63	4,616	1,684	2.82	0.05
90%	-1585	84	5,194	1,895	2.39	0.05
100%	-1815	100	5,770	2,106		

Sample Photos





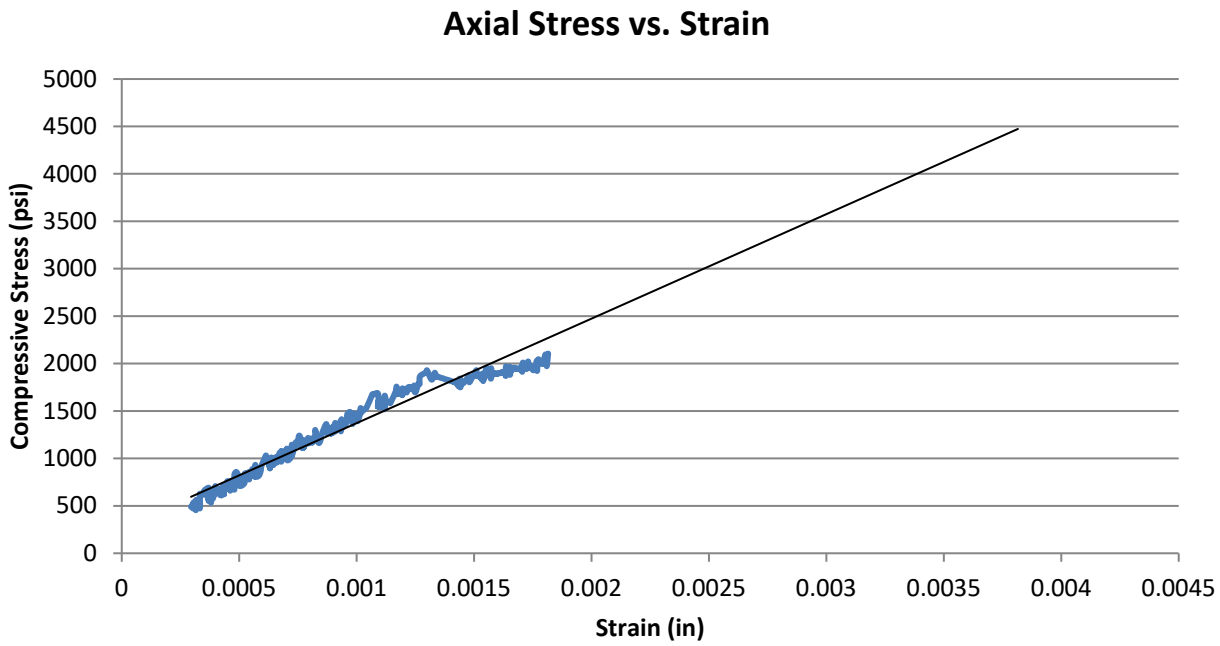
Test Results

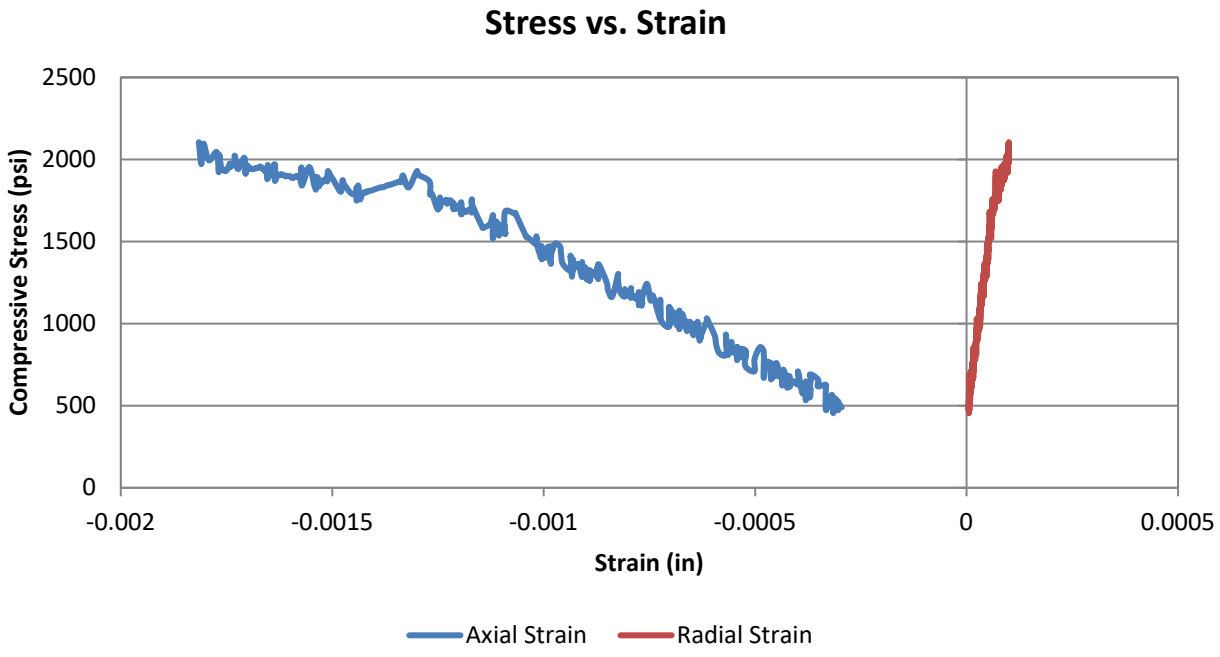
Unconfined Compressive Strength (psi)	**2,110**	Elastic Modulus (psi)	2.98E+06
		Poisson's Ratio in Elastic Range	0.04
Comments	Elastic range was taken as between 0.0005 and 0.001 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

F&ME CONSULTANTS

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.868	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.498	Reviewed By	WAP
Boring	C3C-B6	Unit Weight (pcf)	165.1	Core Size	NQ
Sample No.	NQ-1 / 24-1369	L/D Ratio	2.41	Recovery	67%
Depth	66.5' - 66.9'	Load Rate (psi/sec)	20	RQD	63%
Description	Gray, Phyllite				





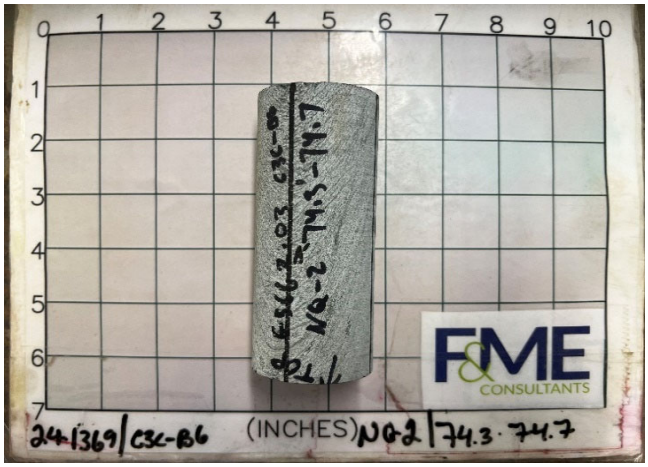
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

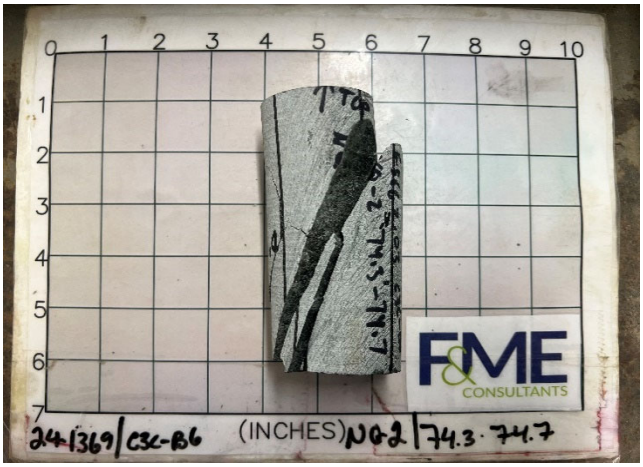
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.346	Reviewed By	WAP
Boring	C3C-B6	Unit Weight (pcf)	165.5	Core Size	NQ
Sample No.	NQ-2 / 24-1369	L/D Ratio	2.32	Recovery	100%
Depth	74.3' - 74.7'	Load Rate (psi/sec)	20	RQD	100%
Description	Gray Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^{6} (psi)	Poisson's Ratio
10%	Sample Preload Range					
20%						
30%	-383	6	1,804	657	3.43	0.02
40%	-524	15	2,404	875	3.34	0.03
50%	-681	27	2,997	1,091	3.20	0.04
60%	-799	38	3,605	1,313	3.29	0.05
70%	-930	48	4,203	1,530	3.29	0.05
80%	-1008	57	4,806	1,750	3.47	0.06
90%	-1172	83	5,407	1,969	3.36	0.07
100%	-1220	128	6,011	2,189		

Sample Photos





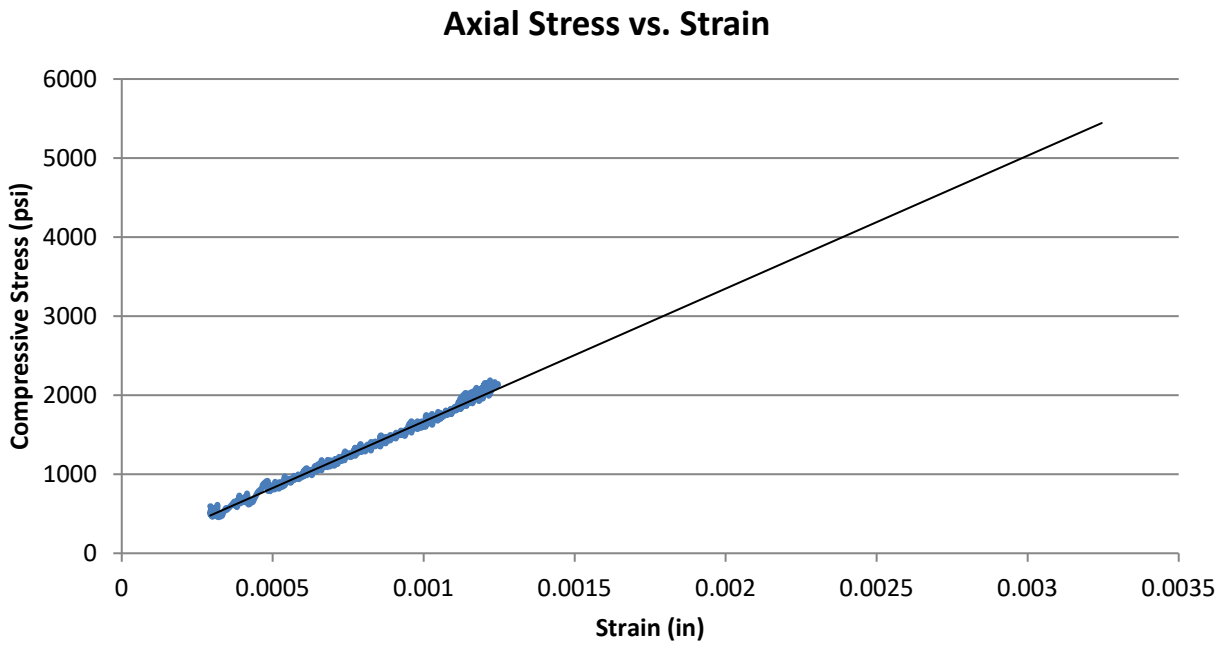
Test Results

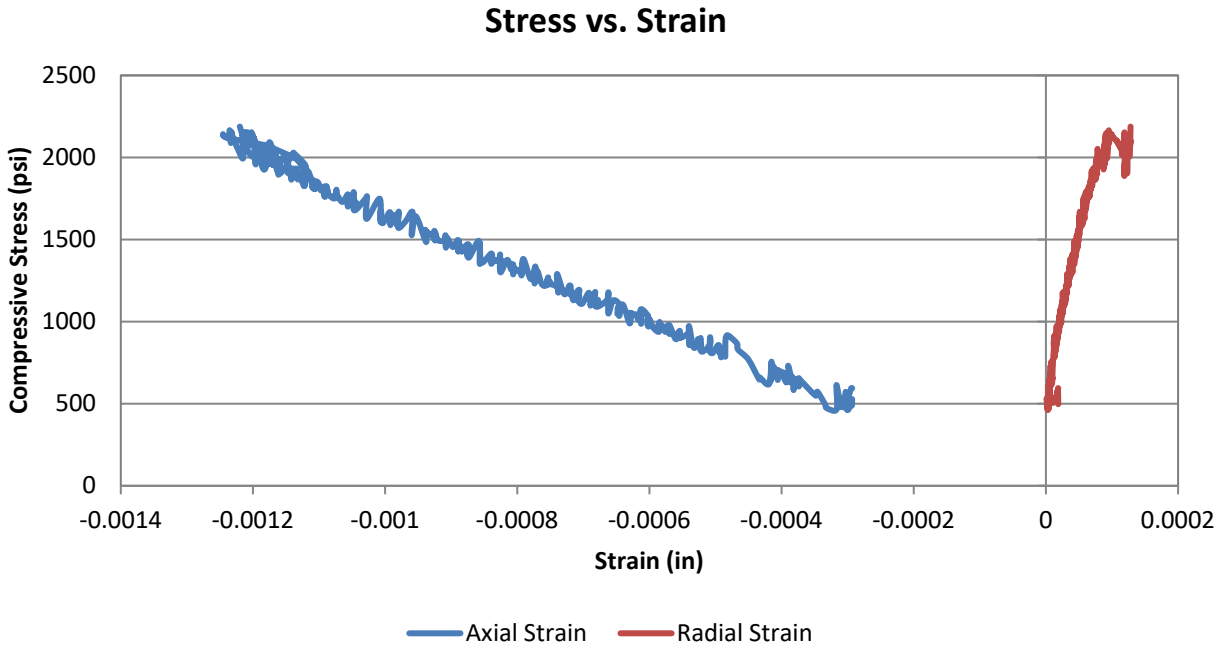
Unconfined Compressive Strength (psi)	**2,190**	Elastic Modulus (psi)	3.30E+06
		Poisson's Ratio in Elastic Range	0.04
Comments	Elastic range was taken as between 0.0005 and 0.001 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

F&ME CONSULTANTS

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	5/6/2024
Project No.	G5662.030	Sample Diameter (in.)	1.87	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.346	Reviewed By	WAP
Boring	C3C-B6	Unit Weight (pcf)	165.5	Core Size	NQ
Sample No.	NQ-2 / 24-1369	L/D Ratio	2.32	Recovery	100%
Depth	74.3' - 74.7'	Load Rate (psi/sec)	20	RQD	100%
Description	Gray Phyllite				





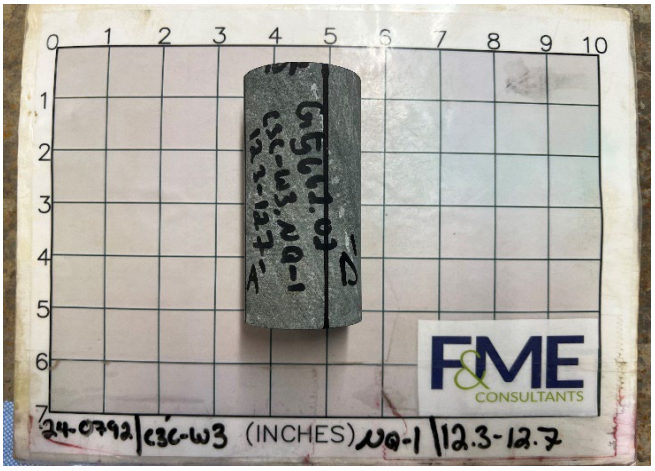
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

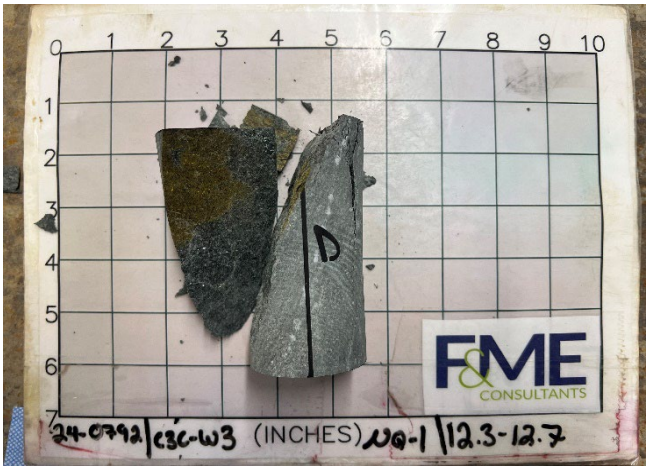
Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.869	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.975	Reviewed By	WAP
Boring	C3C-W3	Unit Weight (pcf)	172.3	Core Size	NQ
Sample No.	NQ-1 / 24-0972	L/D Ratio	2.13	Recovery	92%
Depth	12.3' - 12.7'	Load Rate (psi/sec)	20	RQD	83%
Description	Dark Bluish Gray Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^6 (psi)	Poisson's Ratio
10%	Preload Range					
20%	-731	153	2,460	897	2.45	0.21
30%	-981	206	3,653	1,331	2.71	0.21
40%	-1347	279	4,856	1,770	2.63	0.21
50%	-1672	343	6,080	2,216	2.65	0.21
60%	-1979	405	7,310	2,664	2.69	0.20
70%	-2345	482	8,508	3,101	2.64	0.21
80%	-2668	548	9,733	3,548	2.66	0.21
90%	-3045	628	10,948	3,991	2.62	0.21
100%	-3886	878	12,165	4,434		

Sample Photos





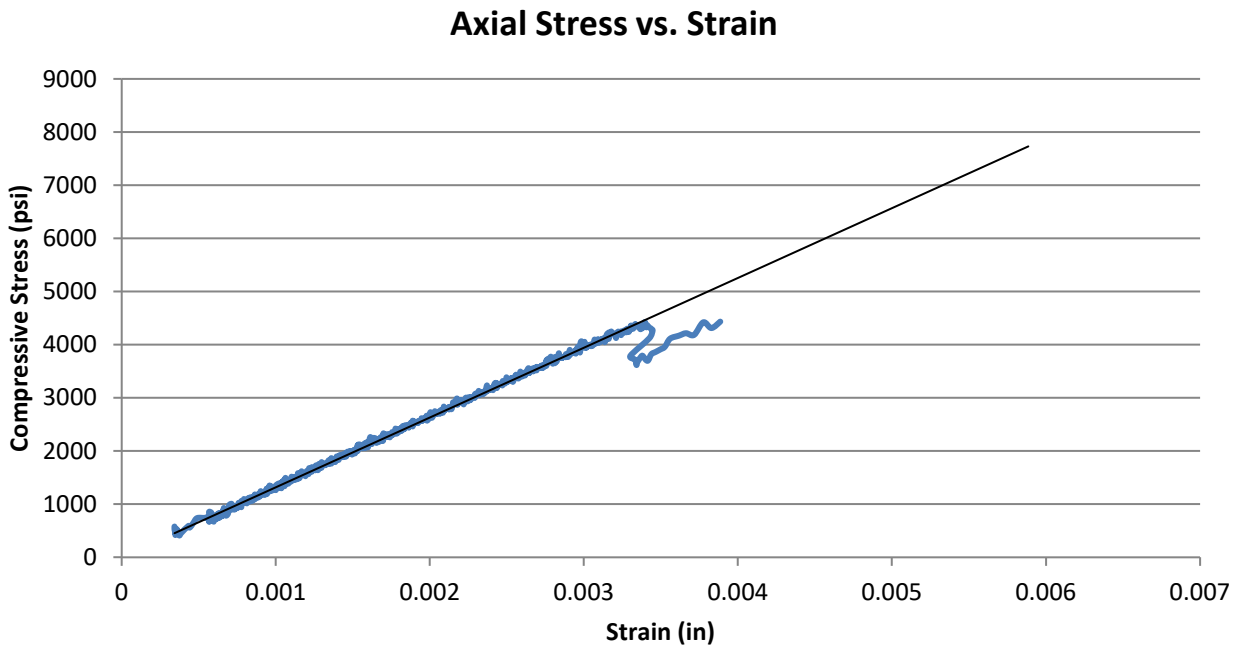
Test Results

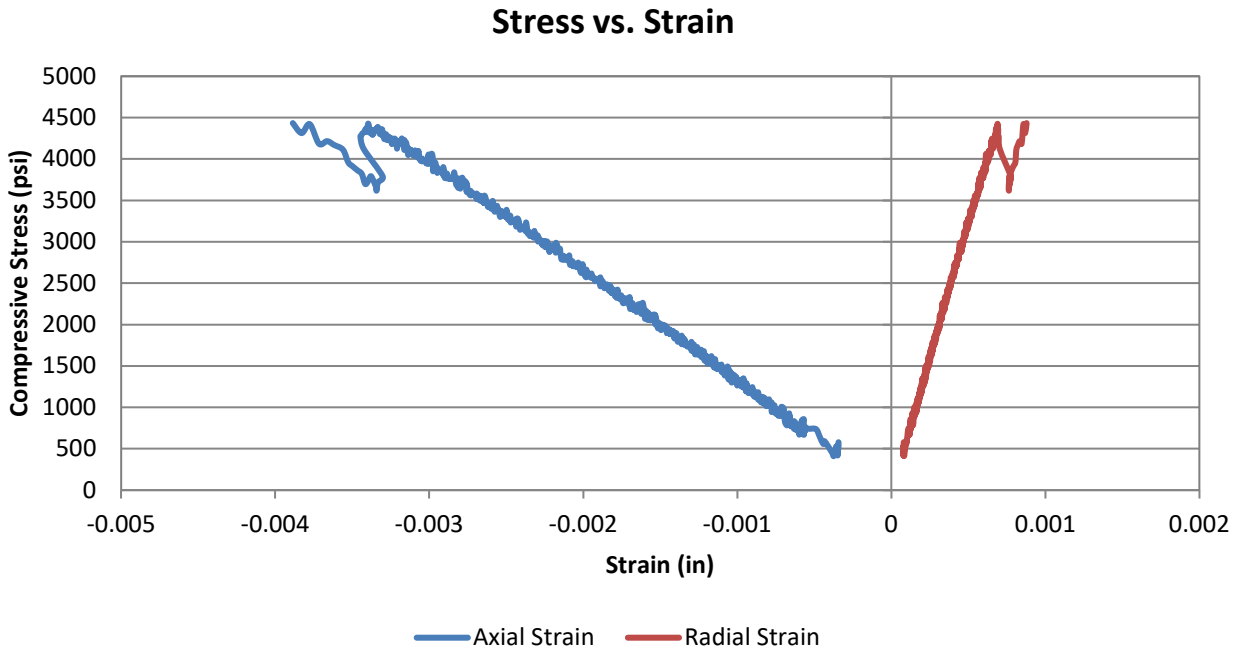
Unconfined Compressive Strength (psi)	**4,430**	Elastic Modulus (psi)	2.65E+06
		Poisson's Ratio in Elastic Range	0.21
Comments	Elastic range was taken as between 0.001 and 0.0025 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

F&ME CONSULTANTS

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.869	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	3.975	Reviewed By	WAP
Boring	C3C-W3	Unit Weight (pcf)	172.3	Core Size	NQ
Sample No.	NQ-1 / 24-0972	L/D Ratio	2.13	Recovery	92%
Depth	12.3' - 12.7'	Load Rate (psi/sec)	20	RQD	83%
Description	Dark Bluish Gray Phyllite				





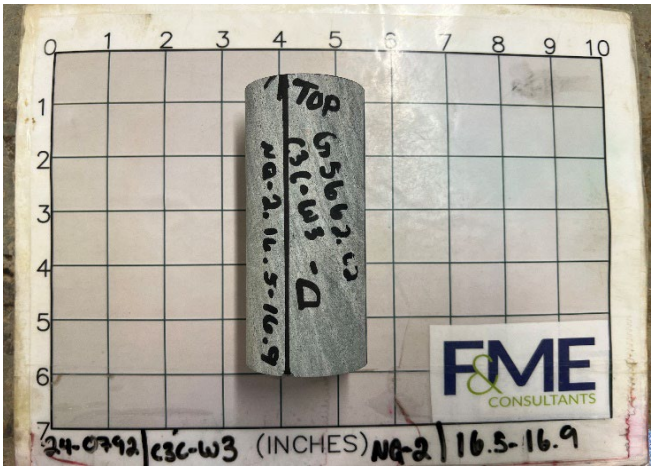
Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.866	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.233	Reviewed By	WAP
Boring	C3C-W3	Unit Weight (pcf)	170.1	Core Size	NQ
Sample No.	NQ-2 / 24-0972	L/D Ratio	2.27	Recovery	93%
Depth	16.5' - 16.9'	Load Rate (psi/sec)	20	RQD	60%
Description	Dark Bluish Gray Phyllite				

Test Data

Percent of Failure Load	Strain (10^{-6}) Axial	Strain (10^{-6}) Radial	Load (lbs)	Compressive Stress (psi)	Secant Modulus x10^6 (psi)	Poisson's Ratio
10%	-638	143	4,456	1,629	5.11	0.22
20%	-1292	277	8,887	3,250	5.03	0.21
30%	-1928	424	13,342	4,879	5.06	0.22
40%	-2542	581	17,781	6,502	5.12	0.23
50%	-3082	736	22,226	8,127	5.27	0.24
60%	-3592	918	26,695	9,762	5.43	0.26
70%	-3963	1130	31,125	11,381	5.74	0.29
80%	-4511	1384	35,568	13,006	5.77	0.31
90%	-4400	1779	40,018	14,633	6.65	0.40
100%	-3838	2218	44,465	16,260		

Sample Photos



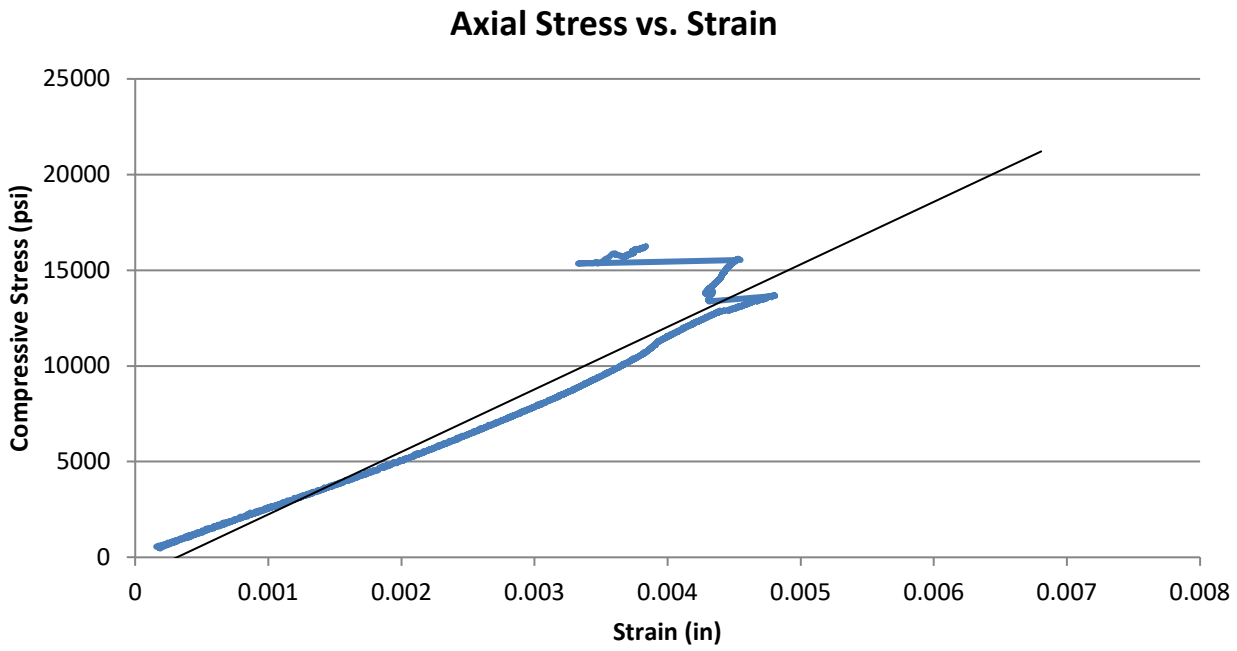
Test Results

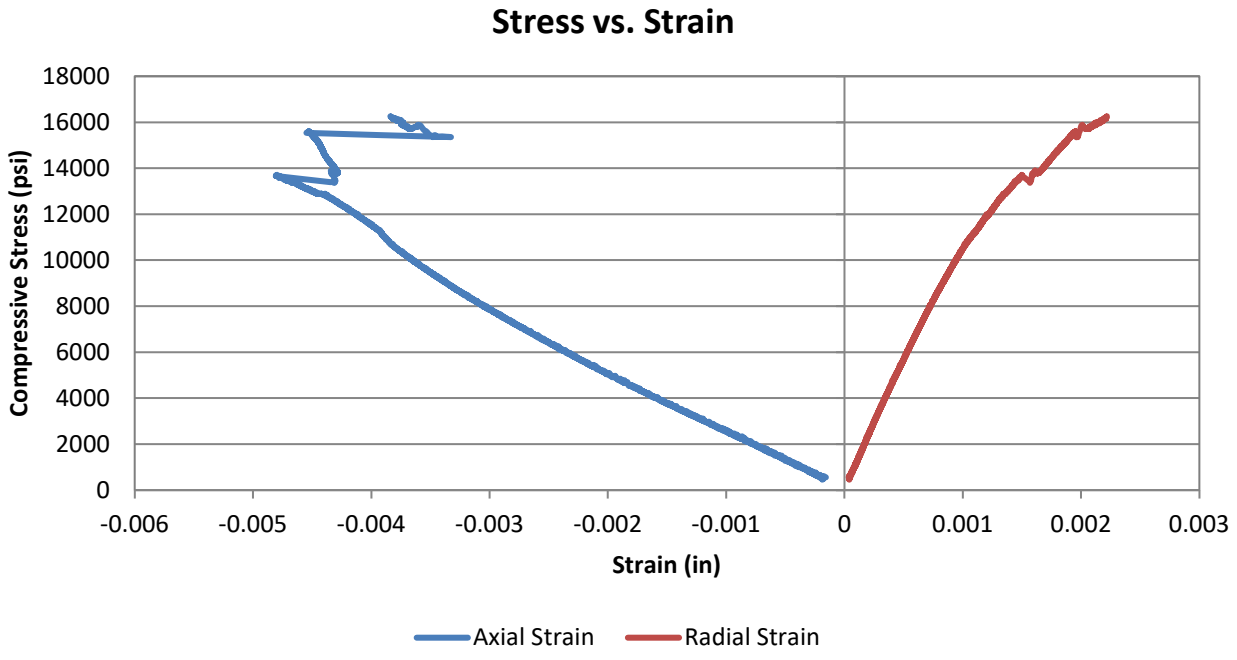
Unconfined Compressive Strength (psi)	**16,260**	Elastic Modulus (psi)	5.07E+06
		Poisson's Ratio in Elastic Range	0.22
Comments	Elastic range was taken as between 0.001 and 0.0025 inches of axial strain. This range was chosen to avoid any non-linear behavior from the initial loading and the inflection point at the end of the elastic range.		

F&ME CONSULTANTS

Compressive Strength and Elastic Moduli of Intact Rock Core Specimens
ASTM D7012 - Method D / SC-T-39

Project	Carolina Crossroads I-20/26/126 Corridor Improvements			Date	4/12/2024
Project No.	G5662.030	Sample Diameter (in.)	1.866	Tested By	TP
SCDOT ID	P039720	Sample Length (in.)	4.233	Reviewed By	WAP
Boring	C3C-W3	Unit Weight (pcf)	170.1	Core Size	NQ
Sample No.	NQ-2 / 24-0972	L/D Ratio	2.27	Recovery	93%
Depth	16.5' - 16.9'	Load Rate (psi/sec)	20	RQD	60%
Description	Dark Bluish Gray Phyllite				





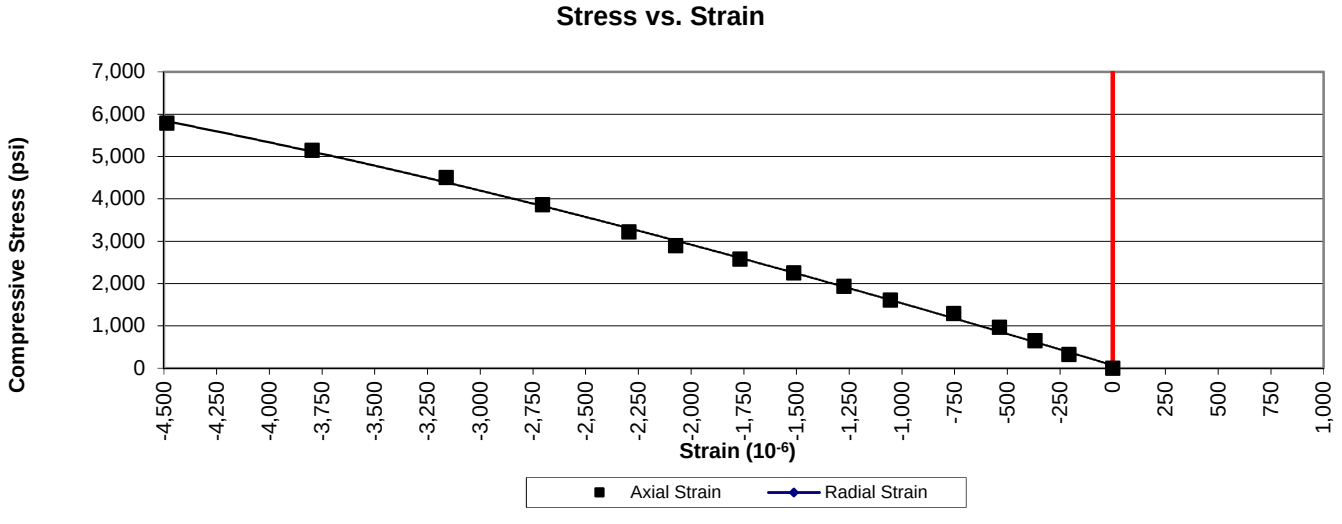
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.99	**Date:**	3/1/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.40	**Tested by:**	BKP / MG
Boring Id:	B-47	**Unit Weight, pcf:**	166.4	**Reviewed by:**	JBB
Sample No:	RC-1	**Moisture Content, %:**	0.4		
Depth (ft):	47.2 - 47.8	**Load Rate, psi/sec:**	48		

Data Point	Strain (10^{-6}) axial	Strain (10^{-6}) radial	Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
1	0		0	0	0.00		
2	-208		1,000	322	1.55		
3	-369		2,000	643	1.74		
4	-536		3,000	965	1.80		
5	-754		4,000	1,286	1.71		
6	-1,054		5,000	1,608	1.53		
7	-1,275		6,000	1,929	1.51		
8	-1,513		7,000	2,251	1.49		
9	-1,767		8,000	2,572	1.46		
10	-2,072		9,000	2,894	1.40		
11	-2,294		10,000	3,215	1.40		
12	-2,704		12,000	3,859	1.43		
13	-3,161		14,000	4,502	1.42		
14	-3,796		16,000	5,145	1.36		
15	-4,485		18,000	5,788	1.29		
16			19,469	6,260			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

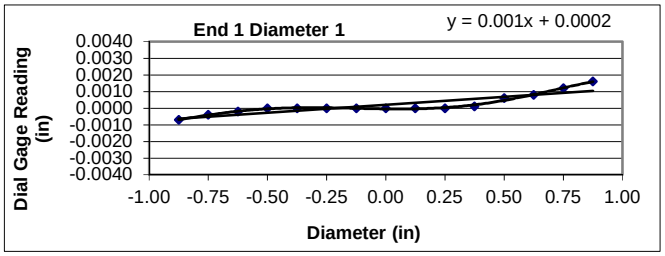
Project:	Carolina Crossroads Project	**Diameter (in):**	1.99	**Date:**	2/27/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.40	**Tested by:**	BKP
Boring Id:	B-47	**Unit Weight (pcf):**	166.4	**Reviewed by:**	JBB
Sample No.:	RC-1	**Moisture Content (%):**	0.4		
Depth (ft):	47.2 - 47.8				

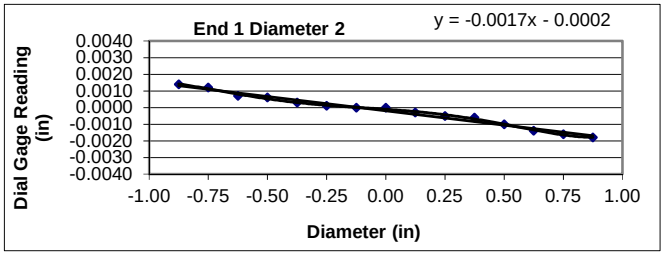
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

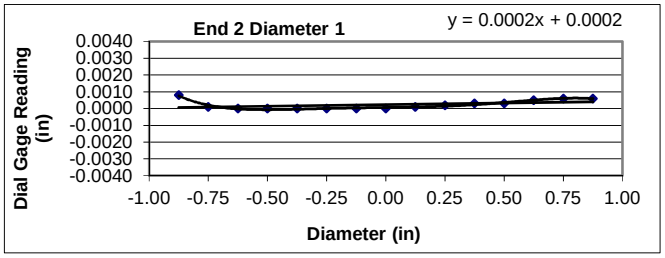
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0007	0.0014	0.0008	0.0002
- 6/8	-0.0004	0.0012	0.0001	0.0000
- 5/8	-0.0002	0.0007	0.0000	0.0000
- 4/8	0.0000	0.0006	0.0000	0.0000
- 3/8	0.0000	0.0003	0.0000	0.0000
- 2/8	0.0000	0.0001	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	-0.0003	0.0001	0.0000
2/8	0.0000	-0.0005	0.0002	0.0000
3/8	0.0001	-0.0006	0.0003	0.0000
4/8	0.0006	-0.0010	0.0003	0.0000
5/8	0.0008	-0.0014	0.0005	-0.0002
6/8	0.0012	-0.0016	0.0006	-0.0005
7/8	0.0016	-0.0018	0.0006	-0.0007

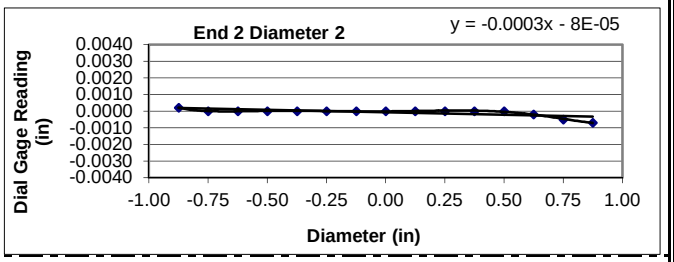




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00095
	Angle of Best Fit Line:	0.05468
End 2:	Slope of Best Fit Line:	0.00019
	Angle of Best Fit Line:	0.01097
	Max Angular Difference:	**0.04**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00172
	Angle of Best Fit Line:	-0.09871
End 2:	Slope of Best Fit Line:	-0.00029
	Angle of Best Fit Line:	-0.01686
	Max Angular Difference:	**-0.08**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0023	0.0012	**YES**
End 1 Diam 2	0.0032	0.0016	**YES**
End 2 Diam 1	0.0008	0.0004	**YES**
End 2 Diam 2	0.0009	0.0005	**YES**

Perpendicularity Tolerance Met? **YES**

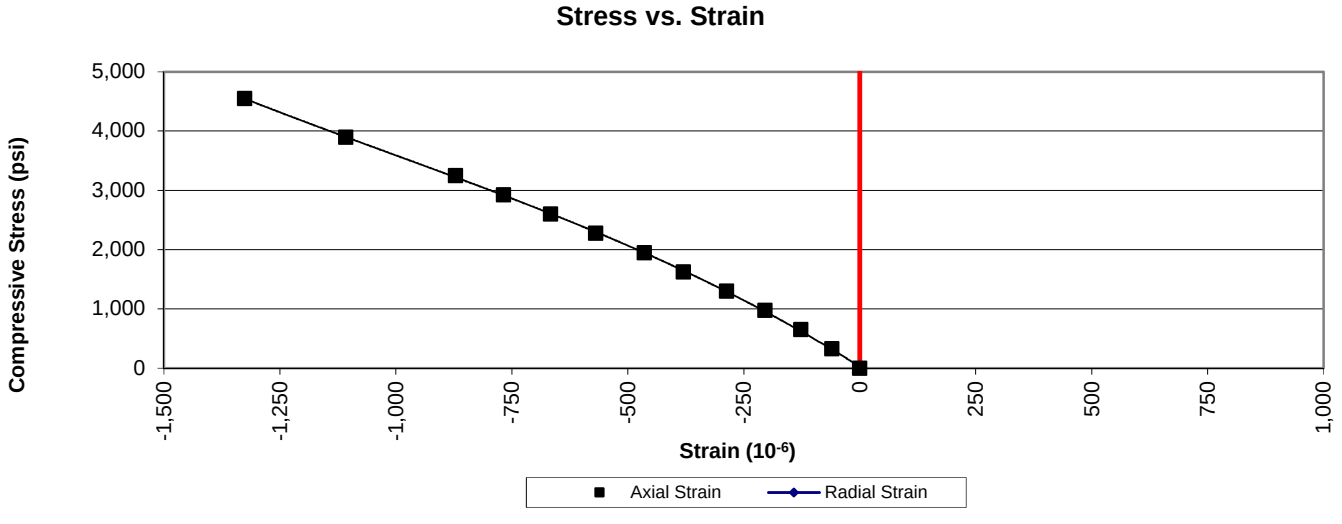
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	3/1/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.47	**Tested by:**	BKP / MG
Boring Id:	B-47	**Unit Weight, pcf:**	170.6	**Reviewed by:**	JBB
Sample No:	RC-3	**Moisture Content, %:**	0.4		
Depth (ft):	55.4 - 56.2	**Load Rate, psi/sec:**	42		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-60		1,000	325	5.42		
3	-127		2,000	649	5.11		
4	-204		3,000	974	4.77		
5	-287		4,000	1,299	4.53		
6	-380		5,000	1,623	4.27		
7	-464		6,000	1,948	4.20		
8	-569		7,000	2,273	3.99		
9	-666		8,000	2,597	3.90		
10	-768		9,000	2,922	3.80		
11	-871		10,000	3,247	3.73		
12	-1,108		12,000	3,896	3.52		
13	-1,326		14,000	4,545	3.43		
14			14,859	4,824			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

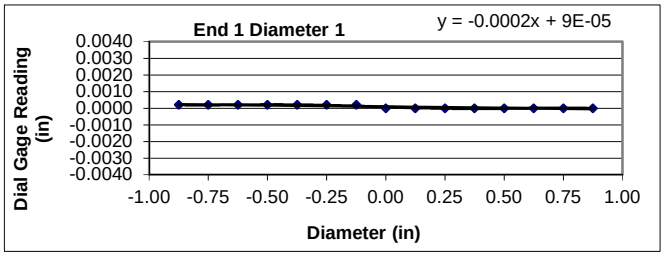
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	2/27/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.47	**Tested by:**	BKP
Boring Id:	B-47	**Unit Weight (pcf):**	170.6	**Reviewed by:**	JBB
Sample No.:	RC-3	**Moisture Content (%):**	0.4		
Depth (ft):	55.4 - 56.2				

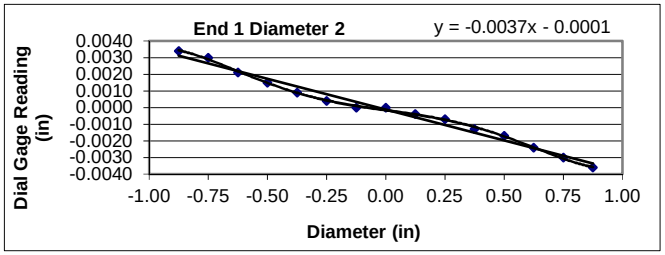
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

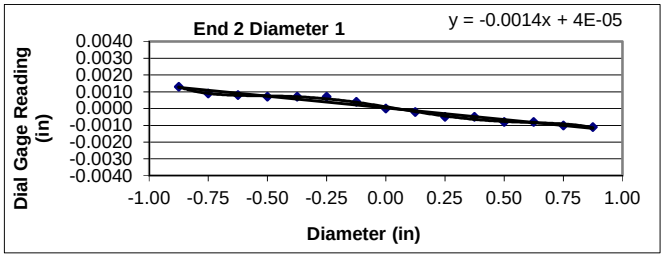
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0002	0.0034	0.0013	0.0000
- 6/8	0.0002	0.0030	0.0009	0.0000
- 5/8	0.0002	0.0021	0.0008	0.0000
- 4/8	0.0002	0.0015	0.0007	0.0000
- 3/8	0.0002	0.0009	0.0007	0.0000
- 2/8	0.0002	0.0004	0.0007	0.0000
- 1/8	0.0002	0.0000	0.0004	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	-0.0004	-0.0002	0.0000
2/8	0.0000	-0.0007	-0.0005	0.0000
3/8	0.0000	-0.0013	-0.0005	0.0000
4/8	0.0000	-0.0017	-0.0008	0.0000
5/8	0.0000	-0.0024	-0.0008	0.0000
6/8	0.0000	-0.0030	-0.0010	0.0000
7/8	0.0000	-0.0036	-0.0011	0.0000

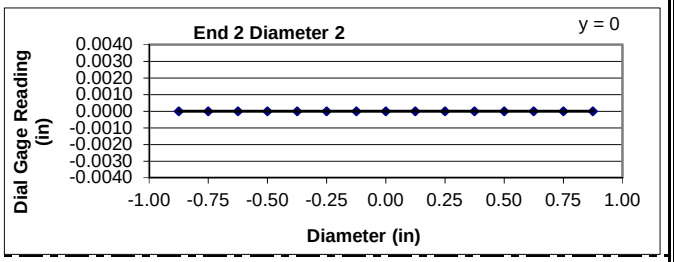




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00016
	Angle of Best Fit Line:	-0.00917
End 2:	Slope of Best Fit Line:	-0.00139
	Angle of Best Fit Line:	-0.07989
	Max Angular Difference:	**0.07**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00370
	Angle of Best Fit Line:	-0.21199
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**-0.21**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0002	0.0001	**YES**
End 1 Diam 2	0.0070	0.0035	**YES**
End 2 Diam 1	0.0024	0.0012	**YES**
End 2 Diam 2	0.0000	0.0000	**YES**

Perpendicularity Tolerance Met? **YES**

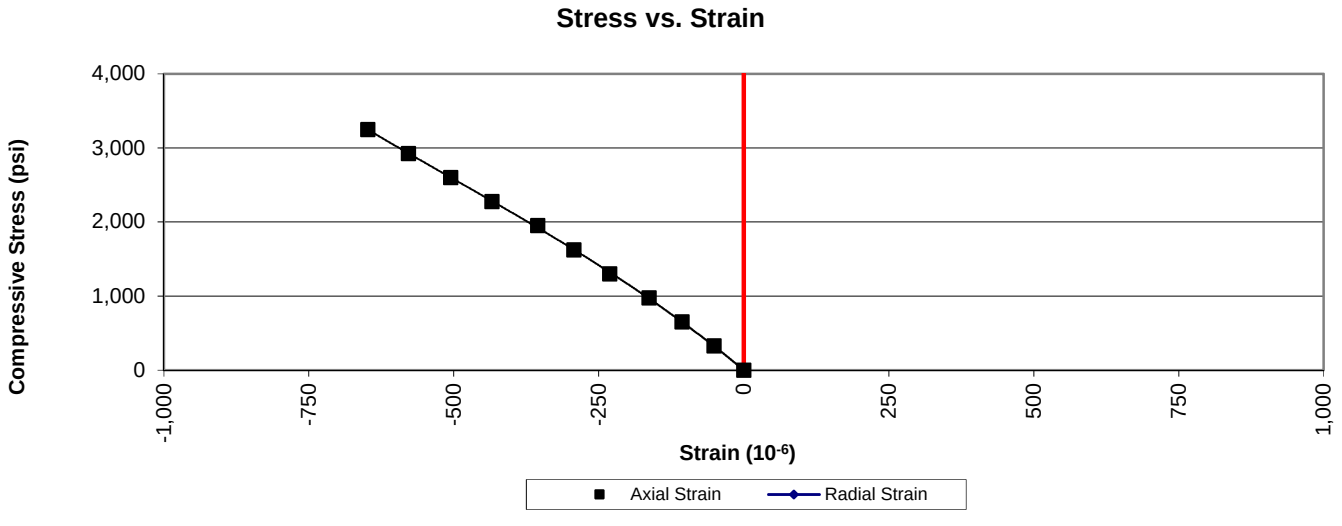
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	3/1/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.45	**Tested by:**	BKP / MG
Boring Id:	B-47	**Unit Weight, pcf:**	169.3	**Reviewed by:**	JBB
Sample No:	RC-4	**Moisture Content, %:**	0.4		
Depth (ft):	64.0 - 65.0	**Load Rate, psi/sec:**	44		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-51		1,000	325	6.37		
3	-106		2,000	649	6.12		
4	-163		3,000	974	5.98		
5	-231		4,000	1,299	5.62		
6	-293		5,000	1,623	5.54		
7	-355		6,000	1,948	5.49		
8	-434		7,000	2,273	5.24		
9	-505		8,000	2,597	5.14		
10	-578		9,000	2,922	5.06		
11	-648		10,000	3,247	5.01		
12			10,041	3,260			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

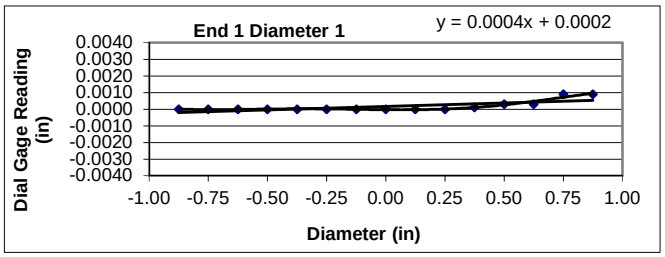
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	2/27/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.45	**Tested by:**	BKP
Boring Id:	B-47	**Unit Weight (pcf):**	169.3	**Reviewed by:**	JBB
Sample No.:	RC-4	**Moisture Content (%):**	0.4		
Depth (ft):	64.0 - 65.0				

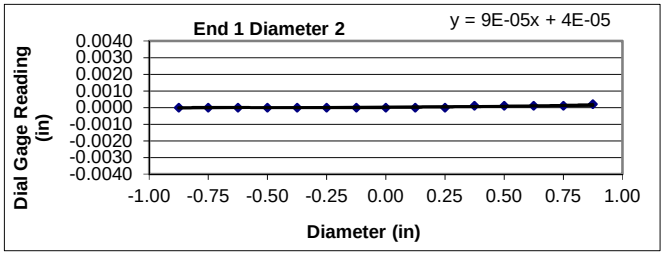
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

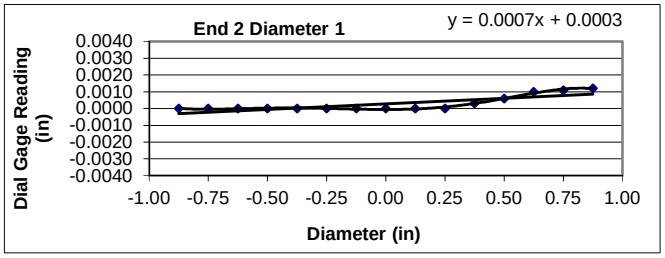
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0000	0.0000	0.0003
- 6/8	0.0000	0.0000	0.0000	0.0002
- 5/8	0.0000	0.0000	0.0000	0.0001
- 4/8	0.0000	0.0000	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0002
2/8	0.0000	0.0000	0.0000	-0.0007
3/8	0.0001	0.0001	0.0003	-0.0010
4/8	0.0003	0.0001	0.0006	-0.0012
5/8	0.0003	0.0001	0.0010	-0.0015
6/8	0.0009	0.0001	0.0011	-0.0016
7/8	0.0009	0.0002	0.0012	-0.0017

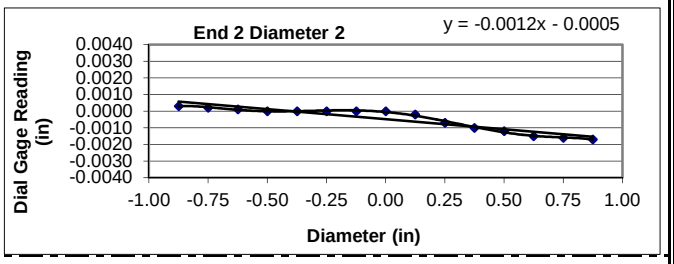




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00042
	Angle of Best Fit Line:	0.02406
End 2:	Slope of Best Fit Line:	0.00067
	Angle of Best Fit Line:	0.03814
	Max Angular Difference:	**-0.01**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00009
	Angle of Best Fit Line:	0.00524
End 2:	Slope of Best Fit Line:	-0.00121
	Angle of Best Fit Line:	-0.06908
	Max Angular Difference:	**0.07**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0009	0.0005	**YES**
End 1 Diam 2	0.0002	0.0001	**YES**
End 2 Diam 1	0.0012	0.0006	**YES**
End 2 Diam 2	0.0020	0.0010	**YES**

Perpendicularity Tolerance Met? **YES**

UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

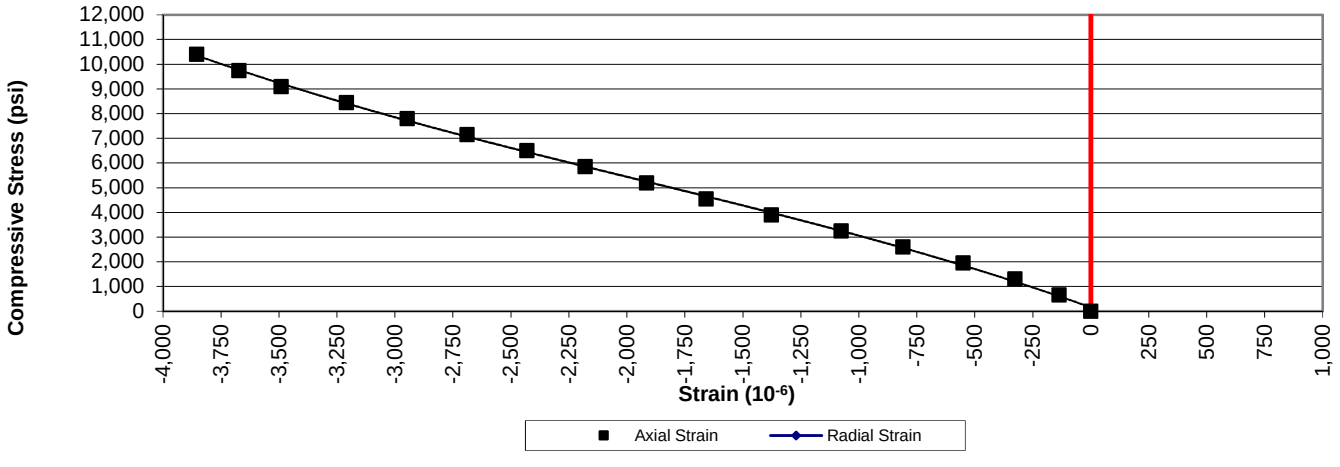
1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	5/2/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.46	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight, pcf:**	178.5	**Reviewed by:**	JBB
Sample No:	RC-1	**Moisture Content, %:**	0.2		
Depth (ft):	15.1 - 15.9	**Load Rate, psi/sec:**	68		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-136		2,000	649	4.77		
3	-326		4,000	1,299	3.98		
4	-550		6,000	1,948	3.54		
5	-809		8,000	2,597	3.21		
6	-1,076		10,000	3,247	3.02		
7	-1,376		12,000	3,896	2.83		
8	-1,658		14,000	4,545	2.74		
9	-1,915		16,000	5,195	2.71		
10	-2,180		18,000	5,844	2.68		
11	-2,430		20,000	6,494	2.67		
12	-2,688		22,000	7,143	2.66		
13	-2,946		24,000	7,792	2.64		
14	-3,208		26,000	8,442	2.63		
15	-3,490		28,000	9,091	2.60		
16	-3,672		30,000	9,740	2.65		
17	-3,854		32,000	10,390	2.70		
18			34,349	11,152			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)
tolerances practicable.

Stress vs. Strain



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

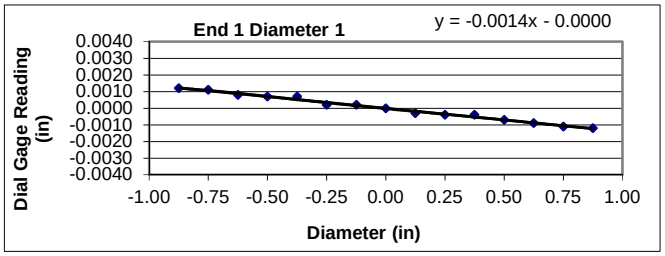
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	4/30/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.46	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight (pcf):**	178.5	**Reviewed by:**	JBB
Sample No.:	RC-1	**Moisture Content (%):**	0.2		
Depth (ft):	15.1 - 15.9				

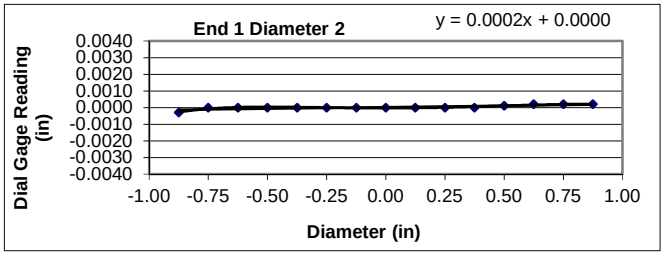
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

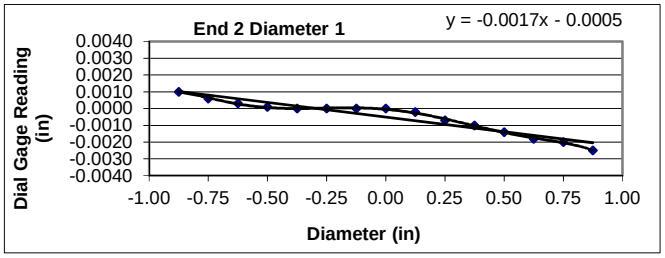
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0012	-0.0003	0.0010	0.0000
- 6/8	0.0011	0.0000	0.0006	0.0000
- 5/8	0.0008	0.0000	0.0003	0.0000
- 4/8	0.0007	0.0000	0.0001	0.0000
- 3/8	0.0007	0.0000	0.0000	0.0000
- 2/8	0.0002	0.0000	0.0000	0.0000
- 1/8	0.0002	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	-0.0003	0.0000	-0.0002	0.0000
2/8	-0.0004	0.0000	-0.0007	0.0000
3/8	-0.0004	0.0000	-0.0010	0.0000
4/8	-0.0007	0.0001	-0.0014	0.0000
5/8	-0.0009	0.0002	-0.0018	0.0000
6/8	-0.0011	0.0002	-0.0020	0.0000
7/8	-0.0012	0.0002	-0.0025	0.0000

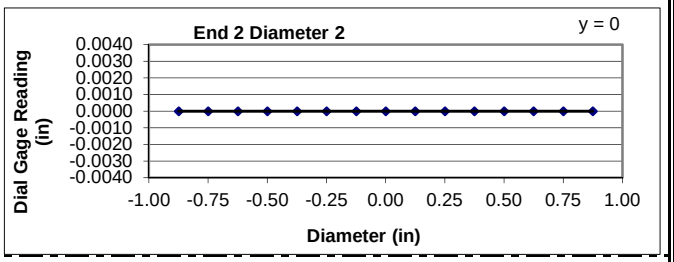




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00140
	Angle of Best Fit Line:	-0.08038
End 2:	Slope of Best Fit Line:	-0.00175
	Angle of Best Fit Line:	-0.10019
	Max Angular Difference:	**0.02**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00017
	Angle of Best Fit Line:	0.00999
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.01**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0024	0.0012	**YES**
End 1 Diam 2	0.0005	0.0003	**YES**
End 2 Diam 1	0.0035	0.0018	**YES**
End 2 Diam 2	0.0000	0.0000	**YES**

Perpendicularity Tolerance Met? **YES**

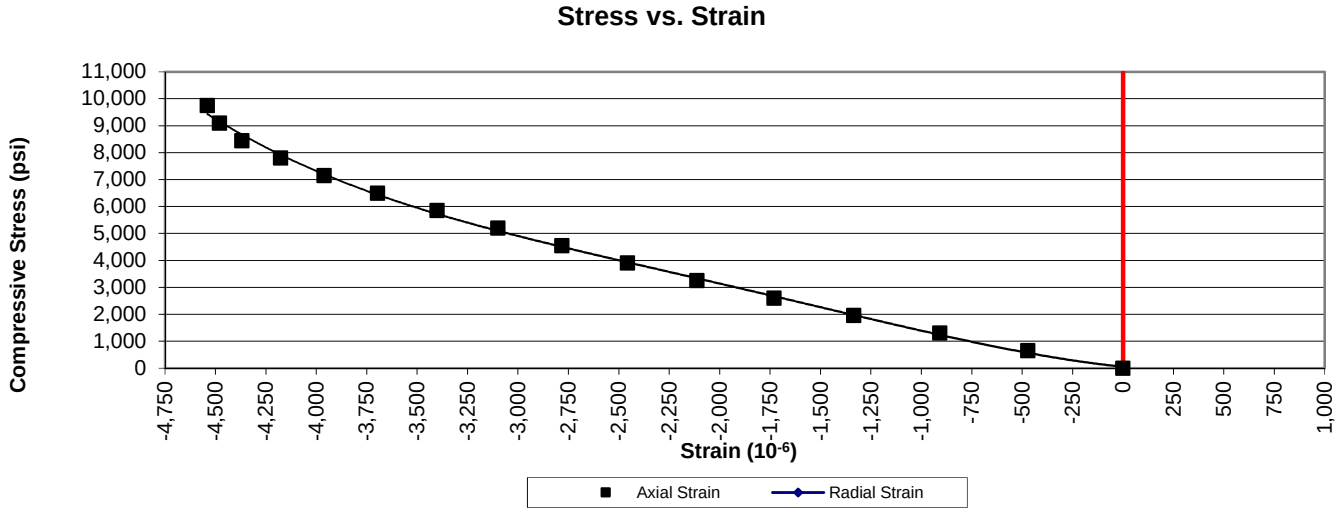
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	5/2/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.45	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight, pcf:**	175.9	**Reviewed by:**	JBB
Sample No:	RC-2	**Moisture Content, %:**	0.5		
Depth (ft):	19.7 - 20.6	**Load Rate, psi/sec:**	73		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-472		2,000	649	1.38		
3	-908		4,000	1,299	1.43		
4	-1,335		6,000	1,948	1.46		
5	-1,730		8,000	2,597	1.50		
6	-2,112		10,000	3,247	1.54		
7	-2,457		12,000	3,896	1.59		
8	-2,782		14,000	4,545	1.63		
9	-3,099		16,000	5,195	1.68		
10	-3,401		18,000	5,844	1.72		
11	-3,696		20,000	6,494	1.76		
12	-3,961		22,000	7,143	1.80		
13	-4,177		24,000	7,792	1.87		
14	-4,369		26,000	8,442	1.93		
15	-4,480		28,000	9,091	2.03		
16	-4,539		30,000	9,740	2.15		
17			32,993	10,712			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)
tolerances practicable.



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

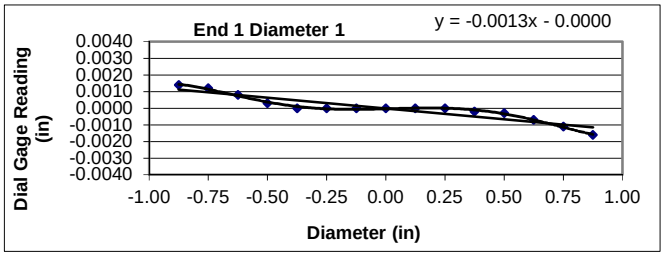
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	4/30/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.45	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight (pcf):**	175.9	**Reviewed by:**	JBB
Sample No.:	RC-2	**Moisture Content (%):**	0.5		
Depth (ft):	19.7 - 20.6				

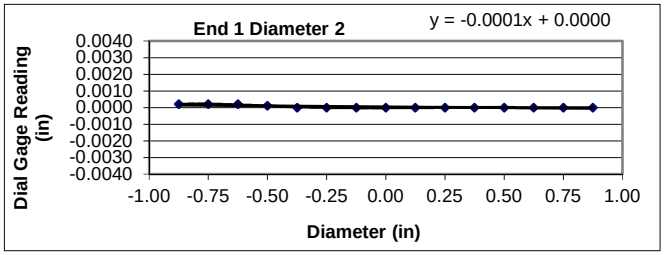
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

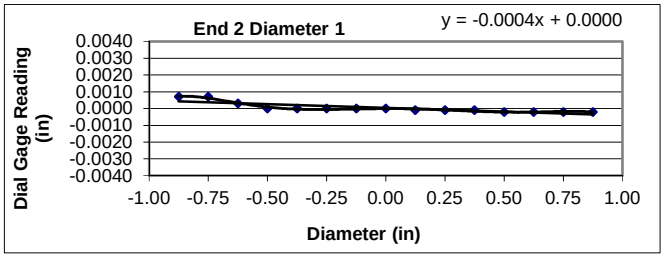
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0014	0.0002	0.0007	0.0000
- 6/8	0.0012	0.0002	0.0007	0.0000
- 5/8	0.0008	0.0002	0.0003	0.0000
- 4/8	0.0003	0.0001	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	-0.0001	0.0000
2/8	0.0000	0.0000	-0.0001	0.0000
3/8	-0.0002	0.0000	-0.0001	0.0001
4/8	-0.0003	0.0000	-0.0002	0.0002
5/8	-0.0007	0.0000	-0.0002	0.0004
6/8	-0.0011	0.0000	-0.0002	0.0005
7/8	-0.0016	0.0000	-0.0002	0.0006

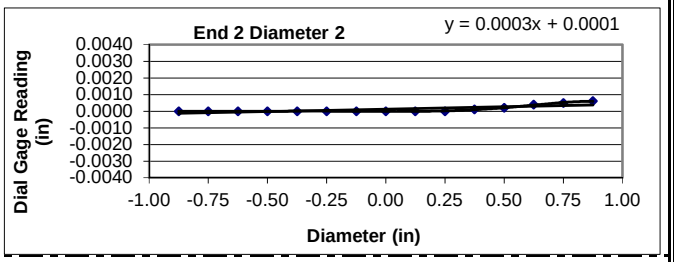




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00129
	Angle of Best Fit Line:	-0.07416
End 2:	Slope of Best Fit Line:	-0.00045
	Angle of Best Fit Line:	-0.02554
	Max Angular Difference:	**-0.05**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00011
	Angle of Best Fit Line:	-0.00655
End 2:	Slope of Best Fit Line:	0.00029
	Angle of Best Fit Line:	0.01686
	Max Angular Difference:	**-0.02**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0030	0.0015	**YES**
End 1 Diam 2	0.0002	0.0001	**YES**
End 2 Diam 1	0.0009	0.0005	**YES**
End 2 Diam 2	0.0006	0.0003	**YES**

Perpendicularity Tolerance Met? **YES**

UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

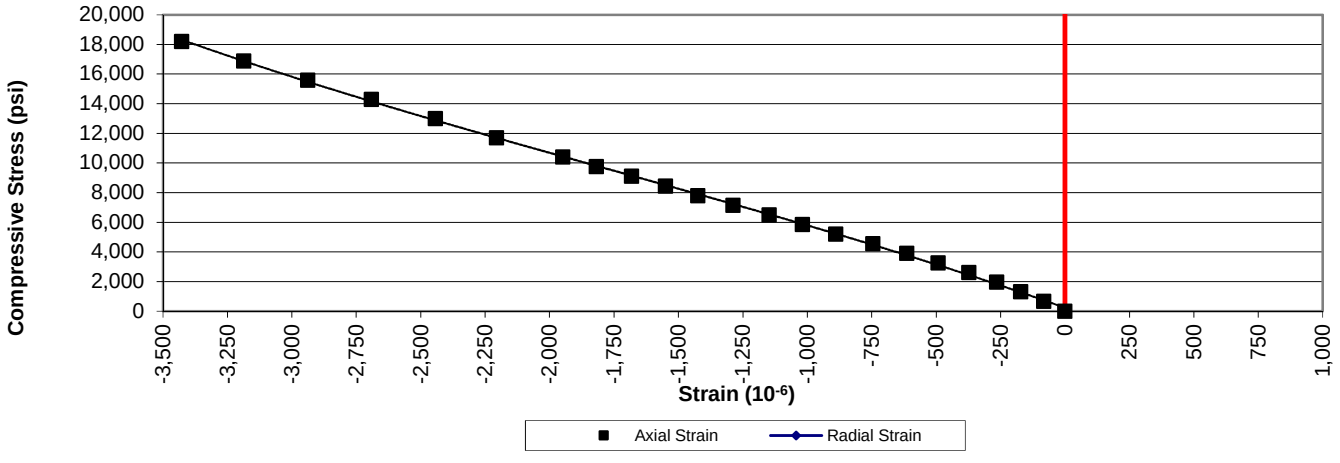
1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	5/2/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.37	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight, pcf:**	179.1	**Reviewed by:**	JBB
Sample No:	RC-4	**Moisture Content, %:**	0.3		
Depth (ft):	34.0 - 34.7	**Load Rate, psi/sec:**	73		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-82		2,000	649	7.91		
3	-172		4,000	1,299	7.55		
4	-265		6,000	1,948	7.35		
5	-373		8,000	2,597	6.96		
6	-492		10,000	3,247	6.60		
7	-614		12,000	3,896	6.35		
8	-745		14,000	4,545	6.10		
9	-889		16,000	5,195	5.84		
10	-1,019		18,000	5,844	5.74		
11	-1,147		20,000	6,494	5.66		
12	-1,288		22,000	7,143	5.55		
13	-1,424		24,000	7,792	5.47		
14	-1,550		26,000	8,442	5.45		
15	-1,681		28,000	9,091	5.41		
16	-1,818		30,000	9,740	5.36		
17	-1,948		32,000	10,390	5.33		
18	-2,205		36,000	11,688	5.30		
19	-2,443		40,000	12,987	5.32		
20	-2,691		44,000	14,286	5.31		
21	-2,938		48,000	15,584	5.30		
22	-3,186		52,000	16,883	5.30		
23	-3,427		56,000	18,182	5.31		
24			58,898	19,123			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)
tolerances practicable.

Stress vs. Strain



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

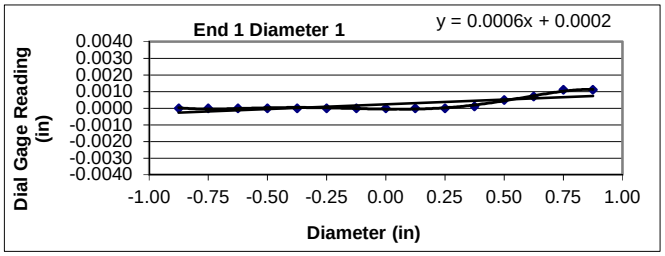
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	4/30/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.37	**Tested by:**	BKP
Boring Id:	B-48	**Unit Weight (pcf):**	179.1	**Reviewed by:**	JBB
Sample No.:	RC-4	**Moisture Content (%):**	0.3		
Depth (ft):	34.0 - 34.7				

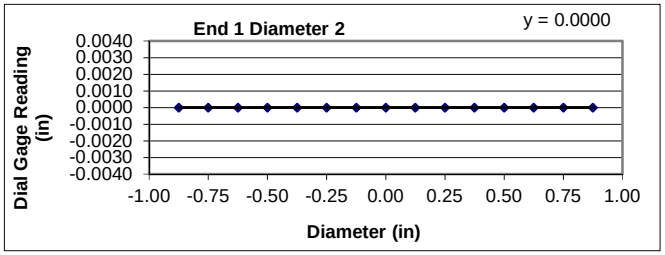
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

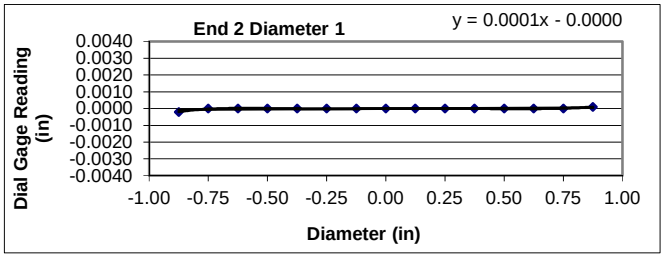
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0000	-0.0002	0.0005
- 6/8	0.0000	0.0000	0.0000	0.0002
- 5/8	0.0000	0.0000	0.0000	0.0001
- 4/8	0.0000	0.0000	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	0.0000
3/8	0.0001	0.0000	0.0000	-0.0002
4/8	0.0005	0.0000	0.0000	-0.0004
5/8	0.0007	0.0000	0.0000	-0.0004
6/8	0.0011	0.0000	0.0000	-0.0006
7/8	0.0011	0.0000	0.0001	-0.0008

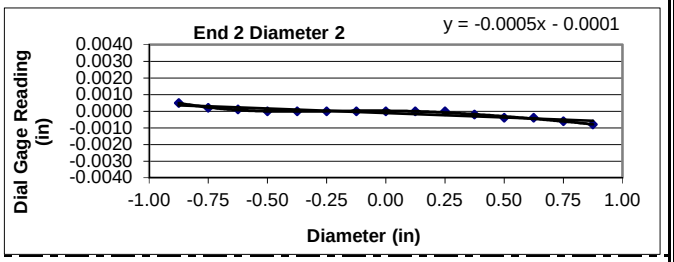




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00057
	Angle of Best Fit Line:	0.03290
End 2:	Slope of Best Fit Line:	0.00006
	Angle of Best Fit Line:	0.00344
	Max Angular Difference:	**0.03**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	-0.00053
	Angle of Best Fit Line:	-0.03045
	Max Angular Difference:	**0.03**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0011	0.0006	**YES**
End 1 Diam 2	0.0000	0.0000	**YES**
End 2 Diam 1	0.0003	0.0002	**YES**
End 2 Diam 2	0.0013	0.0007	**YES**

Perpendicularity Tolerance Met? **YES**

UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

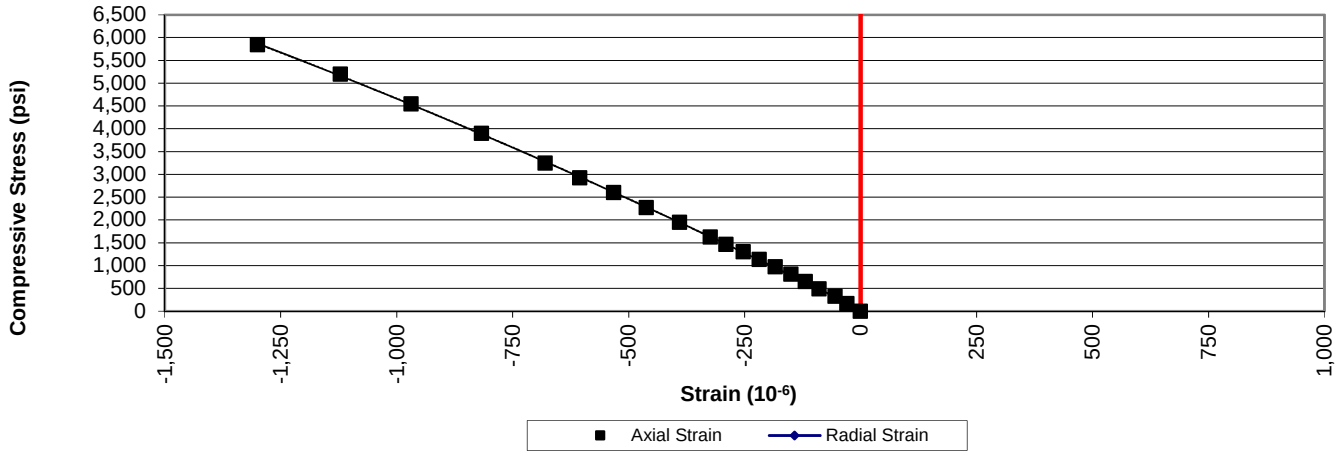
1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	3/12/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.48	**Tested by:**	BKP / MG
Boring Id:	B-49	**Unit Weight, pcf:**	167.8	**Reviewed by:**	JBB
Sample No:	RC-3	**Moisture Content, %:**	0.3		
Depth (ft):	49.2 - 50.3	**Load Rate, psi/sec:**	46		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-29		500	162	5.59		
3	-55		1,000	325	5.91		
4	-89		1,500	487	5.47		
5	-119		2,000	649	5.45		
6	-150		2,500	812	5.41		
7	-184		3,000	974	5.29		
8	-218		3,500	1,136	5.21		
9	-253		4,000	1,299	5.13		
10	-290		4,500	1,461	5.04		
11	-324		5,000	1,623	5.01		
12	-390		6,000	1,948	4.99		
13	-462		7,000	2,273	4.92		
14	-532		8,000	2,597	4.88		
15	-605		9,000	2,922	4.83		
16	-680		10,000	3,247	4.78		
17	-817		12,000	3,896	4.77		
18	-969		14,000	4,545	4.69		
19	-1,121		16,000	5,195	4.63		
20	-1,300		18,000	5,844	4.50		
21			18,229	5,919			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.

Stress vs. Strain



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

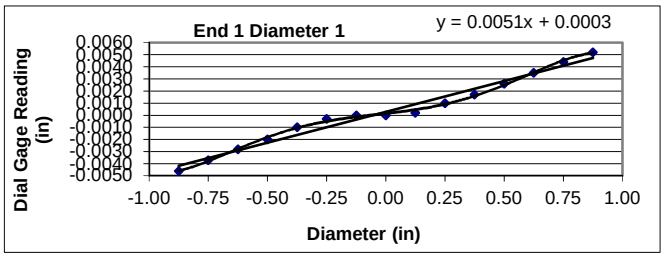
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	3/8/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.48	**Tested by:**	BKP
Boring Id:	B-49	**Unit Weight (pcf):**	167.8	**Reviewed by:**	JBB
Sample No.:	RC-3	**Moisture Content (%):**	0.3		
Depth (ft):	49.2 - 50.3				

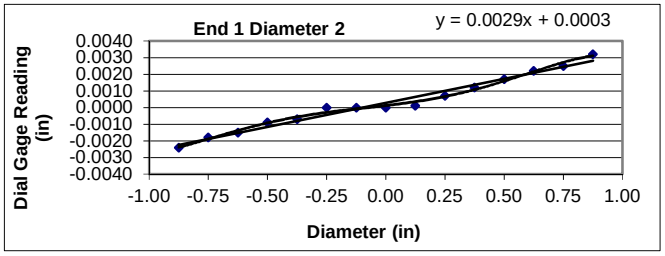
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

End Flatness and Parallelism Readings (Procedure FP1)

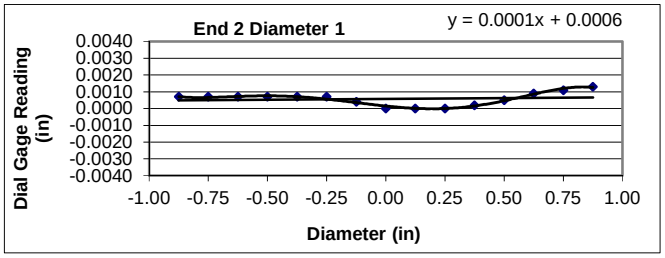
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0046	-0.0024	0.0007	0.0000
- 6/8	-0.0037	-0.0018	0.0007	0.0000
- 5/8	-0.0028	-0.0015	0.0007	0.0000
- 4/8	-0.0020	-0.0009	0.0007	0.0000
- 3/8	-0.0010	-0.0007	0.0007	0.0000
- 2/8	-0.0003	0.0000	0.0007	0.0000
- 1/8	0.0000	0.0000	0.0004	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0001	0.0000	0.0000
2/8	0.0010	0.0007	0.0000	0.0000
3/8	0.0017	0.0012	0.0002	0.0000
4/8	0.0026	0.0017	0.0005	0.0000
5/8	0.0035	0.0022	0.0009	0.0000
6/8	0.0044	0.0025	0.0011	0.0000
7/8	0.0052	0.0032	0.0013	0.0000

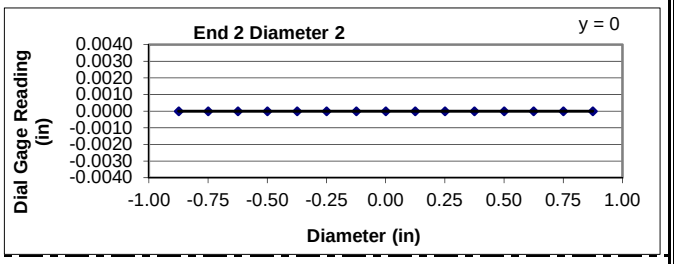




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00509
	Angle of Best Fit Line:	0.29139
End 2:	Slope of Best Fit Line:	0.00010
	Angle of Best Fit Line:	0.00573
	Max Angular Difference:	**0.29**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00289
	Angle of Best Fit Line:	0.16550
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.17**

Parallelism Tolerance Met? **NO**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0098	0.0049	**NO**
End 1 Diam 2	0.0056	0.0028	**YES**
End 2 Diam 1	0.0013	0.0007	**YES**
End 2 Diam 2	0.0000	0.0000	**YES**

Perpendicularity Tolerance Met? **NO**

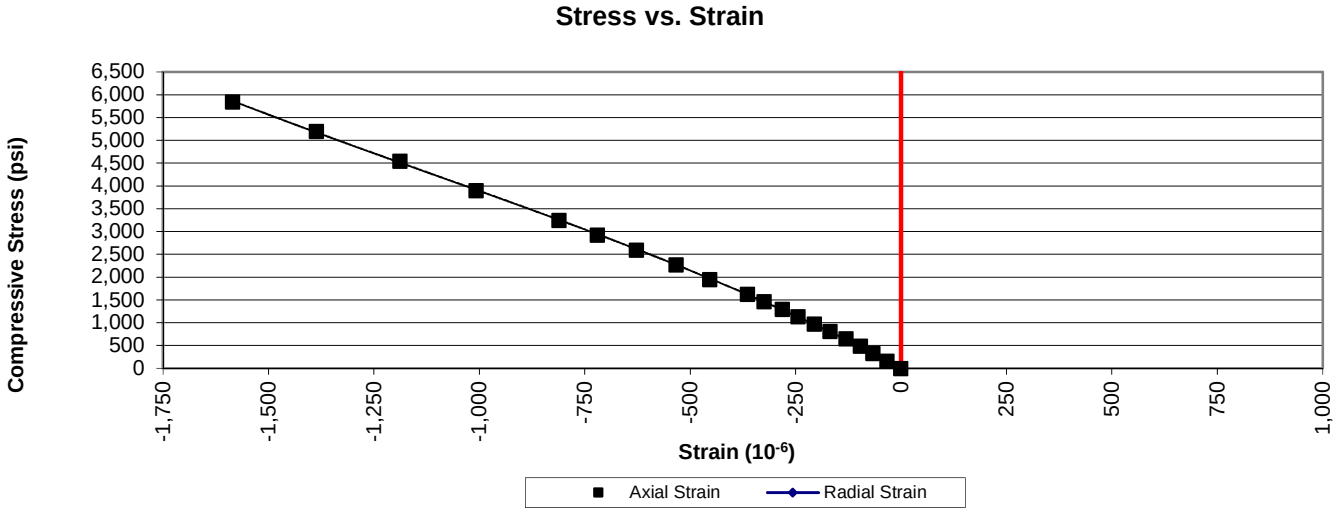
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.98	**Date:**	3/12/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.38	**Tested by:**	BKP / MG
Boring Id:	B-49	**Unit Weight, pcf:**	169.4	**Reviewed by:**	JBB
Sample No:	RC-5	**Moisture Content, %:**	0.4		
Depth (ft):	56.6 - 57.6	**Load Rate, psi/sec:**	46		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-33		500	162	4.91		
3	-66		1,000	325	4.92		
4	-96		1,500	487	5.07		
5	-130		2,000	649	4.99		
6	-168		2,500	812	4.83		
7	-205		3,000	974	4.75		
8	-244		3,500	1,136	4.66		
9	-281		4,000	1,299	4.62		
10	-324		4,500	1,461	4.51		
11	-364		5,000	1,623	4.46		
12	-453		6,000	1,948	4.30		
13	-533		7,000	2,273	4.26		
14	-627		8,000	2,597	4.14		
15	-720		9,000	2,922	4.06		
16	-811		10,000	3,247	4.00		
17	-1,007		12,000	3,896	3.87		
18	-1,188		14,000	4,545	3.83		
19	-1,386		16,000	5,195	3.75		
20	-1,585		18,000	5,844	3.69		
21			19,997	6,493			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

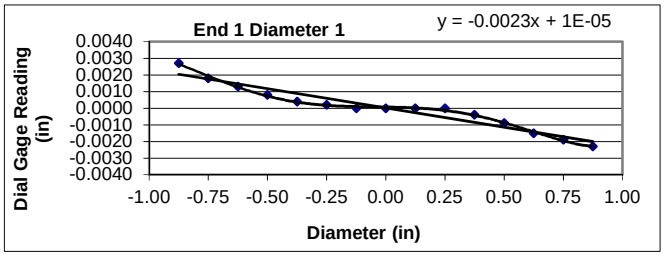
Project:	Carolina Crossroads Project	**Diameter (in):**	1.98	**Date:**	3/8/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.38	**Tested by:**	BKP
Boring Id:	B-49	**Unit Weight (pcf):**	169.4	**Reviewed by:**	JBB
Sample No.:	RC-5	**Moisture Content (%):**	0.4		
Depth (ft):	56.6 - 57.6				

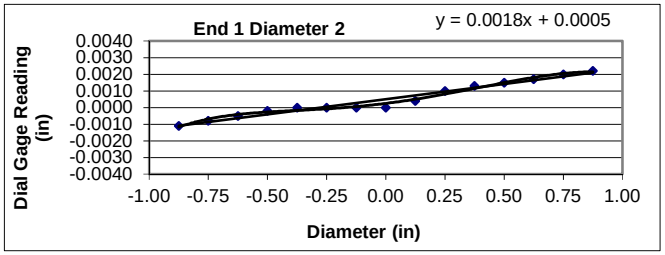
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

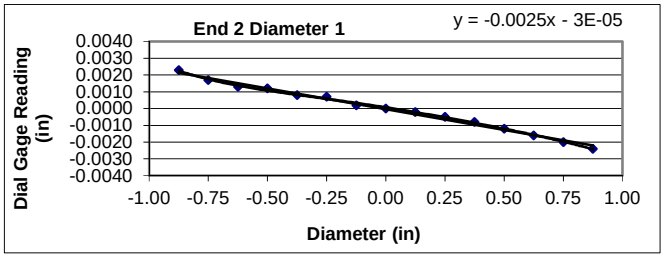
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0027	-0.0011	0.0023	-0.0013
- 6/8	0.0018	-0.0008	0.0017	-0.0011
- 5/8	0.0013	-0.0005	0.0013	-0.0010
- 4/8	0.0008	-0.0002	0.0012	-0.0002
- 3/8	0.0004	0.0000	0.0008	0.0000
- 2/8	0.0002	0.0000	0.0007	0.0000
- 1/8	0.0000	0.0000	0.0002	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0004	-0.0002	0.0000
2/8	0.0000	0.0010	-0.0005	0.0000
3/8	-0.0004	0.0013	-0.0008	0.0000
4/8	-0.0009	0.0015	-0.0012	0.0002
5/8	-0.0015	0.0017	-0.0016	0.0005
6/8	-0.0019	0.0020	-0.0020	0.0010
7/8	-0.0023	0.0022	-0.0024	0.0014

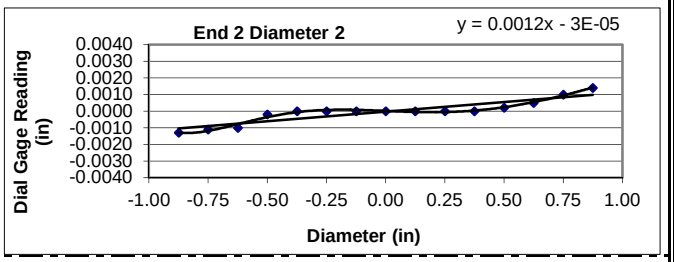




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00231
	Angle of Best Fit Line:	-0.13227
End 2:	Slope of Best Fit Line:	-0.00248
	Angle of Best Fit Line:	-0.14209
	Max Angular Difference:	**0.01**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00183
	Angle of Best Fit Line:	0.10477
End 2:	Slope of Best Fit Line:	0.00116
	Angle of Best Fit Line:	0.06646
	Max Angular Difference:	**0.04**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0050	0.0025	**YES**
End 1 Diam 2	0.0033	0.0017	**YES**
End 2 Diam 1	0.0047	0.0024	**YES**
End 2 Diam 2	0.0027	0.0014	**YES**

Perpendicularity Tolerance Met? **YES**

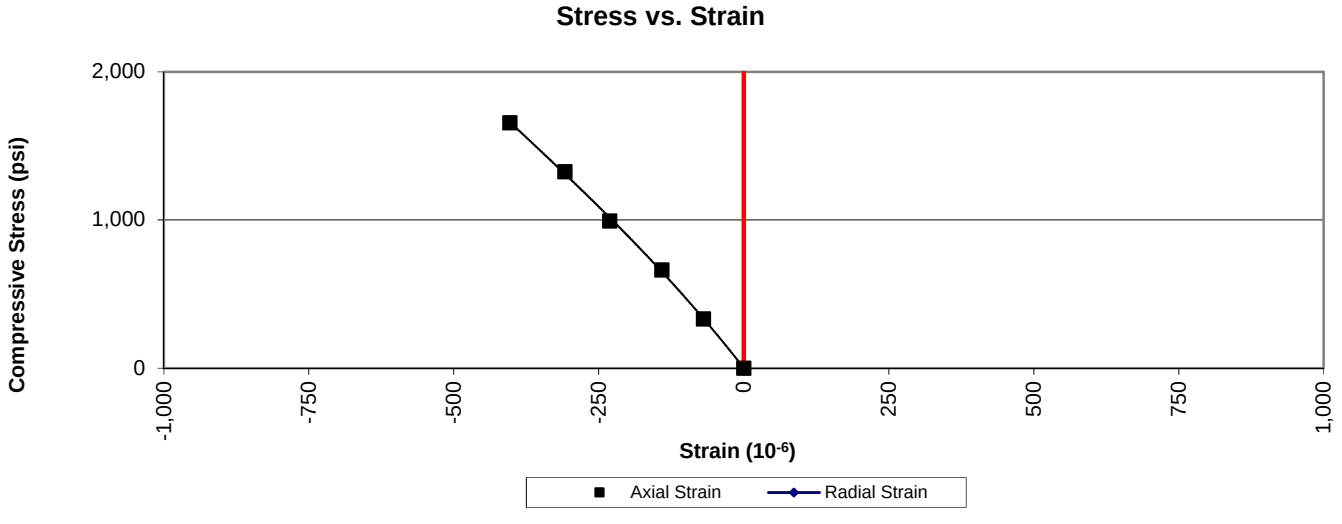
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.96	**Date:**	3/1/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.32	**Tested by:**	BKP / MG
Boring Id:	B-50	**Unit Weight, pcf:**	170.8	**Reviewed by:**	JBB
Sample No:	RC-1	**Moisture Content, %:**	0.3		
Depth (ft):	73.7 - 74.3	**Load Rate, psi/sec:**	22		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-69		1,000	331	4.80		
3	-141		2,000	662	4.70		
4	-231		3,000	993	4.30		
5	-308		4,000	1,325	4.30		
6	-403		5,000	1,656	4.11		
7			5,945	1,969			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Due to the low compressive strength of this specimen, readings of deformation at a minimum of ten evenly spaced load intervals were not able to be obtained.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

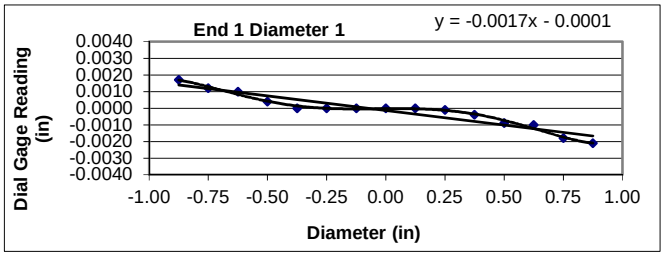
Project:	Carolina Crossroads Project	**Diameter (in):**	1.96	**Date:**	2/27/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.32	**Tested by:**	BKP
Boring Id:	B-50	**Unit Weight (pcf):**	170.8	**Reviewed by:**	JBB
Sample No.:	RC-1	**Moisture Content (%):**	0.3		
Depth (ft):	73.7 - 74.3				

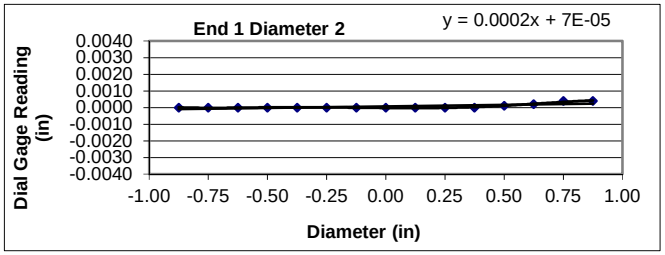
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

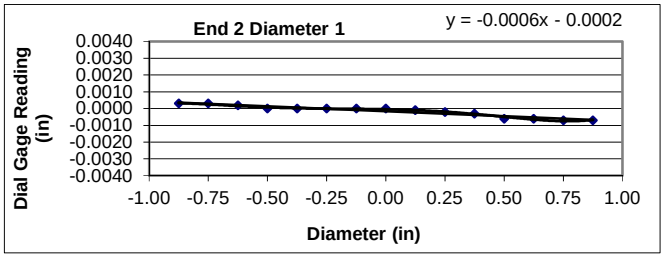
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0017	0.0000	0.0003	0.0028
- 6/8	0.0012	0.0000	0.0003	0.0026
- 5/8	0.0010	0.0000	0.0002	0.0023
- 4/8	0.0004	0.0000	0.0000	0.0018
- 3/8	0.0000	0.0000	0.0000	0.0010
- 2/8	0.0000	0.0000	0.0000	0.0007
- 1/8	0.0000	0.0000	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	-0.0001	-0.0001
2/8	-0.0001	0.0000	-0.0002	-0.0006
3/8	-0.0004	0.0000	-0.0003	-0.0012
4/8	-0.0009	0.0001	-0.0006	-0.0013
5/8	-0.0010	0.0002	-0.0006	-0.0018
6/8	-0.0018	0.0004	-0.0007	-0.0021
7/8	-0.0021	0.0004	-0.0007	-0.0026

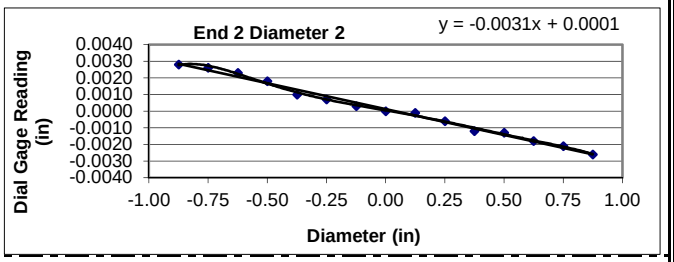




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00175
	Angle of Best Fit Line:	-0.10019
End 2:	Slope of Best Fit Line:	-0.00059
	Angle of Best Fit Line:	-0.03405
	Max Angular Difference:	**-0.07**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00019
	Angle of Best Fit Line:	0.01080
End 2:	Slope of Best Fit Line:	-0.00310
	Angle of Best Fit Line:	-0.17762
	Max Angular Difference:	**0.19**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0038	0.0019	**YES**
End 1 Diam 2	0.0004	0.0002	**YES**
End 2 Diam 1	0.0010	0.0005	**YES**
End 2 Diam 2	0.0054	0.0028	**YES**

Perpendicularity Tolerance Met? **YES**

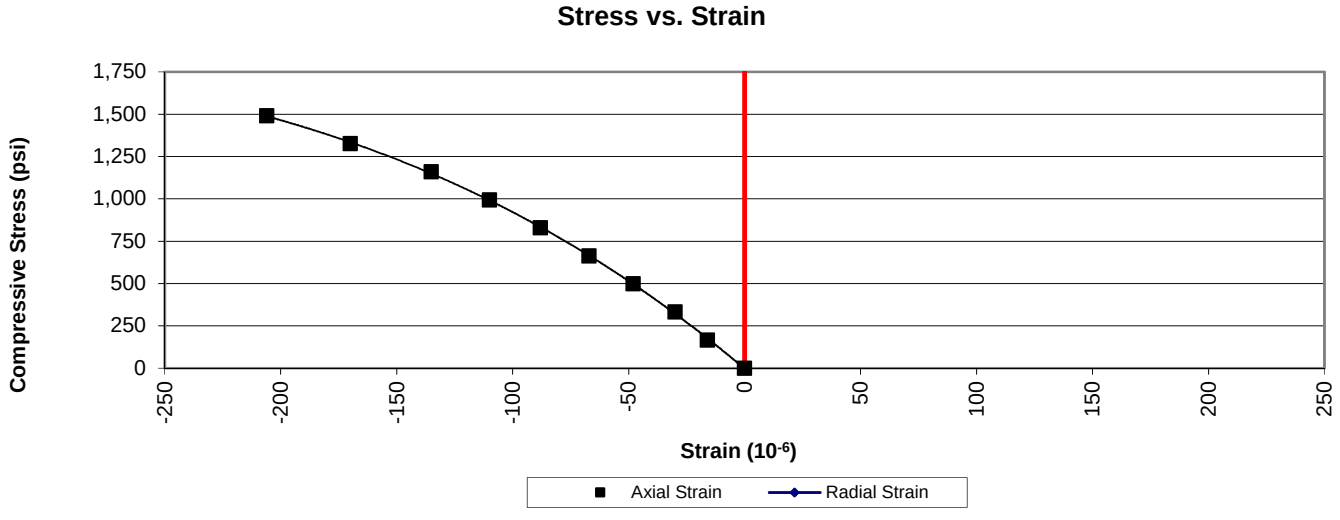
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.96	**Date:**	3/12/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.43	**Tested by:**	BKP / MG
Boring Id:	B-50	**Unit Weight, pcf:**	172.5	**Reviewed by:**	JBB
Sample No:	RC-2	**Moisture Content, %:**	0.3		
Depth (ft):	81.2 - 82.2	**Load Rate, psi/sec:**	22		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-16		500	166	10.38		
3	-30		1,000	331	11.03		
4	-48		1,500	497	10.35		
5	-67		2,000	662	9.88		
6	-88		2,500	828	9.41		
7	-110		3,000	993	9.03		
8	-135		3,500	1,159	8.59		
9	-170		4,000	1,325	7.79		
10	-206		4,500	1,490	7.23		
11			4,745	1,571			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

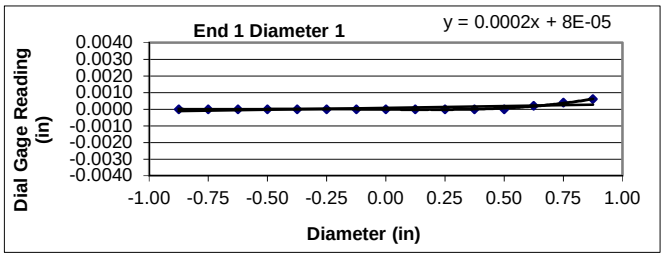
Project:	Carolina Crossroads Project	**Diameter (in):**	1.96	**Date:**	3/8/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.43	**Tested by:**	BKP
Boring Id:	B-50	**Unit Weight (pcf):**	172.5	**Reviewed by:**	JBB
Sample No.:	RC-2	**Moisture Content (%):**	0.3		
Depth (ft):	81.2 - 82.2				

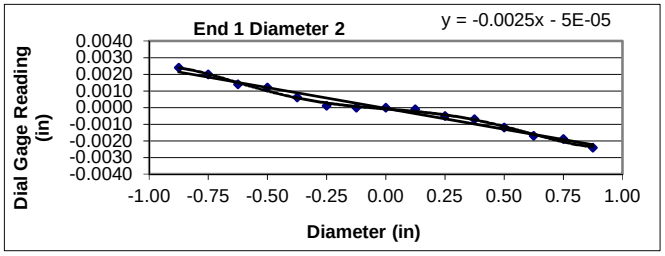
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

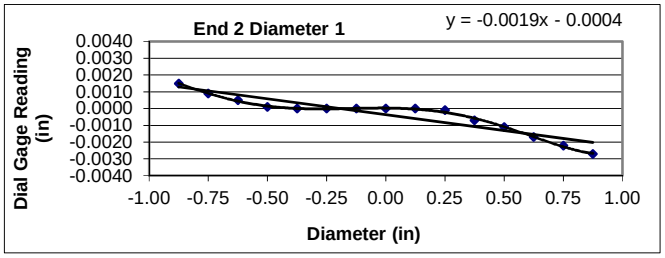
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0024	0.0015	0.0015
- 6/8	0.0000	0.0020	0.0009	0.0010
- 5/8	0.0000	0.0014	0.0005	0.0008
- 4/8	0.0000	0.0012	0.0001	0.0005
- 3/8	0.0000	0.0006	0.0000	0.0002
- 2/8	0.0000	0.0001	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	-0.0001	0.0000	0.0000
2/8	0.0000	-0.0005	-0.0001	-0.0007
3/8	0.0000	-0.0007	-0.0007	-0.0010
4/8	0.0000	-0.0012	-0.0011	-0.0015
5/8	0.0002	-0.0017	-0.0017	-0.0022
6/8	0.0004	-0.0019	-0.0022	-0.0026
7/8	0.0006	-0.0024	-0.0027	-0.0031

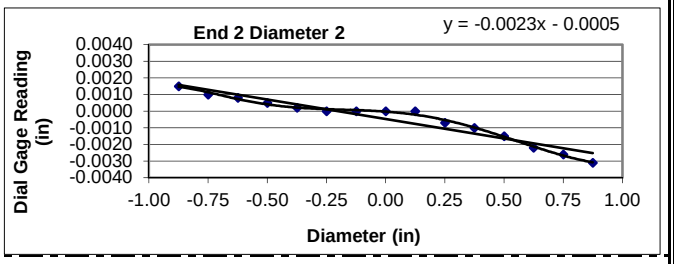




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00022
	Angle of Best Fit Line:	0.01244
End 2:	Slope of Best Fit Line:	-0.00189
	Angle of Best Fit Line:	-0.10821
	Max Angular Difference:	**0.12**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00249
	Angle of Best Fit Line:	-0.14291
End 2:	Slope of Best Fit Line:	-0.00234
	Angle of Best Fit Line:	-0.13391
	Max Angular Difference:	**-0.01**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0006	0.0003	**YES**
End 1 Diam 2	0.0048	0.0024	**YES**
End 2 Diam 1	0.0042	0.0021	**YES**
End 2 Diam 2	0.0046	0.0023	**YES**

Perpendicularity Tolerance Met? **YES**

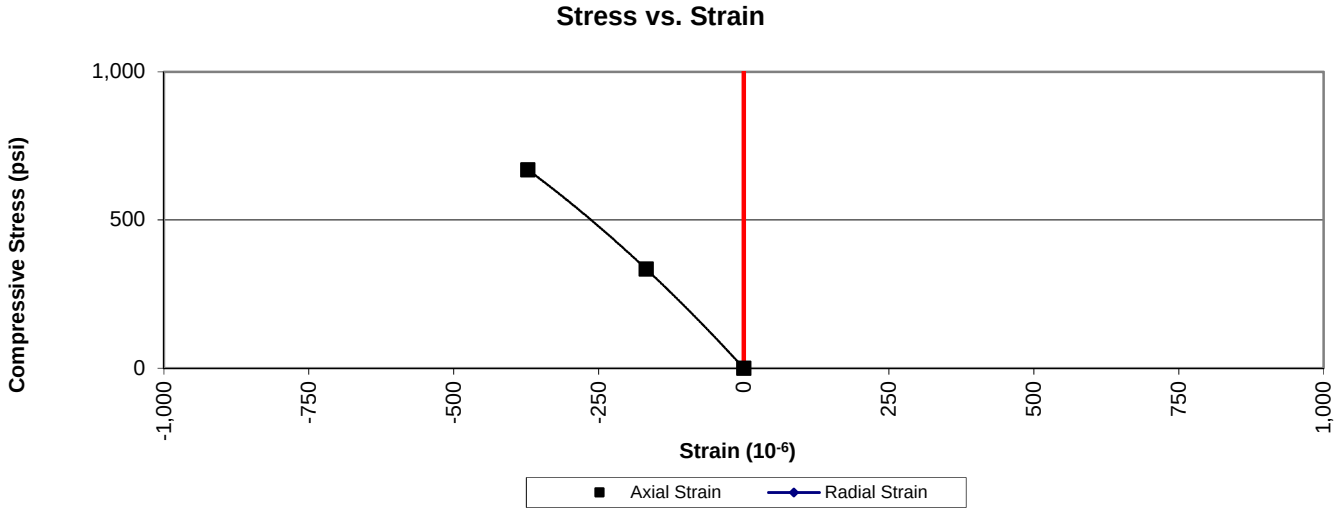
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	1.95	**Date:**	3/2/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	4.34	**Tested by:**	BKP / MG
Boring Id:	B-50	**Unit Weight, pcf:**	167.6	**Reviewed by:**	JBB
Sample No:	RC-4	**Moisture Content, %:**	0.3		
Depth (ft):	87.7 - 88.5	**Load Rate, psi/sec:**	22		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-168		1,000	334	1.99		
3	-372		2,000	669	1.80		
4			2,590	866			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Due to the low compressive strength of this specimen, readings of deformation at a minimum of ten evenly spaced load intervals were not able to be obtained.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

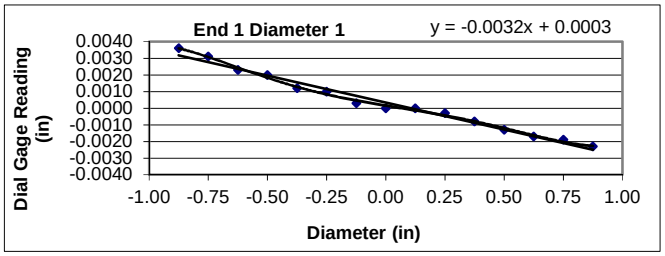
Project:	Carolina Crossroads Project	**Diameter (in):**	1.95	**Date:**	2/27/2018
Project No.:	1461-16-047 Phase B	**Length (in):**	4.34	**Tested by:**	BKP
Boring Id:	B-50	**Unit Weight (pcf):**	167.6	**Reviewed by:**	JBB
Sample No.:	RC-4	**Moisture Content (%):**	0.3		
Depth (ft):	87.7 - 88.5				

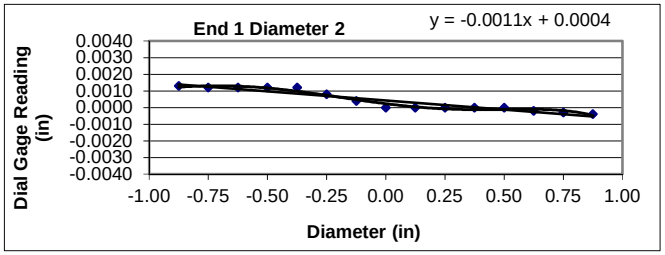
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

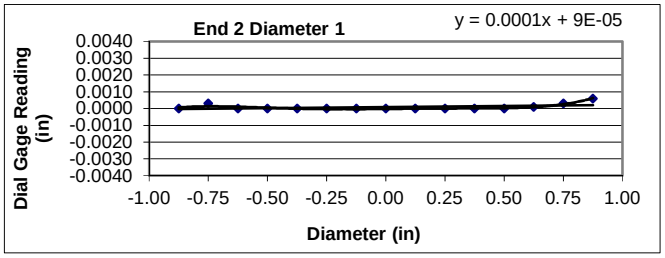
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0036	0.0013	0.0000	0.0042
- 6/8	0.0031	0.0012	0.0003	0.0037
- 5/8	0.0023	0.0012	0.0000	0.0030
- 4/8	0.0020	0.0012	0.0000	0.0022
- 3/8	0.0012	0.0012	0.0000	0.0013
- 2/8	0.0010	0.0008	0.0000	0.0008
- 1/8	0.0003	0.0004	0.0000	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0001
2/8	-0.0003	0.0000	0.0000	-0.0006
3/8	-0.0008	0.0000	0.0000	-0.0012
4/8	-0.0013	0.0000	0.0000	-0.0019
5/8	-0.0017	-0.0002	0.0001	-0.0024
6/8	-0.0019	-0.0003	0.0003	-0.0031
7/8	-0.0023	-0.0004	0.0006	-0.0037

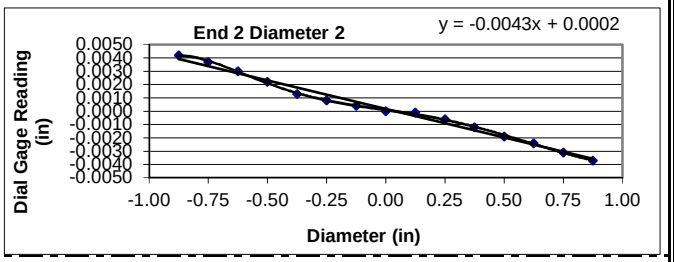




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00324
	Angle of Best Fit Line:	-0.18564
End 2:	Slope of Best Fit Line:	0.00013
	Angle of Best Fit Line:	0.00769
	Max Angular Difference:	**-0.19**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00109
	Angle of Best Fit Line:	-0.06270
End 2:	Slope of Best Fit Line:	-0.00429
	Angle of Best Fit Line:	-0.24604
	Max Angular Difference:	**0.18**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0059	0.0030	**YES**
End 1 Diam 2	0.0017	0.0009	**YES**
End 2 Diam 1	0.0006	0.0003	**YES**
End 2 Diam 2	0.0079	0.0041	**YES**

Perpendicularity Tolerance Met? **YES**

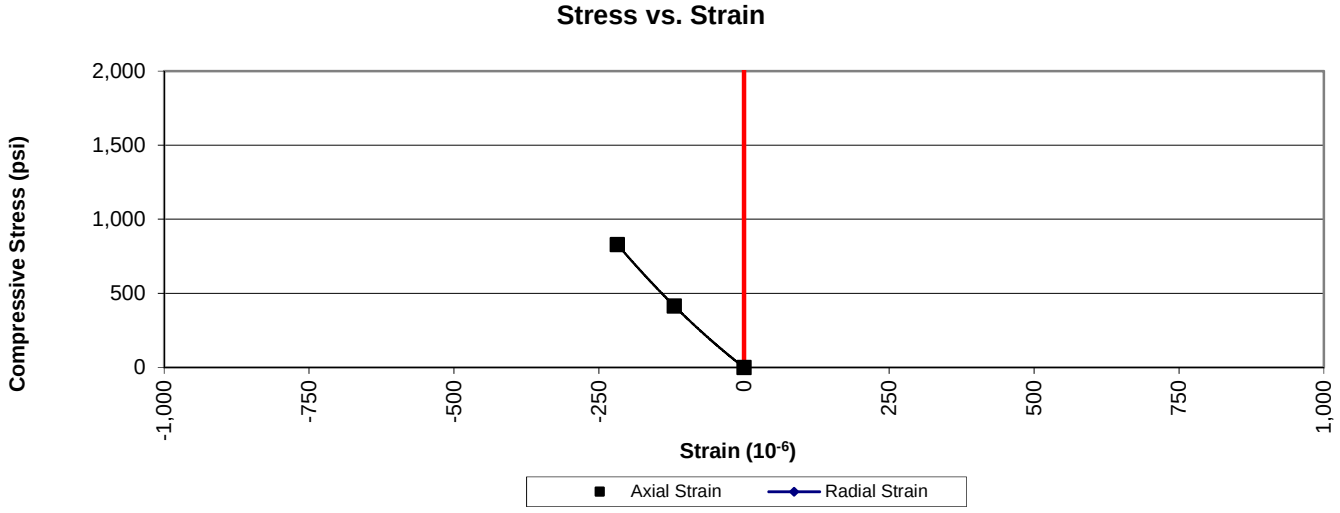
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.48	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.48	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	176.0	**Reviewed by:**	JBB
Sample No:	RC-2	**Moisture Content, %:**	0.2		
Depth (ft):	55.2 - 56.4	**Load Rate, psi/sec:**	50		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-120		2,000	414	3.45		
3	-218		4,000	828	3.80		
4			5,270	1,091			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Due to the low compressive strength of this specimen, readings of deformation at a minimum of ten evenly spaced load intervals were not able to be obtained.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

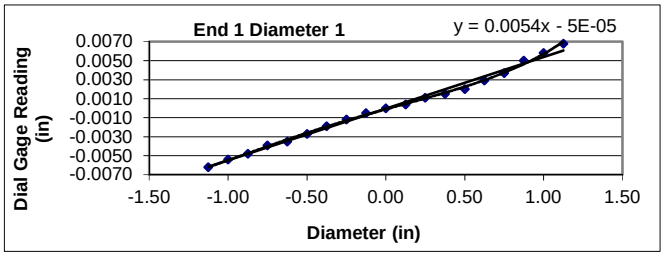
Project:	Carolina Crossroads Project	**Diameter (in):**	2.48	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.48	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	176.0	**Reviewed by:**	JBB
Sample No.:	RC-2	**Moisture Content (%):**	0.2		
Depth (ft):	55.2 - 56.4				

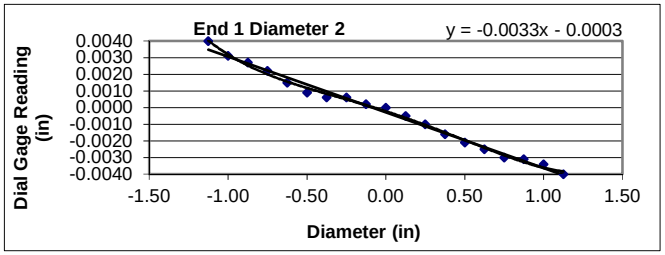
Deviation From Straightness (Procedure S1)

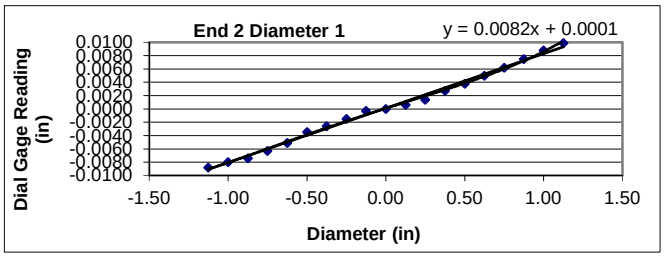
Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

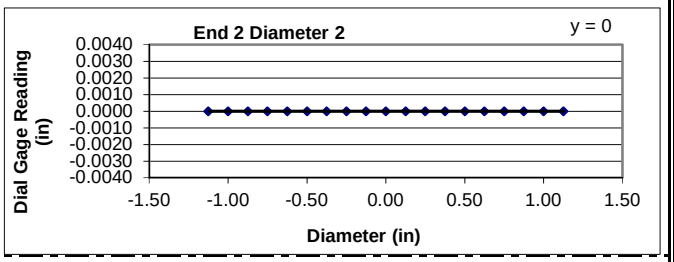
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	-0.0062	0.0040	-0.0088	0.0000
-1	-0.0054	0.0031	-0.0080	0.0000
- 7/8	-0.0048	0.0027	-0.0074	0.0000
- 6/8	-0.0039	0.0022	-0.0063	0.0000
- 5/8	-0.0035	0.0015	-0.0051	0.0000
- 4/8	-0.0027	0.0009	-0.0035	0.0000
- 3/8	-0.0019	0.0006	-0.0026	0.0000
- 2/8	-0.0012	0.0006	-0.0015	0.0000
- 1/8	-0.0005	0.0002	-0.0003	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0004	-0.0005	0.0006	0.0000
2/8	0.0011	-0.0010	0.0014	0.0000
3/8	0.0015	-0.0016	0.0027	0.0000
4/8	0.0020	-0.0021	0.0038	0.0000
5/8	0.0029	-0.0025	0.0050	0.0000
6/8	0.0037	-0.0030	0.0062	0.0000
7/8	0.0050	-0.0031	0.0075	0.0000
1	0.0058	-0.0034	0.0088	0.0000
1 1/8	0.0068	-0.0040	0.0099	0.0000









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00544
	Angle of Best Fit Line:	0.31145
End 2:	Slope of Best Fit Line:	0.00820
	Angle of Best Fit Line:	0.46987
	Max Angular Difference:	**-0.16**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00334
	Angle of Best Fit Line:	-0.19163
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**-0.19**

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0130	0.0052	**NO**
End 1 Diam 2	0.0080	0.0032	**YES**
End 2 Diam 1	0.0187	0.0075	**NO**
End 2 Diam 2	0.0000	0.0000	**YES**

Perpendicularity Tolerance Met? NO

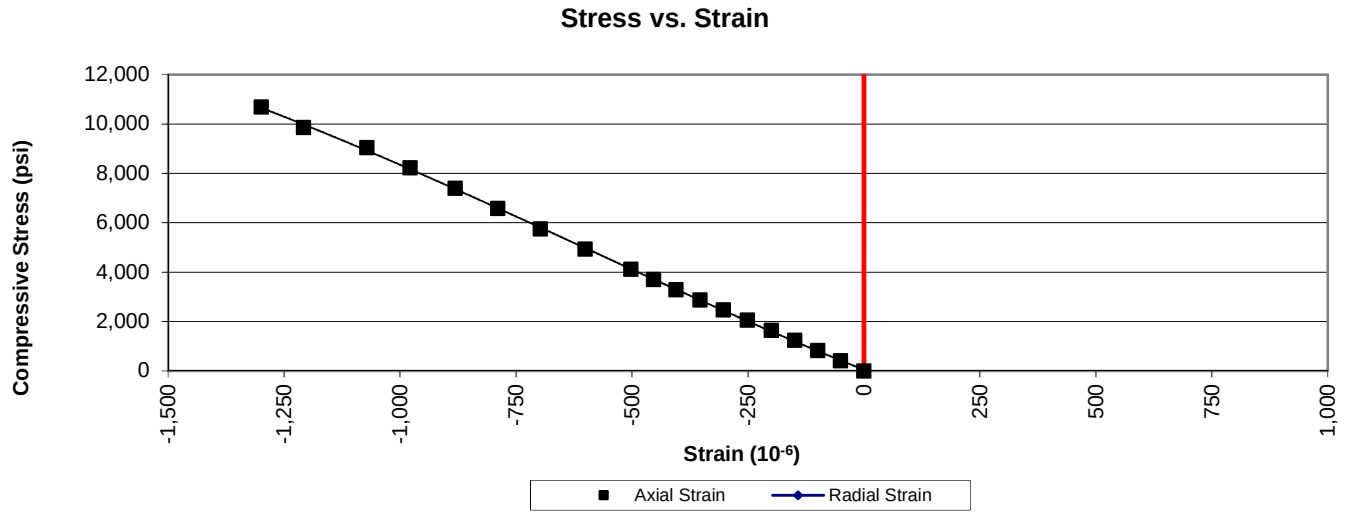
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.57	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	170.1	**Reviewed by:**	JBB
Sample No:	RC-4	**Moisture Content, %:**	0.1		
Depth (ft):	65.2 - 66.3	**Load Rate, psi/sec:**	67		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-50		2,000	411	8.22		
3	-99		4,000	821	8.29		
4	-149		6,000	1,232	8.27		
5	-199		8,000	1,643	8.26		
6	-251		10,000	2,053	8.18		
7	-303		12,000	2,464	8.13		
8	-353		14,000	2,875	8.14		
9	-405		16,000	3,285	8.11		
10	-453		18,000	3,696	8.16		
11	-502		20,000	4,107	8.18		
12	-601		24,000	4,928	8.20		
13	-697		28,000	5,749	8.25		
14	-789		32,000	6,571	8.33		
15	-881		36,000	7,392	8.39		
16	-978		40,000	8,214	8.40		
17	-1,071		44,000	9,035	8.44		
18	-1,208		48,000	9,856	8.16		
19	-1,299		52,000	10,678	8.22		
20			57,443	11,795			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

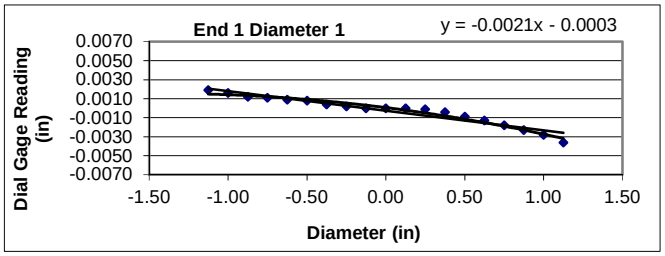
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.57	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	170.1	**Reviewed by:**	JBB
Sample No.:	RC-4	**Moisture Content (%):**	0.1		
Depth (ft):	65.2-66.3				

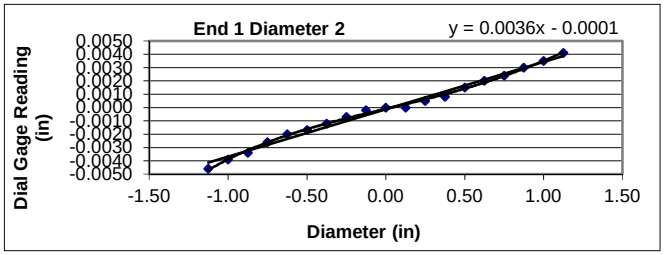
Deviation From Straightness (Procedure S1)

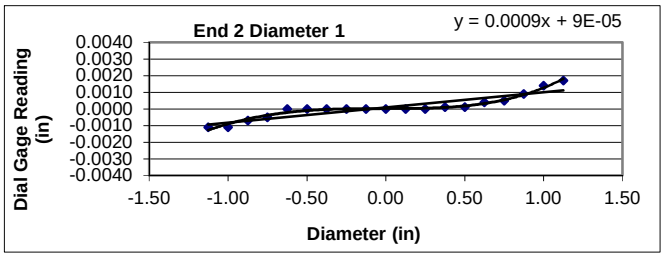
Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

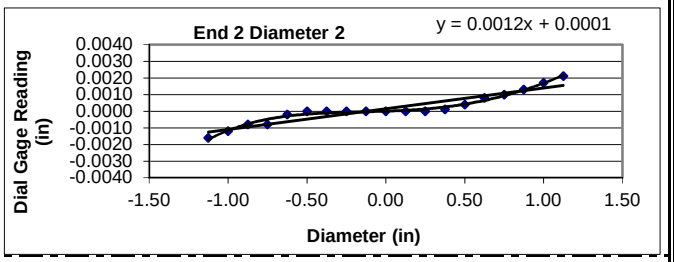
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	0.0019	-0.0046	-0.0011	-0.0016
-1	0.0016	-0.0039	-0.0011	-0.0012
- 7/8	0.0012	-0.0034	-0.0007	-0.0008
- 6/8	0.0011	-0.0026	-0.0005	-0.0008
- 5/8	0.0009	-0.0020	0.0000	-0.0002
- 4/8	0.0008	-0.0017	0.0000	0.0000
- 3/8	0.0004	-0.0012	0.0000	0.0000
- 2/8	0.0002	-0.0007	0.0000	0.0000
- 1/8	0.0000	-0.0002	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	-0.0001	0.0005	0.0000	0.0000
3/8	-0.0004	0.0008	0.0001	0.0001
4/8	-0.0009	0.0015	0.0001	0.0004
5/8	-0.0013	0.0020	0.0004	0.0008
6/8	-0.0018	0.0024	0.0005	0.0010
7/8	-0.0023	0.0030	0.0009	0.0013
1	-0.0028	0.0035	0.0014	0.0017
1 1/8	-0.0036	0.0041	0.0017	0.0021









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00207
	Angle of Best Fit Line:	-0.11853
End 2:	Slope of Best Fit Line:	0.00091
	Angle of Best Fit Line:	0.05235
	Max Angular Difference:	**-0.17**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00356
	Angle of Best Fit Line:	0.20401
End 2:	Slope of Best Fit Line:	0.00125
	Angle of Best Fit Line:	0.07149
	Max Angular Difference:	**0.13**

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0055	0.0022	**YES**
End 1 Diam 2	0.0087	0.0035	**YES**
End 2 Diam 1	0.0028	0.0011	**YES**
End 2 Diam 2	0.0037	0.0015	**YES**

Perpendicularity Tolerance Met? YES

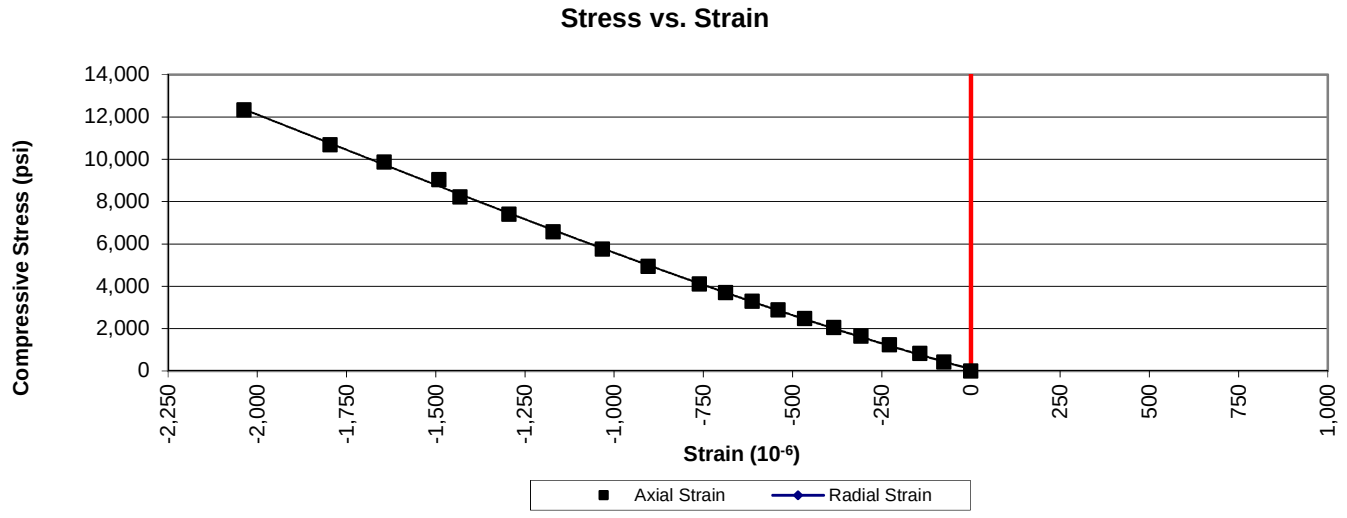
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.51	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	169.5	**Reviewed by:**	JBB
Sample No:	RC-6	**Moisture Content, %:**	0.1		
Depth (ft):	75.2 - 76.3	**Load Rate, psi/sec:**	72		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-76		2,000	411	5.41		
3	-143		4,000	821	5.74		
4	-228		6,000	1,232	5.40		
5	-308		8,000	1,643	5.33		
6	-384		10,000	2,053	5.35		
7	-466		12,000	2,464	5.29		
8	-540		14,000	2,875	5.32		
9	-613		16,000	3,285	5.36		
10	-687		18,000	3,696	5.38		
11	-761		20,000	4,107	5.40		
12	-904		24,000	4,928	5.45		
13	-1,033		28,000	5,749	5.57		
14	-1,171		32,000	6,571	5.61		
15	-1,294		36,000	7,392	5.71		
16	-1,432		40,000	8,214	5.74		
17	-1,491		44,000	9,035	6.06		
18	-1,644		48,000	9,856	6.00		
19	-1,796		52,000	10,678	5.95		
20	-2,037		60,000	12,320	6.05		
			66,081	13,569			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

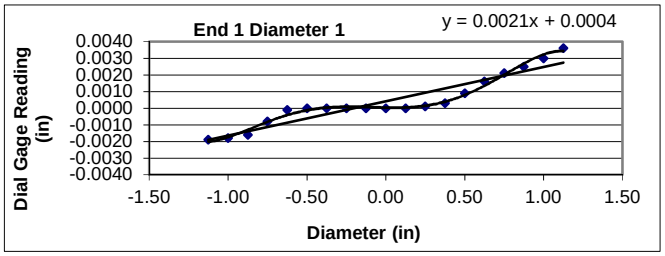
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.51	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	169.5	**Reviewed by:**	JBB
Sample No.:	RC-6	**Moisture Content (%):**	0.1		
Depth (ft):	75.2-76.3				

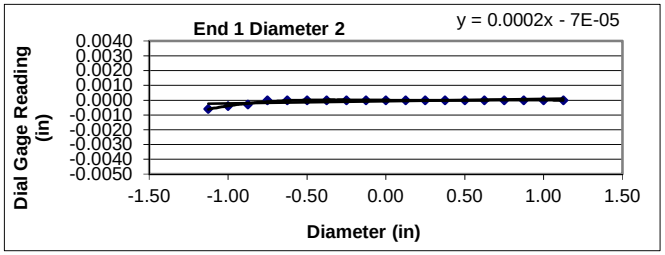
Deviation From Straightness (Procedure S1)

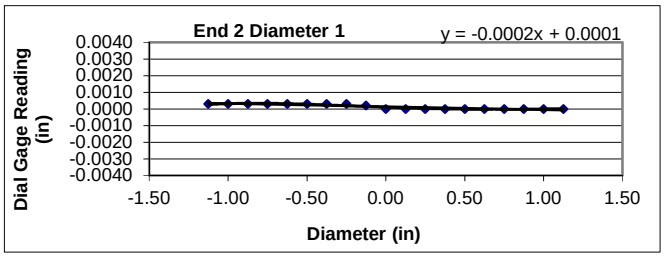
Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

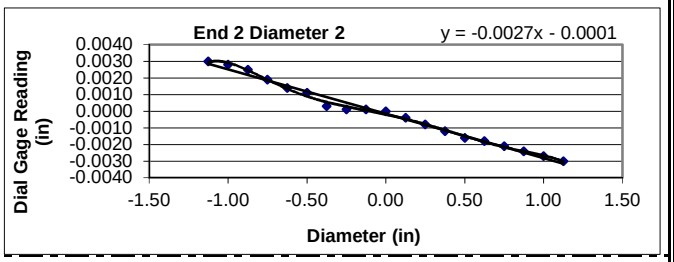
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	-0.0019	-0.0006	0.0003	0.0030
-1	-0.0018	-0.0004	0.0003	0.0028
- 7/8	-0.0016	-0.0003	0.0003	0.0025
- 6/8	-0.0008	0.0000	0.0003	0.0019
- 5/8	-0.0001	0.0000	0.0003	0.0014
- 4/8	0.0000	0.0000	0.0003	0.0011
- 3/8	0.0000	0.0000	0.0003	0.0003
- 2/8	0.0000	0.0000	0.0003	0.0001
- 1/8	0.0000	0.0000	0.0002	0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0004
2/8	0.0001	0.0000	0.0000	-0.0008
3/8	0.0003	0.0000	0.0000	-0.0012
4/8	0.0009	0.0000	0.0000	-0.0016
5/8	0.0016	0.0000	0.0000	-0.0018
6/8	0.0021	0.0000	0.0000	-0.0021
7/8	0.0025	0.0000	0.0000	-0.0024
1	0.0030	0.0000	0.0000	-0.0027
1 1/8	0.0036	0.0000	0.0000	-0.0030









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00207
	Angle of Best Fit Line:	0.11837
End 2:	Slope of Best Fit Line:	-0.00019
	Angle of Best Fit Line:	-0.01078
	Max Angular Difference:	**0.13**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00015
	Angle of Best Fit Line:	0.00860
End 2:	Slope of Best Fit Line:	-0.00267
	Angle of Best Fit Line:	-0.15271
	Max Angular Difference:	**0.16**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0055	0.0022	**YES**
End 1 Diam 2	0.0006	0.0002	**YES**
End 2 Diam 1	0.0003	0.0001	**YES**
End 2 Diam 2	0.0060	0.0024	**YES**

Perpendicularity Tolerance Met? **YES**

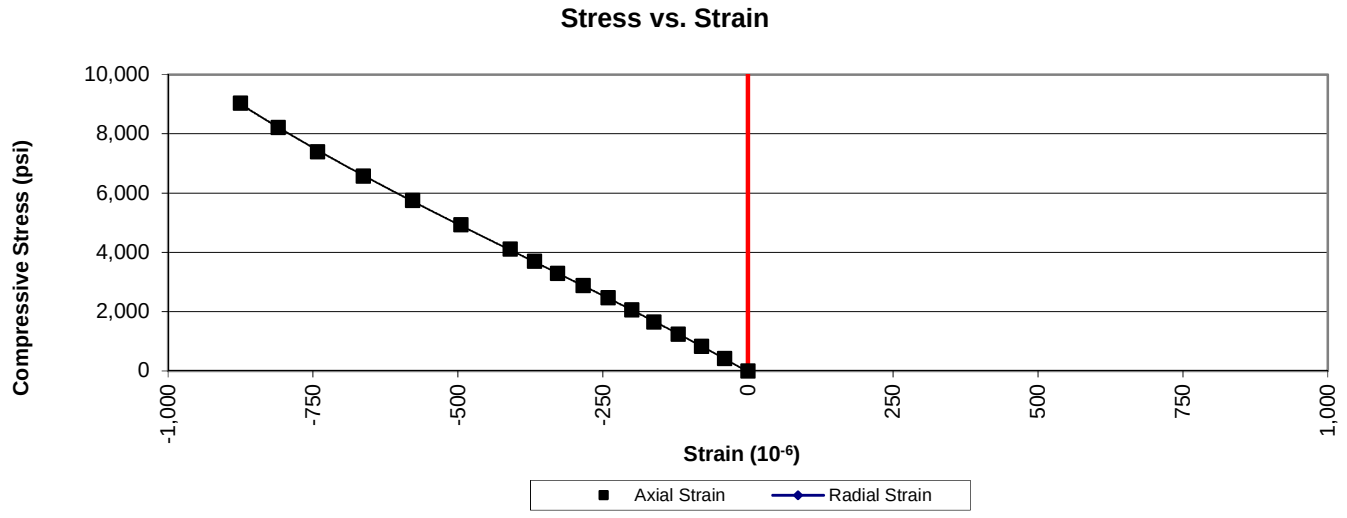
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.61	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	178.5	**Reviewed by:**	JBB
Sample No:	RC-8	**Moisture Content, %:**	0.2		
Depth (ft):	85.5 - 86.7	**Load Rate, psi/sec:**	57		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-40		2,000	411	10.28		
3	-80		4,000	821	10.26		
4	-120		6,000	1,232	10.27		
5	-162		8,000	1,643	10.14		
6	-200		10,000	2,053	10.27		
7	-241		12,000	2,464	10.22		
8	-284		14,000	2,875	10.12		
9	-328		16,000	3,285	10.02		
10	-368		18,000	3,696	10.04		
11	-410		20,000	4,107	10.02		
12	-495		24,000	4,928	9.96		
13	-578		28,000	5,749	9.95		
14	-663		32,000	6,571	9.91		
15	-742		36,000	7,392	9.96		
16	-810		40,000	8,214	10.14		
17	-875		44,000	9,035	10.33		
18			44,481	9,134			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

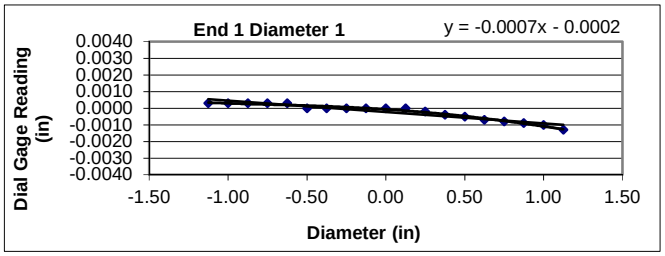
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.61	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	178.5	**Reviewed by:**	JBB
Sample No.:	RC-8	**Moisture Content (%):**	0.2		
Depth (ft):	85.5-86.7				

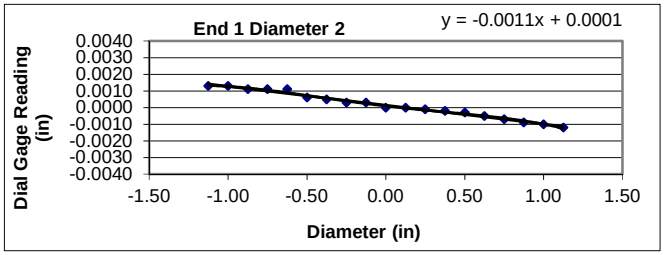
Deviation From Straightness (Procedure S1)

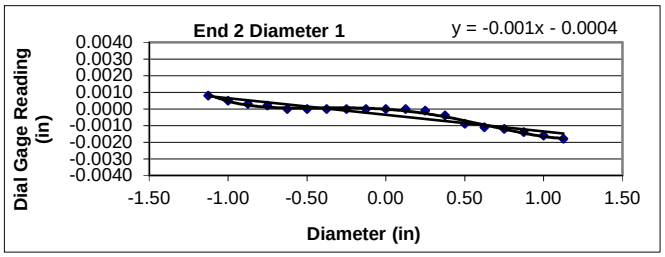
Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

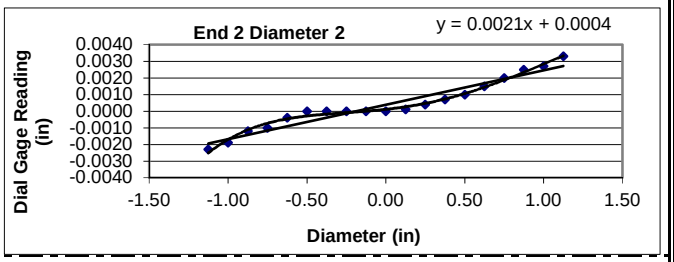
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	0.0003	0.0013	0.0008	-0.0023
-1	0.0003	0.0013	0.0005	-0.0019
- 7/8	0.0003	0.0011	0.0003	-0.0012
- 6/8	0.0003	0.0011	0.0002	-0.0010
- 5/8	0.0003	0.0011	0.0000	-0.0004
- 4/8	0.0000	0.0006	0.0000	0.0000
- 3/8	0.0000	0.0005	0.0000	0.0000
- 2/8	0.0000	0.0003	0.0000	0.0000
- 1/8	0.0000	0.0003	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0001
2/8	-0.0002	-0.0001	-0.0001	0.0004
3/8	-0.0004	-0.0002	-0.0004	0.0007
4/8	-0.0005	-0.0003	-0.0009	0.0010
5/8	-0.0007	-0.0005	-0.0011	0.0015
6/8	-0.0008	-0.0007	-0.0012	0.0020
7/8	-0.0009	-0.0009	-0.0014	0.0025
1	-0.0010	-0.0010	-0.0016	0.0027
1 1/8	-0.0013	-0.0012	-0.0018	0.0033









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00068
	Angle of Best Fit Line:	-0.03892
End 2:	Slope of Best Fit Line:	-0.00100
	Angle of Best Fit Line:	-0.05709
	Max Angular Difference:	**0.02**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00113
	Angle of Best Fit Line:	-0.06473
End 2:	Slope of Best Fit Line:	0.00207
	Angle of Best Fit Line:	0.11869
	Max Angular Difference:	**-0.18**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0016	0.0006	**YES**
End 1 Diam 2	0.0025	0.0010	**YES**
End 2 Diam 1	0.0026	0.0010	**YES**
End 2 Diam 2	0.0056	0.0022	**YES**

Perpendicularity Tolerance Met? **YES**

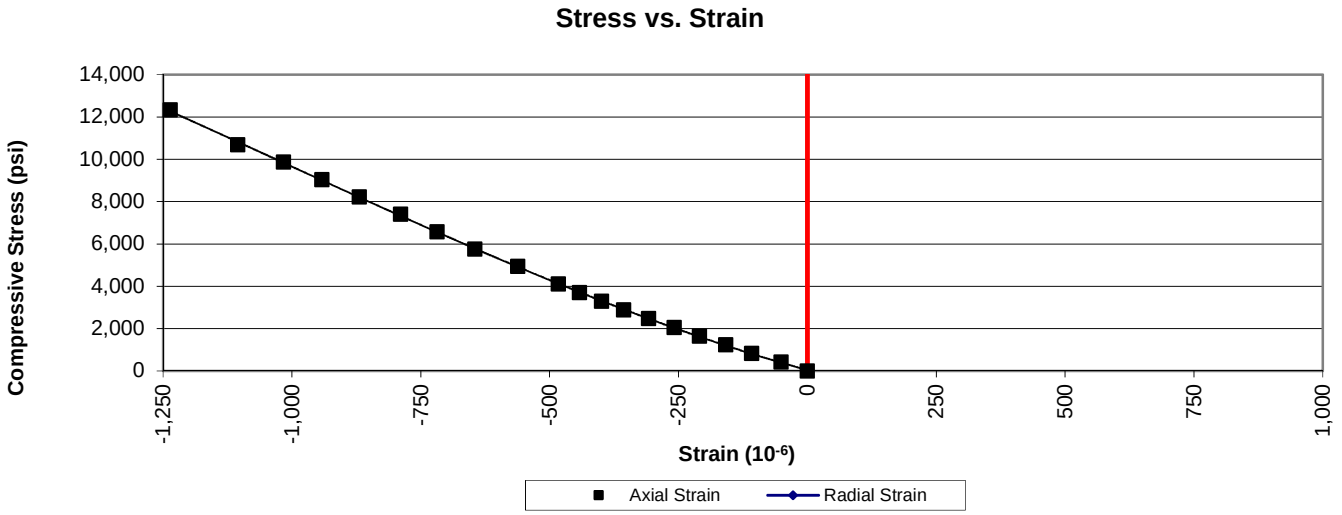
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	3783-17-009	**Length, in.:**	5.47	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	169.5	**Reviewed by:**	JBB
Sample No:	RC-10	**Moisture Content, %:**	0.2		
Depth (ft):	96.5 - 97.5	**Load Rate, psi/sec:**	74		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-51		2,000	411	8.06		
3	-108		4,000	821	7.60		
4	-158		6,000	1,232	7.80		
5	-209		8,000	1,643	7.86		
6	-258		10,000	2,053	7.96		
7	-308		12,000	2,464	8.00		
8	-356		14,000	2,875	8.08		
9	-399		16,000	3,285	8.23		
10	-442		18,000	3,696	8.36		
11	-483		20,000	4,107	8.50		
12	-562		24,000	4,928	8.77		
13	-645		28,000	5,749	8.91		
14	-718		32,000	6,571	9.15		
15	-789		36,000	7,392	9.37		
16	-869		40,000	8,214	9.45		
17	-942		44,000	9,035	9.59		
18	-1,016		48,000	9,856	9.70		
19	-1,105		52,000	10,678	9.66		
20	-1,236		60,000	12,320	9.97		
21			71,392	14,660			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

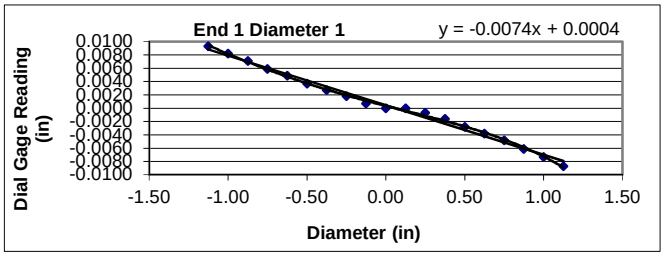
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.47	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	169.5	**Reviewed by:**	JBB
Sample No.:	RC-10	**Moisture Content (%):**	0.2		
Depth (ft):	96.5-97.5				

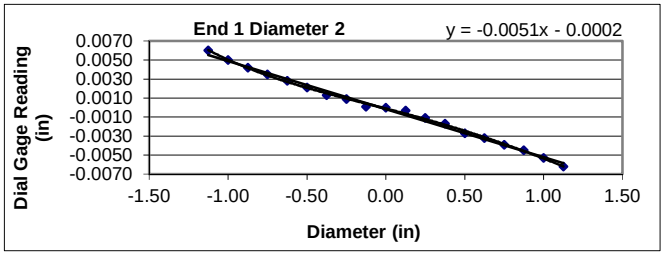
Deviation From Straightness (Procedure S1)

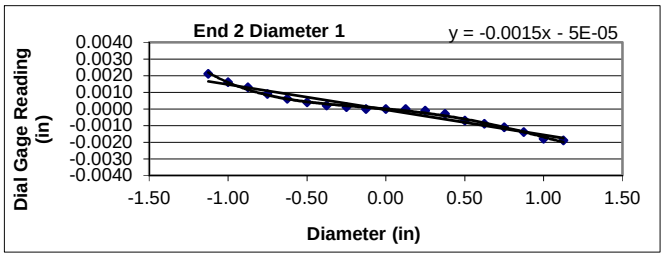
Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

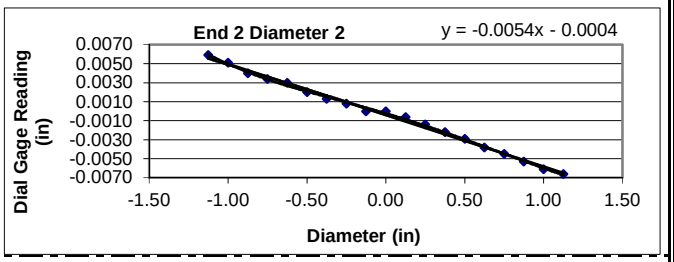
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	0.0093	0.0060	0.0021	0.0059
-1	0.0082	0.0050	0.0016	0.0051
- 7/8	0.0071	0.0042	0.0013	0.0040
- 6/8	0.0059	0.0035	0.0009	0.0034
- 5/8	0.0049	0.0028	0.0006	0.0030
- 4/8	0.0037	0.0021	0.0004	0.0020
- 3/8	0.0027	0.0013	0.0002	0.0013
- 2/8	0.0018	0.0009	0.0001	0.0008
- 1/8	0.0007	0.0001	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	-0.0003	0.0000	-0.0006
2/8	-0.0007	-0.0011	-0.0001	-0.0014
3/8	-0.0016	-0.0017	-0.0003	-0.0022
4/8	-0.0028	-0.0027	-0.0007	-0.0029
5/8	-0.0038	-0.0032	-0.0009	-0.0038
6/8	-0.0048	-0.0039	-0.0011	-0.0045
7/8	-0.0061	-0.0045	-0.0014	-0.0053
1	-0.0073	-0.0053	-0.0018	-0.0061
1 1/8	-0.0087	-0.0062	-0.0019	-0.0066









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00745
	Angle of Best Fit Line:	-0.42676
End 2:	Slope of Best Fit Line:	-0.00151
	Angle of Best Fit Line:	-0.08677
	Max Angular Difference:	**-0.34**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00505
	Angle of Best Fit Line:	-0.28957
End 2:	Slope of Best Fit Line:	-0.00539
	Angle of Best Fit Line:	-0.30855
	Max Angular Difference:	**0.02**

Parallelism Tolerance Met? NO

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0180	0.0072	**NO**
End 1 Diam 2	0.0122	0.0049	**NO**
End 2 Diam 1	0.0040	0.0016	**YES**
End 2 Diam 2	0.0125	0.0050	**NO**

Perpendicularity Tolerance Met? NO

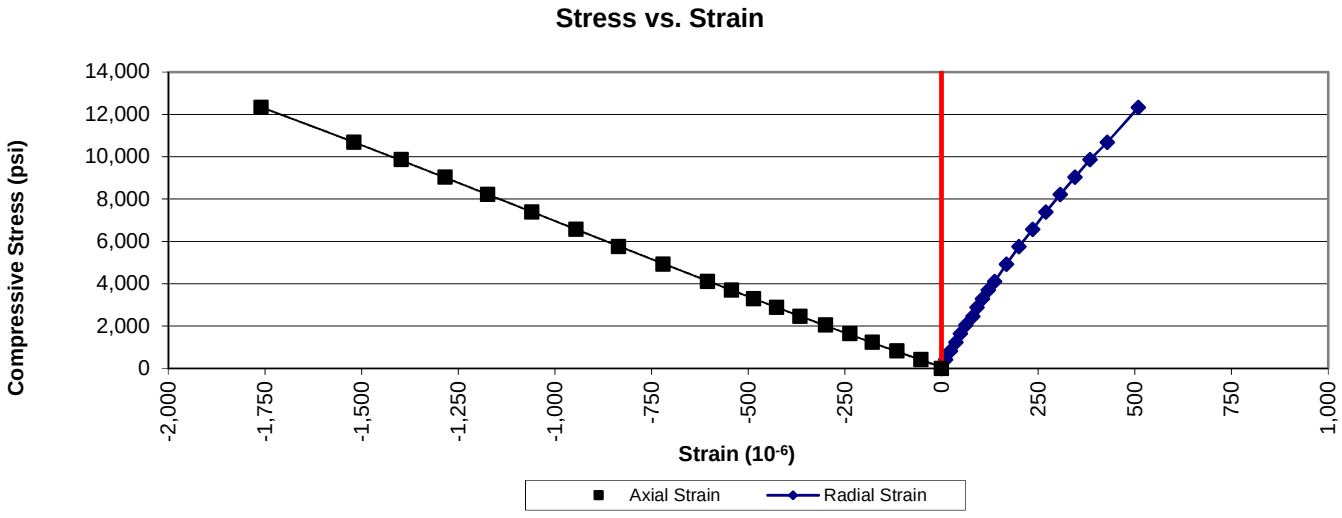
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.58	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	171.3	**Reviewed by:**	JBB
Sample No:	RC-12	**Moisture Content, %:**	0.1		
Depth (ft):	106.2 - 107.5	**Load Rate, psi/sec:**	62		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	0	0	0	0.00	0.00	
2	-53	11	2,000	411	7.75	0.21	
3	-115	23	4,000	821	7.14	0.20	
4	-179	37	6,000	1,232	6.88	0.21	
5	-237	49	8,000	1,643	6.93	0.21	
6	-300	63	10,000	2,053	6.84	0.21	
7	-366	81	12,000	2,464	6.73	0.22	
8	-426	92	14,000	2,875	6.75	0.22	
9	-486	106	16,000	3,285	6.76	0.22	
10	-543	121	18,000	3,696	6.81	0.22	
11	-605	137	20,000	4,107	6.79	0.23	
12	-720	168	24,000	4,928	6.84	0.23	
13	-835	200	28,000	5,749	6.89	0.24	
14	-945	236	32,000	6,571	6.95	0.25	
15	-1,060	270	36,000	7,392	6.97	0.25	
16	-1,174	307	40,000	8,214	7.00	0.26	
17	-1,284	345	44,000	9,035	7.04	0.27	
18	-1,397	384	48,000	9,856	7.06	0.27	
19	-1,520	429	52,000	10,678	7.03	0.28	
20	-1,760	509	60,000	12,320	7.00	0.29	
21			62,084	12,748			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism. Specimen did not meet the desired tolerances for side straightness and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

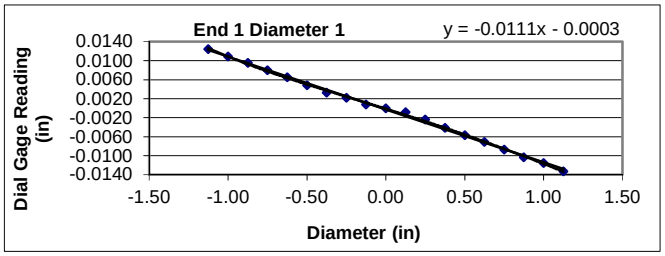
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.58	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	171.3	**Reviewed by:**	JBB
Sample No.:	RC-12	**Moisture Content (%):**	0.1		
Depth (ft):	106.2-107.5				

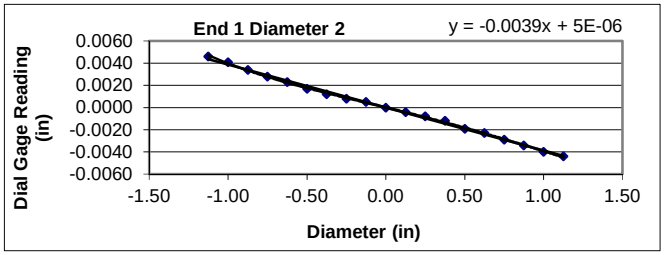
Deviation From Straightness (Procedure S1)

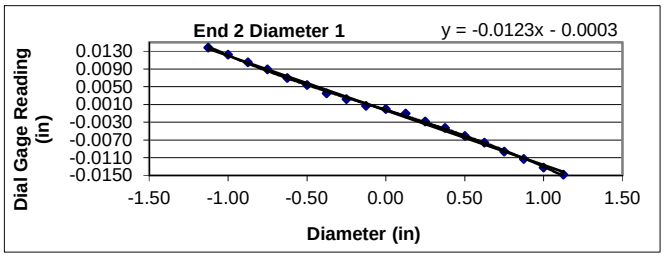
Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

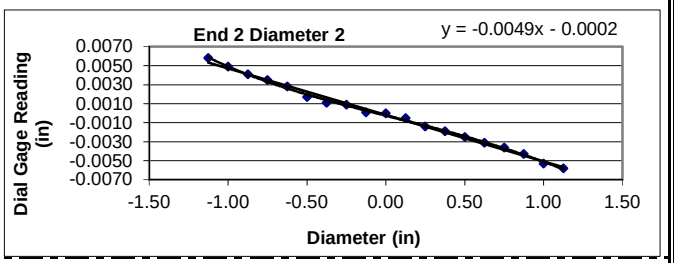
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	0.0124	0.0046	0.0138	0.0058
-1	0.0109	0.0041	0.0122	0.0049
- 7/8	0.0095	0.0034	0.0105	0.0041
- 6/8	0.0080	0.0028	0.0089	0.0035
- 5/8	0.0065	0.0023	0.0070	0.0028
- 4/8	0.0048	0.0017	0.0054	0.0017
- 3/8	0.0033	0.0012	0.0035	0.0011
- 2/8	0.0022	0.0008	0.0022	0.0009
- 1/8	0.0008	0.0005	0.0007	0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	-0.0008	-0.0004	-0.0010	-0.0005
2/8	-0.0024	-0.0008	-0.0028	-0.0014
3/8	-0.0041	-0.0012	-0.0043	-0.0019
4/8	-0.0057	-0.0019	-0.0061	-0.0025
5/8	-0.0071	-0.0023	-0.0076	-0.0031
6/8	-0.0087	-0.0029	-0.0096	-0.0036
7/8	-0.0103	-0.0034	-0.0113	-0.0043
1	-0.0115	-0.0040	-0.0132	-0.0053
1 1/8	-0.0133	-0.0044	-0.0148	-0.0058









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.01112
	Angle of Best Fit Line:	-0.63713
End 2:	Slope of Best Fit Line:	-0.01233
	Angle of Best Fit Line:	-0.70629
	Max Angular Difference:	**0.07**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00388
	Angle of Best Fit Line:	-0.22219
End 2:	Slope of Best Fit Line:	-0.00488
	Angle of Best Fit Line:	-0.27976
	Max Angular Difference:	**0.06**

Parallelism Tolerance Met? YES

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0257	0.0103	**NO**
End 1 Diam 2	0.0090	0.0036	**YES**
End 2 Diam 1	0.0286	0.0115	**NO**
End 2 Diam 2	0.0116	0.0047	**NO**

Perpendicularity Tolerance Met? NO

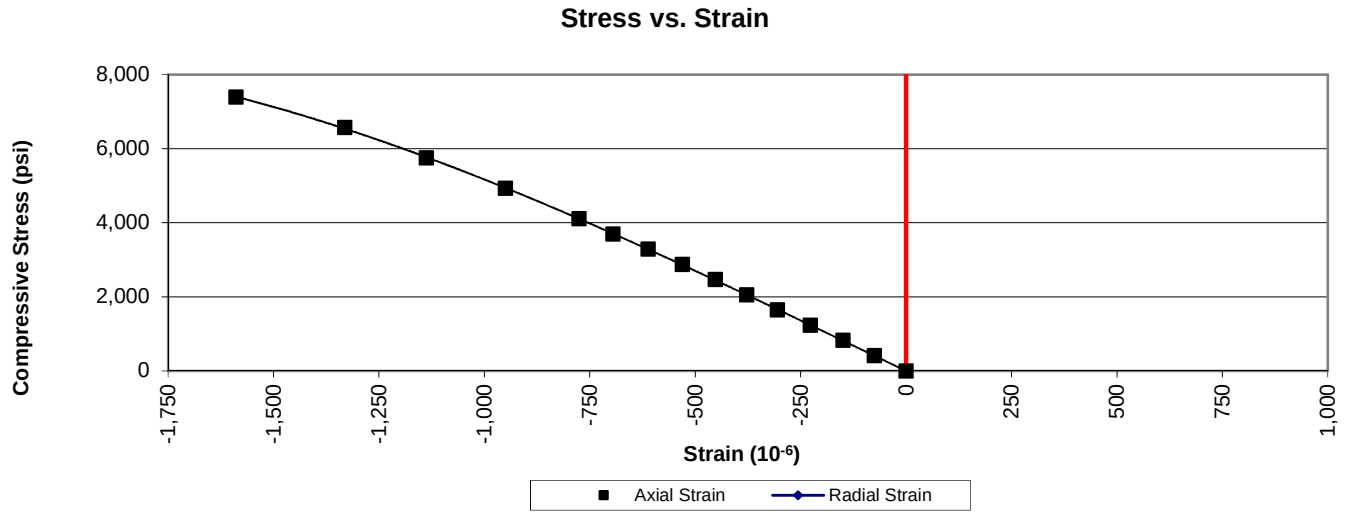
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	Carolina Crossroads Project	**Diameter, in.:**	2.49	**Date:**	2/19/2018
Project No.:	1461-16-047 Phase 2B	**Length, in.:**	5.40	**Tested by:**	BKP / MG
Boring Id:	DH-4	**Unit Weight, pcf:**	170.9	**Reviewed by:**	JBB
Sample No:	RC-14	**Moisture Content, %:**	0.1		
Depth (ft):	115.2 - 116.4	**Load Rate, psi/sec:**	75		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0		0	0	0.00		
2	-75		2,000	411	5.48		
3	-149		4,000	821	5.51		
4	-227		6,000	1,232	5.43		
5	-305		8,000	1,643	5.39		
6	-378		10,000	2,053	5.43		
7	-452		12,000	2,464	5.45		
8	-530		14,000	2,875	5.42		
9	-611		16,000	3,285	5.38		
10	-695		18,000	3,696	5.32		
11	-775		20,000	4,107	5.30		
12	-950		24,000	4,928	5.19		
13	-1,137		28,000	5,749	5.06		
14	-1,331		32,000	6,571	4.94		
15	-1,589		36,000	7,392	4.65		
16			37,068	7,611			Failure

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness. Specimen did not meet the desired tolerances for side straightness, parallelism and end perpendicularity to axis. Specimen prepared to closest tolerances practicable.



PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFY CONFORMANCE OF DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

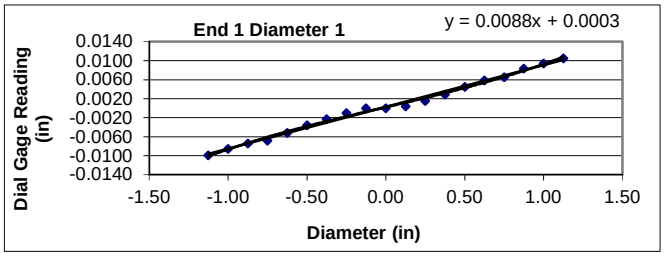
Project:	Carolina Crossroads Project	**Diameter (in):**	2.49	**Date:**	2/8/2018
Project No.:	1461-16-047 Phase 2B	**Length (in):**	5.40	**Tested by:**	BKP
Boring Id:	DH-4	**Unit Weight (pcf):**	170.9	**Reviewed by:**	JBB
Sample No.:	RC-14	**Moisture Content (%):**	0.1		
Depth (ft):	115.2-116.4				

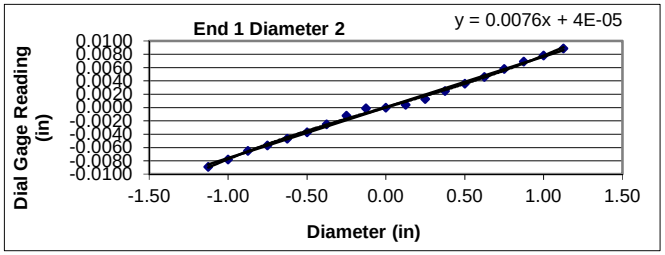
Deviation From Straightness (Procedure S1)

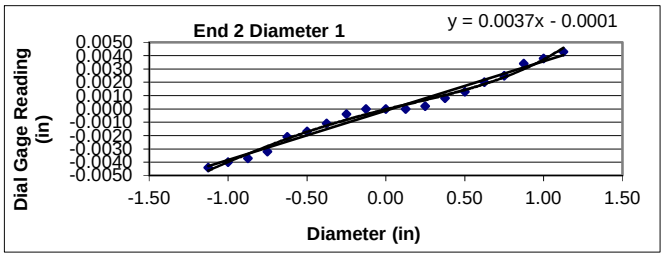
Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

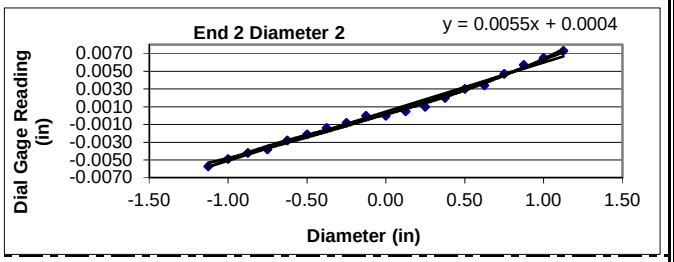
End Flatness and Parallelism Readings (Procedure FP1)

Position	End 1	End 1(90)	End 2	End 2(90)
-1 1/8	-0.0099	-0.0089	-0.0044	-0.0057
-1	-0.0086	-0.0078	-0.0040	-0.0049
- 7/8	-0.0074	-0.0065	-0.0037	-0.0042
- 6/8	-0.0068	-0.0057	-0.0032	-0.0038
- 5/8	-0.0052	-0.0047	-0.0021	-0.0028
- 4/8	-0.0036	-0.0037	-0.0017	-0.0021
- 3/8	-0.0023	-0.0025	-0.0011	-0.0014
- 2/8	-0.0010	-0.0012	-0.0004	-0.0008
- 1/8	0.0000	-0.0001	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0004	0.0004	0.0000	0.0005
2/8	0.0015	0.0013	0.0002	0.0010
3/8	0.0029	0.0025	0.0008	0.0020
4/8	0.0045	0.0036	0.0013	0.0030
5/8	0.0058	0.0046	0.0020	0.0034
6/8	0.0065	0.0058	0.0025	0.0047
7/8	0.0083	0.0069	0.0034	0.0057
1	0.0094	0.0078	0.0038	0.0065
1 1/8	0.0105	0.0089	0.0043	0.0073









Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? YES

Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00878
	Angle of Best Fit Line:	0.50316
End 2:	Slope of Best Fit Line:	0.00371
	Angle of Best Fit Line:	0.21230
	Max Angular Difference:	**0.29**

Parrallelism Diameter 2

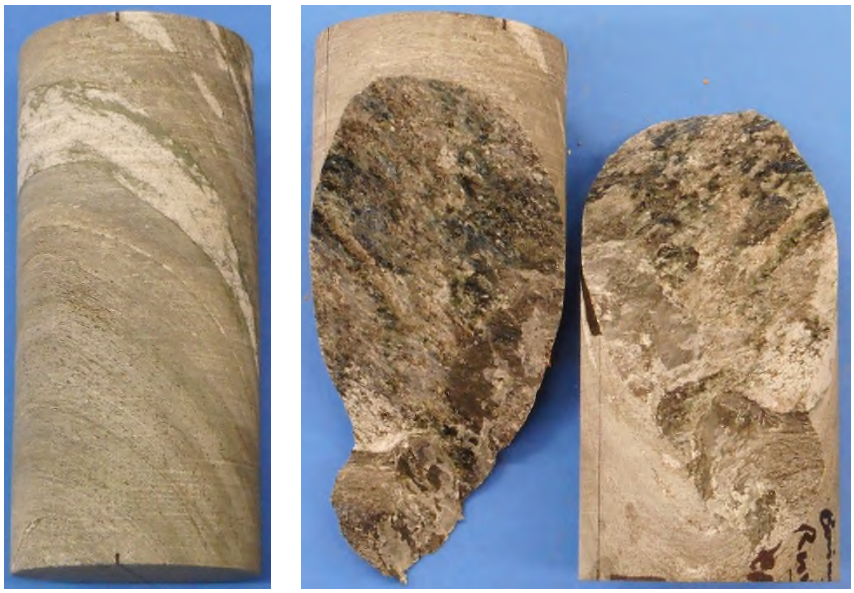
End 1:	Slope of Best Fit Line:	0.00764
	Angle of Best Fit Line:	0.43746
End 2:	Slope of Best Fit Line:	0.00553
	Angle of Best Fit Line:	0.31700
	Max Angular Difference:	**0.12**

Parallelism Tolerance Met? NO

Perpendicularity (Procedure P1)is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0204	0.0082	**NO**
End 1 Diam 2	0.0178	0.0071	**NO**
End 2 Diam 1	0.0087	0.0035	**YES**
End 2 Diam 2	0.0130	0.0052	**NO**

Perpendicularity Tolerance Met? NO



Date: 2/19/2018

Photographer: Ben Painter

1	**Location / Orientation**	DH-4, RC-2 (55.2' – 56.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

Photographer: Ben Painter

2	**Location / Orientation**	DH-4, RC-4 (65.2' – 66.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

Photographer: Ben Painter

3	**Location / Orientation**	DH-4, RC-6 (75.2' – 76.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

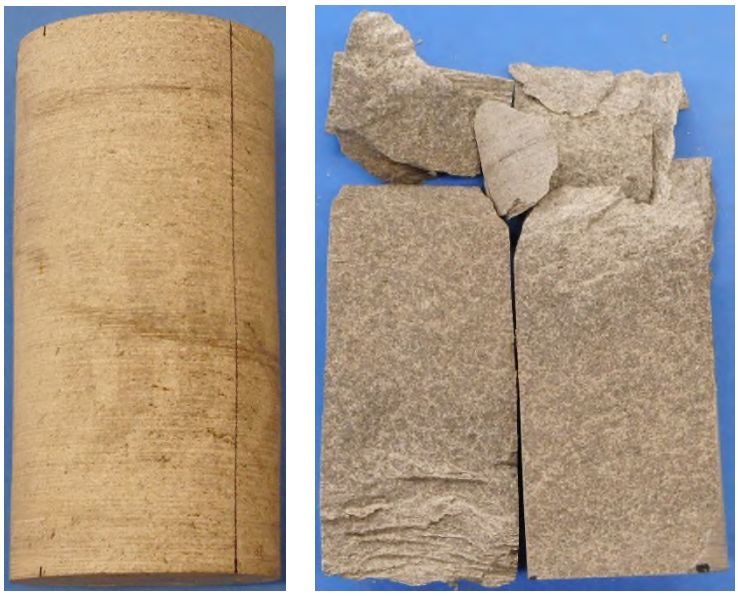
Photographer: Ben Painter

4	**Location / Orientation**	DH-4, RC-8 (85.2' – 86.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

Photographer: Ben Painter

5	**Location / Orientation**	DH-4, RC-10 (96.7′ – 97.5′)
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 2/19/2018

Photographer: Ben Painter

6	**Location / Orientation**	DH-4, RC-12 (106.2′ – 107.5′)
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

Photographer: Ben Painter

7	**Location / Orientation**	DH-4, RC-14 (115.2' – 116.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 2/19/2018

Photographer: Ben Painter

8	**Location / Orientation**	DH-5, RC-2 (45.6' – 46.8')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/1/2018

Photographer: Ben Painter

7	**Location / Orientation**	B-45, RC-6 (42.8' – 43.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/1/2018

Photographer: Ben Painter

8	**Location / Orientation**	B-47, RC-1 (47.2' – 47.8')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/1/2018

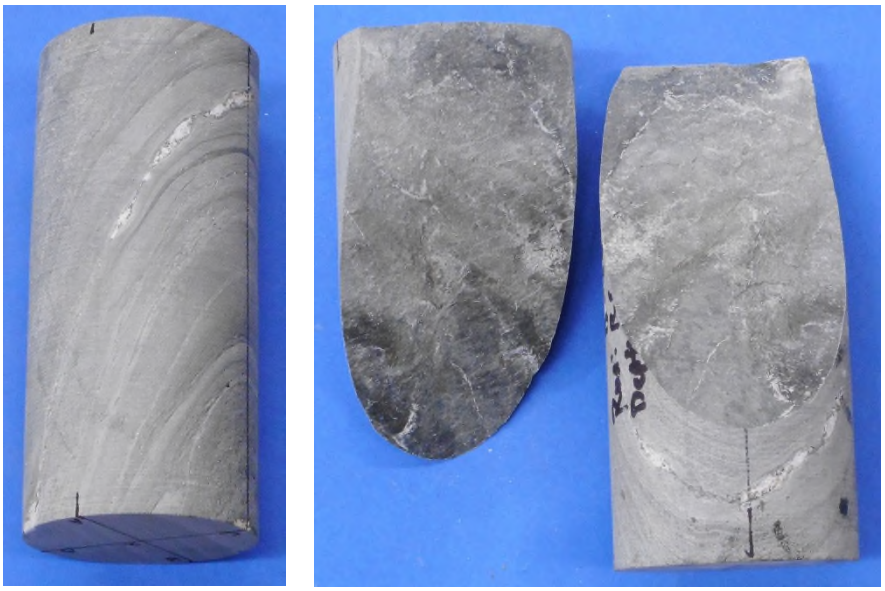
Photographer: Ben Painter

9	**Location / Orientation**	B-47, RC-3 (55.4' – 56.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/1/2018

Photographer: Ben Painter

10	**Location / Orientation**	B-47, RC-4 (64.0' – 65.0')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 3/1/2018

Photographer: Ben Painter

11	**Location / Orientation**	B-50, RC-1 (73.7' – 74.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/1/2018

Photographer: Ben Painter

12	**Location / Orientation**	B-50, RC-4 (87.7' – 88.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/12/2018

Photographer: Ben Painter

3	**Location / Orientation**	B-50, RC-2 (81.2' – 82.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/12/2018

Photographer: Ben Painter

4	**Location / Orientation**	B-49, RC-3 (49.2' – 50.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/12/2018

Photographer: Ben Painter

5	**Location / Orientation**	B-49, RC-5 (56.6' – 57.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/12/2018

Photographer: Ben Painter

6	**Location / Orientation**	B-55, RC-2 (59.6' – 60.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 5/1/2018

Photographer: Ben Painter

3	**Location / Orientation**	B-39, RC-5 (29.1' – 30.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 5/1/2018

Photographer: Ben Painter

4	**Location / Orientation**	B-48, RC-1 (15.1' – 15.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 5/1/2018

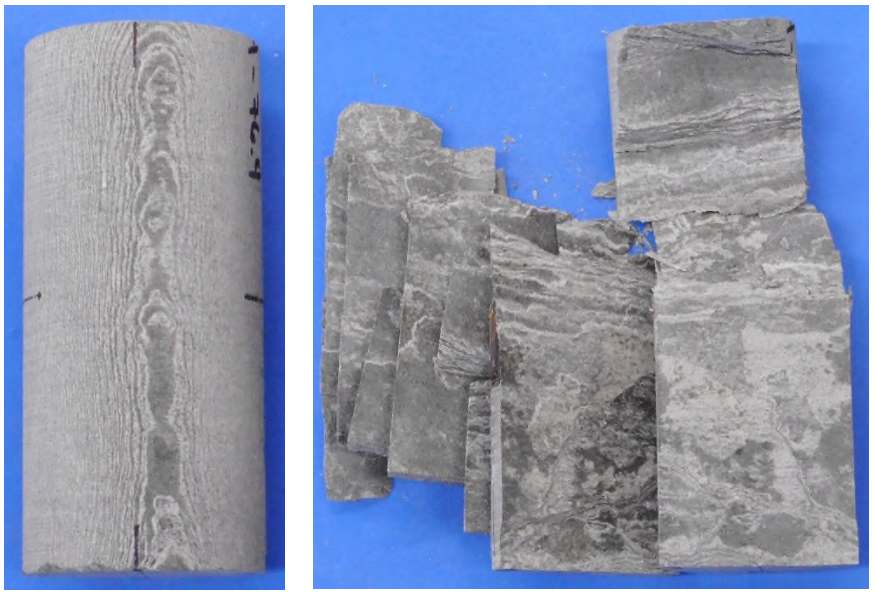
Photographer: Ben Painter

5	**Location / Orientation**	B-48, RC-2 (19.7' – 20.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 5/1/2018

Photographer: Ben Painter

6	**Location / Orientation**	B-48, RC-4 (34.0' – 34.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 3/12/2018

Photographer: Ben Painter

9	**Location / Orientation**	B-52, RC-2 (75.4' – 76.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 3/12/2018

Photographer: Ben Painter

10	**Location / Orientation**	B-52, RC-5 (90.4' – 91.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

APPENDIX

SECTION 5 LABORATORY TEST RESULTS

SECTION 5C UD SAMPLES

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

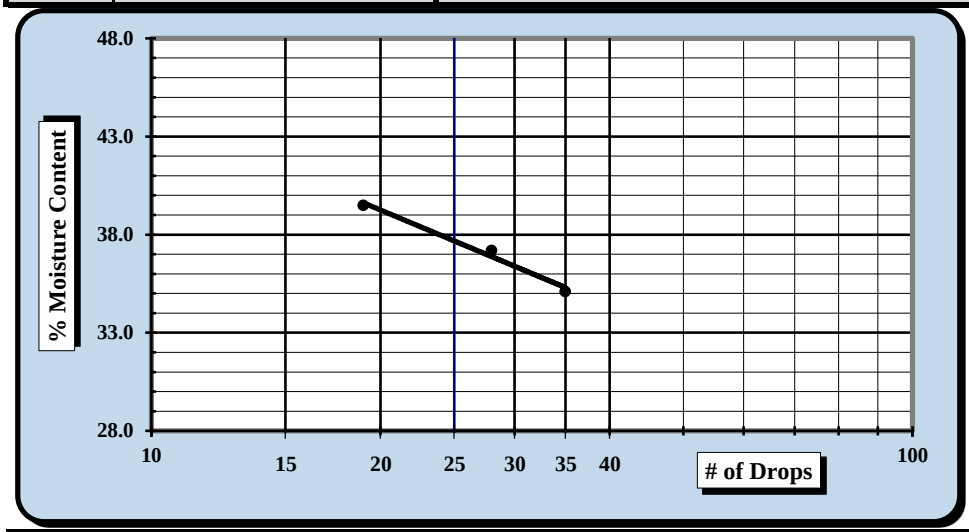
Project #:	1461-16-047.2B	Report Date:	5/17/18
Project Name:	Carolina Crossroads Project	Test Date:	5/14/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	UD-1	Sample Date:	Various
Location:	UD borings	Type:	Undisturbed	Depth:	13.5 - 15.5'

Sample Description: Silt with Sand [ML, A-4(7)]

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24	25	
A	Tare Weight	28.07	25.68	27.28				25.98	26.78	
B	Wet Soil Weight + A	44.13	42.24	48.56				33.02	33.04	
C	Dry Soil Weight + A	39.96	37.75	42.53				31.44	31.64	
D	Water Weight (B-C)	4.17	4.49	6.03				1.58	1.40	
E	Dry Soil Weight (C-A)	11.89	12.07	15.25				5.46	4.86	
F	% Moisture (D/E)*100	35.1%	37.2%	39.5%				28.9%	28.8%	
N	# OF DROPS	35	28	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.9%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**38**
Plastic Limit	**29**
Plastic Index	**9**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	5/17/18	Matthew F. Cooke, P.G.	5/17/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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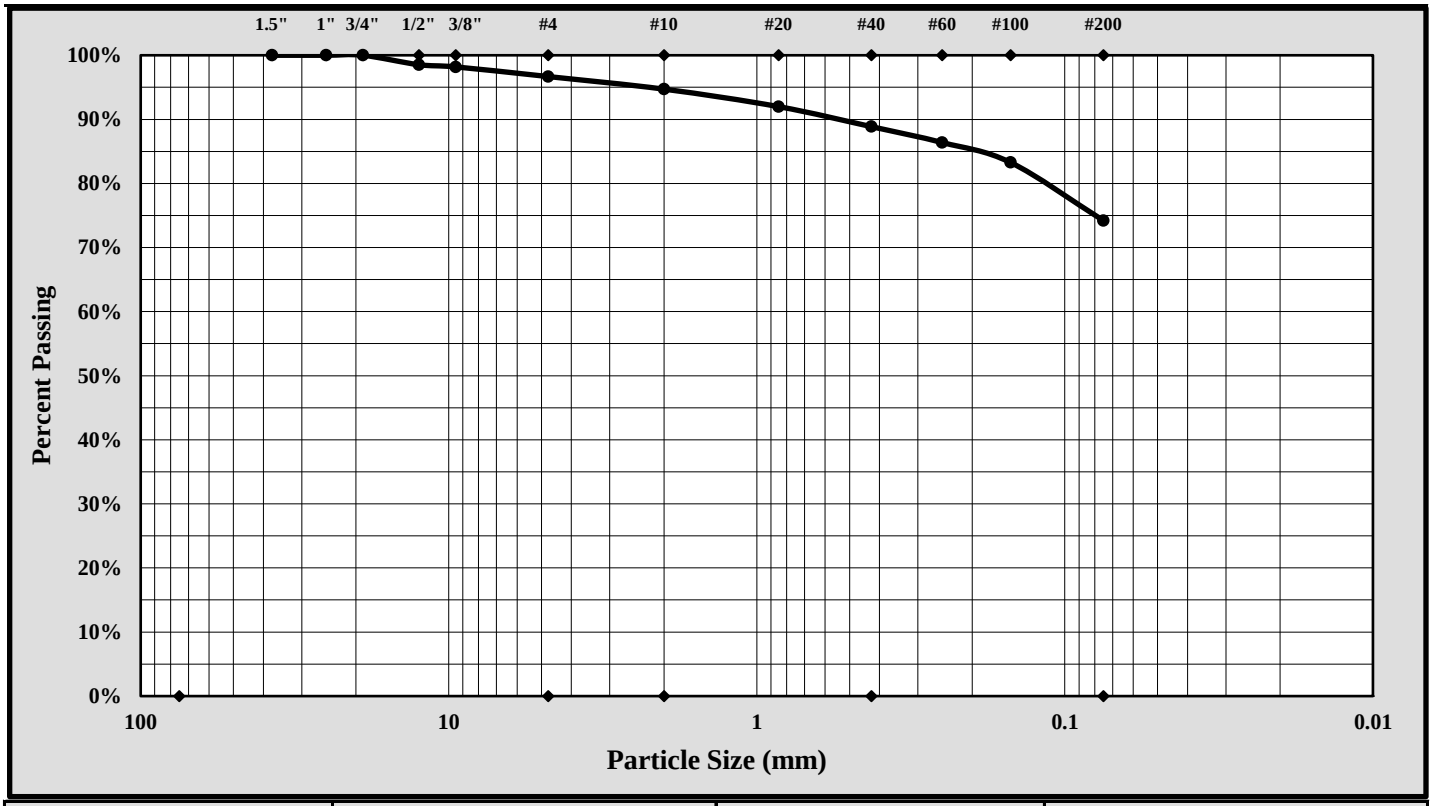
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	5/17/18
Project Name:	Carolina Crossroads Project	Test Date(s):	5/10 - 5/14/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: UD-1	Sample Date: Various
Location:	UD borings	Type: Undisturbed	Depth: 13.5 - 15.5'
Sample Description:	Silt with Sand [ML, A-4(7)]		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	19.0 mm	Gravel:	3.3%
Silt & Clay (% Passing #200):	74.2%	Total Sand:	22.5%

Liquid Limit	38	Plastic Limit	29	Plastic Index	9
Coarse Sand:	2.0%	Medium Sand:	5.8%	Fine Sand:	14.7%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
5/17/18 — *Date*

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Form No: TR-D854-1B
Revision No. 1
Revision Date: 08/09/17

SPECIFIC GRAVITY OF SOIL

Oven dried Specimens ASTM D 854 Method B

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	5/14/18
Project Name:	Carolina Crossroads Project	Test Date(s):	5/07 - 5/09/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: UD-1	Sample Date: Various
Location:	UD Borings	Type: Undisturbed	Depth: 13.5 - 15.5'
Sample Description:	Silt with Sand [ML, A-4(7)]		
Material Excluded:	3.3%		% Passing #4 Sieve: 96.7%

Balance ID. *0.01 gram* *ID#:* *13942* *Cal. Date:* *8/18/17* *Cal. Due:* *8/18/18*

Pycnometer ID No. *23161* *Cal. Date:* *2/10/18* *Balance Verification* Check Mass: 500 gram

Pycnometer Volume (V_p)	249.81	ml.	Mass Determination: 500.00 grams
Pycnometer Mass (PM)	110.90	grams	*If [PM-M_p] is greater than .06 grams,*
Ave. Pycnometer Mass (M_p)	110.90	grams	*recalibrate the dry mass of the pycnometer.*

Method B: Oven-dried Specimens

Soaking Time ASTM C127: 24 ± 4 hrs. ☐
Aggregate not initially dried ☐

Table 2 ASTM D 854	Specimen Dry Mass (g.)	
Soil Type	*250-ml. beaker*	*500-ml. beaker*
SP, SP-SM	*60 ± 10*	*100 ± 10*
SP-SC, SM, SC	*45 ± 10*	*75 ± 10*
Silt or Clay	*35 ± 5*	*50 ± 10*

Initial Dry Mass of Test Specimen - *not required.* grams

$M_{psw;t}$ = *Mass of the Pycnometer, soil, and water* = **384.16** *grams*

Mass of Dry Soil (grams)		Tare #	BB-8
A	Tare Weight		204.29
C	Dry Wt. + Tare Wt.		242.01
M_s	Dry Weight	**C-A**	**37.72**

T_t =	Test Temperature T_t	**21.5** °C
K =	Temperature Coefficient at T_t	**0.99968**
K =	Temperature Coefficient at 23°C	**0.99933**
$p_{w;t}$ =	Density of Water at T_t	**0.99789** g./ml.

$M_{pw;t}$ =	Mass of the Pycnometer and water at T_t	$M_{pw;t} = M_p + (V_p \times p_{w;t})$	**360.18** grams
G_t =	Specific Gravity of Soil Solids at the T_t	$G_t = M_s / (M_{pw;t} - (M_{psw;t}-M_s))$	**2.745**
G =	Specific Gravity of Soil Solids at the 20°C	$G = K \times G_t$	**2.744**

Soils containing plus #4 material tested per **ASTM C 127**

R = *% of Soil retained on the #4 sieve* **3.3%**
P = *% of Soil passing the #4 sieve* **96.7%**

G_{+4} Apparent Specific Gravity of plus #4 material at the 23°C per ASTM C127
Apparent Specific Gravity of plus #4 material corrected to 20°C

G_{total} *Total Sample Specific Gravity*

$$G_{total} = \frac{1}{\frac{R}{100 \times G_{+4}} + \frac{P}{100 \times G}} = 2.744$$

Notes / Deviations / References: ASTM D854: Specific Gravity of Soil Solids by Water Pycnometer

Matthew F. Cooke — *Project Manager*
Project Manager — *Position*
5/14/18 — Date

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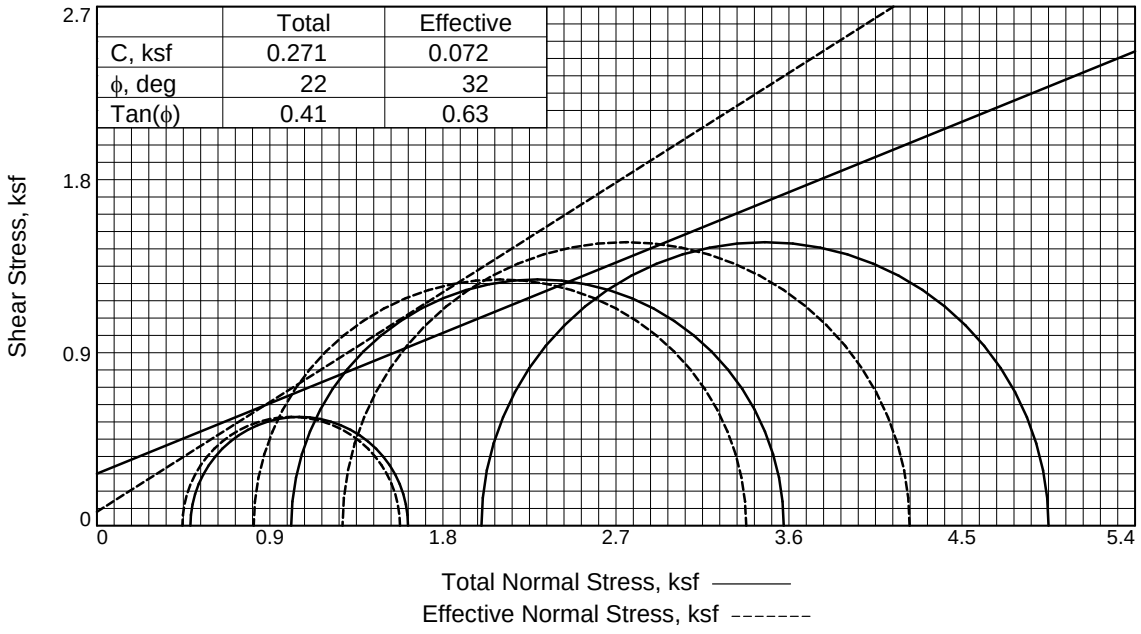
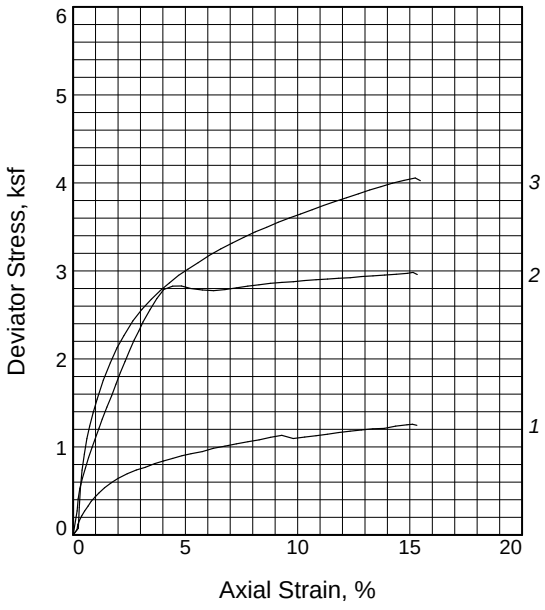
C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.





Specimen No.		1	2	3
Initial	Water Content, %	18.8	20.4	20.0
	Dry Density, pcf	99.2	104.5	103.1
	Saturation, %	71.1	87.6	82.8
	Void Ratio	0.7262	0.6390	0.6622
	Diameter, in.	2.845	2.883	2.862
	Height, in.	5.802	5.897	5.850
At Test	Water Content, %	25.0	21.8	21.9
	Dry Density, pcf	101.6	107.1	107.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6856	0.5990	0.6001
	Diameter, in.	2.823	2.861	2.826
	Height, in.	5.754	5.843	5.775
Strain rate, %/min.		0.34	0.34	0.34
Eff. Cell Pressure, ksf		0.487	1.011	2.000
Fail. Stress, ksf		1.132	2.562	2.950
Total Pore Pr., ksf		7.962	8.115	8.642
Strain, %		9.3	3.4	4.7
Ult. Stress, ksf		1.258	2.983	4.056
Total Pore Pr., ksf		7.873	7.267	7.962
Strain, %		15.1	15.1	15.2
$\bar{\sigma}_1$ Failure, ksf		1.576	3.378	4.227
$\bar{\sigma}_3$ Failure, ksf		0.445	0.816	1.278

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Silt with Sand [ML, A-4(7)]

LL= 38 **PL=** 29 **PI=** 9
Specific Gravity= 2.744
Remarks: The specimens failed with bulging and shear. Failure selected at peak obliquity. ASTM D4767.
Percent passing the #200 sieve: 74.2%
Figure 1

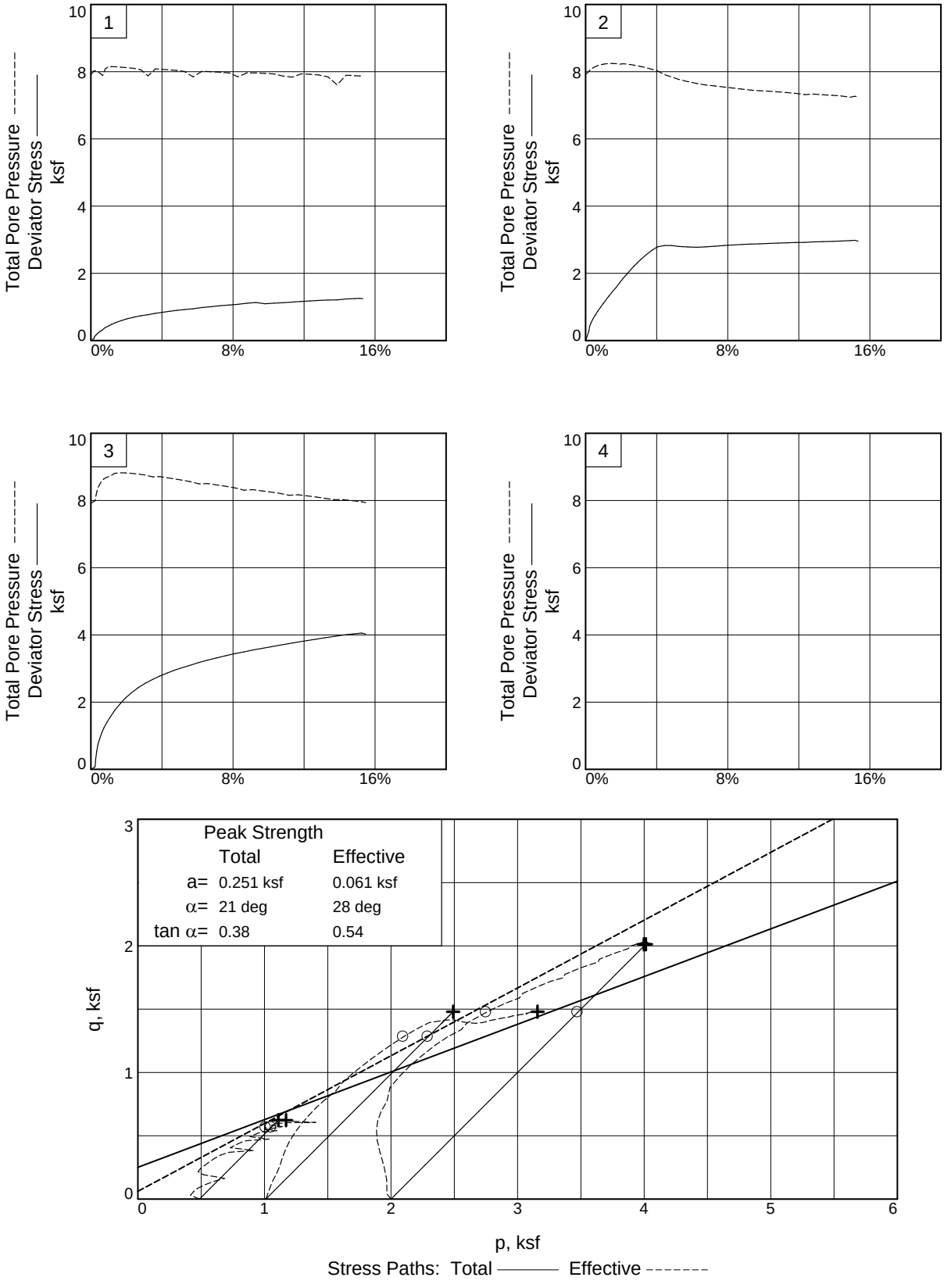
Client: HDR Engineering, Inc.

Project: Carolina Crossroads Project

Location: UD borings
Sample Number: B-50 **Depth:** 13.5 - 15.5'
Proj. No.: 1461-16-047.2B **Date Sampled:** Various

TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

Tested By: Benjamin Kovaleski **Checked By:** Matthew F. Cooke, P.G.



C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.

Client: HDR Engineering, Inc.
Project: Carolina Crossroads Project
Location: UD borings **Depth:** 13.5 - 15.5' **Sample Number:** B-50
Project No.: 1461-16-047.2B **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski **Checked By:** Matthew F. Cooke, P.G.

TRIAXIAL COMPRESSION TEST 5/17/2018

CU with Pore Pressures 4:37 PM

Date: Various
Client: HDR Engineering, Inc.
Project: Carolina Crossroads Project
Project No.: 1461-16-047.2B
Location: UD borings
Depth: 13.5 - 15.5' **Sample Number:** B-50
Description: Silt with Sand [ML, A-4(7)]
Remarks: The specimens failed with bulging and shear. Failure selected at peak obliquity. ASTM D4767. Percent passing the #200 sieve: 74.2%
Type of Sample: Undisturbed
Specific Gravity=2.744 **LL=**38 **PL=**29 **PI=**9
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	54.300			1177.430
Moisture content: Dry soil+tare, gms.	45.700			941.960
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	18.8	25.2	25.0	25.0
Moist specimen weight, gms.	1141.60			
Diameter, in.	2.845	2.825	2.823	
Area, in.²	6.357	6.269	6.259	
Height, in.	5.802	5.762	5.754	
Net decrease in height, in.		0.040	0.008	
Net decrease in water volume, cc.			1.700	
Wet density, pcf	117.9	126.8	127.0	
Dry density, pcf	99.2	101.3	101.6	
Void ratio	0.7262	0.6905	0.6856	
Saturation, %	71.1	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 58.380 psi (8.407 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 0.487 ksf
Strain rate, %/min. = 0.34
Fail. Stress = 1.132 ksf **at reading no.** 28
Ult. Stress = 1.258 ksf **at reading no.** 40

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	0.487	0.487	1.00	55.000	0.487	0.000
1	0.0099	2.644	2.6	0.2	0.061	0.385	0.446	1.16	55.706	0.415	0.030
2	0.0118	5.079	5.1	0.2	0.117	0.381	0.497	1.31	55.737	0.439	0.058
3	0.0166	7.259	7.3	0.3	0.167	0.386	0.552	1.43	55.700	0.469	0.083
4	0.0223	9.515	9.5	0.4	0.218	0.412	0.630	1.53	55.521	0.521	0.109
5	0.0295	11.892	11.9	0.5	0.272	0.452	0.725	1.60	55.239	0.588	0.136
6	0.0384	14.330	14.3	0.7	0.327	0.521	0.848	1.63	54.764	0.684	0.164
7	0.0464	16.847	16.8	0.8	0.384	0.326	0.710	2.18	56.116	0.518	0.192
8	0.0562	18.967	19.0	1.0	0.432	0.260	0.692	2.66	56.574	0.476	0.216
9	0.0665	21.047	21.0	1.2	0.479	0.254	0.732	2.89	56.618	0.493	0.239
10	0.0807	23.658	23.7	1.4	0.537	0.263	0.799	3.04	56.555	0.531	0.268
11	0.0982	26.300	26.3	1.7	0.595	0.273	0.867	3.18	56.486	0.570	0.297
12	0.1152	28.510	28.5	2.0	0.643	0.286	0.928	3.25	56.397	0.607	0.321
13	0.1389	31.009	31.0	2.4	0.696	0.307	1.003	3.27	56.250	0.655	0.348
14	0.1621	33.043	33.0	2.8	0.739	0.351	1.089	3.11	55.946	0.720	0.369
15	0.1850	34.531	34.5	3.2	0.769	0.530	1.299	2.45	54.697	0.915	0.384
16	0.2090	36.608	36.6	3.6	0.812	0.323	1.135	3.51	56.134	0.729	0.406
17	0.2320	38.116	38.1	4.0	0.842	0.337	1.179	3.49	56.037	0.758	0.421
18	0.2555	39.611	39.6	4.4	0.871	0.353	1.224	3.47	55.930	0.788	0.435
19	0.2787	41.125	41.1	4.8	0.900	0.371	1.271	3.43	55.806	0.821	0.450
20	0.3022	42.327	42.3	5.3	0.923	0.398	1.321	3.32	55.616	0.859	0.461
21	0.3312	43.707	43.7	5.8	0.948	0.561	1.509	2.69	54.481	1.035	0.474
22	0.3599	45.680	45.7	6.3	0.985	0.394	1.379	3.50	55.644	0.887	0.493
23	0.3894	47.098	47.1	6.8	1.010	0.408	1.419	3.47	55.543	0.914	0.505
24	0.4184	48.537	48.5	7.3	1.035	0.424	1.459	3.44	55.435	0.942	0.518
25	0.4480	49.955	50.0	7.8	1.060	0.445	1.504	3.38	55.292	0.975	0.530
26	0.4766	51.197	51.2	8.3	1.080	0.558	1.638	2.94	54.507	1.098	0.540
27	0.5058	52.891	52.9	8.8	1.110	0.442	1.552	3.51	55.311	0.997	0.555
28	0.5348	54.233	54.2	9.3	1.132	0.445	1.576	3.54	55.292	1.011	0.566
29	0.5641	55.606	55.6	9.8	1.095	0.456	1.552	3.40	55.211	1.004	0.548
30	0.5936	56.901	56.9	10.3	1.113	0.474	1.587	3.35	55.087	1.030	0.556
31	0.6225	58.080	58.1	10.8	1.127	0.538	1.665	3.10	54.647	1.101	0.564
32	0.6516	59.434	59.4	11.3	1.145	0.569	1.714	3.01	54.430	1.141	0.573
33	0.6809	60.901	60.9	11.8	1.165	0.473	1.637	3.46	55.098	1.055	0.582
34	0.7099	62.100	62.1	12.3	1.179	0.486	1.665	3.43	55.006	1.075	0.589
35	0.7385	63.315	63.3	12.8	1.193	0.505	1.698	3.36	54.875	1.101	0.597
36	0.7684	64.507	64.5	13.4	1.206	0.562	1.768	3.15	54.477	1.165	0.603
37	0.7976	65.273	65.3	13.9	1.211	0.799	2.010	2.52	52.833	1.404	0.606
38	0.8268	67.158	67.2	14.4	1.237	0.511	1.749	3.42	54.831	1.130	0.619
39	0.8557	68.433	68.4	14.9	1.252	0.526	1.778	3.38	54.724	1.152	0.626
40	0.8699	69.030	69.0	15.1	1.258	0.534	1.792	3.36	54.675	1.163	0.629
41	0.8810	68.640	68.6	15.3	1.246	0.547	1.794	3.28	54.578	1.171	0.623

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	58.970			1309.400
Moisture content: Dry soil+tare, gms.	48.980			1074.710
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	20.4	22.6	21.8	21.8
Moist specimen weight, gms.	1271.51			
Diameter, in.	2.883	2.871	2.861	
Area, in.²	6.528	6.475	6.427	
Height, in.	5.897	5.873	5.843	
Net decrease in height, in.		0.024	0.030	
Net decrease in water volume, cc.			7.700	
Wet density, pcf	125.8	129.7	130.5	
Dry density, pcf	104.5	105.8	107.1	
Void ratio	0.6390	0.6190	0.5990	
Saturation, %	87.6	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 62.020 psi (8.931 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 1.011 ksf
Strain rate, %/min. = 0.34
Fail. Stress = 2.562 ksf **at reading no.** 20
Ult. Stress = 2.983 ksf **at reading no.** 45

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.011	1.011	1.00	55.000	1.011	0.000
1	0.0105	12.245	12.2	0.2	0.274	0.925	1.199	1.30	55.598	1.062	0.137
2	0.0131	18.471	18.5	0.2	0.413	0.892	1.305	1.46	55.826	1.098	0.206
3	0.0172	23.552	23.6	0.3	0.526	0.859	1.385	1.61	56.056	1.122	0.263
4	0.0240	28.779	28.8	0.4	0.642	0.819	1.461	1.78	56.331	1.140	0.321
5	0.0319	34.068	34.1	0.5	0.759	0.782	1.541	1.97	56.587	1.162	0.380
6	0.0403	39.612	39.6	0.7	0.881	0.749	1.630	2.18	56.820	1.189	0.441
7	0.0492	44.768	44.8	0.8	0.995	0.725	1.720	2.37	56.982	1.223	0.497
8	0.0583	49.793	49.8	1.0	1.104	0.708	1.813	2.56	57.102	1.260	0.552
9	0.0673	54.732	54.7	1.2	1.212	0.696	1.908	2.74	57.186	1.302	0.606
10	0.0757	59.496	59.5	1.3	1.316	0.690	2.006	2.91	57.227	1.348	0.658
11	0.0877	65.763	65.8	1.5	1.451	0.686	2.138	3.11	57.254	1.412	0.726
12	0.1002	71.836	71.8	1.7	1.582	0.694	2.275	3.28	57.204	1.484	0.791
13	0.1114	77.894	77.9	1.9	1.712	0.709	2.421	3.41	57.096	1.565	0.856
14	0.1227	84.106	84.1	2.1	1.845	0.695	2.539	3.66	57.196	1.617	0.922
15	0.1351	90.032	90.0	2.3	1.970	0.704	2.674	3.80	57.132	1.689	0.985
16	0.1467	95.874	95.9	2.5	2.094	0.719	2.813	3.91	57.029	1.766	1.047
17	0.1585	101.485	101.5	2.7	2.212	0.737	2.949	4.00	56.903	1.843	1.106
18	0.1707	106.480	106.5	2.9	2.316	0.757	3.073	4.06	56.762	1.915	1.158
19	0.1820	111.526	111.5	3.1	2.421	0.779	3.200	4.11	56.607	1.990	1.210
20	0.2003	118.403	118.4	3.4	2.562	0.816	3.378	4.14	56.354	2.097	1.281
21	0.2179	124.603	124.6	3.7	2.687	0.858	3.546	4.13	56.058	2.202	1.344
22	0.2359	129.726	129.7	4.0	2.789	0.908	3.697	4.07	55.717	2.302	1.395

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.2591	132.097	132.1	4.4	2.828	1.017	3.845	3.78	54.961	2.431	1.414
24	0.2822	132.695	132.7	4.8	2.829	1.085	3.914	3.61	54.485	2.500	1.415
25	0.3065	131.939	131.9	5.2	2.801	1.162	3.963	3.41	53.952	2.562	1.400
26	0.3364	131.857	131.9	5.8	2.784	1.228	4.012	3.27	53.493	2.620	1.392
27	0.3657	132.211	132.2	6.3	2.777	1.281	4.057	3.17	53.128	2.669	1.388
28	0.3952	133.506	133.5	6.8	2.789	1.328	4.117	3.10	52.798	2.722	1.394
29	0.4247	135.157	135.2	7.3	2.808	1.355	4.163	3.07	52.610	2.759	1.404
30	0.4545	136.873	136.9	7.8	2.828	1.386	4.214	3.04	52.397	2.800	1.414
31	0.4838	138.357	138.4	8.3	2.843	1.417	4.260	3.01	52.179	2.839	1.422
32	0.5132	139.888	139.9	8.8	2.859	1.448	4.307	2.97	51.966	2.877	1.429
33	0.5436	141.275	141.3	9.3	2.871	1.481	4.351	2.94	51.737	2.916	1.435
34	0.5729	142.419	142.4	9.8	2.878	1.498	4.376	2.92	51.614	2.937	1.439
35	0.6029	143.901	143.9	10.3	2.891	1.512	4.403	2.91	51.521	2.957	1.446
36	0.6324	145.204	145.2	10.8	2.901	1.532	4.433	2.89	51.384	2.982	1.451
37	0.6620	146.388	146.4	11.3	2.908	1.552	4.460	2.87	51.241	3.006	1.454
38	0.6913	147.706	147.7	11.8	2.918	1.575	4.492	2.85	51.085	3.033	1.459
39	0.7211	148.827	148.8	12.3	2.923	1.613	4.535	2.81	50.821	3.074	1.461
40	0.7510	150.387	150.4	12.9	2.936	1.598	4.534	2.84	50.921	3.066	1.468
41	0.7807	151.659	151.7	13.4	2.944	1.618	4.561	2.82	50.787	3.089	1.472
42	0.8111	153.086	153.1	13.9	2.954	1.634	4.588	2.81	50.671	3.111	1.477
43	0.8409	154.463	154.5	14.4	2.963	1.653	4.615	2.79	50.542	3.134	1.481
44	0.8704	155.922	155.9	14.9	2.973	1.691	4.664	2.76	50.275	3.178	1.486
45	0.8848	156.909	156.9	15.1	2.983	1.664	4.647	2.79	50.467	3.155	1.492
46	0.8957	156.023	156.0	15.3	2.960	1.677	4.637	2.76	50.372	3.157	1.480

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	68.060			1238.980
Moisture content: Dry soil+tare, gms.	56.720			1016.680
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	20.0	23.7	21.9	21.9
Moist specimen weight, gms.	1221.65			
Diameter, in.	2.862	2.855	2.826	
Area, in.²	6.433	6.402	6.273	
Height, in.	5.850	5.836	5.775	
Net decrease in height, in.		0.014	0.061	
Net decrease in water volume, cc.			18.600	
Wet density, pcf	123.7	128.4	130.5	
Dry density, pcf	103.1	103.8	107.1	
Void ratio	0.6622	0.6503	0.6001	
Saturation, %	82.8	100.0	100.0	

Test Readings for Specimen No. 3

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 68.890 psi (9.920 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 2.000 ksf
Strain rate, %/min. = 0.34
Fail. Stress = 2.950 ksf **at reading no.** 19
Ult. Stress = 4.056 ksf **at reading no.** 40

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.000	2.000	1.00	55.000	2.000	0.000
1	0.0136	3.361	3.4	0.2	0.077	1.930	2.007	1.04	55.487	1.969	0.038
2	0.0157	13.578	13.6	0.3	0.311	1.810	2.121	1.17	56.323	1.965	0.155
3	0.0189	23.513	23.5	0.3	0.538	1.673	2.211	1.32	57.272	1.942	0.269
4	0.0229	32.197	32.2	0.4	0.736	1.545	2.281	1.48	58.161	1.913	0.368
5	0.0287	40.180	40.2	0.5	0.918	1.433	2.350	1.64	58.941	1.892	0.459
6	0.0355	47.946	47.9	0.6	1.094	1.338	2.432	1.82	59.596	1.885	0.547
7	0.0424	54.286	54.3	0.7	1.237	1.277	2.514	1.97	60.022	1.895	0.618
8	0.0514	61.048	61.0	0.9	1.389	1.228	2.617	2.13	60.364	1.922	0.694
9	0.0618	67.961	68.0	1.1	1.543	1.196	2.739	2.29	60.585	1.968	0.772
10	0.0777	77.613	77.6	1.3	1.758	1.112	2.870	2.58	61.166	1.991	0.879
11	0.0957	86.694	86.7	1.7	1.957	1.097	3.054	2.78	61.275	2.075	0.978
12	0.1130	94.501	94.5	2.0	2.127	1.098	3.225	2.94	61.262	2.162	1.063
13	0.1306	101.014	101.0	2.3	2.266	1.112	3.378	3.04	61.171	2.245	1.133
14	0.1537	108.862	108.9	2.7	2.432	1.134	3.566	3.15	61.017	2.350	1.216
15	0.1771	115.259	115.3	3.1	2.564	1.165	3.730	3.20	60.797	2.448	1.282
16	0.2010	120.828	120.8	3.5	2.677	1.217	3.894	3.20	60.439	2.555	1.338
17	0.2243	125.899	125.9	3.9	2.778	1.209	3.987	3.30	60.491	2.598	1.389
18	0.2476	130.386	130.4	4.3	2.865	1.243	4.108	3.30	60.258	2.675	1.432
19	0.2714	134.844	134.8	4.7	2.950	1.278	4.227	3.31	60.017	2.753	1.475
20	0.2952	138.657	138.7	5.1	3.020	1.313	4.333	3.30	59.775	2.823	1.510
21	0.3218	142.744	142.7	5.6	3.094	1.357	4.451	3.28	59.469	2.904	1.547
22	0.3505	147.383	147.4	6.1	3.178	1.425	4.603	3.23	58.995	3.014	1.589

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.3796	151.545	151.5	6.6	3.250	1.416	4.666	3.29	59.055	3.041	1.625
24	0.4092	155.530	155.5	7.1	3.317	1.457	4.774	3.28	58.771	3.116	1.659
25	0.4390	159.495	159.5	7.6	3.383	1.499	4.881	3.26	58.482	3.190	1.691
26	0.4685	163.293	163.3	8.1	3.444	1.544	4.988	3.23	58.169	3.266	1.722
27	0.4978	166.697	166.7	8.6	3.497	1.612	5.109	3.17	57.693	3.361	1.748
28	0.5275	170.334	170.3	9.1	3.553	1.599	5.151	3.22	57.788	3.375	1.776
29	0.5565	173.629	173.6	9.6	3.601	1.634	5.235	3.20	57.544	3.434	1.801
30	0.5851	176.826	176.8	10.1	3.648	1.669	5.316	3.19	57.302	3.493	1.824
31	0.6150	180.169	180.2	10.6	3.695	1.709	5.404	3.16	57.022	3.557	1.848
32	0.6443	183.620	183.6	11.2	3.745	1.766	5.510	3.12	56.630	3.638	1.872
33	0.6742	186.946	186.9	11.7	3.790	1.751	5.541	3.16	56.730	3.646	1.895
34	0.7036	190.142	190.1	12.2	3.833	1.784	5.617	3.15	56.502	3.700	1.916
35	0.7336	193.407	193.4	12.7	3.875	1.817	5.693	3.13	56.269	3.755	1.938
36	0.7630	196.782	196.8	13.2	3.920	1.858	5.778	3.11	55.985	3.818	1.960
37	0.7921	199.816	199.8	13.7	3.957	1.894	5.852	3.09	55.734	3.873	1.979
38	0.8213	203.050	203.1	14.2	3.998	1.896	5.894	3.11	55.722	3.895	1.999
39	0.8509	205.894	205.9	14.7	4.030	1.927	5.957	3.09	55.508	3.942	2.015
40	0.8803	208.479	208.5	15.2	4.056	1.958	6.014	3.07	55.295	3.986	2.028
41	0.8932	207.492	207.5	15.5	4.026	1.985	6.011	3.03	55.108	3.998	2.013

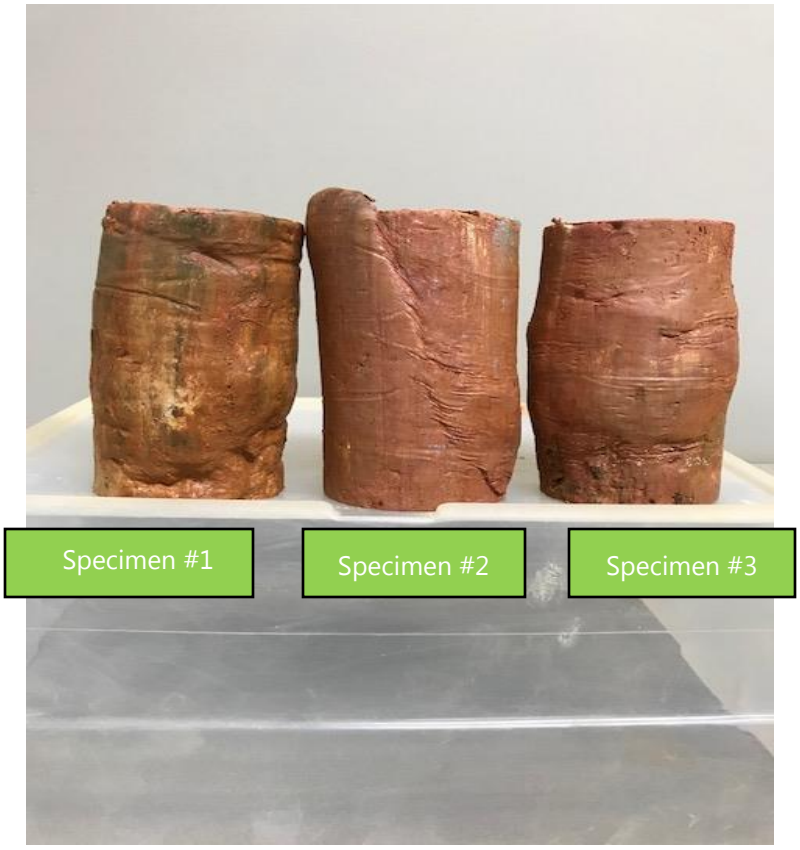
Project Name: Carolina Crossroads Project

Boring #: B-50

Depth: 13.5 – 15.5′

Sample #: UD-1

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)



Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

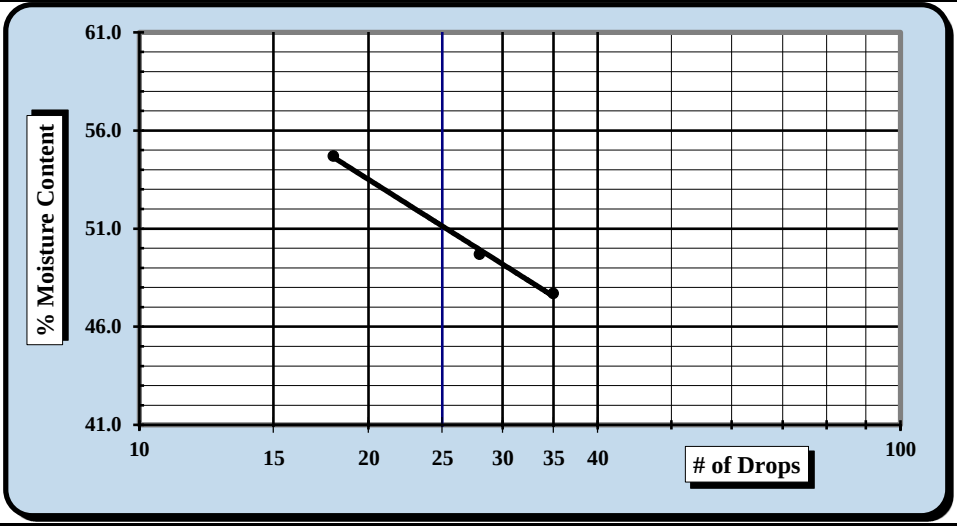
Project #:	1461-16-047.2B	Report Date:	5/18/18
Project Name:	Carolina Crossroads Project	Test Date:	5/16/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	B-50	Sample #:	UD-2	Sample Date:	Various
Location:	UD borings	Type:	Undisturbed	Depth:	35 - 37'

Sample Description: Sandy Fat Clay [CH, A-7-6(9)]

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	26.70	26.48	26.32				25.92	26.94	
B	Wet Soil Weight + A	40.66	43.66	41.90				33.96	34.64	
C	Dry Soil Weight + A	36.15	37.96	36.39				32.19	32.95	
D	Water Weight (B-C)	4.51	5.70	5.51				1.77	1.69	
E	Dry Soil Weight (C-A)	9.45	11.48	10.07				6.27	6.01	
F	% Moisture (D/E)*100	47.7%	49.7%	54.7%				28.2%	28.1%	
N	# OF DROPS	35	28	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**51**
Plastic Limit	**28**
Plastic Index	**23**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	5/18/18	Matthew F. Cooke, P.G.	5/18/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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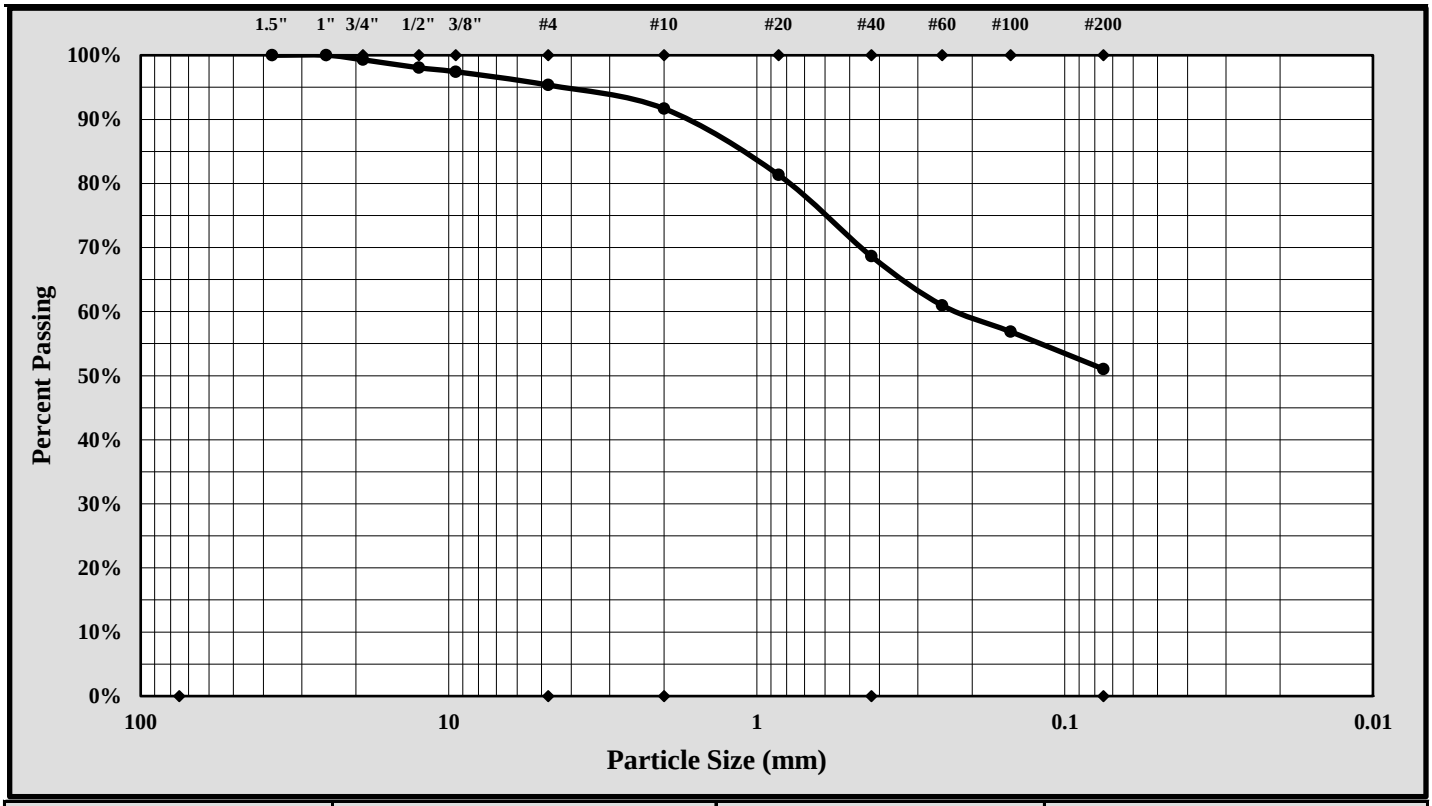
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	5/18/18
Project Name:	Carolina Crossroads Project	Test Date(s):	5/14 - 5/18/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: UD-2	Sample Date: Various
Location:	UD borings	Type: Undisturbed	Depth: 35 - 37'
Sample Description:	Sandy Fat Clay [CH, A-7-6(9)]		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	19.0 mm	Gravel:	4.7%
Silt & Clay (% Passing #200):	51.0%	Total Sand:	44.3%

Liquid Limit	51	Plastic Limit	28	Plastic Index	23
Coarse Sand:	3.7%	Medium Sand:	23.0%	Fine Sand:	17.6%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
5/18/18 — *Date*

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Form No: TR-D854-1B
Revision No. 1
Revision Date: 08/09/17

SPECIFIC GRAVITY OF SOIL

Oven dried Specimens ASTM D 854 Method B

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	5/14/18
Project Name:	Carolina Crossroads Project	Test Date(s):	5/08 - 5/10/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	B-50	Sample #: UD-2	Sample Date: Various
Location:	UD Borings	Type: Undisturbed	Depth: 35 - 37'
Sample Description:	Sandy Fat Clay [CH, A-7-6(9)]		
Material Excluded:	4.7%		% Passing #4 Sieve: 95.3%

Balance ID.	*0.01 gram*	*ID#:*	*13942*	*Cal. Date:*	*8/18/17*	*Cal. Due:*	*8/18/18*
Pycnometer ID No.	*23162*	*Cal. Date:*	*2/10/18*	*Balance Verification*		Check Mass:	500 gram

Pycnometer Volume (V_p)	249.82	ml.	Mass Determination: 500.00 grams
Pycnometer Mass (PM)	115.03	grams	*If [PM-M_p] is greater than .06 grams,*
Ave. Pycnometer Mass (M_p)	115.03	grams	*recalibrate the dry mass of the pycnometer.*

Method B: Oven-dried Specimens

Soaking Time ASTM C127: 24 ± 4 hrs. ☐
Aggregate not initially dried ☐

Table 2 ASTM D 854	Specimen Dry Mass (g.)	
Soil Type	*250-ml. beaker*	*500-ml. beaker*
SP, SP-SM	*60 ± 10*	*100 ± 10*
SP-SC, SM, SC	*45 ± 10*	*75 ± 10*
Silt or Clay	*35 ± 5*	*50 ± 10*

Initial Dry Mass of Test Specimen - *not required.* grams

$M_{psw;t}$ = *Mass of the Pycnometer, soil, and water =* **388.44** *grams*

Mass of Dry Soil (grams)		Tare #	7
A	Tare Weight		192.22
C	Dry Wt. + Tare Wt.		230.33
M_s	Dry Weight	**C-A**	**38.11**

T_t =	Test Temperature T_t	**21.5** °C
K =	Temperature Coefficient at T_t	**0.99968**
K =	Temperature Coefficient at 23°C	**0.99933**
$p_{w;t}$ =	Density of Water at T_t	**0.99789** g./ml.

$M_{pw;t}$ =	Mass of the Pycnometer and water at T_t	$M_{pw;t} = M_p + (V_p \times p_{w;t})$	**364.32** grams
G_t =	Specific Gravity of Soil Solids at the T_t	$G_t = M_s / (M_{pw;t} - (M_{psw;t}-M_s))$	**2.724**
G =	Specific Gravity of Soil Solids at the 20°C	$G = K \times G_t$	**2.723**

Soils containing plus #4 material tested per ***ASTM C 127***

R = *% of Soil retained on the #4 sieve* **4.7%**
P = *% of Soil passing the #4 sieve* **95.3%**

G_{+4} Apparent Specific Gravity of plus #4 material at the 23°C per ASTM C127
Apparent Specific Gravity of plus #4 material corrected to 20°C

G_{total} *Total Sample Specific Gravity*

$$G_{total} = \frac{1}{\frac{R}{100 \times G_{+4}} + \frac{P}{100 \times G}} = 2.723$$

Notes / Deviations / References: ASTM D854: Specific Gravity of Soil Solids by Water Pycnometer

Matthew F. Cooke — *Project Manager*
Project Manager — *Position*
5/14/18 — Date

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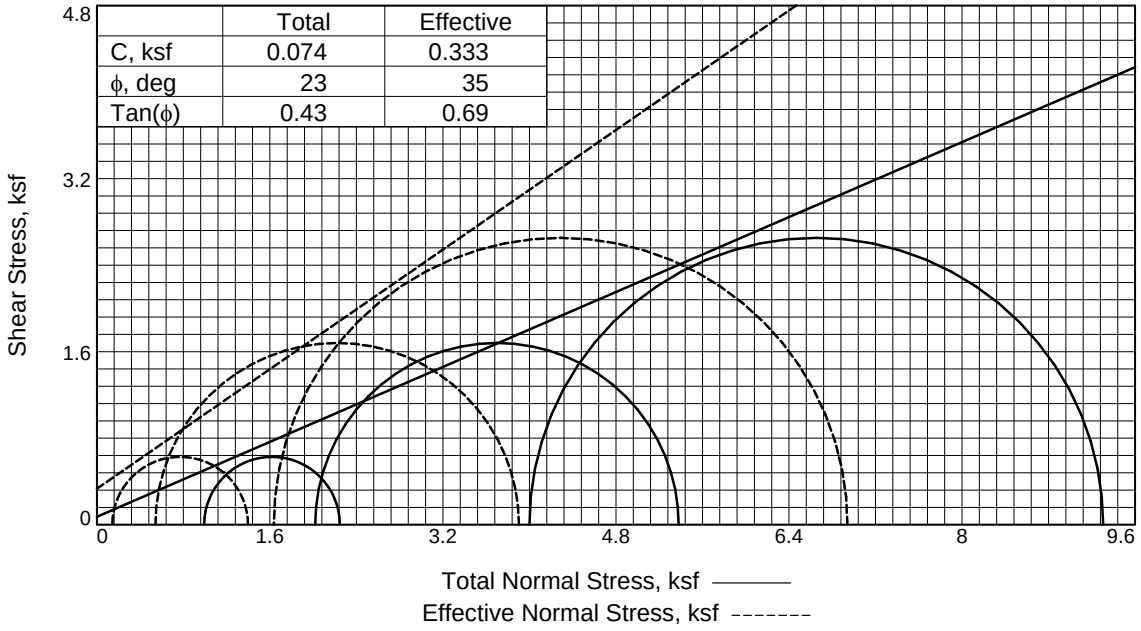
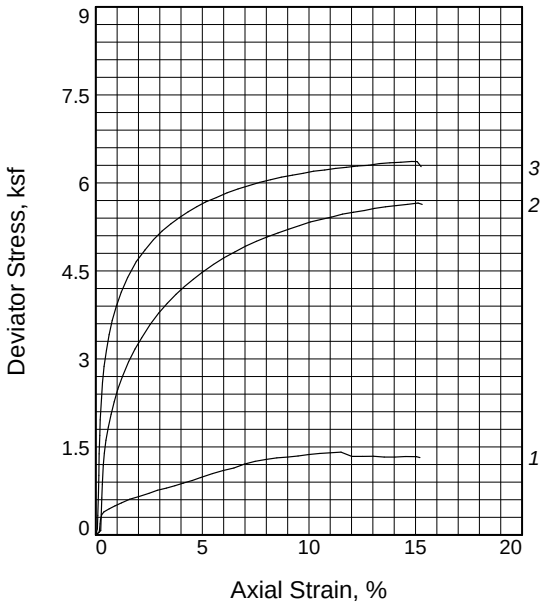
C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.

	Total	Effective
C, ksf	0.074	0.333
ϕ, deg	23	35
Tan(ϕ)	0.43	0.69





Specimen No.		1	2	3
Initial	Water Content, %	15.1	20.5	23.0
	Dry Density, pcf	116.9	108.8	103.5
	Saturation, %	90.9	99.4	97.5
	Void Ratio	0.4538	0.5617	0.6422
	Diameter, in.	2.864	2.878	2.879
	Height, in.	5.152	5.354	5.512
At Test	Water Content, %	15.1	19.6	21.3
	Dry Density, pcf	120.4	110.8	107.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4115	0.5338	0.5810
	Diameter, in.	2.827	2.862	2.844
	Height, in.	5.133	5.318	5.439
Strain rate, %/min.		0.25	0.25	0.25
Eff. Cell Pressure, ksf		0.992	2.019	4.000
Fail. Stress, ksf		1.255	3.361	5.305
Total Pore Pr., ksf		8.769	9.397	10.284
Strain, %		7.5	2.2	3.5
Ult. Stress, ksf		1.336	5.657	6.365
Total Pore Pr., ksf		8.668	7.789	9.301
Strain, %		15.0	15.1	15.1
$\bar{\sigma}_1$ Failure, ksf		1.397	3.903	6.941
$\bar{\sigma}_3$ Failure, ksf		0.143	0.542	1.636

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Sandy Fat Clay [CH, A-7-6(9)]

LL= 51 **PL=** 28 **PI=** 23
Specific Gravity= 2.723
Remarks: Specimen failed with shear and bulging. Failure selected at peak obliquity. ASTM D4767.
Percent passing the #200 sieve: 51.0%
Figure 1

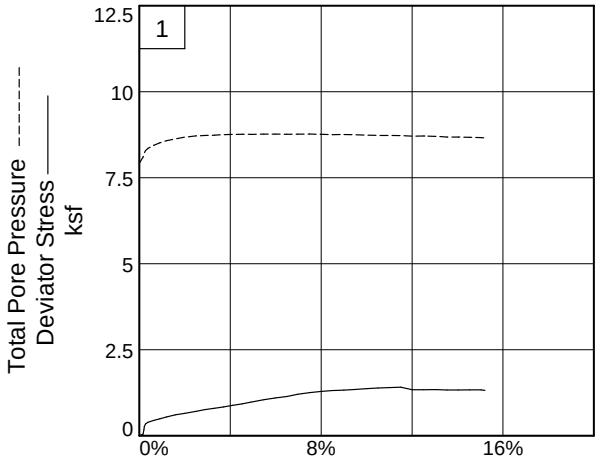
Client: HDR Engineering, Inc.

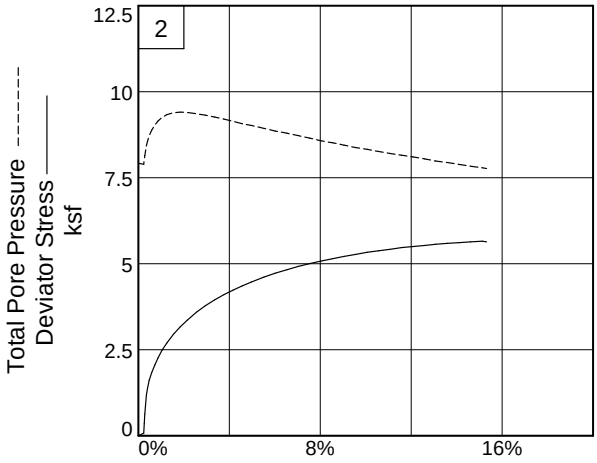
Project: Carolina Crossroads Project

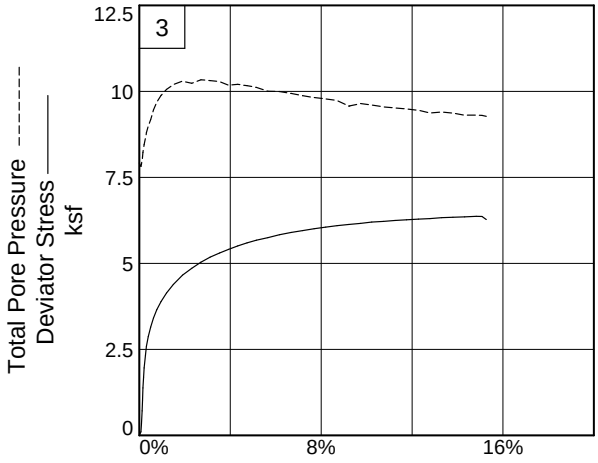
Location: UD borings
Sample Number: B-50 **Depth:** 35 - 37'
Proj. No.: 1461-16-047.2B **Date Sampled:** Various

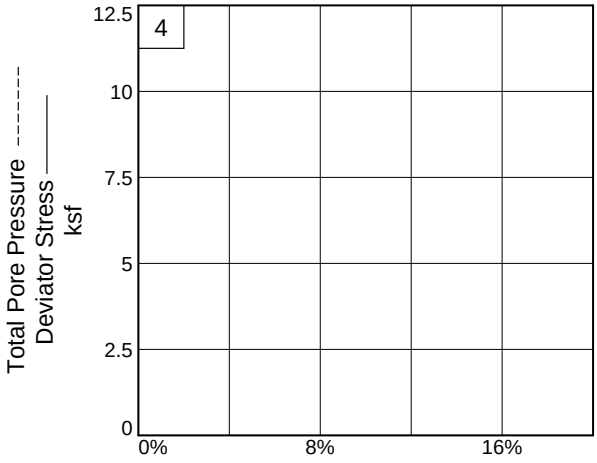
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

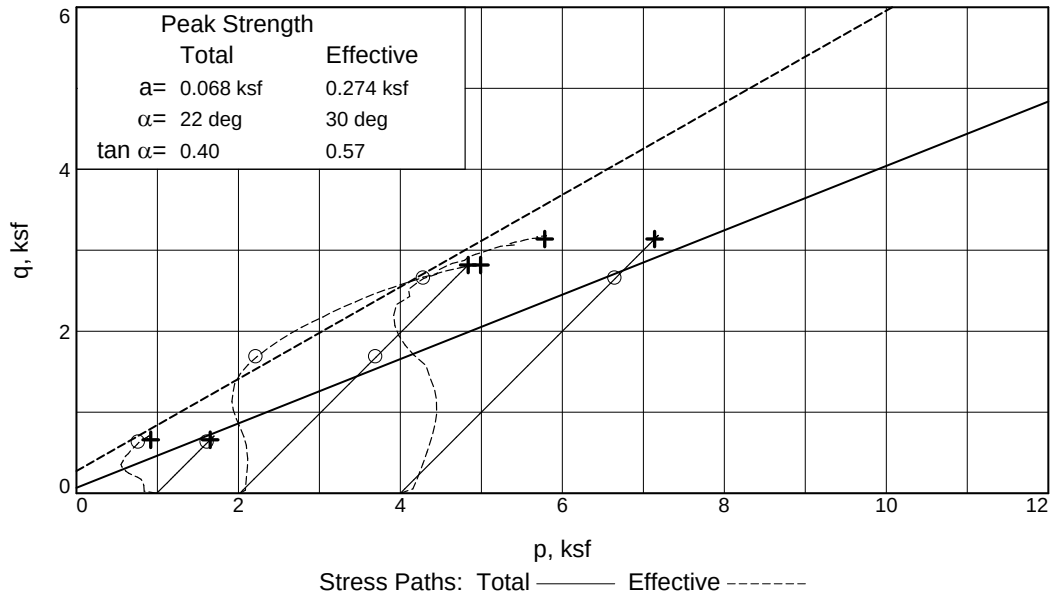
Tested By: Benjamin Kovaleski **Checked By:** Matthew F. Cooke, P.G.











Client: HDR Engineering, Inc.
Project: Carolina Crossroads Project
Location: UD borings **Depth:** 35 - 37' **Sample Number:** B-50
Project No.: 1461-16-047.2B **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski **Checked By:** Matthew F. Cooke, P.G.

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.

TRIAXIAL COMPRESSION TEST 5/18/2018

CU with Pore Pressures 4:15 PM

Date: Various
Client: HDR Engineering, Inc.
Project: Carolina Crossroads Project
Project No.: 1461-16-047.2B
Location: UD borings
Depth: 35 - 37' **Sample Number:** B-50
Description: Sandy Fat Clay [CH, A-7-6(9)]
Remarks: Specimen failed with shear and bulging. Failure selected at peak obliquity. ASTM D4767. Percent passing the #200 sieve: 51.0%
Type of Sample: Undisturbed
Specific Gravity=2.723 **LL=**51 **PL=**28 **PI=**23
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	15.810			245.850
Moisture content: Dry soil+tare, gms.	13.730			213.570
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.1	16.4	15.1	15.1
Moist specimen weight, gms.	1173.09			
Diameter, in.	2.864	2.860	2.827	
Area, in.²	6.442	6.425	6.278	
Height, in.	5.152	5.145	5.133	
Net decrease in height, in.		0.007	0.012	
Net decrease in water volume, cc.			13.600	
Wet density, pcf	134.6	136.7	138.6	
Dry density, pcf	116.9	117.4	120.4	
Void ratio	0.4538	0.4478	0.4115	
Saturation, %	90.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 61.890 psi (8.912 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 0.992 ksf
Strain rate, %/min. = 0.25
Fail. Stress = 1.255 ksf **at reading no.** 22
Ult. Stress = 1.336 ksf **at reading no.** 37

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	0.992	0.992	1.00	55.000	0.992	0.000
1	0.0085	2.156	2.2	0.2	0.049	0.812	0.862	1.06	56.248	0.837	0.025
2	0.0104	8.268	8.3	0.2	0.189	0.738	0.927	1.26	56.767	0.832	0.095
3	0.0113	11.383	11.4	0.2	0.261	0.692	0.953	1.38	57.083	0.822	0.130
4	0.0140	15.021	15.0	0.3	0.344	0.626	0.970	1.55	57.542	0.798	0.172
5	0.0196	17.274	17.3	0.4	0.395	0.558	0.953	1.71	58.013	0.756	0.197
6	0.0324	19.600	19.6	0.6	0.447	0.469	0.916	1.95	58.634	0.692	0.223
7	0.0464	21.795	21.8	0.9	0.495	0.396	0.891	2.25	59.143	0.643	0.248
8	0.0618	24.090	24.1	1.2	0.546	0.336	0.882	2.62	59.556	0.609	0.273
9	0.0818	27.014	27.0	1.6	0.610	0.282	0.891	3.17	59.934	0.586	0.305
10	0.1030	29.073	29.1	2.0	0.653	0.233	0.886	3.81	60.272	0.560	0.327
11	0.1282	31.769	31.8	2.5	0.710	0.195	0.906	4.64	60.533	0.551	0.355
12	0.1482	34.212	34.2	2.9	0.762	0.184	0.946	5.15	60.615	0.565	0.381
13	0.1697	36.049	36.0	3.3	0.800	0.177	0.976	5.52	60.663	0.577	0.400
14	0.1903	38.050	38.1	3.7	0.840	0.160	1.000	6.26	60.780	0.580	0.420
15	0.2110	40.258	40.3	4.1	0.885	0.153	1.038	6.80	60.830	0.595	0.443
16	0.2322	42.410	42.4	4.5	0.929	0.148	1.077	7.28	60.863	0.612	0.464
17	0.2520	44.833	44.8	4.9	0.978	0.151	1.129	7.47	60.841	0.640	0.489
18	0.2808	48.247	48.2	5.5	1.046	0.144	1.190	8.25	60.887	0.667	0.523
19	0.3065	50.940	50.9	6.0	1.099	0.144	1.243	8.62	60.889	0.693	0.549
20	0.3326	53.210	53.2	6.5	1.141	0.148	1.289	8.72	60.863	0.719	0.571
21	0.3576	56.544	56.5	7.0	1.207	0.147	1.353	9.23	60.872	0.750	0.603
22	0.3838	59.123	59.1	7.5	1.255	0.143	1.397	9.79	60.898	0.770	0.627
23	0.4097	60.991	61.0	8.0	1.287	0.150	1.437	9.60	60.850	0.793	0.644
24	0.4362	62.641	62.6	8.5	1.315	0.160	1.475	9.20	60.777	0.818	0.657
25	0.4621	63.656	63.7	9.0	1.329	0.157	1.486	9.45	60.798	0.822	0.664
26	0.4871	64.800	64.8	9.5	1.345	0.163	1.509	9.24	60.756	0.836	0.673
27	0.5130	66.366	66.4	10.0	1.370	0.175	1.545	8.84	60.676	0.860	0.685
28	0.5389	67.664	67.7	10.5	1.389	0.182	1.571	8.63	60.626	0.877	0.695
29	0.5647	68.581	68.6	11.0	1.400	0.184	1.584	8.60	60.611	0.884	0.700
30	0.5906	69.606	69.6	11.5	1.413	0.186	1.599	8.61	60.601	0.892	0.706
31	0.6164	69.898	69.9	12.0	1.339	0.203	1.543	7.58	60.477	0.873	0.670
32	0.6426	70.487	70.5	12.5	1.340	0.200	1.540	7.71	60.504	0.870	0.670
33	0.6689	71.090	71.1	13.0	1.341	0.209	1.550	7.42	60.439	0.879	0.670
34	0.6947	71.054	71.1	13.5	1.329	0.228	1.557	6.82	60.305	0.893	0.664
35	0.7202	71.613	71.6	14.0	1.329	0.229	1.557	6.81	60.302	0.893	0.664
36	0.7457	72.566	72.6	14.5	1.336	0.236	1.573	6.66	60.249	0.904	0.668
37	0.7722	73.134	73.1	15.0	1.336	0.244	1.580	6.48	60.196	0.912	0.668
38	0.7804	72.461	72.5	15.2	1.319	0.258	1.577	6.12	60.101	0.917	0.660

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	36.450			251.200
Moisture content: Dry soil+tare, gms.	30.250			210.020
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	20.5	20.5	19.6	19.6
Moist specimen weight, gms.	1199.13			
Diameter, in.	2.878	2.875	2.862	
Area, in.²	6.505	6.493	6.432	
Height, in.	5.354	5.349	5.318	
Net decrease in height, in.		0.005	0.031	
Net decrease in water volume, cc.			8.600	
Wet density, pcf	131.2	131.5	132.6	
Dry density, pcf	108.8	109.2	110.8	
Void ratio	0.5617	0.5573	0.5338	
Saturation, %	99.4	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 69.020 psi (9.939 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 2.019 ksf
Strain rate, %/min. = 0.25
Fail. Stress = 3.361 ksf **at reading no.** 15
Ult. Stress = 5.657 ksf **at reading no.** 42

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.019	2.019	1.00	55.000	2.019	0.000
1	0.0124	3.284	3.3	0.2	0.073	2.049	2.122	1.04	54.790	2.086	0.037
2	0.0135	15.819	15.8	0.3	0.353	1.920	2.274	1.18	55.684	2.097	0.177
3	0.0149	28.276	28.3	0.3	0.631	1.796	2.427	1.35	56.550	2.111	0.316
4	0.0164	38.605	38.6	0.3	0.862	1.683	2.545	1.51	57.329	2.114	0.431
5	0.0186	53.037	53.0	0.3	1.183	1.505	2.689	1.79	58.565	2.097	0.592
6	0.0215	62.473	62.5	0.4	1.393	1.371	2.764	2.02	59.496	2.068	0.696
7	0.0253	72.471	72.5	0.5	1.615	1.215	2.829	2.33	60.585	2.022	0.807
8	0.0311	82.558	82.6	0.6	1.837	1.055	2.893	2.74	61.691	1.974	0.919
9	0.0383	92.560	92.6	0.7	2.057	0.908	2.965	3.27	62.714	1.937	1.029
10	0.0461	102.230	102.2	0.9	2.269	0.786	3.055	3.89	63.560	1.921	1.134
11	0.0550	112.118	112.1	1.0	2.484	0.691	3.175	4.59	64.219	1.933	1.242
12	0.0662	121.926	121.9	1.2	2.696	0.605	3.301	5.46	64.818	1.953	1.348
13	0.0820	133.923	133.9	1.5	2.952	0.548	3.500	6.38	65.213	2.024	1.476
14	0.0978	144.197	144.2	1.8	3.169	0.533	3.702	6.95	65.320	2.117	1.584
15	0.1145	153.427	153.4	2.2	3.361	0.542	3.903	7.20	65.258	2.222	1.680
16	0.1357	164.542	164.5	2.6	3.590	0.577	4.167	7.22	65.010	2.372	1.795
17	0.1566	173.931	173.9	2.9	3.779	0.621	4.401	7.08	64.704	2.511	1.890
18	0.1784	182.526	182.5	3.4	3.949	0.674	4.623	6.86	64.341	2.648	1.975
19	0.2000	190.357	190.4	3.8	4.101	0.734	4.836	6.58	63.920	2.785	2.051
20	0.2214	197.343	197.3	4.2	4.234	0.798	5.032	6.30	63.477	2.915	2.117
21	0.2431	203.916	203.9	4.6	4.356	0.869	5.226	6.01	62.982	3.048	2.178
22	0.2644	210.171	210.2	5.0	4.471	0.920	5.391	5.86	62.633	3.155	2.236

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.2937	218.096	218.1	5.5	4.613	1.003	5.616	5.60	62.052	3.310	2.306
24	0.3201	224.576	224.6	6.0	4.725	1.082	5.807	5.37	61.505	3.445	2.362
25	0.3474	230.566	230.6	6.5	4.824	1.144	5.968	5.22	61.079	3.556	2.412
26	0.3739	236.539	236.5	7.0	4.923	1.216	6.139	5.05	60.577	3.677	2.462
27	0.4007	241.837	241.8	7.5	5.006	1.288	6.294	4.89	60.075	3.791	2.503
28	0.4274	246.704	246.7	8.0	5.079	1.367	6.446	4.72	59.530	3.906	2.540
29	0.4547	251.416	251.4	8.6	5.147	1.425	6.572	4.61	59.123	3.999	2.574
30	0.4812	256.000	256.0	9.0	5.212	1.492	6.704	4.49	58.662	4.098	2.606
31	0.5085	260.400	260.4	9.6	5.272	1.563	6.835	4.37	58.168	4.199	2.636
32	0.5351	264.963	265.0	10.1	5.335	1.614	6.949	4.30	57.808	4.282	2.667
33	0.5619	268.552	268.6	10.6	5.377	1.675	7.052	4.21	57.388	4.363	2.688
34	0.5885	272.114	272.1	11.1	5.418	1.732	7.150	4.13	56.992	4.441	2.709
35	0.6154	276.204	276.2	11.6	5.468	1.785	7.253	4.06	56.621	4.519	2.734
36	0.6426	279.508	279.5	12.1	5.501	1.836	7.337	4.00	56.271	4.586	2.751
37	0.6700	282.652	282.7	12.6	5.531	1.893	7.423	3.92	55.877	4.658	2.765
38	0.6956	286.020	286.0	13.1	5.566	1.954	7.520	3.85	55.451	4.737	2.783
39	0.7229	289.227	289.2	13.6	5.595	1.999	7.594	3.80	55.139	4.796	2.797
40	0.7496	291.911	291.9	14.1	5.614	2.050	7.664	3.74	54.781	4.857	2.807
41	0.7773	294.771	294.8	14.6	5.634	2.104	7.738	3.68	54.410	4.921	2.817
42	0.8041	297.685	297.7	15.1	5.657	2.150	7.806	3.63	54.092	4.978	2.828
43	0.8144	297.257	297.3	15.3	5.636	2.172	7.808	3.59	53.934	4.990	2.818

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	15.400			251.450
Moisture content: Dry soil+tare, gms.	12.520			207.250
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	23.0	22.9	21.3	21.3
Moist specimen weight, gms.	1199.30			
Diameter, in.	2.879	2.868	2.844	
Area, in.²	6.510	6.460	6.351	
Height, in.	5.512	5.491	5.439	
Net decrease in height, in.		0.021	0.052	
Net decrease in water volume, cc.			15.200	
Wet density, pcf	127.3	128.7	130.5	
Dry density, pcf	103.5	104.7	107.5	
Void ratio	0.6422	0.6234	0.5810	
Saturation, %	97.5	100.0	100.0	

Test Readings for Specimen No. 3

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 82.780 psi (11.920 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 4.000 ksf
Strain rate, %/min. = 0.25
Fail. Stress = 5.305 ksf **at reading no.** 21
Ult. Stress = 6.365 ksf **at reading no.** 45

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	4.000	4.000	1.00	55.000	4.000	0.000
1	0.0040	4.675	4.7	0.1	0.106	4.101	4.207	1.03	54.301	4.154	0.053
2	0.0050	14.771	14.8	0.1	0.335	4.036	4.371	1.08	54.749	4.204	0.167
3	0.0068	31.634	31.6	0.1	0.716	3.918	4.635	1.18	55.569	4.277	0.358
4	0.0077	44.936	44.9	0.1	1.017	3.820	4.838	1.27	56.249	4.329	0.509
5	0.0086	61.058	61.1	0.2	1.382	3.697	5.079	1.37	57.104	4.388	0.691
6	0.0101	74.906	74.9	0.2	1.695	3.579	5.274	1.47	57.925	4.427	0.848
7	0.0114	86.714	86.7	0.2	1.962	3.466	5.428	1.57	58.709	4.447	0.981
8	0.0148	103.026	103.0	0.3	2.329	3.280	5.609	1.71	60.004	4.444	1.165
9	0.0170	114.655	114.7	0.3	2.591	3.123	5.714	1.83	61.095	4.418	1.296
10	0.0213	127.200	127.2	0.4	2.873	2.927	5.799	1.98	62.457	4.363	1.436
11	0.0272	139.521	139.5	0.5	3.147	2.744	5.891	2.15	63.727	4.317	1.574
12	0.0339	151.490	151.5	0.6	3.413	2.459	5.872	2.39	65.702	4.166	1.707
13	0.0418	162.487	162.5	0.8	3.656	2.231	5.887	2.64	67.287	4.059	1.828
14	0.0521	173.287	173.3	1.0	3.891	2.036	5.927	2.91	68.642	3.981	1.946
15	0.0652	184.828	184.8	1.2	4.140	1.861	6.001	3.22	69.856	3.931	2.070
16	0.0813	196.560	196.6	1.5	4.390	1.722	6.112	3.55	70.819	3.917	2.195
17	0.1033	209.552	209.6	1.9	4.661	1.623	6.284	3.87	71.510	3.953	2.330
18	0.1254	219.302	219.3	2.3	4.857	1.686	6.543	3.88	71.074	4.114	2.429
19	0.1473	228.238	228.2	2.7	5.035	1.584	6.618	4.18	71.783	4.101	2.517
20	0.1695	235.940	235.9	3.1	5.183	1.605	6.788	4.23	71.635	4.196	2.591
21	0.1920	242.528	242.5	3.5	5.305	1.636	6.941	4.24	71.420	4.288	2.652
22	0.2135	248.319	248.3	3.9	5.409	1.743	7.152	4.10	70.677	4.447	2.705

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.2355	253.921	253.9	4.3	5.508	1.714	7.222	4.21	70.878	4.468	2.754
24	0.2580	259.153	259.2	4.7	5.597	1.755	7.352	4.19	70.592	4.554	2.798
25	0.2801	263.950	263.9	5.1	5.676	1.804	7.480	4.15	70.254	4.642	2.838
26	0.3076	268.805	268.8	5.7	5.750	1.918	7.668	4.00	69.458	4.793	2.875
27	0.3353	274.170	274.2	6.2	5.833	1.923	7.756	4.03	69.426	4.839	2.916
28	0.3630	278.770	278.8	6.7	5.899	1.978	7.877	3.98	69.041	4.928	2.949
29	0.3909	282.981	283.0	7.2	5.955	2.044	7.999	3.91	68.582	5.022	2.977
30	0.4182	287.154	287.2	7.7	6.010	2.100	8.110	3.86	68.199	5.105	3.005
31	0.4461	290.878	290.9	8.2	6.054	2.138	8.192	3.83	67.934	5.165	3.027
32	0.4732	294.595	294.6	8.7	6.098	2.187	8.285	3.79	67.590	5.236	3.049
33	0.5014	297.913	297.9	9.2	6.132	2.348	8.480	3.61	66.476	5.414	3.066
34	0.5292	301.211	301.2	9.7	6.165	2.274	8.439	3.71	66.989	5.356	3.082
35	0.5560	304.653	304.7	10.2	6.201	2.316	8.517	3.68	66.699	5.416	3.101
36	0.5844	307.446	307.4	10.7	6.222	2.372	8.594	3.62	66.308	5.483	3.111
37	0.6120	310.477	310.5	11.3	6.247	2.402	8.649	3.60	66.098	5.526	3.124
38	0.6395	313.271	313.3	11.8	6.267	2.433	8.700	3.58	65.884	5.567	3.134
39	0.6678	316.164	316.2	12.3	6.288	2.469	8.757	3.55	65.634	5.613	3.144
40	0.6956	318.683	318.7	12.8	6.301	2.549	8.850	3.47	65.081	5.699	3.151
41	0.7235	322.055	322.1	13.3	6.330	2.521	8.852	3.51	65.270	5.687	3.165
42	0.7505	324.550	324.5	13.8	6.343	2.550	8.893	3.49	65.071	5.722	3.172
43	0.7785	327.018	327.0	14.3	6.353	2.613	8.966	3.43	64.635	5.789	3.177
44	0.8060	329.693	329.7	14.8	6.367	2.609	8.976	3.44	64.661	5.793	3.184
45	0.8200	330.574	330.6	15.1	6.365	2.619	8.984	3.43	64.591	5.802	3.182
46	0.8303	326.751	326.8	15.3	6.277	2.644	8.921	3.37	64.422	5.782	3.139

Project Name: Carolina Crossroads Project

Boring #: B-50

Depth: 35 - 37′

Sample #: UD-2

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)

Specimen #1 Specimen #2 Specimen #3

APPENDIX

SECTION 5 LABORATORY TEST RESULTS

SECTION 5D BULK SAMPLES

Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

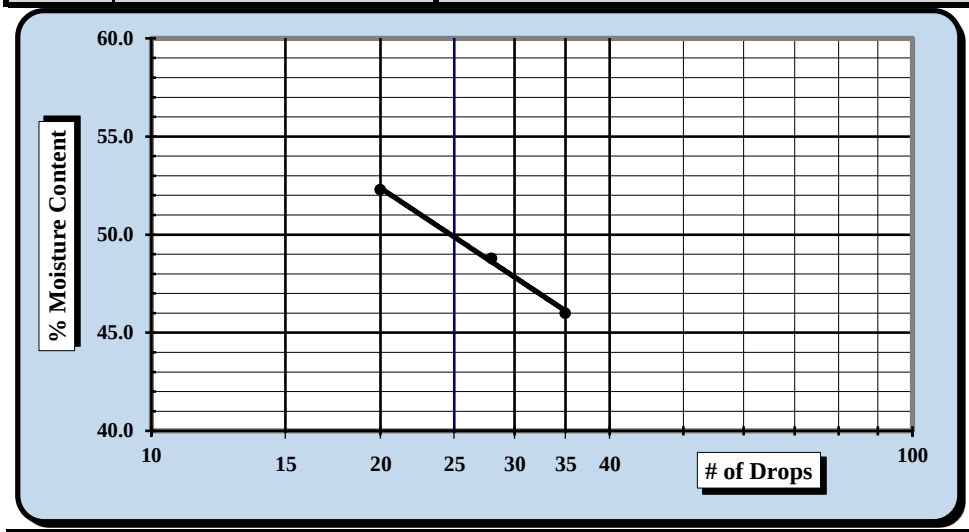
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date:	3/08/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-44	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Pavement Boring	Type:	Bulk	Depth:	1.1' - 11.1'
Sample Description:	Sandy Fat Clay (A-7-6 (17))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	31	32	33				34	35	
A	Tare Weight	28.63	27.68	26.68				28.27	26.96	
B	Wet Soil Weight + A	44.79	43.42	39.75				35.75	33.78	
C	Dry Soil Weight + A	39.70	38.26	35.26				34.33	32.51	
D	Water Weight (B-C)	5.09	5.16	4.49				1.42	1.27	
E	Dry Soil Weight (C-A)	11.07	10.58	8.58				6.06	5.55	
F	% Moisture (D/E)*100	46.0%	48.8%	52.3%				23.4%	22.9%	
N	# OF DROPS	35	28	20				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.2%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**50**
Plastic Limit	**23**
Plastic Index	**27**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 66.6%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	3/09/18		3/09/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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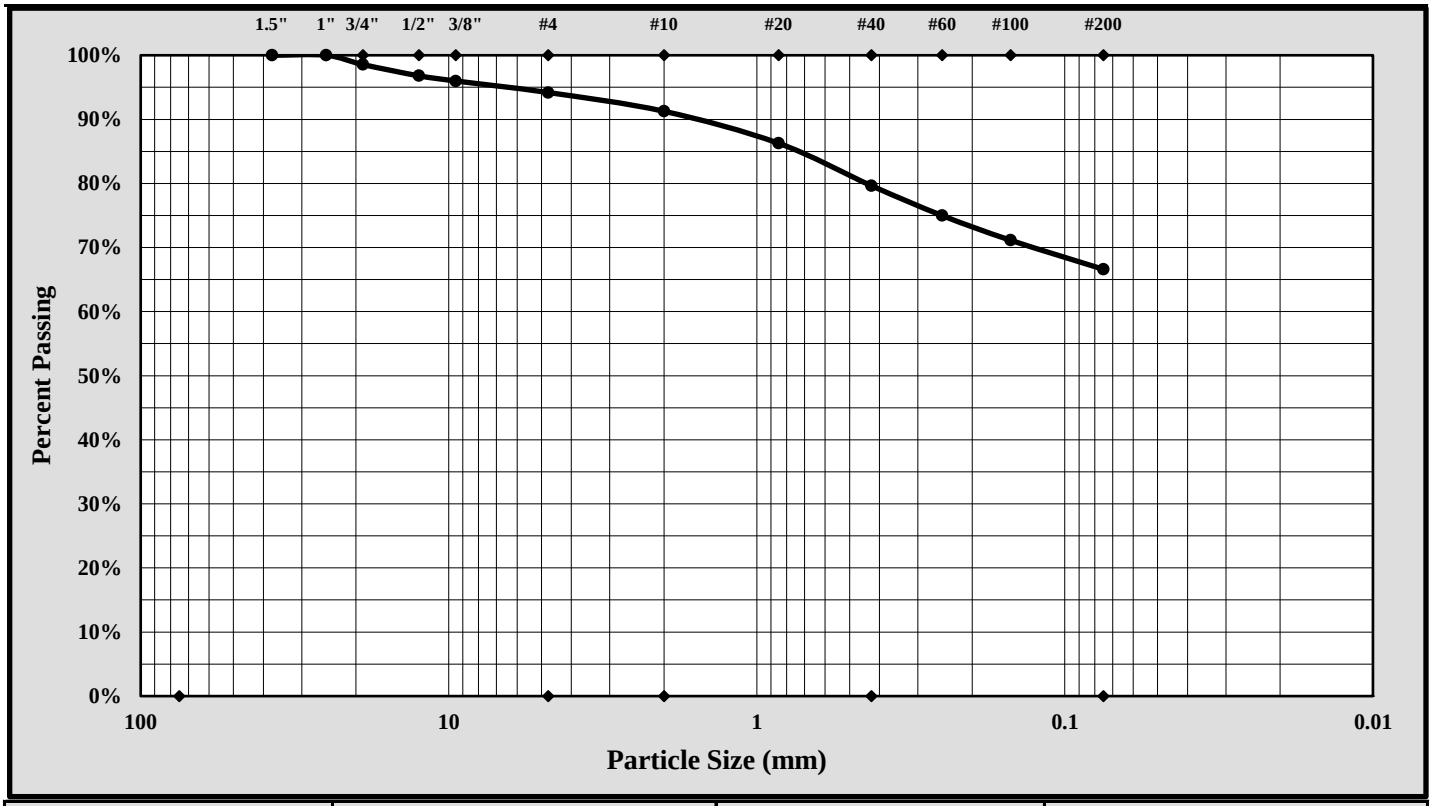
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/05 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	P-44	Sample #: BS-1	Sample Date: 2/13/2018
Location:	Pavement Boring	Type: Bulk	Depth: 1.1' - 11.1'
Sample Description:	Sandy Fat Clay (CH, A-7-6(17))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	25.0 mm	Gravel:	5.8%
Silt & Clay (% Passing #200):	66.6%	Total Sand:	27.6%

Liquid Limit	50	Plastic Limit	23	Plastic Index	27
Coarse Sand:	2.9%	Medium Sand:	11.6%	Fine Sand:	13.1%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/09/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

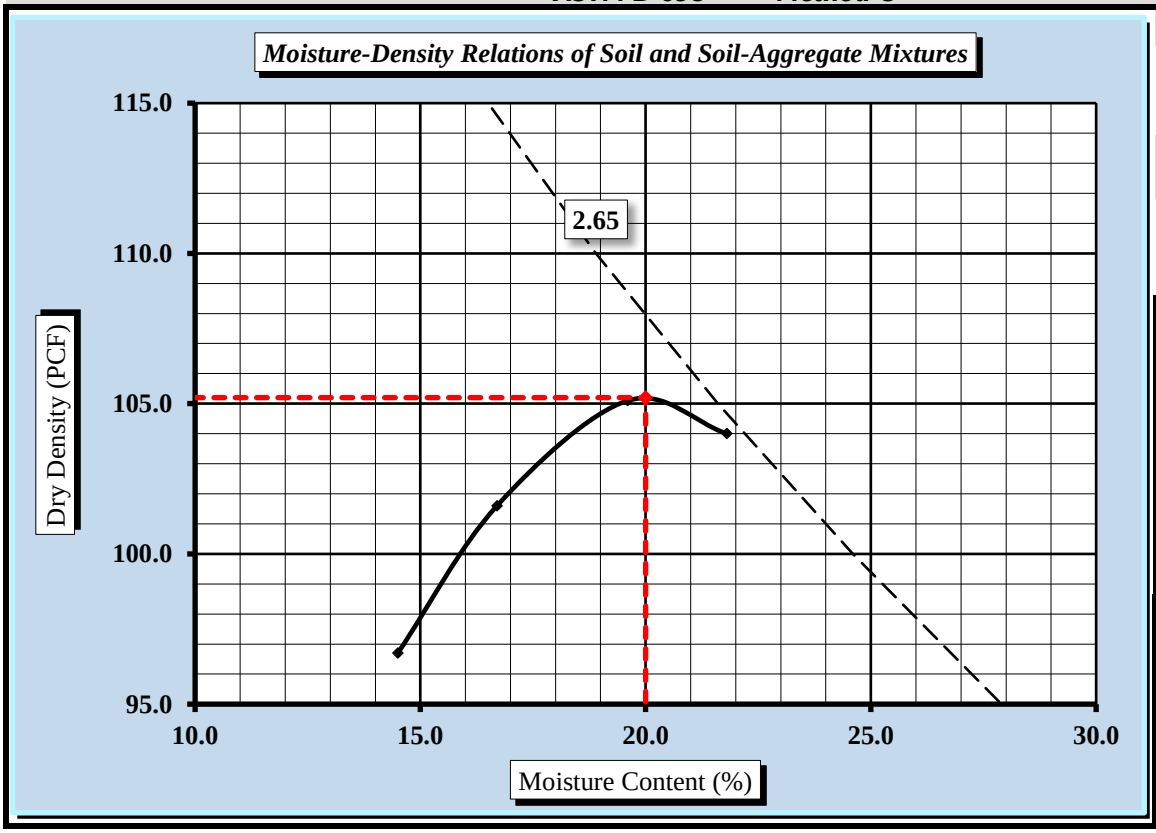
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/01/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-44	Sample #:	BS-1	Sample Date:	2/13/18
Location:	Pavement Boring	Type:	Bulk	Depth:	1.1' - 11.1'
Sample Description:	Sandy Fat Clay (CH, A-7-6(17))				

Maximum Dry Density 105.2 PCF. Optimum Moisture Content 20.0%

ASTM D 698 - - Method C



Soil Properties

Natural Moisture Content	25.9%
Specific Gravity of Soil	2.650
Liquid Limit	50
Plastic Limit	23
Plastic Index	27

% Passing	
3/4"	98.6%
3/8"	96.0%
#4	94.2%
#10	91.3%
#40	79.7%
#60	75.0%
#100	71.1%
#200	66.6%

Oversize Fraction	
Bulk Gravity	
% Moisture	
% Oversize	
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☐ 3/8 inch Sieve ☐ 3/4 inch Sieve ☒

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Brian Vaughan, P.E.		Group Leader	3/09/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/02 - 3/06/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

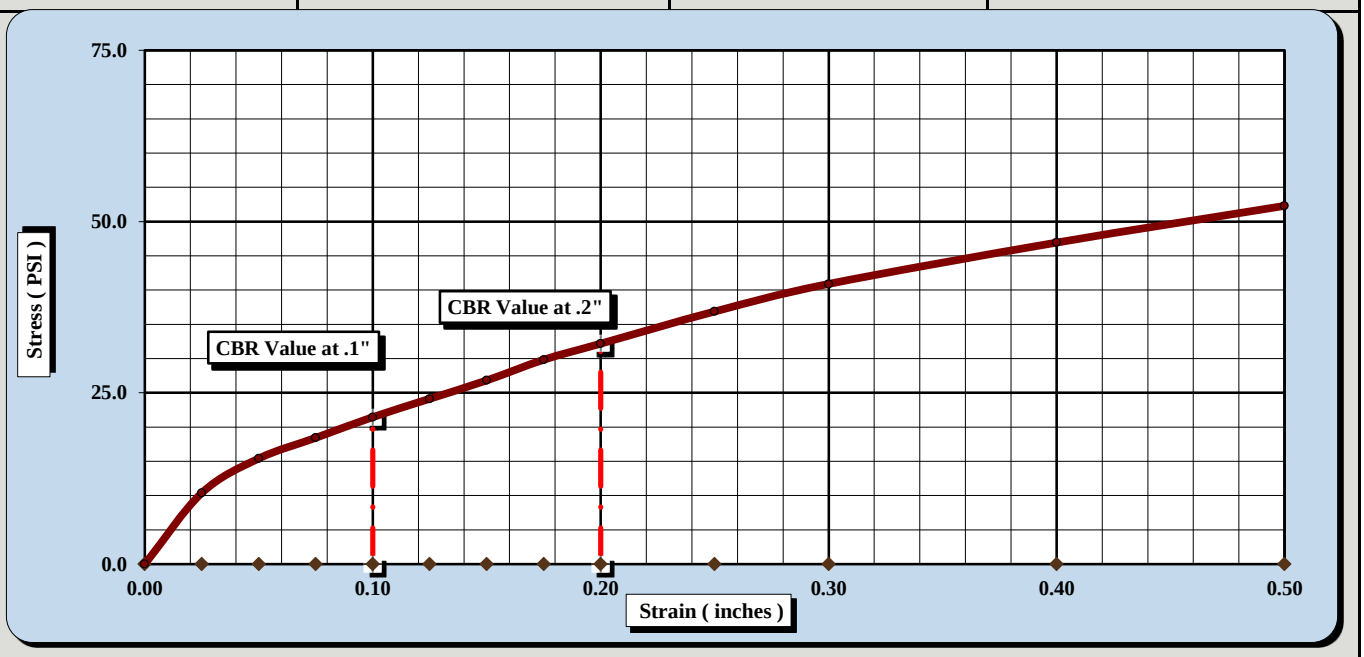
Boring #:	P-44	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Pavement Boring	Type:	Bulk	Depth:	1.1' - 11.1'

Sample Description: Sandy Fat Clay (CH, A-7-6(17))

ASTM D 698 *Method C* Maximum Dry Density: 105.2 PCF Optimum Moisture Content: 20.0%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 1.4%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 2.1	CBR at 0.2 in. 2.1	CBR at 0.1 in. 2.2	CBR at 0.2 in. 2.1



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	20		
Initial Dry Density (PCF)	94.7	Final Dry Density (PCF)	92.9
Moisture Content of the Compacted Specimen	20.0%	Moisture Content (top 1" after soaking)	32.4%
Percent Compaction	90.0%	Percent Swell	1.9%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	50	Plastic Index	27	% Passing the #200 Sieve	66.6%

Notes/Deviations/References:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/09/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/06/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/02 - 3/06/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

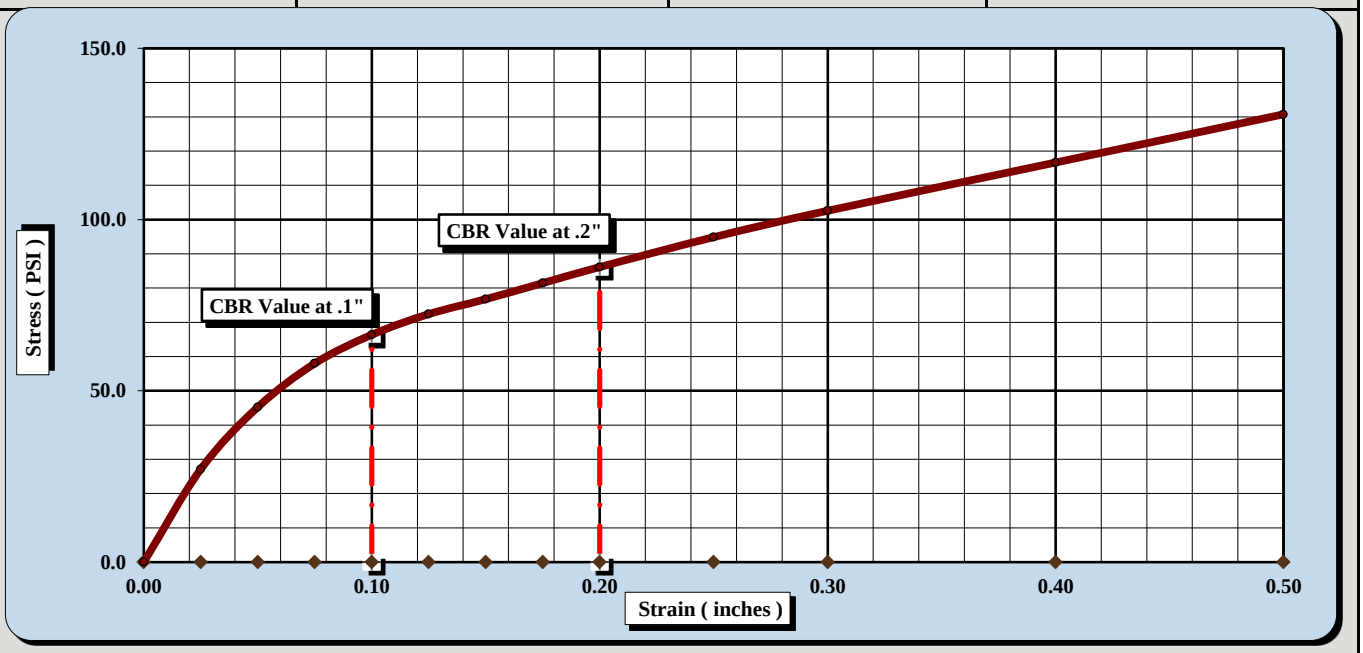
Boring #:	P-44	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Pavement Boring	Type:	Bulk	Depth:	1.1' - 11.1'

Sample Description: Sandy Fat Clay (CH, A-7-6(17))

ASTM D 698 *Method C* Maximum Dry Density: 105.2 PCF Optimum Moisture Content: 20.0%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 1.4%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 6.6	CBR at 0.2 in. 5.7	CBR at 0.1 in. 6.6	CBR at 0.2 in. 5.7



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	35		
Initial Dry Density (PCF)	99.9	Final Dry Density (PCF)	98.7
Moisture Content of the Compacted Specimen	20.0%	Moisture Content (top 1" after soaking)	26.7%
Percent Compaction	95.0%	Percent Swell	1.2%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	50	Plastic Index	27	% Passing the #200 Sieve	66.6%

Notes/Deviations/References:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/06/18
Technical Responsibility	*Signature*	*Position*	*Date*

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/06/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/02 - 3/06/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

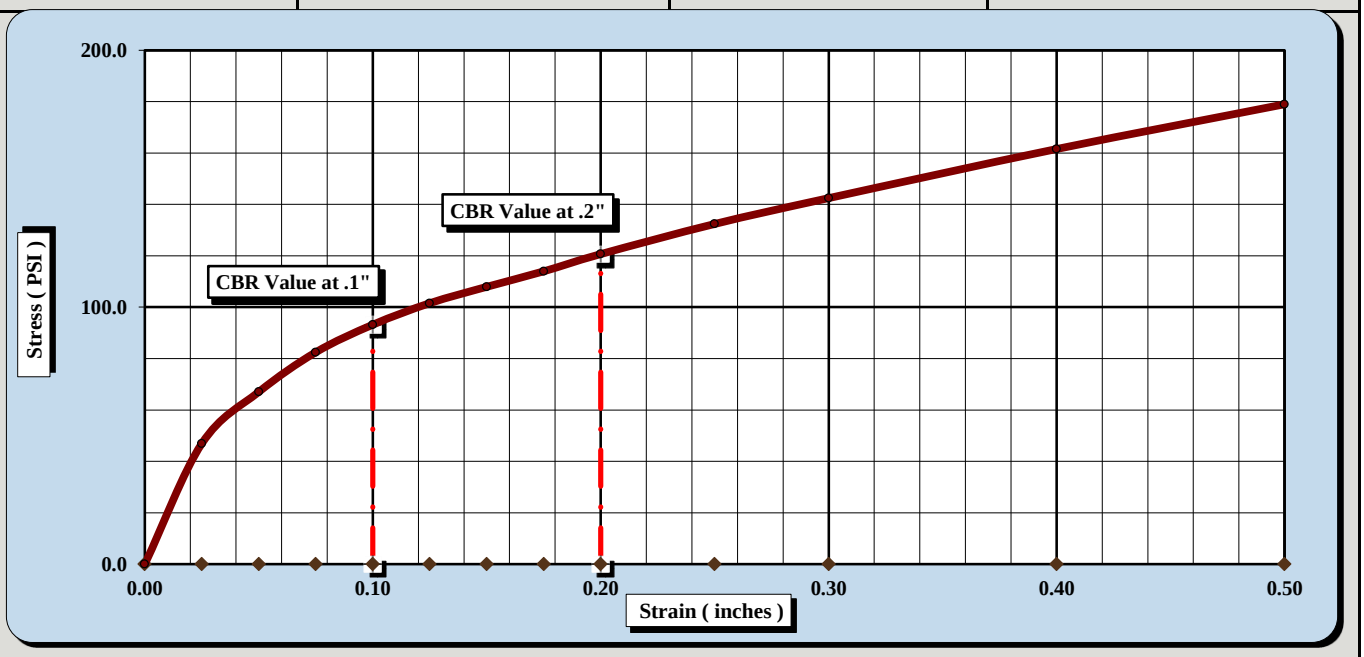
Boring #:	P-44	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Pavement Boring	Type:	Bulk	Depth:	1.1' - 11.1'

Sample Description: Sandy Fat Clay (CH, A-7-6(17))

ASTM D 698 *Method C* Maximum Dry Density: 105.2 PCF Optimum Moisture Content: 20.0%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 1.4%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 9.3	CBR at 0.2 in. 8.0	CBR at 0.1 in. 9.3	CBR at 0.2 in. 8.0



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	56		
Initial Dry Density (PCF)	105.2	Final Dry Density (PCF)	104.2
Moisture Content of the Compacted Specimen	20.0%	Moisture Content (top 1" after soaking)	26.9%
Percent Compaction	100.0%	Percent Swell	0.9%

Soak Time:	96 hrs.	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	50	Plastic Index	27	% Passing the #200 Sieve	66.6%

Notes/Deviations/References:

Brian Vaughan, P.E.		Group Leader	3/06/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

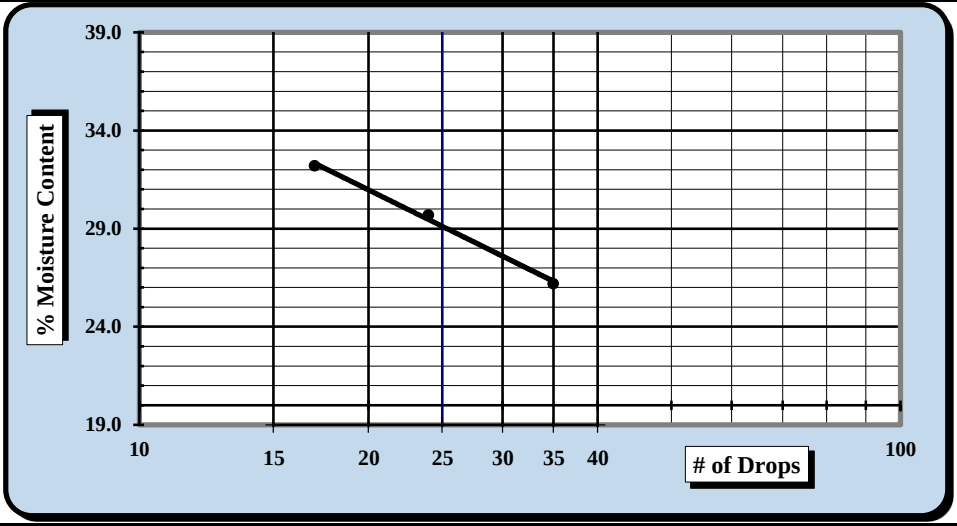
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date:	4/02/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-47	Sample #:	BS-1	Sample Date:	2/15/18
Location:	Pavement Boring	Type:	Bulk	Depth:	1.4' - 11.4'
Sample Description:	Clayey Sand (SC, A-6(3))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	26.70	26.48	26.36				25.93	26.95	
B	Wet Soil Weight + A	44.16	46.75	43.32				32.68	34.93	
C	Dry Soil Weight + A	40.53	42.11	39.19				31.83	33.94	
D	Water Weight (B-C)	3.63	4.64	4.13				0.85	0.99	
E	Dry Soil Weight (C-A)	13.83	15.63	12.83				5.90	6.99	
F	% Moisture (D/E)*100	26.2%	29.7%	32.2%				14.4%	14.2%	
N	# OF DROPS	35	24	17				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**14.3%**		



One Point Liquid Limit

N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐
Liquid Limit **29**
Plastic Limit **14**
Plastic Index **15**
Group Symbol **CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Estimate the % Retained on the #40 Sieve:* N/A

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski	4/03/18	Matthew F. Cooke, P.G.	4/03/18
Technician Name	*Date*	*Technical Responsibility*	*Date*

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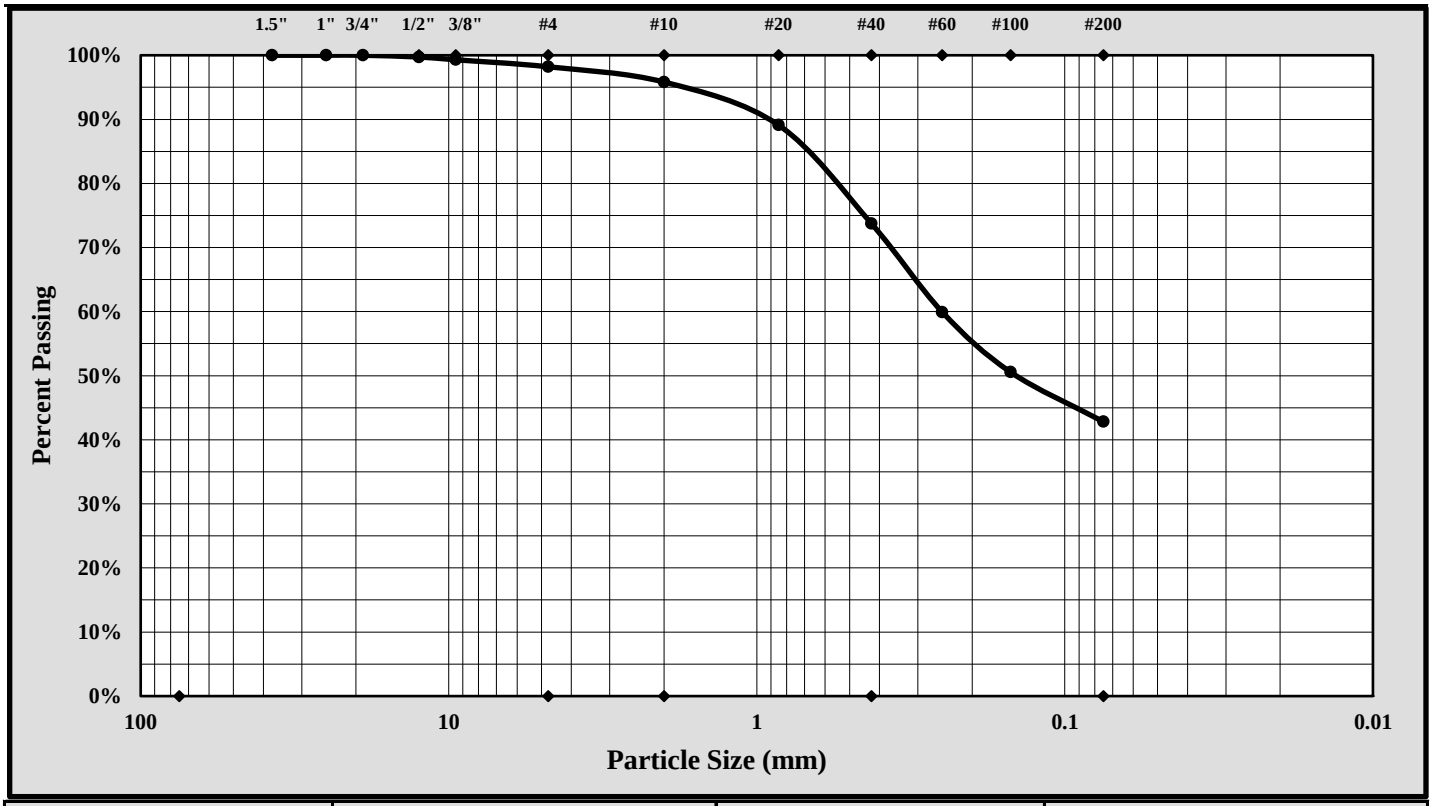
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/26 - 4/02/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	P-47 Sample #: BS-1	Sample Date:	2/15/18
Location:	Pavement Boring Type: Bulk	Depth:	1.4' - 11.4'
Sample Description:	Clayey Sand (SC, A-6(3))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	9.50 mm	Gravel:	1.8%
Silt & Clay (% Passing #200):	42.8%	Total Sand:	55.4%

Liquid Limit	29	Plastic Limit	14	Plastic Index	15
Coarse Sand:	2.4%	Medium Sand:	22.1%	Fine Sand:	30.9%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

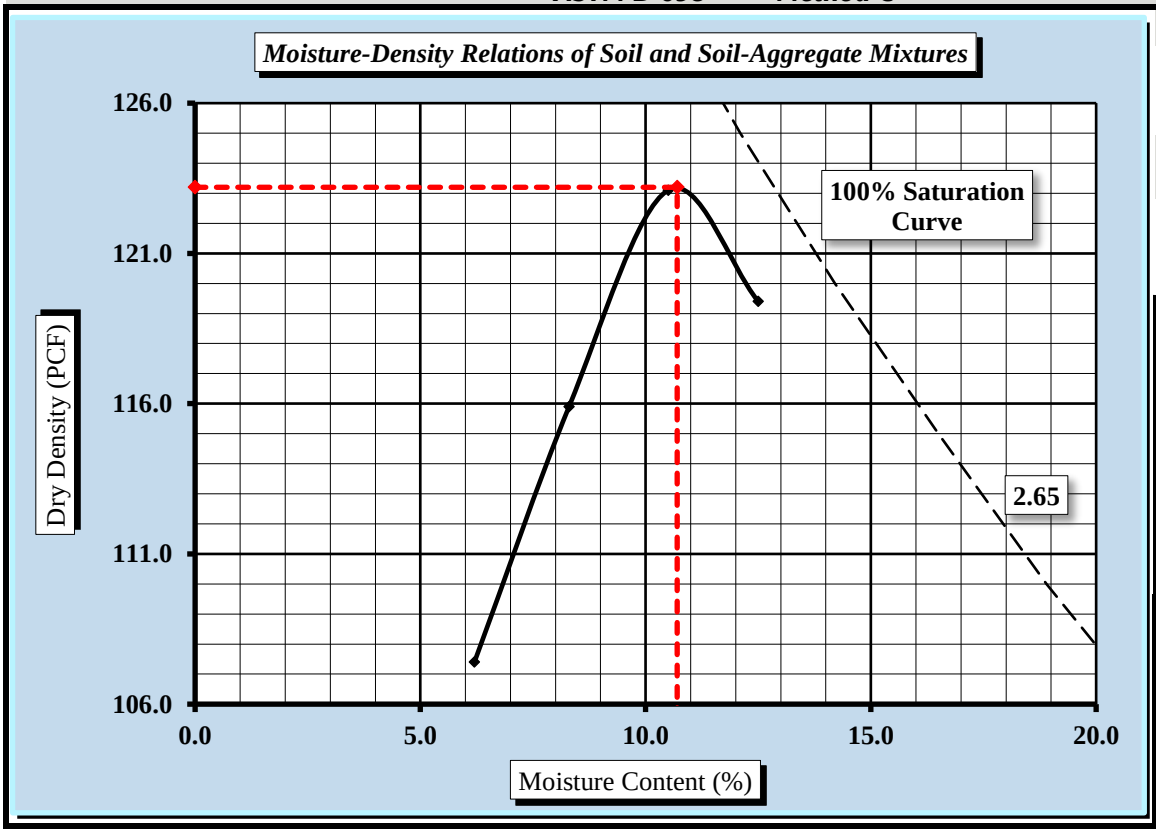
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/08/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	P-47	Sample #:	BS-1	Sample Date:	2/15/18
Location:	Pavement Boring	Type:	Bulk	Depth:	1.4' - 11.4'
Sample Description:	Clayey Sand (SC, A-6(3))				

Maximum Dry Density 123.2 PCF. Optimum Moisture Content 10.7%

ASTM D 698 - - Method C



Soil Properties

Natural Moisture Content	16.6%
Specific Gravity of Soil	2.650
Liquid Limit	29
Plastic Limit	14
Plastic Index	15

% Passing	
3/4"	100.0%
3/8"	99.3%
#4	98.2%
#10	96.0%
#40	74.0%
#60	60.0%
#100	50.6%
#200	42.8%

Oversize Fraction
Bulk Gravity
% Moisture
% Oversize
MDD
Opt. MC

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☐ 3/8 inch Sieve ☐ 3/4 inch Sieve ☒

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Matthew F. Cooke, P.G.	Project Manager	4/03/18
Technical Responsibility	*Position*	*Date*

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Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/16 - 3/20/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

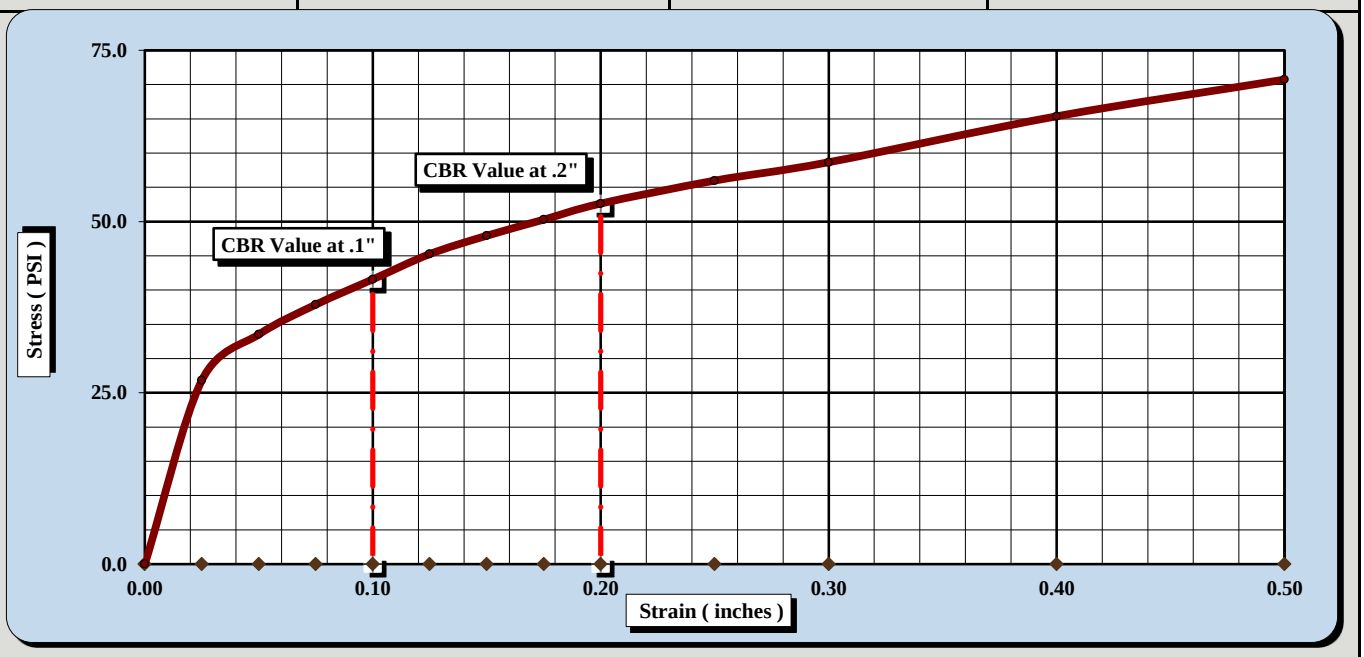
Boring #:	P-47	Sample #:	BS-1	Sample Date:	2/15/18
Location:	Pavement Boring	Type:	Bulk	Depth:	1.4' - 11.4'

Sample Description: Clayey Sand (SC, A-6(3))

ASTM D 698 *Method C* Maximum Dry Density: 123.2 PCF Optimum Moisture Content: 10.7%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 4.2	CBR at 0.2 in. 3.5	CBR at 0.1 in. 4.2	CBR at 0.2 in. 3.5



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	15		
Initial Dry Density (PCF)	110.9	Final Dry Density (PCF)	110.8
Moisture Content of the Compacted Specimen	10.7%	Moisture Content (top 1" after soaking)	16.3%
Percent Compaction	90.0%	Percent Swell	0.0%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.9
Liquid Limit	29	Plastic Index	15	% Passing the #200 Sieve	42.8%

Notes/Deviations/References:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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Form No. TR-D1883-T193-3
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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/16 - 3/20/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

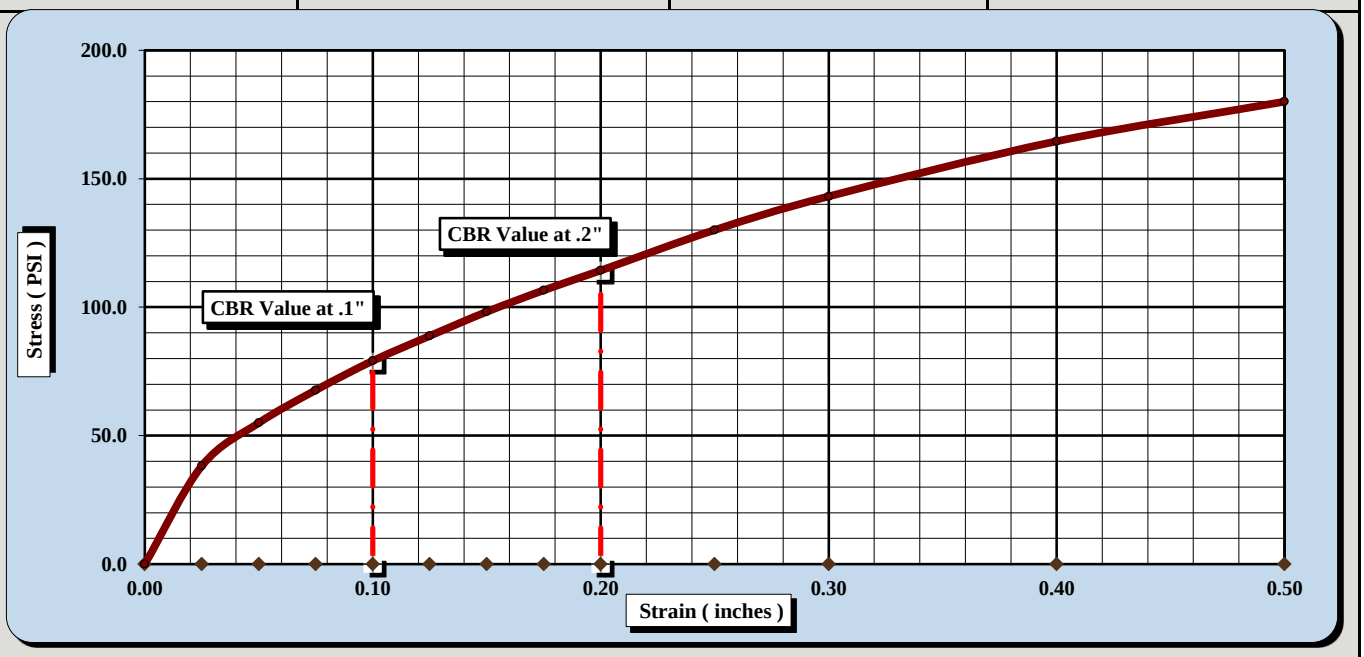
Boring #:	P-47	Sample #:	BS-1	Sample Date:	2/15/18
Location:	Pavement Boring	Type:	Bulk	Depth:	1.4' - 11.4'

Sample Description: Clayey Sand (SC, A-6(3)])

ASTM D 698 *Method C* Maximum Dry Density: 123.2 PCF Optimum Moisture Content: 10.7%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 7.9	CBR at 0.2 in. 7.6	CBR at 0.1 in. 7.9	CBR at 0.2 in. 7.6



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	25		
Initial Dry Density (PCF)	117.0	Final Dry Density (PCF)	117.0
Moisture Content of the Compacted Specimen	10.7%	Moisture Content (top 1" after soaking)	12.6%
Percent Compaction	95.0%	Percent Swell	0.0%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.8
Liquid Limit	29	Plastic Index	15	% Passing the #200 Sieve	42.8%

Notes/Deviations/References:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

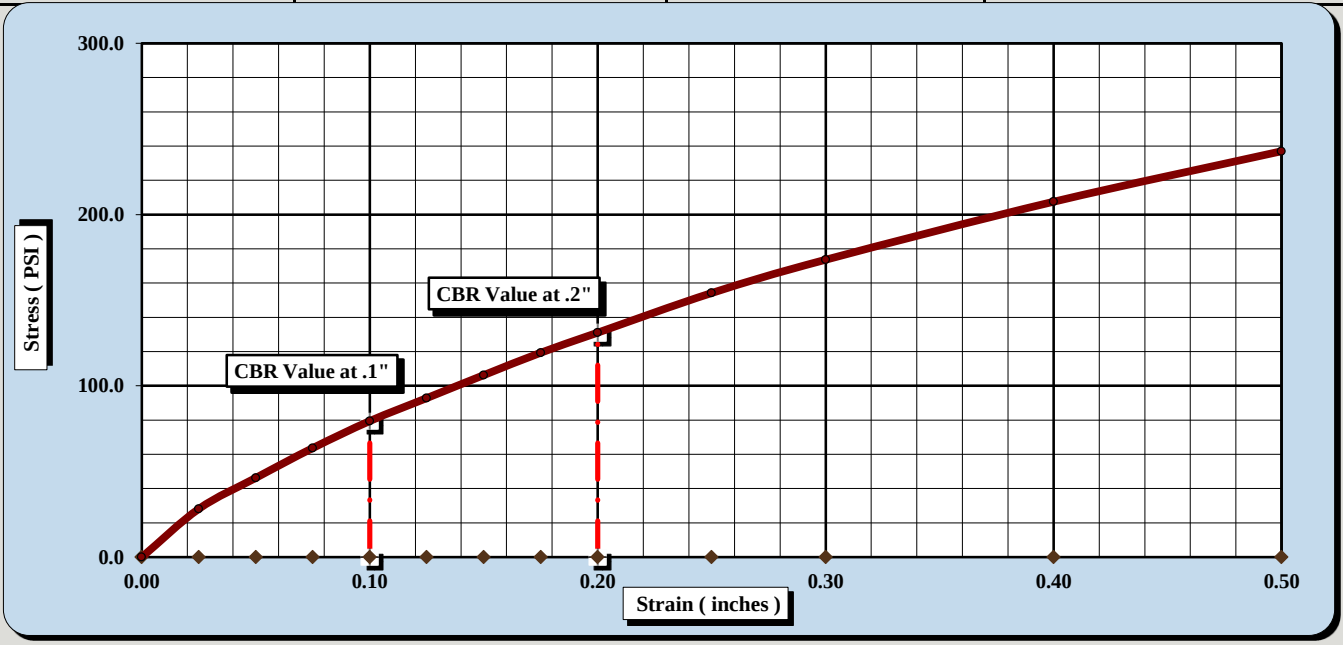
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	4/03/18
Project Name:	Carolina Crossroads Project	Test Date(s)	3/16 - 3/20/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	P-47	Sample #: BS-1	Sample Date: 2/15/18
Location:	Pavement Boring	Type: Bulk	Depth: 1.4' - 11.4'
Sample Description:	Clayey Sand (SC, A-6(3))		

ASTM D 698 *Method C* Maximum Dry Density: 123.2 PCF Optimum Moisture Content: 10.7%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values		Corrected CBR Values	
CBR at 0.1 in. 7.9	CBR at 0.2 in. 8.7	CBR at 0.1 in. 8.0	CBR at 0.2 in. 8.7



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with ASTM D1883, Section 6.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	50		
Initial Dry Density (PCF)	123.2	Final Dry Density (PCF)	123.2
Moisture Content of the Compacted Specimen	10.7%	Moisture Content (top 1" after soaking)	11.9%
Percent Compaction	100.0%	Percent Swell	0.0%

Soak Time:	96 hrs.	Surcharge Weight	20.0	Surcharge Wt. per sq. Ft.	101.9
Liquid Limit	29	Plastic Index	15	% Passing the #200 Sieve	42.8%

Notes/Deviations/References:

Matthew F. Cooke, P.G. — *Technical Responsibility*
Project Manager — *Position*
4/03/18 — *Date*

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Form No. TR-D4318-T89-90
Revision No. 1
Revision Date: 7/26/17

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

ASTM D 4318 ☒ AASHTO T 89 ☐ AASHTO T 90 ☐

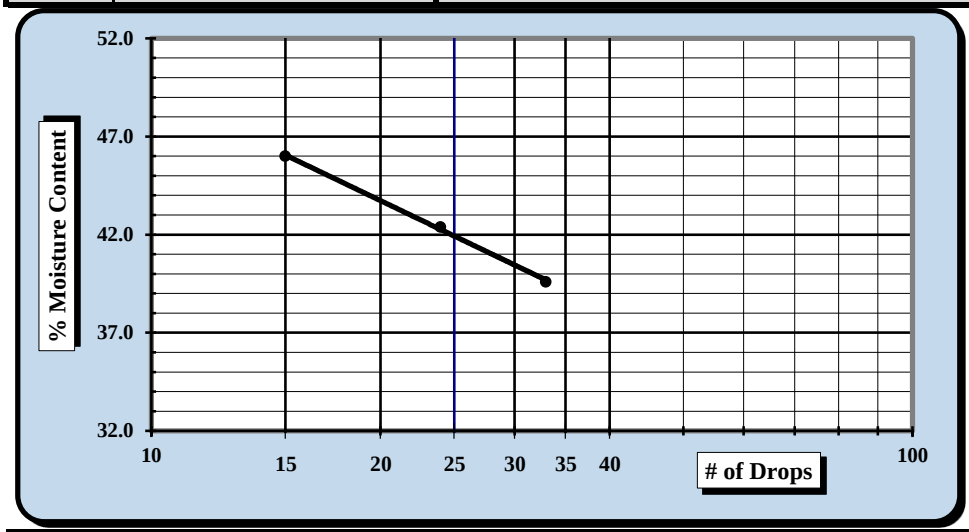
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date:	3/08/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	RW-40	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Embankment Boring	Type:	Bulk	Depth:	0.0' - 10.0'
Sample Description:	Lean Clay with Sand (CL, A-7-6(15))				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	8/18/2017	Grooving tool	23119	10/15/2017
LL Apparatus	23158	2/1/2018			
Oven	13978	10/7/2017			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	36	37	38				39	40	
A	Tare Weight	25.70	26.22	26.28				25.90	26.29	
B	Wet Soil Weight + A	42.91	41.96	41.39				34.13	34.35	
C	Dry Soil Weight + A	38.03	37.27	36.63				32.61	32.87	
D	Water Weight (B-C)	4.88	4.69	4.76				1.52	1.48	
E	Dry Soil Weight (C-A)	12.33	11.05	10.35				6.71	6.58	
F	% Moisture (D/E)*100	39.6%	42.4%	46.0%				22.7%	22.5%	
N	# OF DROPS	33	24	15				*Moisture Contents determined by ASTM D 2216*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.6%**		



One Point Liquid Limit			
N	**Factor**	**N**	**Factor**
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.99	29	1.018
24	0.995	30	1.022
25	1.000		

NP, Non-Plastic ☐

Liquid Limit	**42**
Plastic Limit	**23**
Plastic Index	**19**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 79.0%

Notes / Deviations / References: Group symbol for minus No. 40 sieve portion only

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

Benjamin J. Kovaleski — *Technician Name*
3/09/18 — *Date*
Brian Vaughn — *Technical Responsibility*
3/09/18 — *Date*

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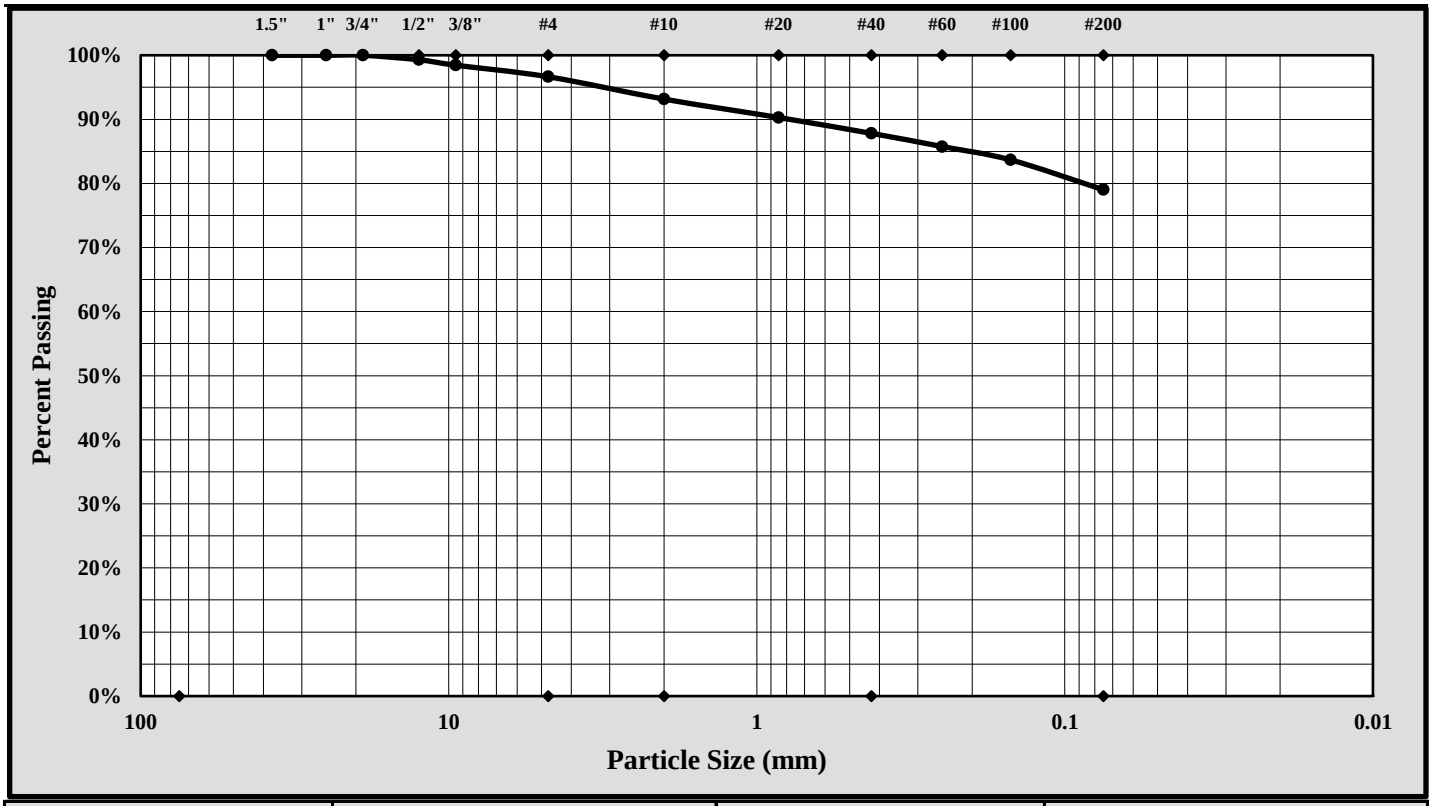
Particle Size Analysis of Soils

ASTM D 6913

S&ME, Inc. Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date(s):	3/05 - 3/09/18
Client Name:	HDR Engineering, Inc.		
Address:	4400 Leeds Ave., North Charleston, South Carolina		
Boring #:	RW-40 Sample #: BS-1	Sample Date:	2/13/2018
Location:	Embankment Boring Type: Bulk	Depth:	0.0' - 10.0'
Sample Description:	Lean Clay with Sand (CL, A-7-6(15))		



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size:	12.5 mm	Gravel:	3.4%
Silt & Clay (% Passing #200):	79.0%	Total Sand:	17.6%

Liquid Limit	42	Plastic Limit	23	Plastic Index	19
Coarse Sand:	3.5%	Medium Sand:	5.3%	Fine Sand:	8.8%

Description of Sand and Gravel: Rounded ☐ Angular ☒ Hard & Durable ☒ Soft ☐ Weathered & Friable ☐

References / Comments / Deviations:

Brian Vaughan, P.E.	Brian Vaughan	Group Leader	3/09/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

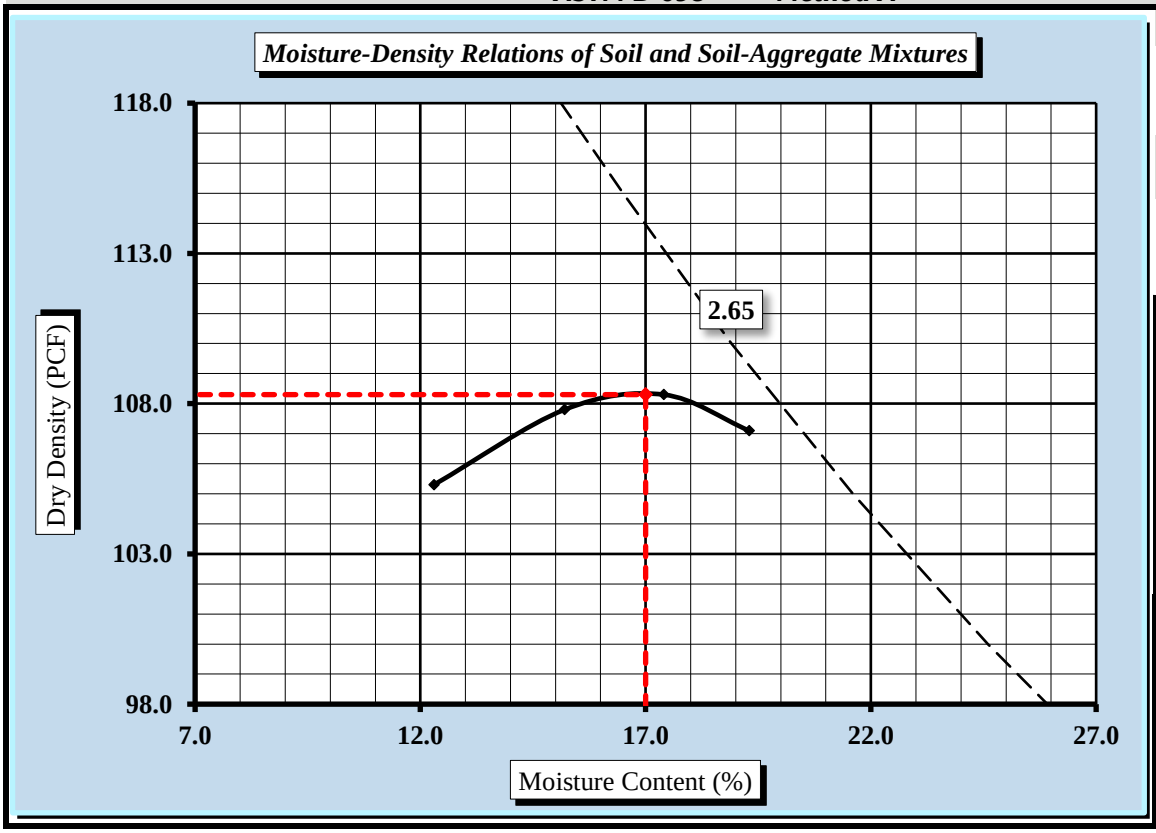
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1461-16-047.2B	Report Date:	3/09/18
Project Name:	Carolina Crossroads Project	Test Date(s):	2/27/18
Client Name:	HDR Engineering, Inc.		
Client Address:	4400 Leeds Ave., North Charleston, South Carolina		

Boring #:	RW-40	Sample #:	BS-1	Sample Date:	2/13/18
Location:	Embankment Boring	Type:	Bulk	Depth:	0.0' - 10.0'
Sample Description:	Lean Clay with Sand (CL, A-7-6(15))				

Maximum Dry Density 108.3 PCF. Optimum Moisture Content 17.0%

ASTM D 698 - - Method A



Soil Properties

Natural Moisture Content	16.9%
Specific Gravity of Soil	2.650
Liquid Limit	42
Plastic Limit	23
Plastic Index	19

% Passing	
3/4"	100.0%
3/8"	98.4%
#4	96.6%
#10	93.2%
#40	87.8%
#60	85.8%
#100	83.7%
#200	79.0%

Oversize Fraction	
Bulk Gravity	
% Moisture	
% Oversize	
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☒ 3/8 inch Sieve ☐ 3/4 inch Sieve ☐

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

ASTM D 2216: Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

ASTM D 698: Laboratory Compaction Characteristics of Soil Using Standard Effort

Brian Vaughan, P.E.		Group Leader	3/09/18
Technical Responsibility	*Signature*	*Position*	*Date*

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Form No. TR-26-SCT36-1
Revision No. 0
Revision Date: 2/21/18

% Ignition Loss of Inorganic Soils

SC T 36

Project #: **1461-16-047.2B** Report Date: 3/09/18
Project Name: **Carolina Crossroads Project** Test Date(s): 3/09/18
Client Name: HDR Engineering, Inc.
Client Address: 4400 Leeds Ave., North Charleston, South Carolina

Boring #:	RW-40	Sample #:	BS-1	Sample Date:	2/13/2018
Location:	Embankment Boring	Type:	Bulk	Depth:	0.0' - 10.0'

Sample Description: Lean Clay with Sand (CL, A-7-6(15))

Equipment: Balance (GP1/G1): S&ME ID# **13942** *0.01 g.Readability, 500g. Minimum Capacity*
Oven: S&ME ID# **13978** Muffle Furnace: S&ME ID# **23123**

Gradation Percentage Determination

		Tare #	
T	Total Mass of Oven Dry Sample	grams	2291.37
d	Mass Retained on 2mm Sieve	grams	155.81
e	Mass Passing 2mm and Retained on 75µm Sieve	grams	325.38
f	Mass Passing 75µm Sieve	T-(d+e)	1810.18
P	%Passing 75µm Sieve of Sample Passing 2mm Sieve	1-(f/(e+f))*100	15.2%

% Ignition Loss Determination

Muffle Furnace Temperature: **1000 + 50** **°C**

		Tare #	B
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	grams	56.78
b	Mass of Oven Dry Specimen + Tare Wt.	grams	78.20
c	Ash Weight + Tare Wt.	grams	77.84
M	Mass of Oven Dry Specimen	(b-t)	21.42
C	Ash Weight	c-t	21.06
L	Loss	M-C	**0.36**
	% Ignition Loss	(P*L)/M*100	**0.3%**

Remarks:

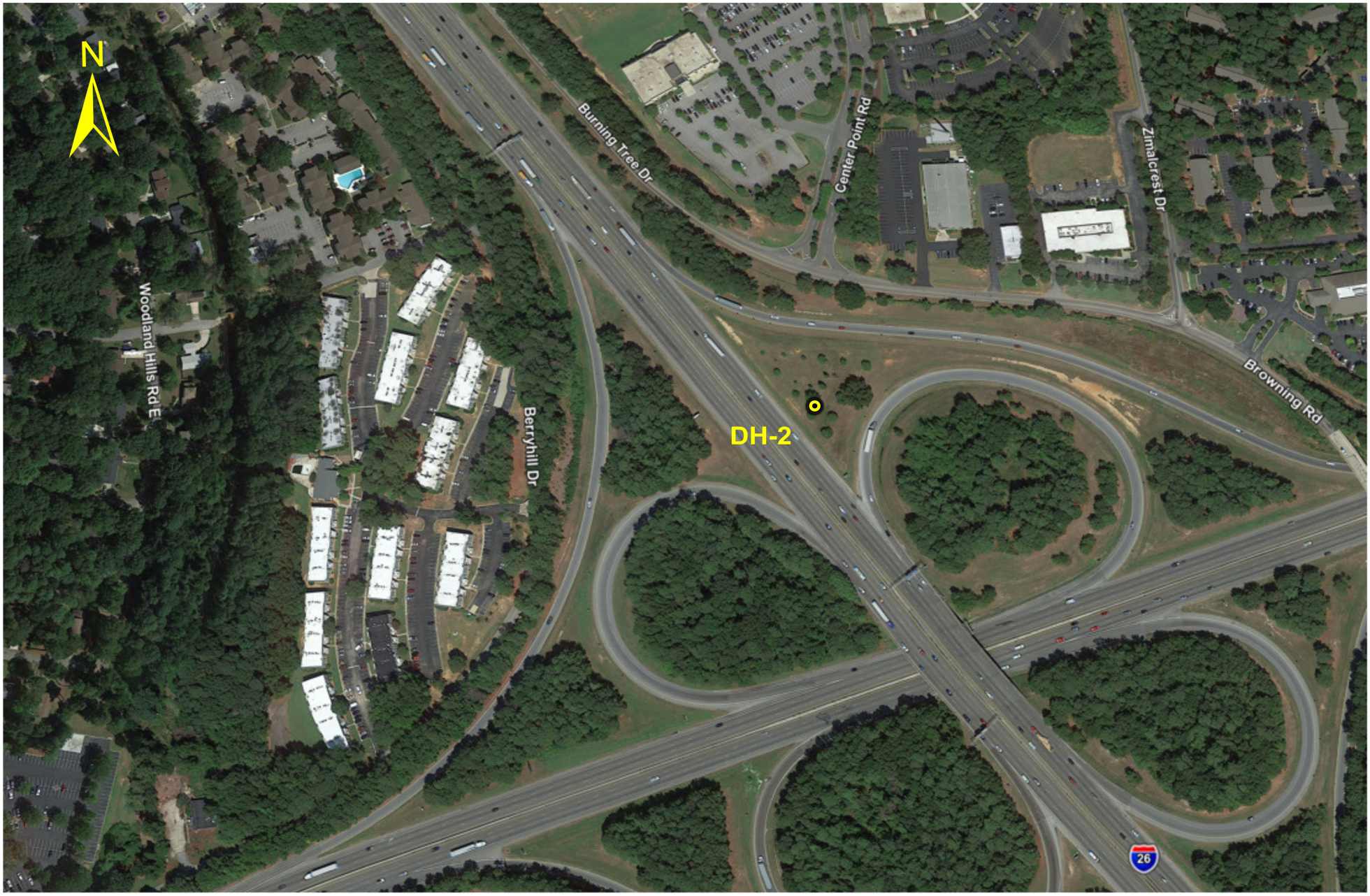
References: SC T 36: Procedure for Determining % Ignition Loss of Inorganic Soils

Technician Name: Benjamin Kovaleski NICET Lab Level III 117226
Certification #

Technical Responsibility: Brian Vaughan, P.E. *Signature* Group Leader *Position*

APPENDIX

SECTION 6 GEOPHYSICAL TEST RESULTS



GeoWave Solutions, Inc.
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I-26 Corridor Improvements at I-20/I-126

F&ME Consultants

Columbia, South Carolina

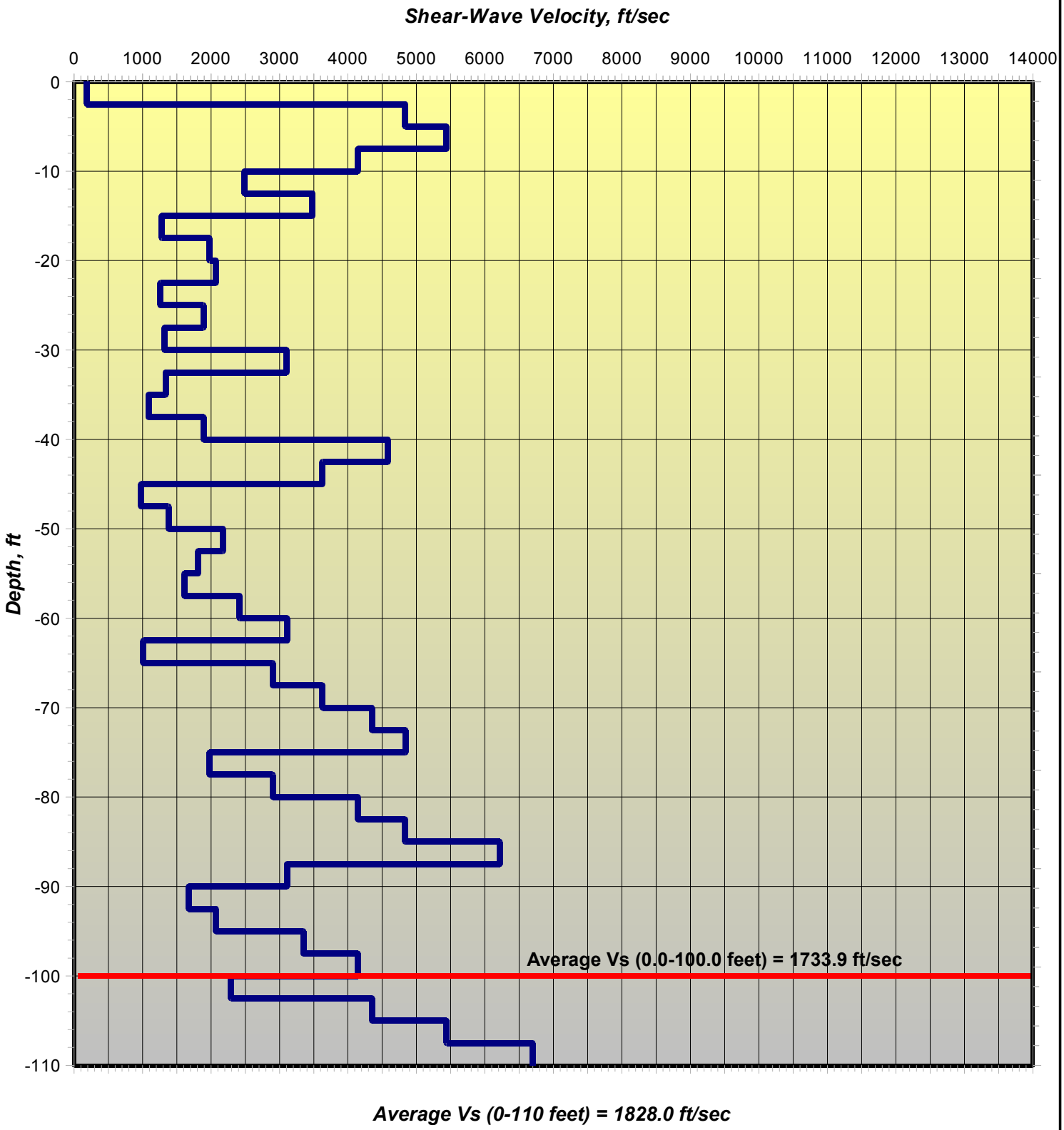
Downhole Seismic
Shear-Wave Investigation

February 7, 2018

Project Manager: M. Ellers

DH-2

34° 2.305'N 81° 6.693'W



Average Vs (0-110 feet) = 1828.0 ft/sec

GeoWave Solutions, Inc.
4575 Ansley Lane
Cumming, Georgia 30040
Tel: 770-886-3776
Fax: 770-886-7212
www.geowavesolutions.com

I-26 Corridor Improvements at I-20/I-126

F&ME Consultants

Downhole Seismic Shear-Wave Investigation

Project Manager: M. Ellers

February 7, 2018

DH-2

34° 2.305'N 81° 6.693'W

Depth (ft)	Vs (ft/sec)
-2.5	187.6
-5.0	4835.6
-7.5	5440.0
-10.0	4144.8
-12.5	2486.9
-15.0	3481.6
-17.5	1280.0
-20.0	1978.2
-22.5	2072.4
-25.0	1261.7
-27.5	1891.1
-30.0	1319.3
-32.5	3105.6
-35.0	1339.4
-37.5	1088.0
-40.0	1892.2
-42.5	4581.0
-45.0	3626.7
-47.5	978.0
-50.0	1381.9
-52.5	2175.8
-55.0	1812.9
-57.5	1611.9
-60.0	2417.6
-62.5	3109.5
-65.0	1012.1
-67.5	2900.2
-70.0	3628.4
-72.5	4347.8
-75.0	4837.8
-77.5	1978.2
-80.0	2901.3
-82.5	4144.8
-85.0	4835.6
-87.5	6217.1
-90.0	3108.6
-92.5	1673.8
-95.0	2072.4
-97.5	3347.7
-100.0	4144.7
-102.5	2290.5
-105.0	4352.0
-107.5	5440.0
-110.0	6695.4

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February 7, 2018

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I-26 Corridor Improvements at I-20/I-126

F&ME Consultants

Columbia, South Carolina

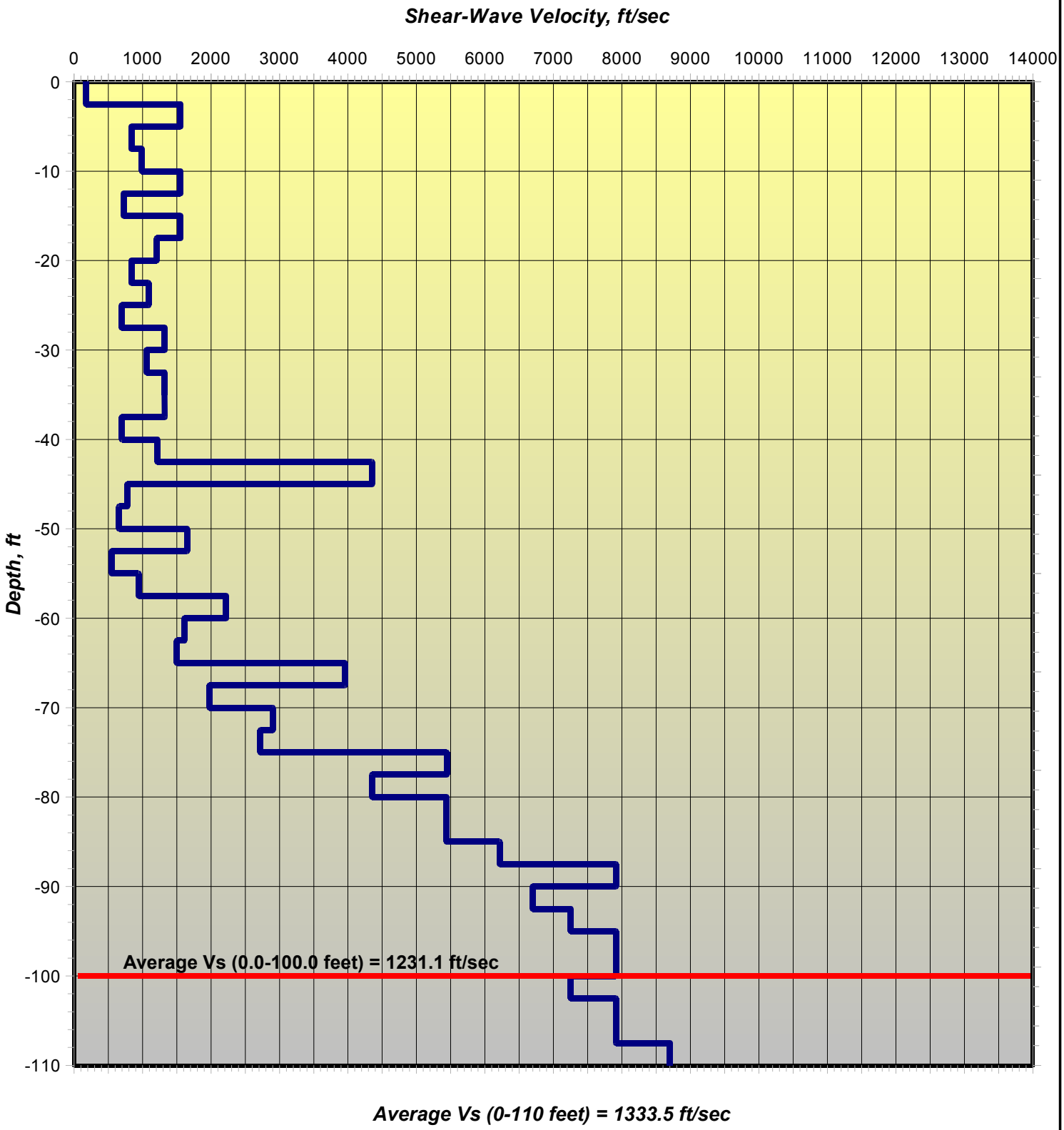
Downhole Seismic
Shear-Wave Investigation

February 7, 2018

Project Manager: M. Ellers

DH-3

34° 1.683'N 81° 6.111'W



Average Vs (0-110 feet) = 1333.5 ft/sec

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I-26 Corridor Improvements at I-20/I-126

F&ME Consultants

Downhole Seismic Shear-Wave Investigation

Project Manager: M. Ellers

February 7, 2018

DH-3

34° 1.683'N 81° 6.111'W

Depth (ft)	Vs (ft/sec)
-2.5	172.7
-5.0	1553.8
-7.5	837.0
-10.0	989.3
-12.5	1553.8
-15.0	725.5
-17.5	1553.8
-20.0	1208.9
-22.5	837.0
-25.0	1087.9
-27.5	692.7
-30.0	1322.8
-32.5	1058.0
-35.0	1322.1
-37.5	1322.8
-40.0	696.0
-42.5	1216.1
-45.0	4352.0
-47.5	777.1
-50.0	659.1
-52.5	1652.3
-55.0	551.0
-57.5	944.8
-60.0	2222.2
-62.5	1611.4
-65.0	1500.7
-67.5	3956.4
-70.0	1978.2
-72.5	2900.4
-75.0	2720.4
-77.5	5442.0
-80.0	4352.0
-82.5	5440.0
-85.0	5440.0
-87.5	6217.1
-90.0	7912.8
-92.5	6695.4
-95.0	7253.3
-97.5	7912.8
-100.0	7912.7
-102.5	7253.3
-105.0	7912.8
-107.5	7912.7
-110.0	8704.1

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I-26 Corridor Improvements at I-20/I-126

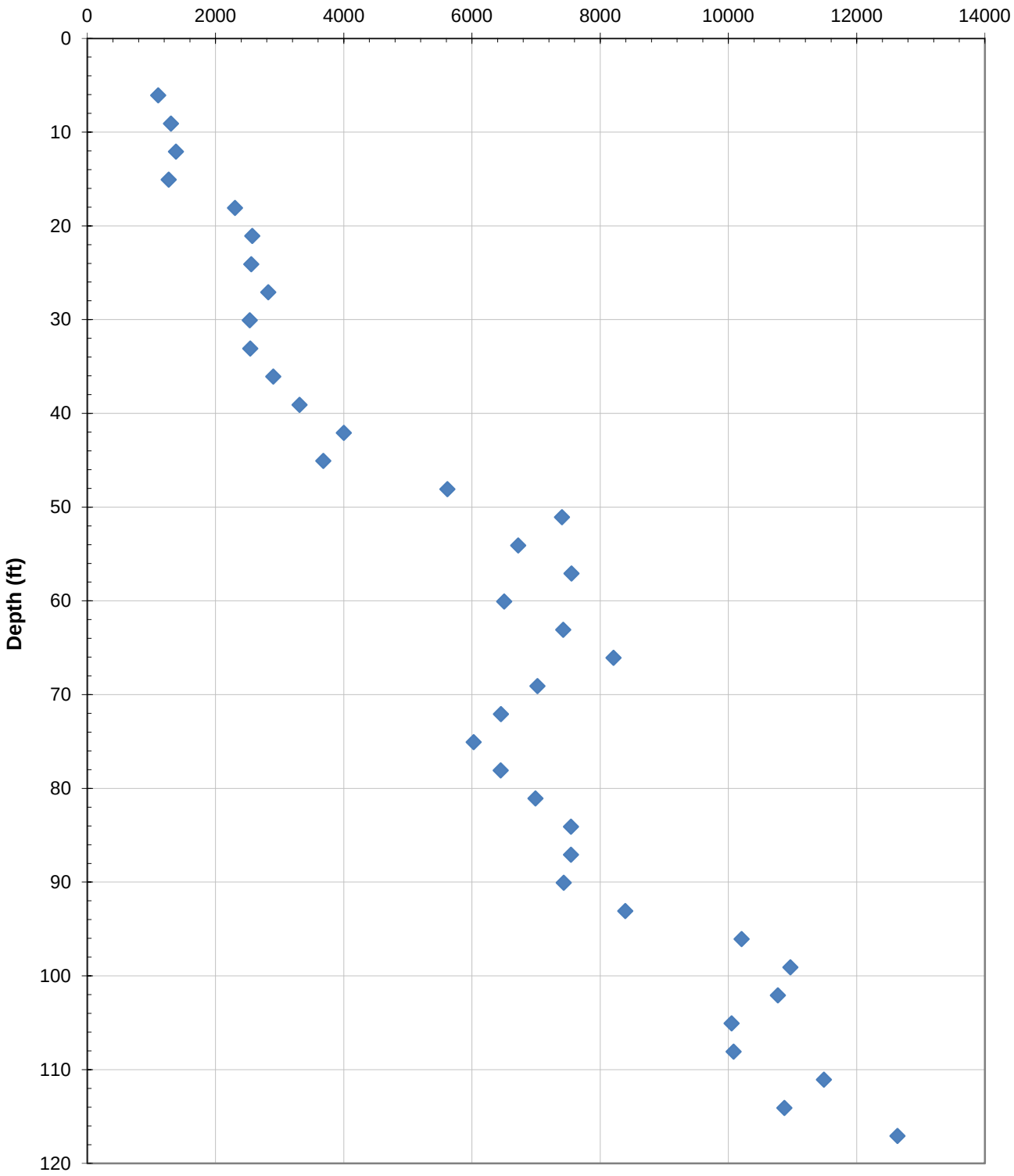
F&ME Consultants

Downhole Seismic Shear-Wave Investigation

Project Manager: M. Ellers

February 7, 2018

Shear Wave Velocity Profile DH-4
I-20/26/126 Improvement Project
Lexington and Richland Counties, South Carolina
1461-16-047



Shear Wave Velocity Calculations

Carolina Crossroads I-20/26/126 Improvement Project

Lexington and Richland Counties, South Carolina

Sounding ID: **DH-4**

Project Number: **1461-16-047**

Geophone Offset: 0.00 Feet

Casing Stickup: 1.42 Feet

Source Offset: 6.00 Feet

Date: 17-Jan-17

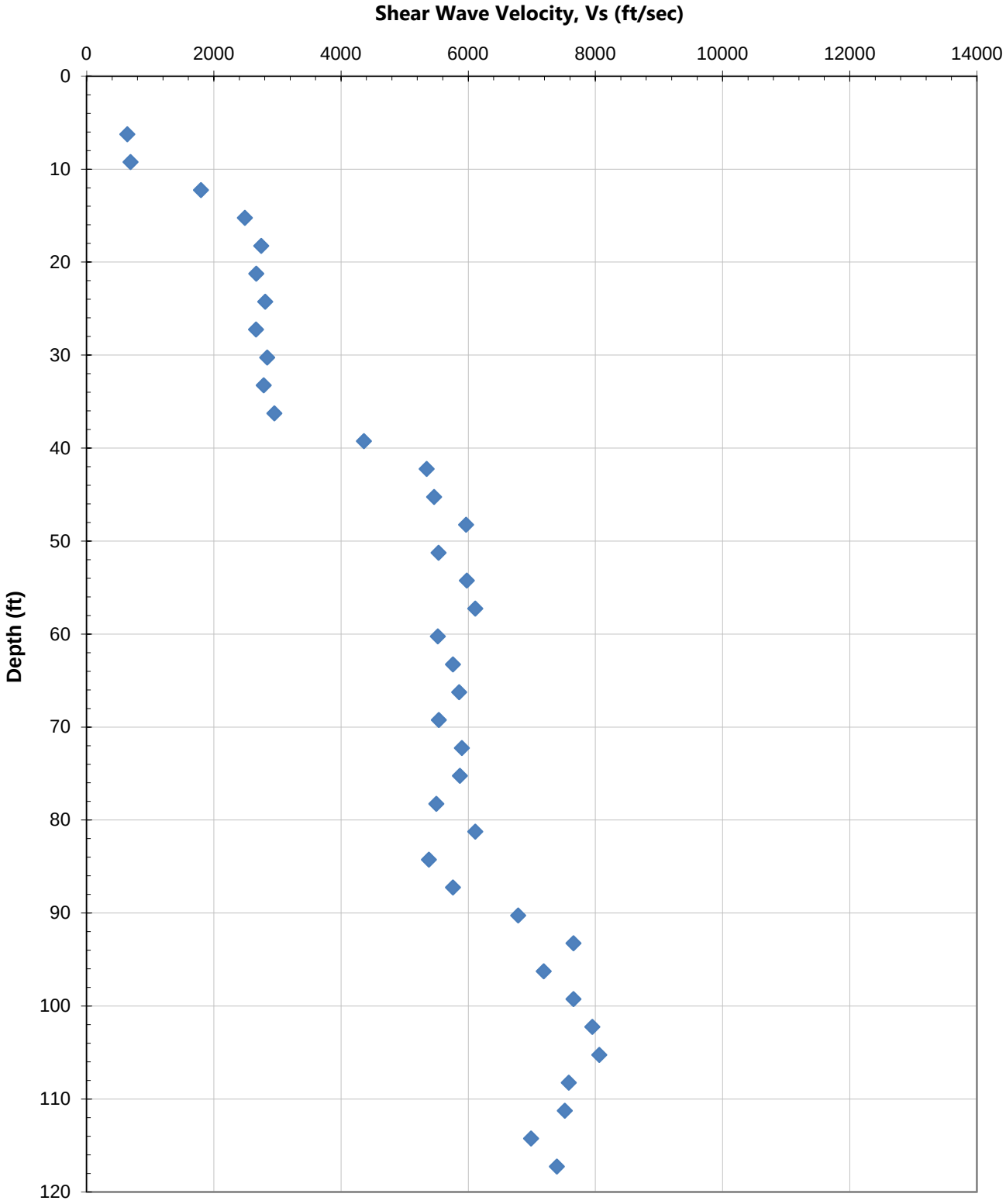
Rig: n/a

Test Depth (feet)	Geophone Depth (feet)	Waveform Ray Path (feet)	Incremental Distance (feet)	S-WAVE Characteristic Arrival Time (seconds)	S-WAVE Incremental Time Interval (seconds)	S-WAVE Interval Velocity (ft/s)	Interval Depth (feet)	d_i/v_{si}	Poissons
4.58	4.58	7.55	7.55	0.0075					
7.58	7.58	9.67	2.12	0.0094	0.0019	1102.7	6.08	0.00551	0.34
10.58	10.58	12.16	2.50	0.0113	0.0019	1302.6	9.08	0.00230	0.41
13.58	13.58	14.85	2.68	0.0133	0.0019	1380.2	12.08	0.00217	0.45
16.58	16.58	17.63	2.79	0.0155	0.0022	1266.7	15.08	0.00237	0.47
19.58	19.58	20.48	2.85	0.0167	0.0012	2303.5	18.08	0.00130	0.48
22.58	22.58	23.36	2.88	0.0178	0.0011	2570.4	21.08	0.00117	0.46
25.58	25.58	26.27	2.91	0.0190	0.0011	2554.7	24.08	0.00117	0.46
28.58	28.58	29.20	2.93	0.0200	0.0010	2823.4	27.08	0.00106	0.45
31.58	31.58	32.14	2.94	0.0212	0.0012	2531.7	30.08	0.00118	0.47
34.58	34.58	35.10	2.95	0.0223	0.0012	2540.2	33.08	0.00118	0.47
37.58	37.58	38.06	2.96	0.0233	0.0010	2900.4	36.08	0.00103	0.46
40.58	40.58	41.02	2.97	0.0242	0.0009	3310.9	39.08	0.00091	0.44
43.58	43.58	43.99	2.97	0.0250	0.0007	3999.6	42.08	0.00075	0.41
46.58	46.58	46.96	2.97	0.0258	0.0008	3681.6	45.08	0.00081	0.42
49.58	49.58	49.94	2.98	0.0263	0.0005	5616.9	48.08	0.00053	0.28
52.58	52.58	52.92	2.98	0.0267	0.0004	7403.3	51.08	0.00041	0.23
55.58	55.58	55.90	2.98	0.0272	0.0004	6718.6	54.08	0.00045	0.31
58.58	58.58	58.89	2.98	0.0276	0.0004	7551.0	57.08	0.00040	0.36
61.58	61.58	61.87	2.99	0.0280	0.0005	6501.6	60.08	0.00046	0.37
64.58	64.58	64.86	2.99	0.0284	0.0004	7420.8	63.08	0.00040	0.44
67.58	67.58	67.85	2.99	0.0288	0.0004	8207.1	66.08	0.00037	0.38
70.58	70.58	70.83	2.99	0.0292	0.0004	7019.9	69.08	0.00043	0.44
73.58	73.58	73.82	2.99	0.0297	0.0005	6449.5	72.08	0.00047	0.44
76.58	76.58	76.81	2.99	0.0302	0.0005	6025.6	75.08	0.00050	0.41
79.58	79.58	79.81	2.99	0.0306	0.0005	6448.5	78.08	0.00047	0.43
82.58	82.58	82.80	2.99	0.0311	0.0004	6990.9	81.08	0.00043	0.42
85.58	85.58	85.79	2.99	0.0315	0.0004	7541.6	84.08	0.00040	0.37
88.58	88.58	88.78	2.99	0.0319	0.0004	7542.9	87.08	0.00040	0.37
91.58	91.58	91.78	2.99	0.0323	0.0004	7431.8	90.08	0.00040	0.39
94.58	94.58	94.77	2.99	0.0326	0.0004	8391.0	93.08	0.00036	0.36
97.58	97.58	97.76	2.99	0.0329	0.0003	10204.3	96.08	0.00029	0.26
100.58	100.58	100.76	2.99	0.0332	0.0003	10965.0	99.08	0.00027	0.20
103.58	103.58	103.75	2.99	0.0335	0.0003	10770.2	102.08	0.00028	0.23
106.58	106.58	106.75	3.00	0.0338	0.0003	10048.3	105.08	0.00030	0.22
109.58	109.58	109.74	3.00	0.0341	0.0003	10081.9	108.08	0.00030	0.33
112.58	112.58	112.74	3.00	0.0343	0.0003	11488.9	111.08	0.00026	0.26
115.58	115.58	115.74	3.00	0.0346	0.0003	10872.6	114.08	0.00028	0.29
118.58	118.58	118.73	3.00	0.0348	0.0002	12634.3	117.08	0.00024	0.24

Weighted Average Soil Shear Wave Velocity, v_s 100 (ft/s): 3232 0.37

Note: The weighted average shear wave velocity reported above is for the interval from 6.08 to 105.08 feet.

Shear Wave Velocity Profile DH-5
I-20/26/126 Improvement Project
Lexington and Richland Counties, South Carolina
1461-16-047



Shear Wave Velocity Calculations

Carolina Crossroads I-20/26/126 Improvement Project

Lexington and Richland Counties, South Carolina

Sounding ID: **DH-5** Project Number: **1461-16-047**

Geophone Offset: 0.00 Feet Date: 17-Jan-17

Casing Stickup: 1.25 Feet

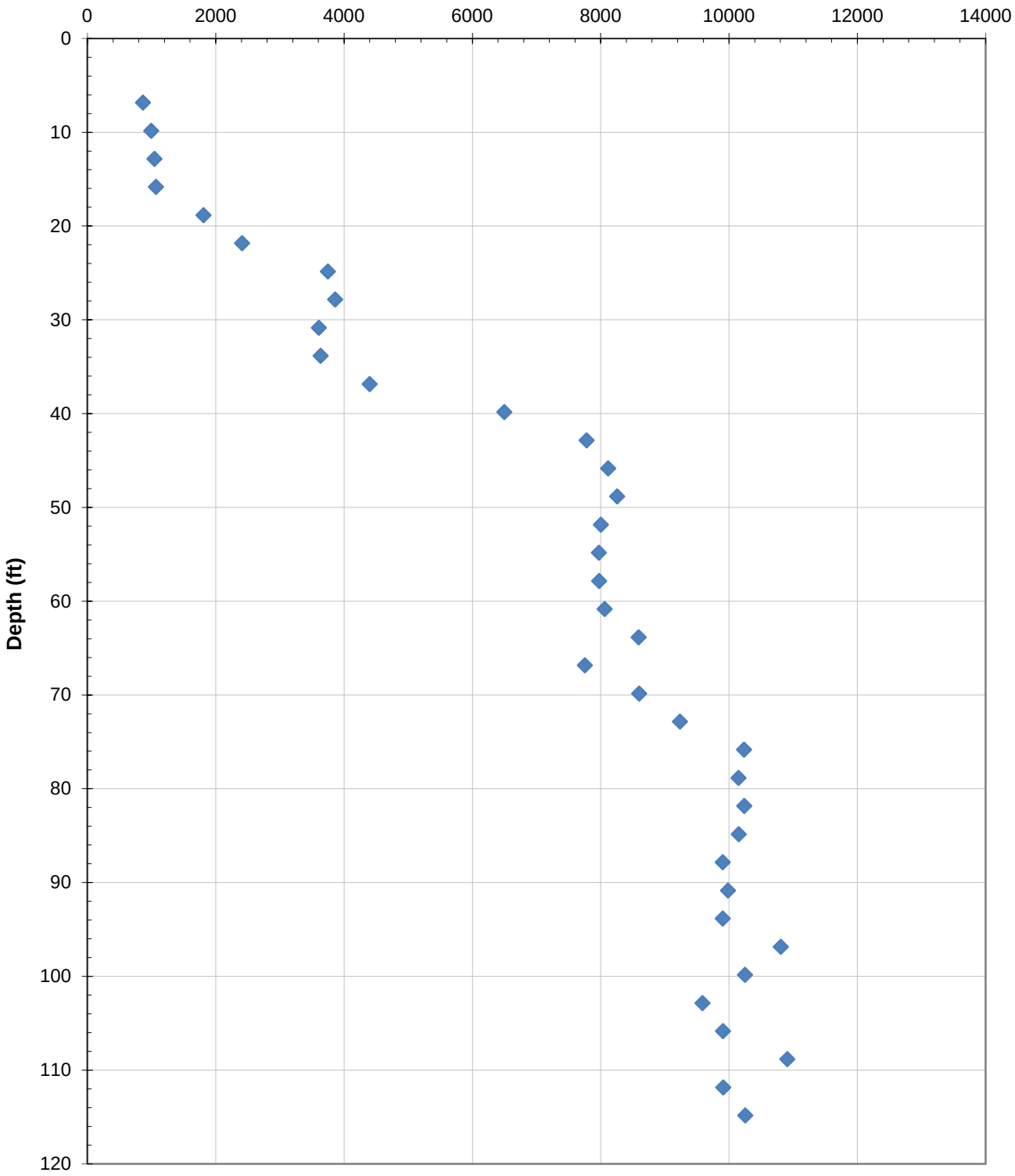
Source Offset: 6.00 Feet Rig: n/a

Test Depth (feet)	Geophone Depth (feet)	Waveform Ray Path (feet)	Incremental Distance (feet)	S-WAVE Characteristic Arrival Time (seconds)	S-WAVE Incremental Time Interval (seconds)	S-WAVE Interval Velocity (ft/s)	Interval Depth (feet)	d_i/v_{si}	Poissons
4.75	4.75	7.65	7.65	0.0105					
7.75	7.75	9.80	2.15	0.0139	0.0034	639.9	6.25	0.00977	0.50
10.75	10.75	12.31	2.51	0.0175	0.0036	688.8	9.25	0.00436	0.50
13.75	13.75	15.00	2.69	0.0190	0.0015	1798.3	12.25	0.00167	0.49
16.75	16.75	17.79	2.79	0.0201	0.0011	2486.0	15.25	0.00121	0.48
19.75	19.75	20.64	2.85	0.0212	0.0010	2746.6	18.25	0.00109	0.48
22.75	22.75	23.53	2.89	0.0222	0.0011	2666.2	21.25	0.00113	0.48
25.75	25.75	26.44	2.91	0.0233	0.0010	2807.1	24.25	0.00107	0.48
28.75	28.75	29.37	2.93	0.0244	0.0011	2664.1	27.25	0.00113	0.48
31.75	31.75	32.31	2.94	0.0254	0.0010	2836.7	30.25	0.00106	0.48
34.75	34.75	35.26	2.95	0.0265	0.0011	2785.2	33.25	0.00108	0.47
37.75	37.75	38.22	2.96	0.0275	0.0010	2949.9	36.25	0.00102	0.46
40.75	40.75	41.19	2.97	0.0282	0.0007	4359.7	39.25	0.00069	0.42
43.75	43.75	44.16	2.97	0.0287	0.0006	5346.8	42.25	0.00056	0.35
46.75	46.75	47.13	2.97	0.0293	0.0005	5465.2	45.25	0.00055	0.39
49.75	49.75	50.11	2.98	0.0298	0.0005	5968.2	48.25	0.00050	0.31
52.75	52.75	53.09	2.98	0.0303	0.0005	5533.3	51.25	0.00054	0.41
55.75	55.75	56.07	2.98	0.0308	0.0005	5977.8	54.25	0.00050	0.35
58.75	58.75	59.06	2.98	0.0313	0.0005	6110.6	57.25	0.00049	0.25
61.75	61.75	62.04	2.99	0.0318	0.0005	5521.5	60.25	0.00054	0.34
64.75	64.75	65.03	2.99	0.0323	0.0005	5759.7	63.25	0.00052	0.32
67.75	67.75	68.02	2.99	0.0329	0.0005	5856.6	66.25	0.00051	0.33
70.75	70.75	71.00	2.99	0.0334	0.0005	5538.3	69.25	0.00054	0.27
73.75	73.75	73.99	2.99	0.0339	0.0005	5900.7	72.25	0.00051	0.24
76.75	76.75	76.98	2.99	0.0344	0.0005	5867.9	75.25	0.00051	0.21
79.75	79.75	79.98	2.99	0.0350	0.0005	5496.9	78.25	0.00055	0.39
82.75	82.75	82.97	2.99	0.0354	0.0005	6109.7	81.25	0.00049	0.36
85.75	85.75	85.96	2.99	0.0360	0.0006	5380.8	84.25	0.00056	0.39
88.75	88.75	88.95	2.99	0.0365	0.0005	5760.1	87.25	0.00052	0.38
91.75	91.75	91.95	2.99	0.0370	0.0004	6784.9	90.25	0.00044	0.33
94.75	94.75	94.94	2.99	0.0374	0.0004	7654.5	93.25	0.00039	0.23
97.75	97.75	97.93	2.99	0.0378	0.0004	7186.7	96.25	0.00042	0.30
100.75	100.75	100.93	2.99	0.0382	0.0004	7656.4	99.25	0.00039	0.24
103.75	103.75	103.92	2.99	0.0385	0.0004	7951.9	102.25	0.00038	0.32
106.75	106.75	106.92	3.00	0.0389	0.0004	8060.1	105.25	0.00037	0.15
109.75	109.75	109.91	3.00	0.0393	0.0004	7580.9	108.25	0.00040	0.26
112.75	112.75	112.91	3.00	0.0397	0.0004	7518.3	111.25	0.00040	0.24
115.75	115.75	115.91	3.00	0.0401	0.0004	6988.9	114.25	0.00043	0.34
118.75	118.75	118.90	3.00	0.0405	0.0004	7393.8	117.25	0.00041	0.42

Weighted Average Soil Shear Wave Velocity, v_s 100 (ft/s): 2775 0.36

Note: The weighted average shear wave velocity reported above is for the interval from 6.25 to 105.25 feet.

Shear Wave Velocity Profile DH-6
I-20/26/126 Improvement Project
Lexington and Richland Counties, South Carolina
1461-16-047



Shear Wave Velocity Calculations

Carolina Crossroads I-20/26/126 Improvement Project

Lexington and Richland Counties, South Carolina

Sounding ID: **DH-6** Project Number: **1461-16-047**

Geophone Offset: 0.00 Feet Date: 30-Jan-17

Casing Stickup: 0.66 Feet

Source Offset: 6.00 Feet Rig: n/a

Test Depth (feet)	Geophone Depth (feet)	Waveform Ray Path (feet)	Incremental Distance (feet)	S-WAVE Characteristic Arrival Time (seconds)	S-WAVE Incremental Time Interval (seconds)	S-WAVE Interval Velocity (ft/s)	Interval Depth (feet)	d_i/v_{si}	Poissons
5.34	5.34	8.03	8.03	0.0071					
8.34	8.34	10.27	2.24	0.0097	0.0026	866.1	6.84	0.00790	0.20
11.34	11.34	12.83	2.56	0.0123	0.0026	992.4	9.84	0.00302	0.25
14.34	14.34	15.54	2.72	0.0149	0.0026	1044.3	12.84	0.00287	0.23
17.34	17.34	18.35	2.80	0.0175	0.0026	1069.2	15.84	0.00281	0.22
20.34	20.34	21.21	2.86	0.0191	0.0016	1807.2	18.84	0.00166	0.20
23.34	23.34	24.10	2.89	0.0203	0.0012	2410.4	21.84	0.00124	0.33
26.34	26.34	27.01	2.92	0.0211	0.0008	3745.7	24.84	0.00080	0.35
29.34	29.34	29.95	2.93	0.0218	0.0008	3860.8	27.84	0.00078	0.33
32.34	32.34	32.89	2.94	0.0227	0.0008	3607.6	30.84	0.00083	0.35
35.34	35.34	35.85	2.95	0.0235	0.0008	3635.6	33.84	0.00083	0.41
38.34	38.34	38.81	2.96	0.0241	0.0007	4398.1	36.84	0.00068	0.42
41.34	41.34	41.77	2.97	0.0246	0.0005	6495.9	39.84	0.00046	0.35
44.34	44.34	44.74	2.97	0.0250	0.0004	7782.0	42.84	0.00039	0.24
47.34	47.34	47.72	2.97	0.0253	0.0004	8117.4	45.84	0.00037	0.20
50.34	50.34	50.70	2.98	0.0257	0.0004	8256.0	48.84	0.00036	0.21
53.34	53.34	53.68	2.98	0.0261	0.0004	8001.4	51.84	0.00037	0.21
56.34	56.34	56.66	2.98	0.0265	0.0004	7971.4	54.84	0.00038	0.20
59.34	59.34	59.64	2.98	0.0268	0.0004	7976.1	57.84	0.00038	0.20
62.34	62.34	62.63	2.99	0.0272	0.0004	8061.7	60.84	0.00037	0.21
65.34	65.34	65.61	2.99	0.0275	0.0003	8591.3	63.84	0.00035	0.20
68.34	68.34	68.60	2.99	0.0279	0.0004	7751.9	66.84	0.00039	0.23
71.34	71.34	71.59	2.99	0.0283	0.0003	8597.4	69.84	0.00035	0.24
74.34	74.34	74.58	2.99	0.0286	0.0003	9235.8	72.84	0.00032	0.25
77.34	77.34	77.57	2.99	0.0289	0.0003	10233.7	75.84	0.00029	0.28
80.34	80.34	80.56	2.99	0.0292	0.0003	10148.6	78.84	0.00030	0.29
83.34	83.34	83.56	2.99	0.0295	0.0003	10238.2	81.84	0.00029	0.21
86.34	86.34	86.55	2.99	0.0298	0.0003	10152.6	84.84	0.00030	0.32
89.34	89.34	89.54	2.99	0.0301	0.0003	9900.4	87.84	0.00030	0.36
92.34	92.34	92.53	2.99	0.0304	0.0003	9985.1	90.84	0.00030	0.35
95.34	95.34	95.53	2.99	0.0307	0.0003	9903.3	93.84	0.00030	0.30
98.34	98.34	98.52	2.99	0.0310	0.0003	10805.0	96.84	0.00028	0.22
101.34	101.34	101.52	2.99	0.0312	0.0003	10247.2	99.84	0.00029	0.34
104.34	104.34	104.51	2.99	0.0316	0.0003	9587.1	102.84	0.00031	0.33
107.34	107.34	107.51	3.00	0.0319	0.0003	9907.6	105.84	0.00030	0.23
110.34	110.34	110.50	3.00	0.0321	0.0003	10908.4	108.84	0.00028	0.28
113.34	113.34	113.50	3.00	0.0324	0.0003	9909.3	111.84	0.00030	0.31
116.34	116.34	116.49	3.00	0.0327	0.0003	10251.7	114.84	0.00029	0.25
119.34	119.34	119.49	3.00	0.0330	0.0003	10164.8	117.84	0.00030	0.42
						Weighted Average Soil Shear Wave Velocity, v_s 100 (ft/s):		**3207**	0.28

Note: The weighted average shear wave velocity reported above is for the interval from 6.84 to 105.84 feet.

APPENDIX

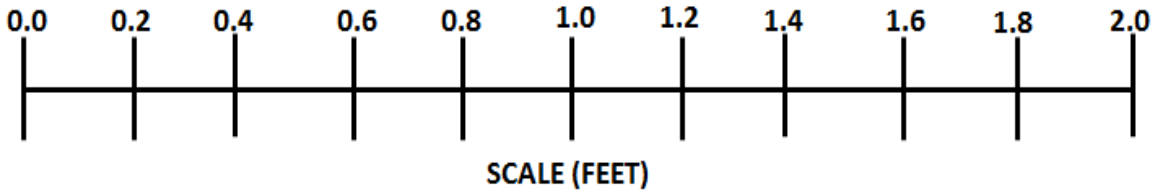
SECTION 7 ROCK CORE PHOTOS

Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B1

Begin Run 1
31.5 Feet

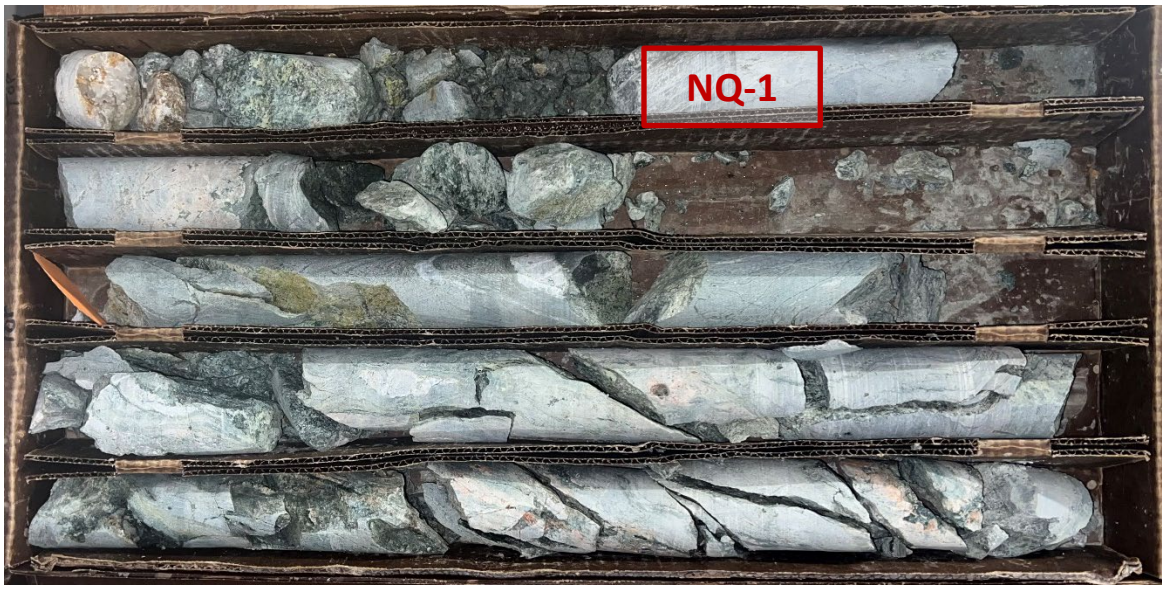
Begin Run 2
36.5 Feet

End Run 2
41.5 Feet



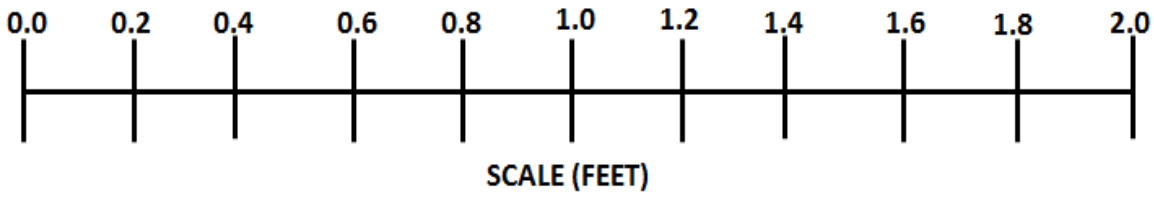
Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B2

Begin Run 1
31.5 Feet



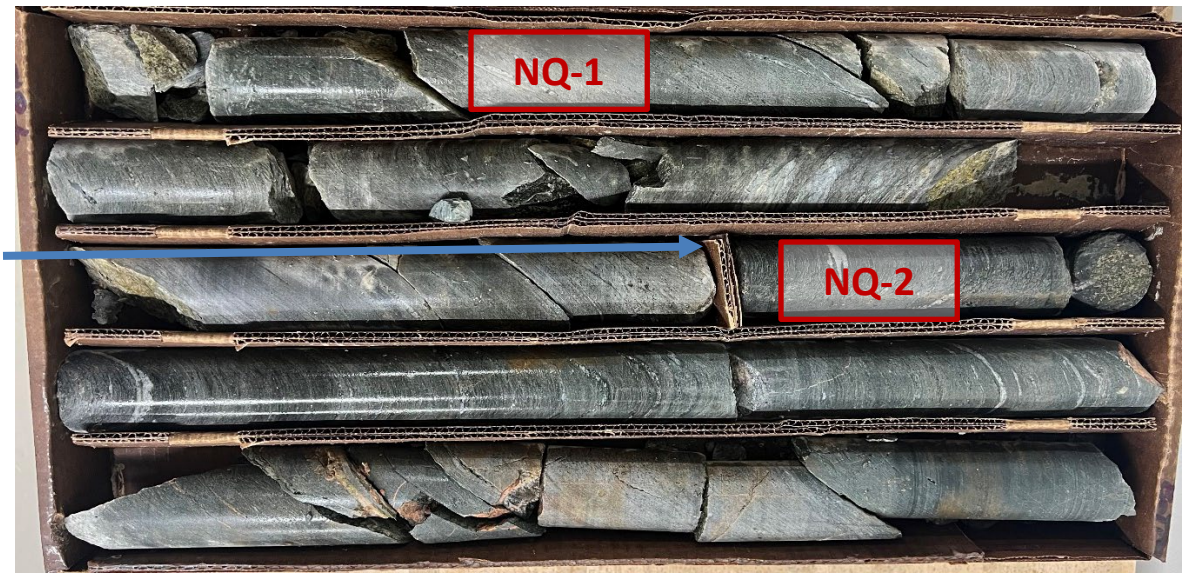
Begin Run 2
36.5 Feet

End Run 2
41.5 Feet



Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B3

Begin Run 1
46.0 Feet



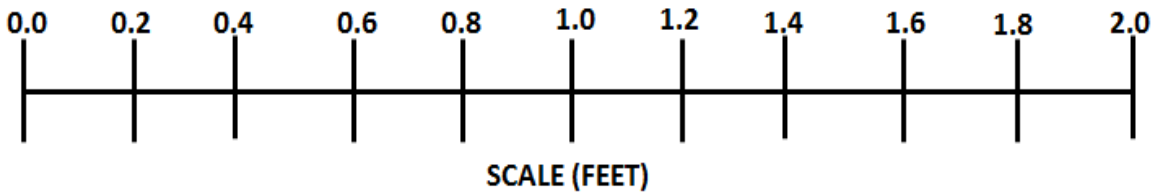
Begin Run 2
51.0 Feet

End Run 2
56.0 Feet

Begin Run 3
56.0 Feet

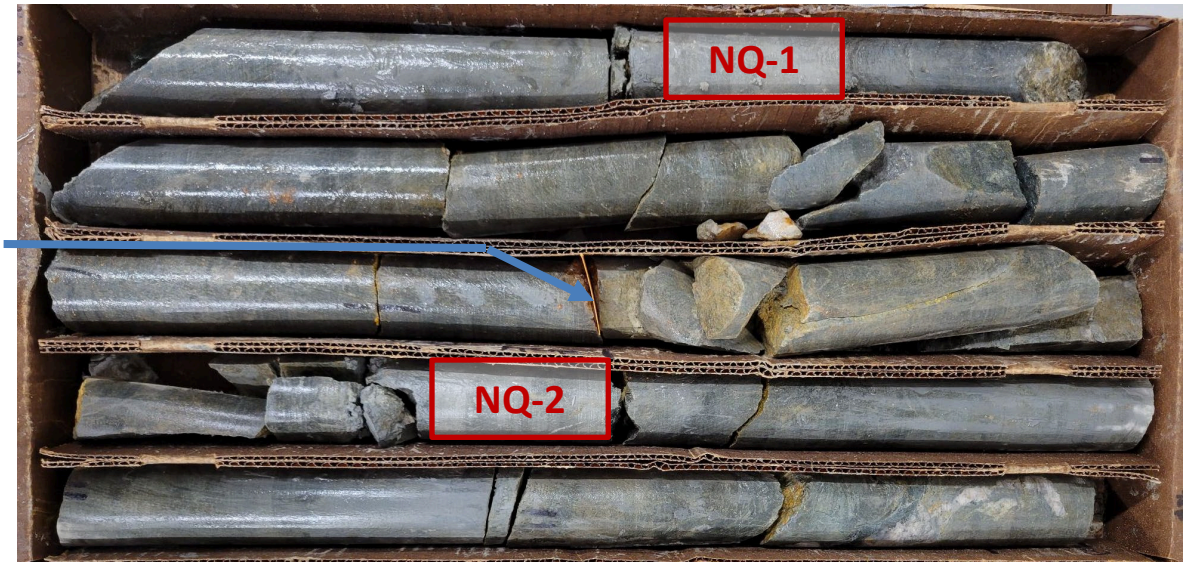
Begin Run 4
61.0 Feet

End Run 4
66.0 Feet



Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B4

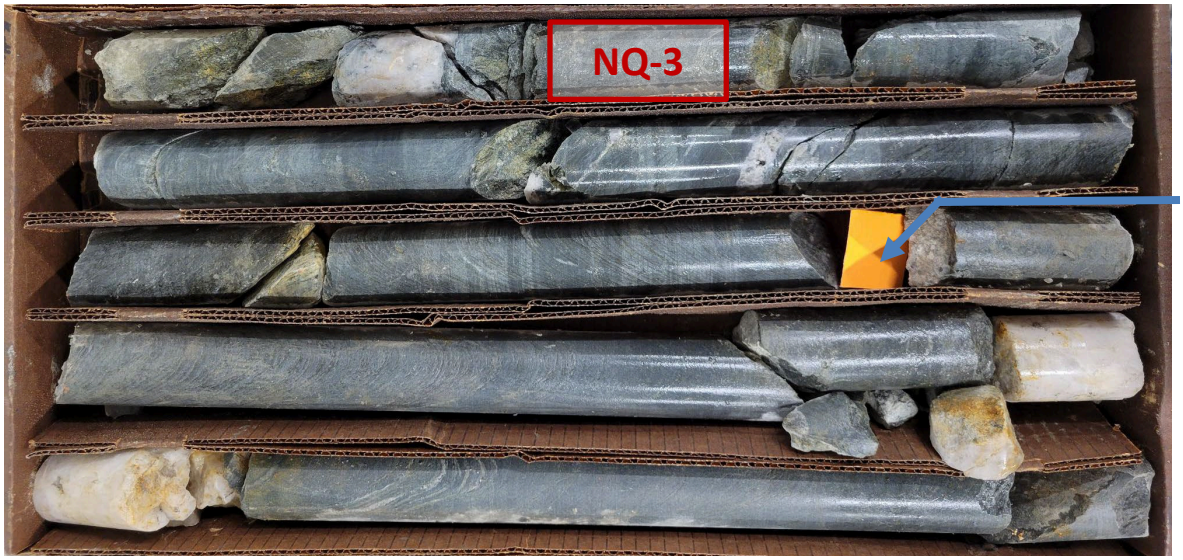
Begin Run 1
41.8 Feet



Begin Run 2
46.8 Feet

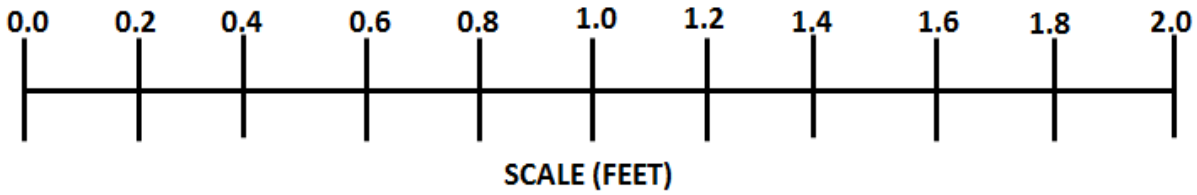
End Run 2
51.8 Feet

Begin Run 3
51.8 Feet



Begin Run 4
56.8 Feet

End Run 4
61.8 Feet

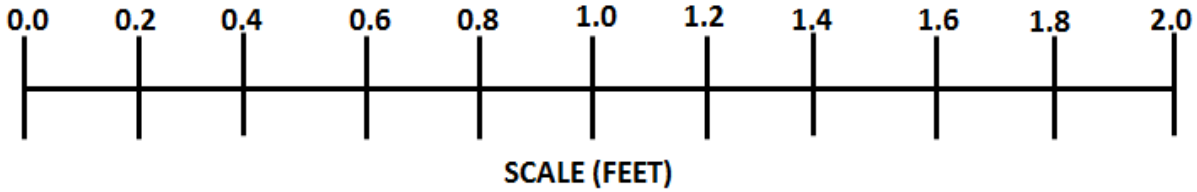


Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B5

Begin Run 1
73.5 Feet

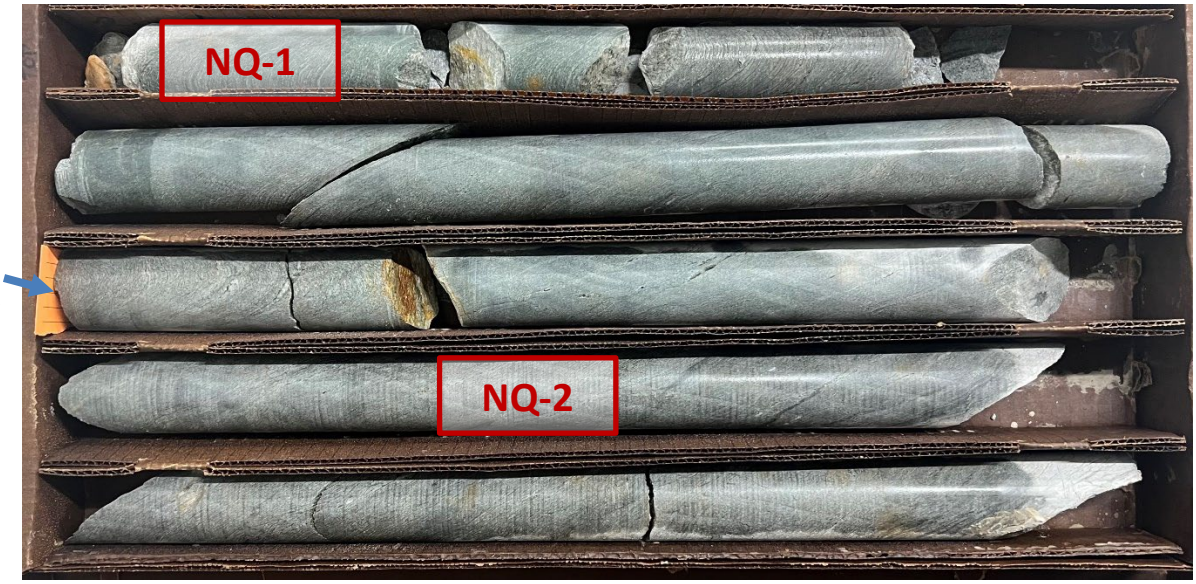
Begin Run 2
78.5 Feet

End Run 2
83.5 Feet



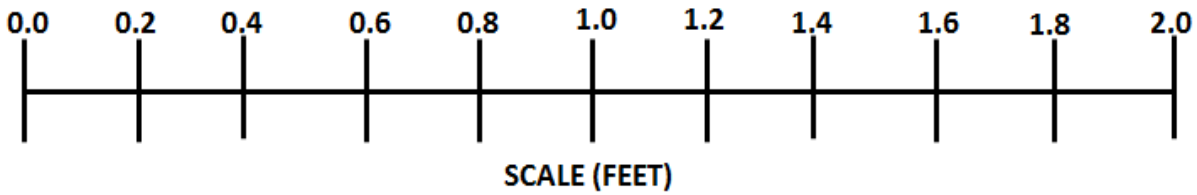
Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B6

Begin Run 1
66.5 Feet



Begin Run 2
71.5 Feet

End Run 2
76.5 Feet



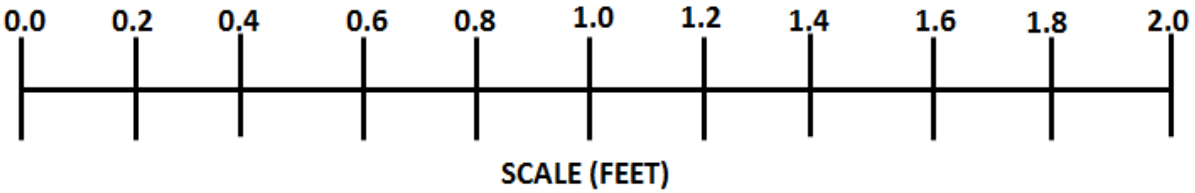
Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-B7

Begin Run 1
73.5 Feet

Begin Run 2
78.5 Feet

End Run 2
83.5 Feet

*** No Testable Cores**

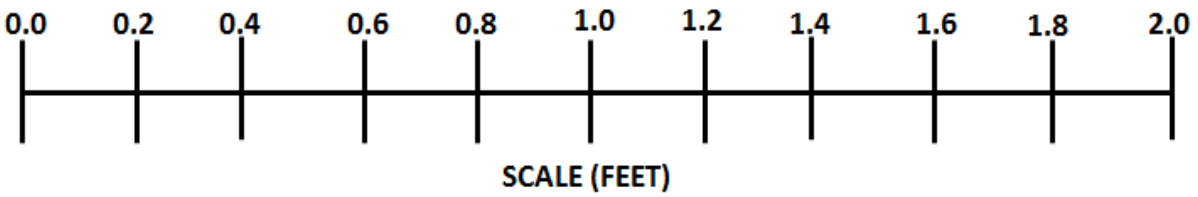


Carolina Crossroads Ph. 3C
CORE PHOTOGRAPHS: C3C-W3

Begin Run 1
11.5 Feet

Begin Run 2
16.5 Feet

End Run 2
21.5 Feet



Boring B-47, Box 1 & 2

1	Remarks:	Boring B-47, Box 1

2	Remarks:	Boring B-47, Box 2

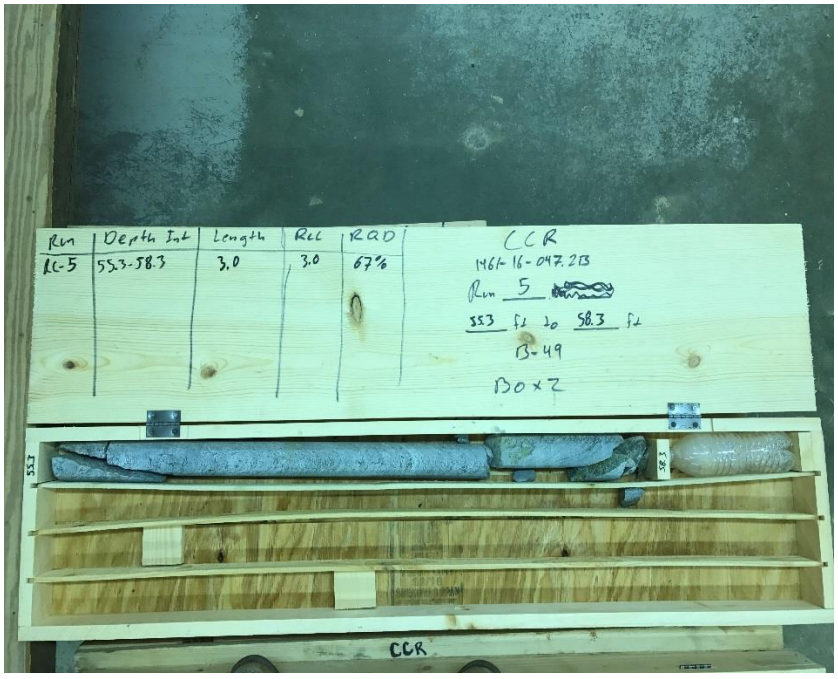
Boring B-48, Box 1 & 2

1	Remarks:	Boring B-48, Box 1

2	Remarks:	Boring B-48, Box 2

Boring B-49, Box 1 & 2

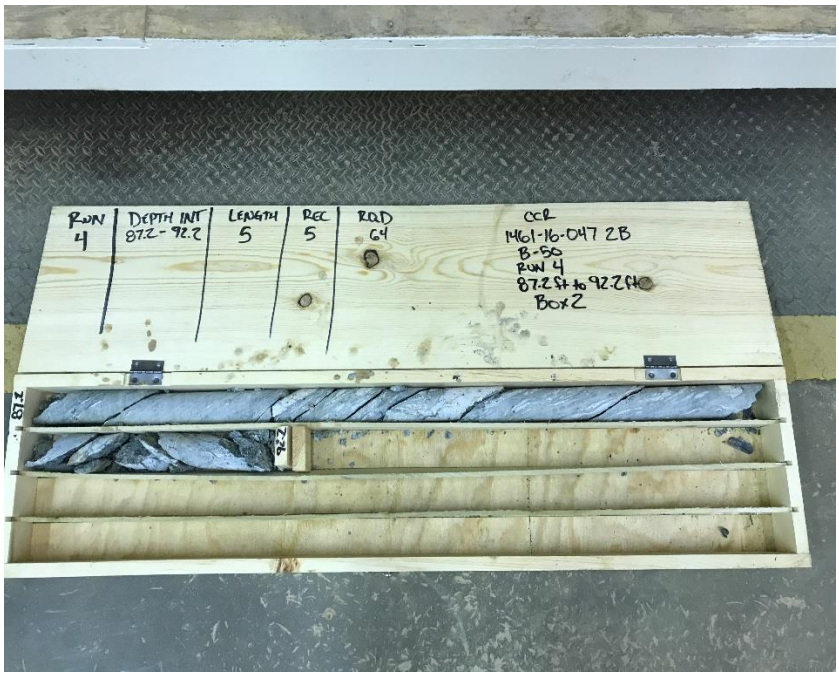
1	**Remarks:**	**Boring B-49, Box 1**



2	**Remarks:**	**Boring B-49, Box 2**

Boring B-50, Box 1 & 2

1	Remarks:	Boring B-50, Box 1



2	Remarks:	Boring B-50, Box 2

Boring B-51, Box 1

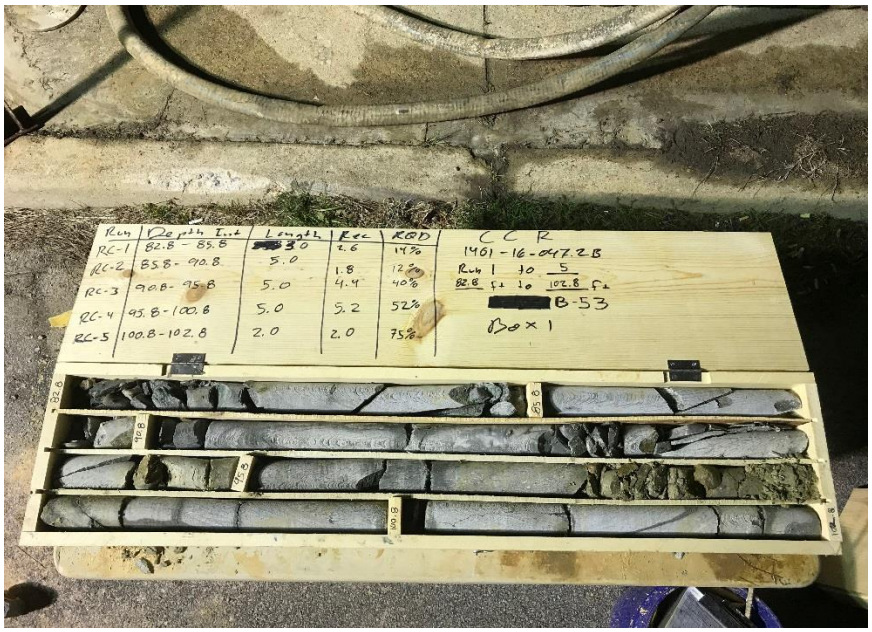
1	**Remarks:**	**Boring B-51, Box 1**

Boring B-52, Box 1 & 2

1	**Remarks:**	**Boring B-52, Box 1**

2	**Remarks:**	**Boring B-52, Box 2**

Boring B-53, Box 1



1	**Remarks:**	**Boring B-53, Box 1**

APPENDIX

SECTION 8 SPT HAMMER ENERGY REPORTS

CAROLINAS GEOTECHNICAL GROUP

N.C. Firm License: P-1904

2400 Crownpoint Executive Drive
Suite 800
Charlotte, NC 28227

(980) 339-8684
contact@carolinasgeotech.com
www.carolinasgeotech.com

April 16, 2023

Mr. Adam J. Shannon
Breccia Construction, LLC
620-B Industrial Way
Chester, South Carolina 29706

SUBJECT: **Report of SPT Hammer Energy**
Breccia Construction, LLC CME 550X ATV Rig (SN 294593)
Chester, South Carolina
CG2 Project No.: 240021095

Dear Mr. Shannon:

Carolinas Geotechnical Group, PLLC (CG2) has completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer mounted on a Breccia Construction, LLC (Breccia) CME 550X ATV-mounted drill rig with a serial number of 294593, see attached Drill Rig Photo Log. This service was performed by Mr. Robert E. Kral, PE on April 7, 2023. SPT energy testing was performed in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation (NCDOT), Geotechnical Engineering Unit's requirements. The testing procedures, equipment used during testing, and detailed results are presented in this report.

CG2 recommends Breccia submit this Report of SPT Hammer Energy to the NCDOT Geotechnical Engineering Unit for review and approval no later than May 5, 2023.

DYNAMIC TESTING METHODOLOGY

Testing was performed using a model SPT (Serial No. 4549 TB) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA was used to record and interpret data from two piezoresistive accelerometers (Serial Nos. K10959 and K10960) bolted to a 2-foot long AWJ drill rod (SN 528AWJ) internally instrumented with two strain transducers. The instrumented AWJ drill rod has a cross-sectional area of 1.19 square inches, an outside diameter of approximately 1.75 inches, and an inside diameter of 1.25 inches at the gauge location. The accelerometers and strain gauges, which are mounted on opposing axis near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces and computes the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. Preliminary results are recorded and displayed in real-time for each blow. Calibration sheets for the PDA, accelerometers, and the instrumented rod are included in the Appendix III.

TESTING AND OBSERVATIONS

CG2 personnel was on site April 7, 2023 to observe and perform high-strain dynamic testing during SPT sampling on the CME 550X ATV-mounted drill rig operated by L. Guempel of Breccia. The measurements were taken during drilling operations at 1817 Lowrys Highway in Chester, South Carolina (Chester County). The approximate coordinates (not professionally surveyed) for the test location are 34.7703792, -81.2453281. No Soil Test Boring Log was maintained. SPT energy measurements were recorded during three intervals at depths of approximately 28½, 33½, and 38½, feet below the existing ground surface. The information presented in the table below summarizes the equipment tested and tooling used during the SPT energy measurements.

Table 1: SPT Field Data

Drill Rig Information	
Manufacturer	CME
Model	550X
Serial Number	294593
Operator	L. Guempel
Carrier	ATV
Hammer Information	
Model / Type	CME / Auto
Serial Number	N/A
Anvil Height (inches)	11.5
Anvil Diameter (inches)	2.5
Drop Height (inches)	30
Ram Weight (pounds)	140
Ram Serial Number	N/A
Drilling and Instrumented Rod Information	
Drill Rod Type	AWJ
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.19
Typical Lengths (feet)	5
Instrumented Rod Type	AWJ (SN 528)
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.19
Total Instrumented Rod Length (feet)	2.00
Length Below Gages (feet)	0.70
Split-Spoon Length (feet)	2.85

DYNAMIC TESTING RESULTS

The total rod length from the instrumentation to the tip of the split-spoon sampler was determined by adding 3.6 feet to the required drill rod length at each sample depth. Based on the test data, the automatic hammer on the CME 550X ATV-mounted drill rig operated at a rate of about 55.5 to 58.6 blows per minute (BPM) during dynamic testing. The measured transferred hammer energy (EFV) ranged from 280.5 to 315.7 foot-pounds, which corresponds to Energy Transfer Ratio (ETR) values of 80.1 to 90.2%, respectively. These data ranges are based on the overall minimum and maximum values for the last 12 inches of each sample interval.

The SPT Energy Measurement Data Summary tables in the Appendix present the test data from every hammer blow at each sampling interval along with representative force and velocity traces for each test interval. The reported blow counts, obtained by the drill rig personnel, a summary of the test data, and average computed BPM, EFV, and ETR values are provided in Table 2. The BPM, EFV, and ETR values presented in Table 2 were computed by averaging data from the last 12 inches of each sample interval. Plots and tables of the following are also included in the Appendix and present the test data with depth for each test interval:

- Penetration vs. BLC
- Penetration vs. FMX
- Penetration vs. EFV
- Penetration vs. CSX
- Penetration vs. VMX
- Penetration vs. ETR
- Average ETR vs. Rod Length
- ETR vs. Rod Length

Table 2: Summary of Dynamic Testing Results

Data Set ID	Sample Depth (ft)	Drill Rod Length (ft)	Instrumentation to Sampler Tip Length (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Piedmont Residual)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (%)
1	28½ - 30	30	33.6	4-6-7 / 13	SA SILT	58.3	303.9	86.8
2	33½ - 35	35	38.6	3-6-7 / 13	SA SILT	55.9	288.6	82.5
3	38½ - 40	40	43.6	4-6-7 / 13	SA SILT	56.4	304.6	87.0
					Overall Average	**56.9**	**299.1**	**85.4**

The average hammer rate, transferred energy, and transfer ratio were calculated for each depth interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e., the blows that determine the N-value) were included when computing the average values shown in Table 2. The overall average transferred hammer energy for the automatic hammer on the CME 550X ATV-mounted drill rig (for the depth intervals presented in Table 2) was 299.1 foot-pounds, with an average ETR of 85.4%.

LIMITATIONS OF REPORT

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The information contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

CLOSING

CG2 is pleased to have the opportunity to provide these services to you. If you have questions concerning the content of this report, or if CG2 can be of further service, please contact CG2 at (980) 339-8684.

Sincerely,
Carolinas Geotechnical Group, PLLC

DocuSigned by:
D. Matthew Brewer
386129C0A4C1462...
D. Matthew Brewer, PE
Senior Project Engineer

DocuSigned by:
Robert E. Kral
8AD703B2A8484F4...
Robert E. Kral, PE
Senior Project Engineer
NC Registration No. 042642

Appendices:

- Appendix I - CME 550X ATV Rig (SN 294593) SPT Energy Measurements Summary Plots and Tables
- Appendix II - SPT Hammer Energy Field Form (Field Log) and Drill Rig Photo Log
- Appendix III - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix IV - Certificate of Proficiency

APPENDIX I

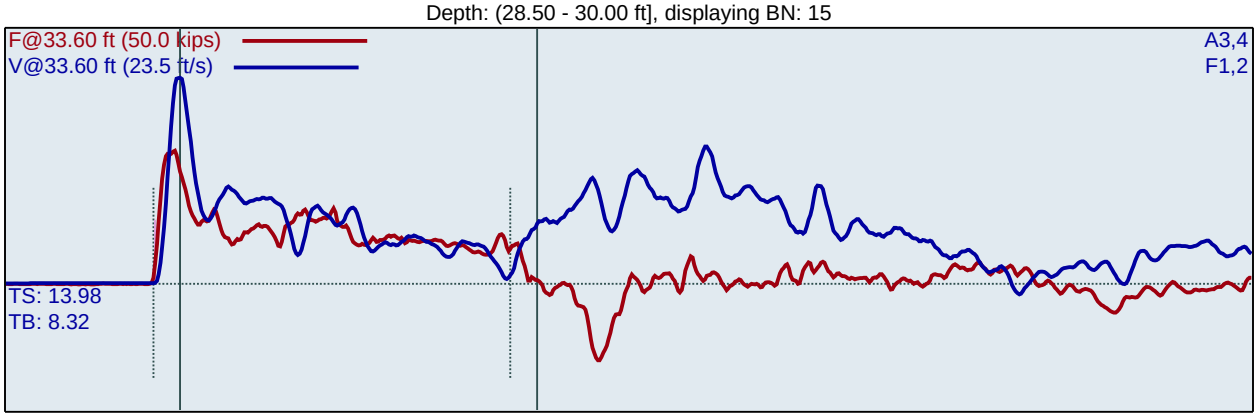
CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/7/2023

AR: 1.19 in^2
LE: 33.60 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (28.50 - 30.00 ft], displaying BN: 15



F1 : [528AWJ-1] 203.51 PDICAL (1) FF1
F2 : [528AWJ-2] 203.28 PDICAL (1) FF1

A3 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1
A4 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

LP	BL#	BC	BPM	FMX	VMX	DMX	CSX	DFN	EFV	ETR
ft		/6"	bpm	kips	ft/s	in	ksi	in	ft-lb	%
28.63	1	4	1.9	27.4	17.1	2.6	23.0	1.5	278.1	79.4
28.75	2	4	52.5	27.9	17.8	1.8	23.5	1.5	292.5	83.6
28.88	3	4	57.1	27.9	18.0	1.6	23.4	1.5	297.5	85.0
29.00	4	4	57.8	27.5	18.0	1.6	23.1	1.5	295.9	84.6
29.08	5	6	58.1	28.1	18.2	1.6	23.6	1.0	300.5	85.9
29.17	6	6	57.9	27.4	18.2	1.4	23.0	1.0	298.8	85.4
29.25	7	6	58.6	27.4	18.4	1.3	23.0	1.0	299.9	85.7
29.33	8	6	58.0	27.0	18.4	1.2	22.7	1.0	307.4	87.8
29.42	9	6	58.4	26.8	18.5	1.1	22.5	1.0	301.5	86.2
29.50	10	6	58.1	27.1	18.6	1.1	22.8	1.0	311.5	89.0
29.57	11	7	58.2	26.7	18.5	1.1	22.5	0.9	300.6	85.9
29.64	12	7	58.6	26.5	18.6	1.0	22.2	0.9	306.3	87.5
29.71	13	7	58.1	26.2	18.9	0.9	22.0	0.9	308.1	88.0
29.79	14	7	58.6	26.1	18.7	1.0	21.9	0.9	308.9	88.3
29.86	15	7	58.1	26.0	19.0	0.9	21.8	0.9	303.9	86.8
29.93	16	7	58.5	26.1	19.0	0.9	21.9	0.9	306.8	87.7
30.00	17	7	58.3	26.0	19.2	0.9	21.8	0.9	296.7	84.8
		Average	58.3	26.7	18.6	1.1	22.5	0.9	303.9	86.8
		Std Dev	0.2	0.6	0.3	0.2	0.5	0.1	4.4	1.3
		Maximum	58.6	28.1	19.2	1.6	23.6	1.0	311.5	89.0
		Minimum	57.9	26.0	18.2	0.9	21.8	0.9	296.7	84.8

N-value: 13

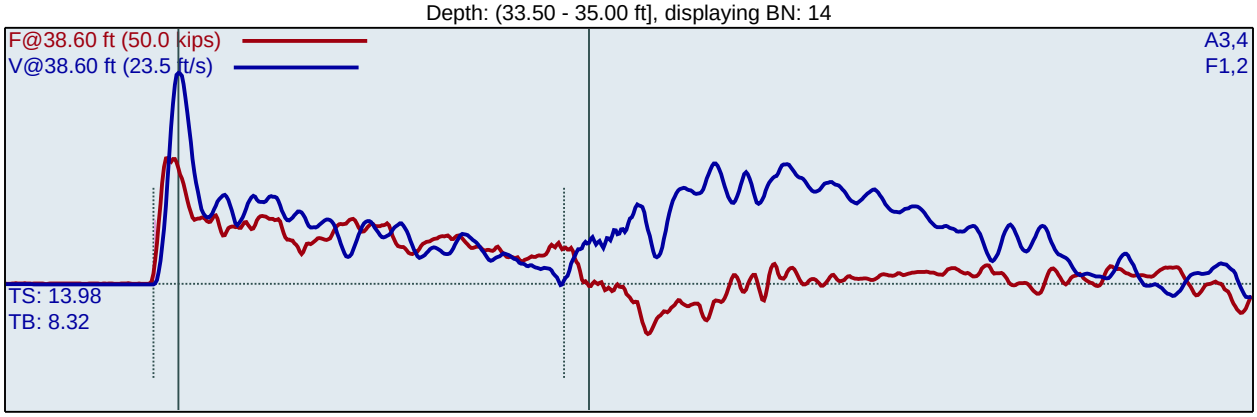
CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/7/2023

AR: 1.19 in^2
LE: 38.60 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 14



F1 : [528AWJ-1] 203.51 PDICAL (1) FF1
F2 : [528AWJ-2] 203.28 PDICAL (1) FF1

A3 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1
A4 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1

LP ft	BL#	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
33.67	1	3	1.9	26.2	18.4	2.0	22.0	2.0	283.6	81.0
33.83	2	3	55.1	25.2	18.7	2.0	21.1	2.0	293.9	84.0
34.00	3	3	55.4	24.8	19.0	2.0	20.9	2.0	295.1	84.3
34.08	4	6	55.9	24.6	19.0	1.1	20.7	1.0	280.5	80.1
34.17	5	6	55.5	24.9	19.0	1.1	20.9	1.0	286.3	81.8
34.25	6	6	56.1	24.6	19.2	1.0	20.7	1.0	283.7	81.1
34.33	7	6	55.9	24.7	19.2	1.0	20.7	1.0	284.7	81.3
34.42	8	6	56.2	24.7	19.2	1.0	20.8	1.0	288.1	82.3
34.50	9	6	55.8	24.5	19.3	1.0	20.6	1.0	287.4	82.1
34.57	10	7	56.1	24.6	19.4	0.9	20.7	0.9	291.4	83.3
34.64	11	7	55.9	24.7	19.4	0.9	20.7	0.9	289.6	82.7
34.71	12	7	56.0	24.4	19.5	0.9	20.5	0.9	287.6	82.2
34.79	13	7	55.9	24.5	19.5	0.9	20.6	0.9	291.5	83.3
34.86	14	7	55.8	24.5	19.4	0.9	20.6	0.9	295.4	84.4
34.93	15	7	56.0	24.5	19.4	0.9	20.6	0.9	294.4	84.1
35.00	16	7	55.5	24.6	19.3	0.9	20.7	0.9	291.7	83.3
		Average	55.9	24.6	19.3	1.0	20.7	0.9	288.6	82.5
		Std Dev	0.2	0.1	0.1	0.1	0.1	0.1	4.1	1.2
		Maximum	56.2	24.9	19.5	1.1	20.9	1.0	295.4	84.4
		Minimum	55.5	24.4	19.0	0.9	20.5	0.9	280.5	80.1

N-value: 13

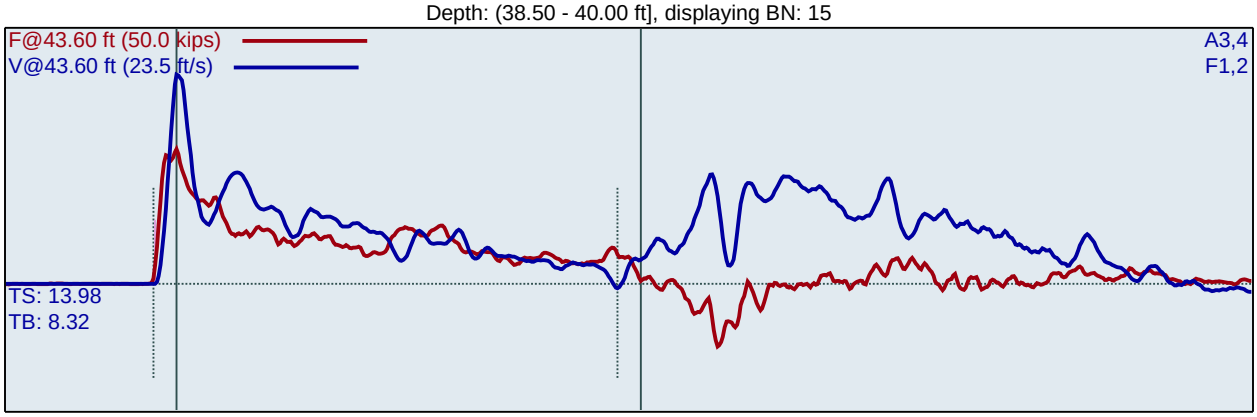
CME 550X (SN 294593)
REK
B-1

B-1
Interval start: 4/7/2023

AR: 1.19 in^2
LE: 43.60 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft], displaying BN: 15



F1 : [528AWJ-1] 203.51 PDICAL (1) FF1
F2 : [528AWJ-2] 203.28 PDICAL (1) FF1

A3 (PR): [K10960] 419.894 mv/6.4v/5000g (1) VF1
A4 (PR): [K10959] 413.827 mv/6.4v/5000g (1) VF1

LP ft	BL#	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
38.63	1	4	1.9	28.1	17.7	1.6	23.7	1.5	283.3	80.9
38.75	2	4	53.0	28.3	18.0	1.6	23.8	1.5	287.4	82.1
38.88	3	4	54.8	28.3	18.6	1.5	23.8	1.5	294.7	84.2
39.00	4	4	55.9	27.7	18.6	1.5	23.3	1.5	295.9	84.5
39.08	5	6	56.2	28.2	18.9	1.1	23.7	1.0	297.3	85.0
39.17	6	6	56.3	27.0	18.5	1.0	22.7	1.0	295.7	84.5
39.25	7	6	56.3	27.7	18.5	1.1	23.3	1.0	297.8	85.1
39.33	8	6	56.7	27.4	19.1	1.2	23.1	1.0	306.9	87.7
39.42	9	6	56.1	26.7	18.8	1.0	22.4	1.0	300.3	85.8
39.50	10	6	56.7	26.9	18.8	1.0	22.6	1.0	301.1	86.0
39.57	11	7	56.3	27.2	19.2	0.9	22.9	0.9	305.3	87.2
39.64	12	7	56.5	26.6	19.2	0.9	22.4	0.9	305.7	87.4
39.71	13	7	56.3	26.7	19.0	0.9	22.4	0.9	308.4	88.1
39.79	14	7	56.6	26.5	19.3	0.9	22.3	0.9	311.1	88.9
39.86	15	7	56.3	26.3	19.2	0.9	22.1	0.9	308.5	88.1
39.93	16	7	56.3	25.5	19.8	0.9	21.4	0.9	315.7	90.2
40.00	17	7	56.7	26.4	19.4	0.9	22.2	0.9	306.3	87.5
		Average	56.4	26.9	19.1	1.0	22.6	0.9	304.6	87.0
		Std Dev	0.2	0.7	0.3	0.1	0.6	0.1	5.6	1.6
		Maximum	56.7	28.2	19.8	1.2	23.7	1.0	315.7	90.2
		Minimum	56.1	25.5	18.5	0.9	21.4	0.9	295.7	84.5

N-value: 13

Summary of SPT Test Results

Project: CME 550X (SN 294593), Test Date: 4/7/2023

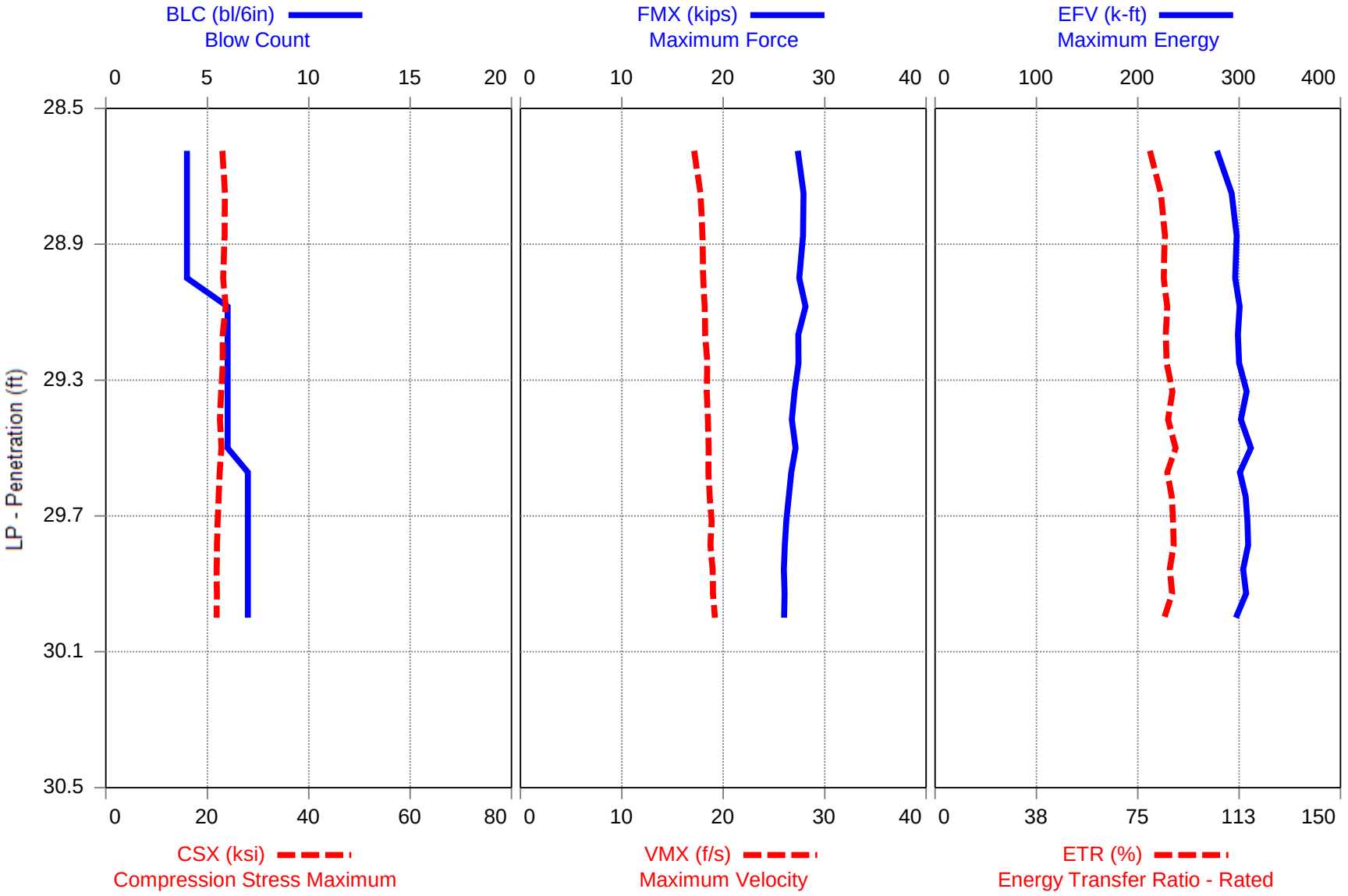
BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR %
33.60	28.50	30.00	**4-6-7**	**13**	**18**	58.3	26.7	18.6	1.1	22.5	0.9	303.9	86.8
38.60	33.50	35.00	**3-6-7**	**13**	**18**	55.9	24.6	19.3	1.0	20.7	0.9	288.6	82.5
43.60	38.50	40.00	**4-6-7**	**13**	**18**	56.4	26.9	19.1	1.0	22.6	0.9	304.6	87.0
				Overall Average Values:		56.9	26.1	19.0	1.0	21.9	0.9	299.1	85.4
				Standard Deviation:		1.0	1.2	0.4	0.2	1.0	0.1	8.8	2.5
				Overall Maximum Value:		58.6	28.2	19.8	1.6	23.7	1.0	315.7	90.2
				Overall Minimum Value:		55.5	24.4	18.2	0.9	20.5	0.9	280.5	80.1

GRL Engineers, Inc. - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 14-April-2023 Test started: 07-April-2023

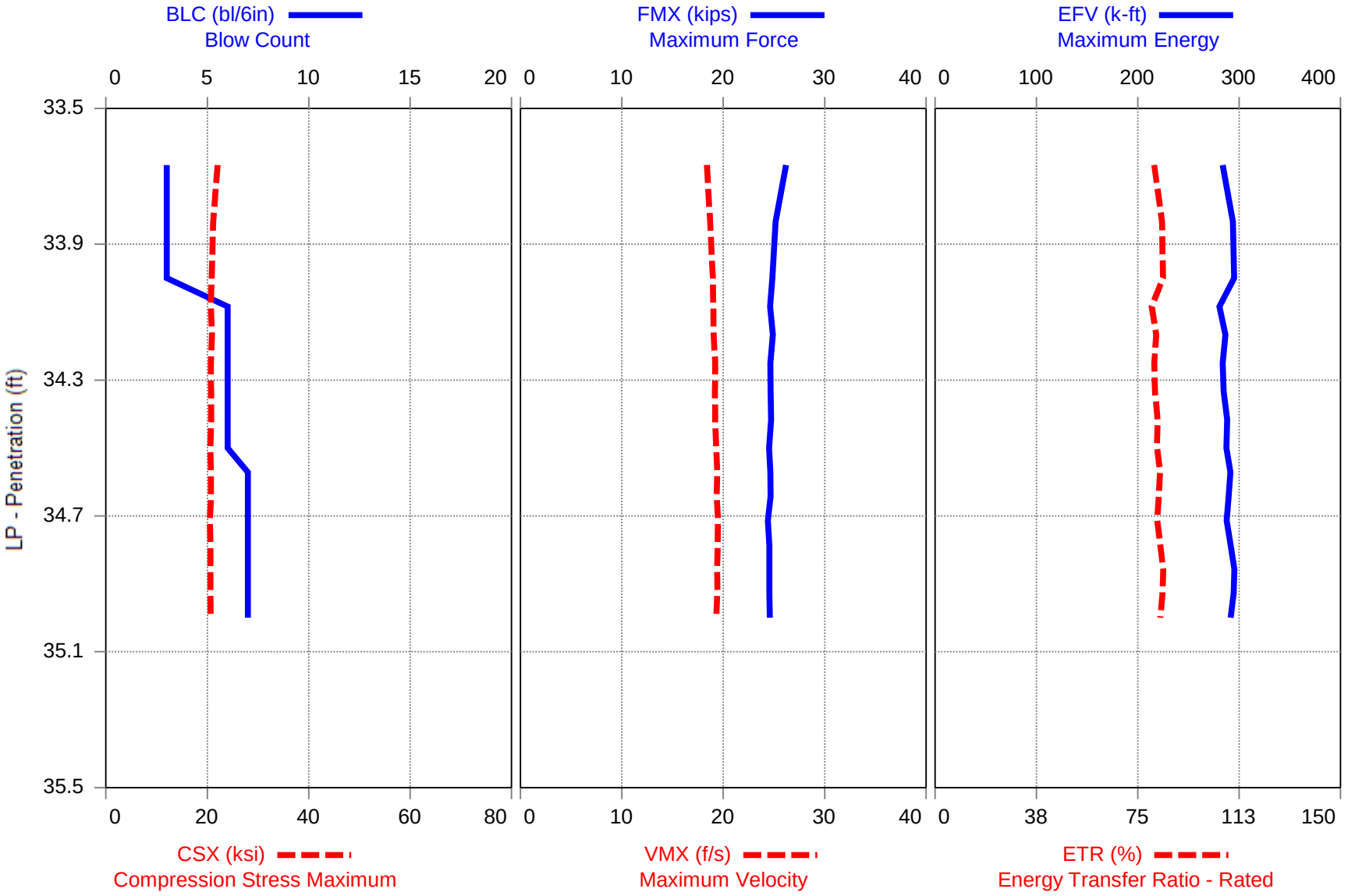
CME 550X (SN 294593) - 28.5 TO 30.0



GRL Engineers, Inc. - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 14-April-2023 Test started: 07-April-2023

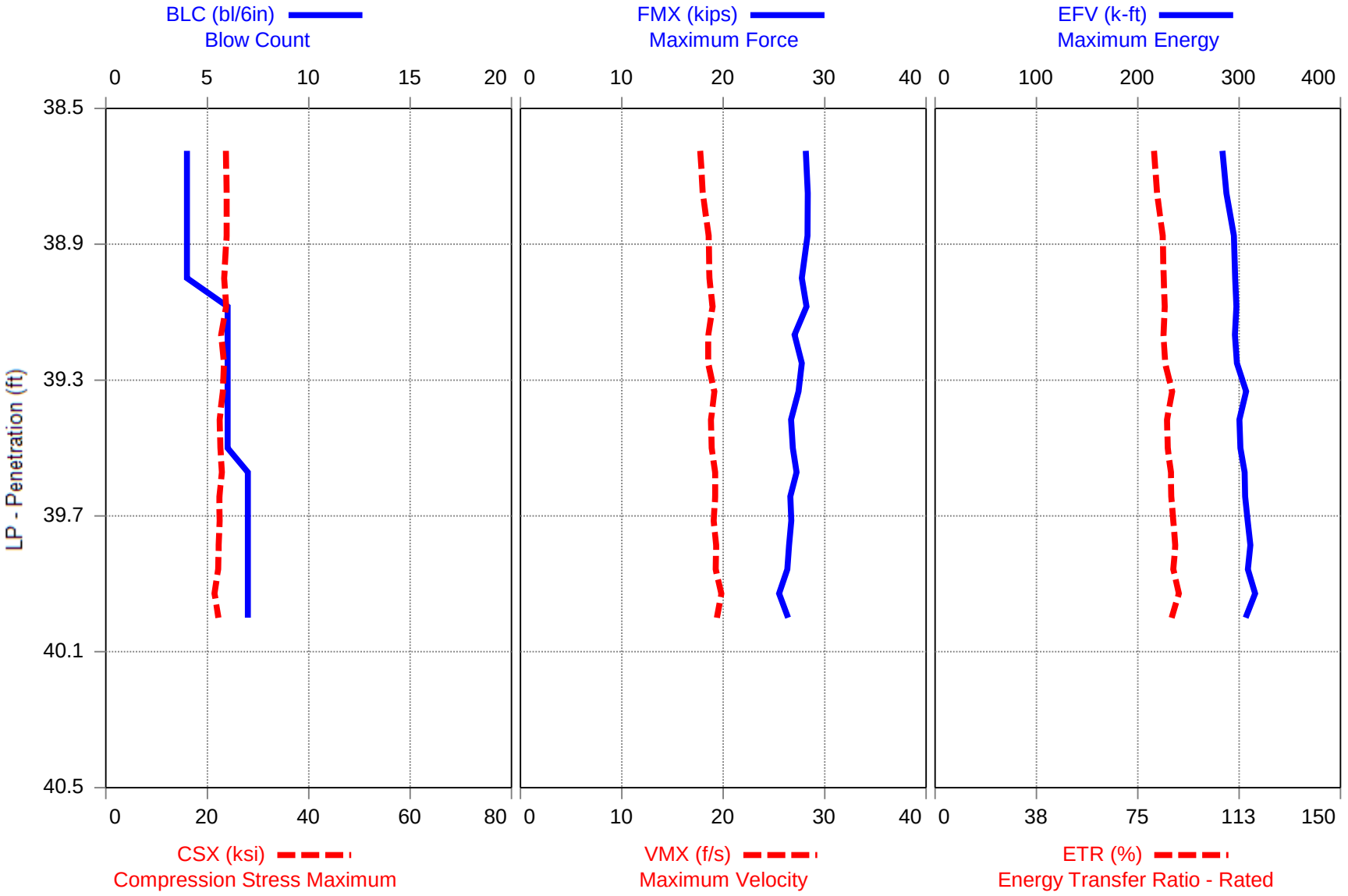
CME 550X (SN 294593) - 33.5 TO 35.0

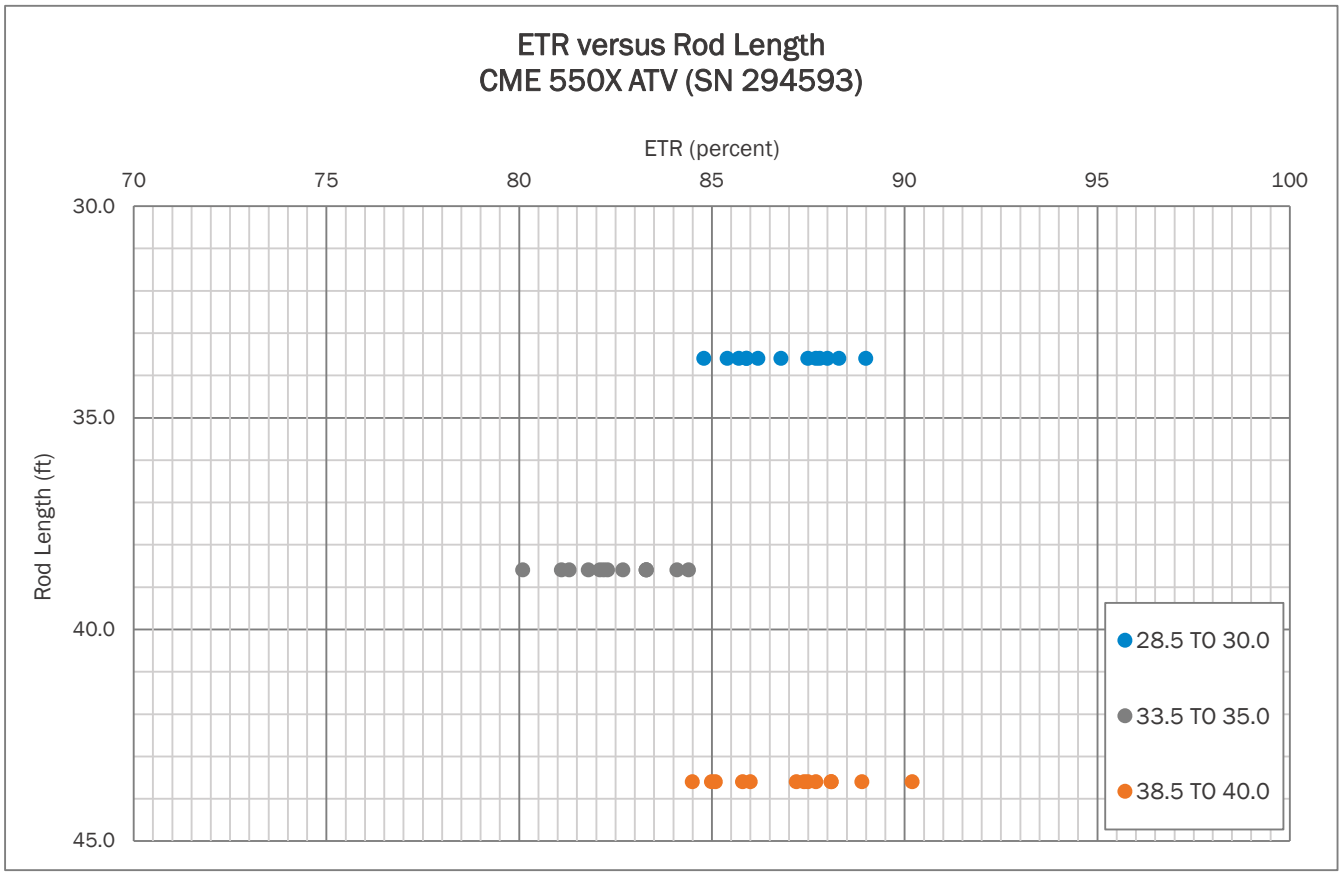


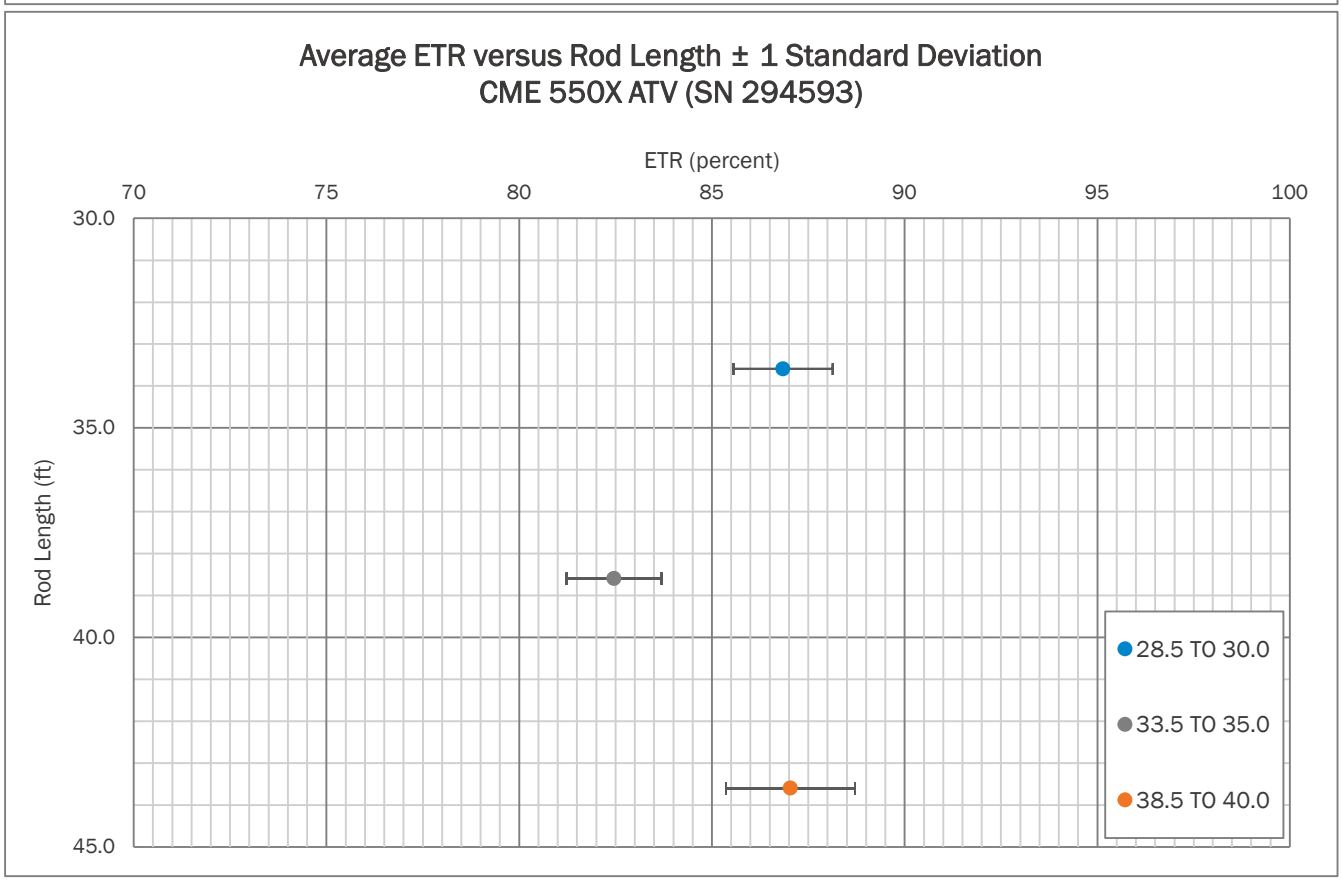
GRL Engineers, Inc. - PDIPLOT2 Ver 2021.1.61.0 - Case Method & iCAP® Results

Printed: 14-April-2023 Test started: 07-April-2023

CME 550X (SN 294593) - 38.5 TO 40.0




ETR versus Rod Length
CME 550X ATV (SN 294593)
ETR (percent)
70
75
80
85
90
95
100
30.0
35.0
40.0
45.0
Rod Length (ft)
28.5 TO 30.0
33.5 TO 35.0
38.5 TO 40.0


Average ETR versus Rod Length ± 1 Standard Deviation
CME 550X ATV (SN 294593)
ETR (percent)
70
75
80
85
90
95
100
30.0
35.0
40.0
45.0
Rod Length (ft)
28.5 TO 30.0
33.5 TO 35.0
38.5 TO 40.0

APPENDIX II

CAROLINAS GEOTECHNICAL GROUP

SPT Hammer Energy Field Form

Project:	SPT HAMMER ENERGY	**Date:**	4/7/2023
Project No.:	240021095	**Weather:**	50's CLOUDY
Boring No.:	B-1	**Drill Rod Type:**	AWJ

On-site Personnel

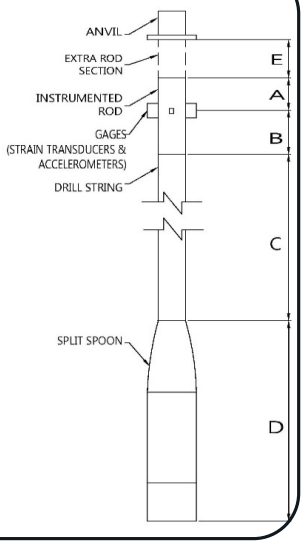
Drilling Company:	BRECCIA CONSTRUCTION, LLC
Rig Operator:	L. GUEMPEL
Engr/Geologist:	N/A
Client Rep.:	N/A
Analyzer Oper.:	R. KRAL

Rig/Hammer Info

Drill Rig Make/Model:	CME 550X
Carrier Type:	ATV
Rig Serial No.:	294593 (DR-4)
Hammer Type/Model:	CME
Hammer Serial No.:	N/A
Hammer Drop System:	AUTO
Lubrication Condition:	PER MANUFACTURER
Manufacturer Recommended Operation Rate (bpm):	55
Drop Height (in.):	30
Hammer Weight (lbs):	140
Anvil Dimension (in.):	11.5
Drilling Method:	2.25 HSA

Rod Info

(A + E) Impact Surface to Gages Length:	1.36	ft
(B) Instr. Rod Length below Gages:	0.70	ft
(A) + (B) Instr. Rod Length:	2.00	ft
(D) Spoon Length:	2.85	ft
(E) Rod Length Above Instr. Rod (if applicable):	0.06	ft
Instr. Rod S/N:	528AWJ	
Instr. Rod Outside Dia.:	1.75	in.
Instr. Rod Area:	1.19	in^2
PDA Make/Model:	SPT	
PDA Serial No.:	4549 TB	
Calib. Pulse Test (y/n):	Y	



Gage Info

Gage		Serial No.	Calibration No.
Accel.	A3	K10959	413.83
	A4	K10960	419.89
Strain	F3	528AWJ-1	205.26
	F4	528AWJ-2	205.86

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (military)	Length of Drill String (ft) ***(C)***	(LE) Length below Gages (ft) ***(B) + (C) + (D)***	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts 6"	12"	18"	N-Value	Drop Height in Tolerance (y/n)	Soil Class.
7-Apr	28.5 TO 30.0	0837/0837	30	33.6	57	4	6	7	13	Y	SA SI
7-Apr	33.5 TO 35.0	0843/0843	35	38.6	56	3	6	7	13	Y	SA SI
7-Apr	38.5 TO 40.0	0853/0853	40	43.6	56	4	6	7	13	Y	SA SI

Notes:
TESTING PERFORMED AT 1817 LOWRYS HIGHWAY IN CHESTER, SOUTH CAROLINA (CHESTER COUNTY). THE APPROXIMATE COORDINATES ARE 34.7703792, -81.2453281.

NOTE: (1) Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions (e.g. veritcality, weather, or lubrication between trials). (2) Note any changes in rod diameter along drill string and record locations of short rod sections.

Prepared By (print/signature)

4/7/2023
Date

Figure No. 1: Rear View of Drill Rig

Figure No. 2: Side View of Drill Rig

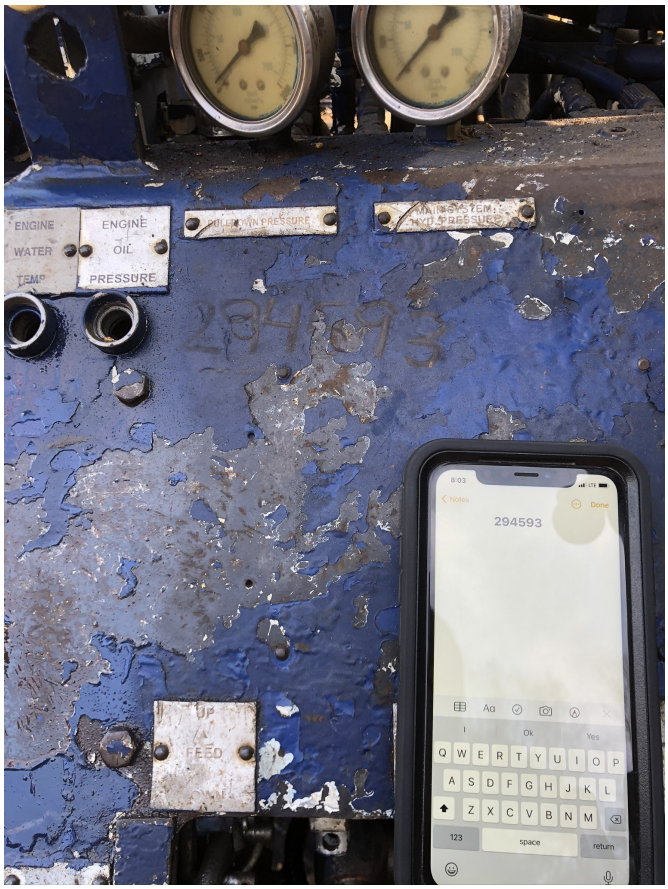


Figure No. 3: Serial Number Plate

Figure No. 4: Automatic Hammer

APPENDIX III

Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model SPT

Serial Number: 4549 TB

was calibrated on 14 July 2022

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.

CORPORATE SEAL 1972 OHIO

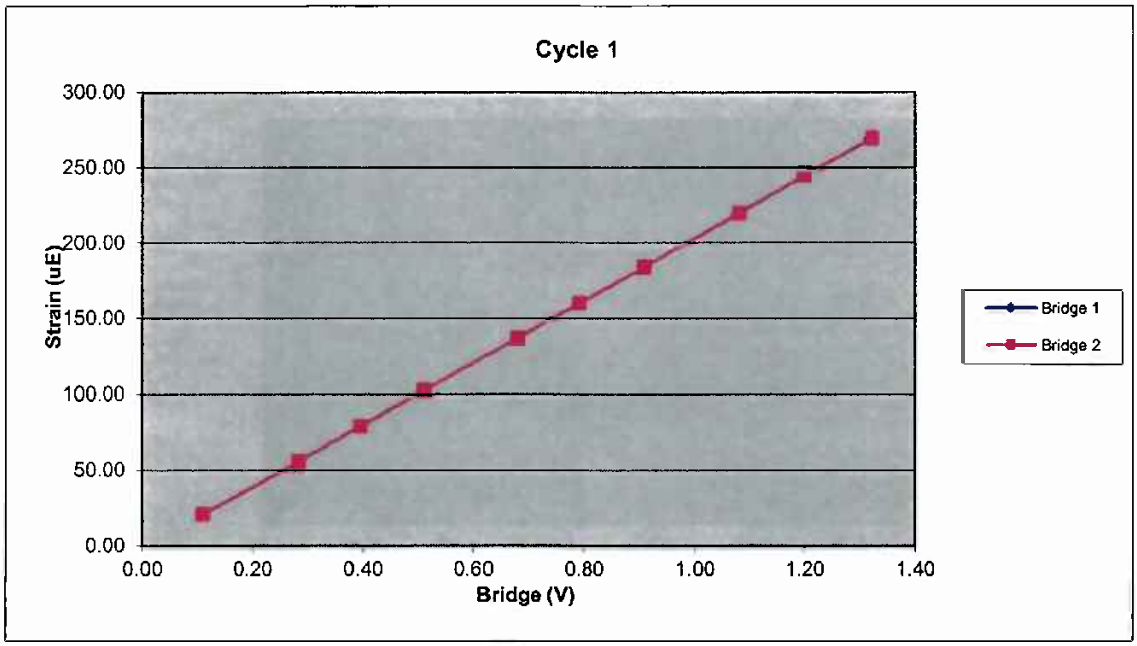
Tested by

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

528AWJ		Cycle 1		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	803.20	21.15	0.11	0.11
3	2080.73	56.33	0.28	0.28
4	2904.01	79.79	0.39	0.39
5	3765.89	103.49	0.51	0.51
6	5005.11	138.03	0.68	0.68
7	5828.59	161.56	0.79	0.79
8	6692.71	185.68	0.91	0.91
9	7962.93	221.03	1.08	1.08
10	8831.54	245.89	1.20	1.20
11	9736.80	270.68	1.32	1.32

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7358.13**	**Force Calibration (lb/V)**	**7351.82**
Offset	3.52	Offset	6.26
Correlation	0.999999	Correlation	0.999999
Strain Calibration (µE/V)	**205.90**	**Strain Calibration (µE/V)**	**205.73**
Offset	-1.56	Offset	-1.48
Correlation	0.999995	Correlation	0.999996

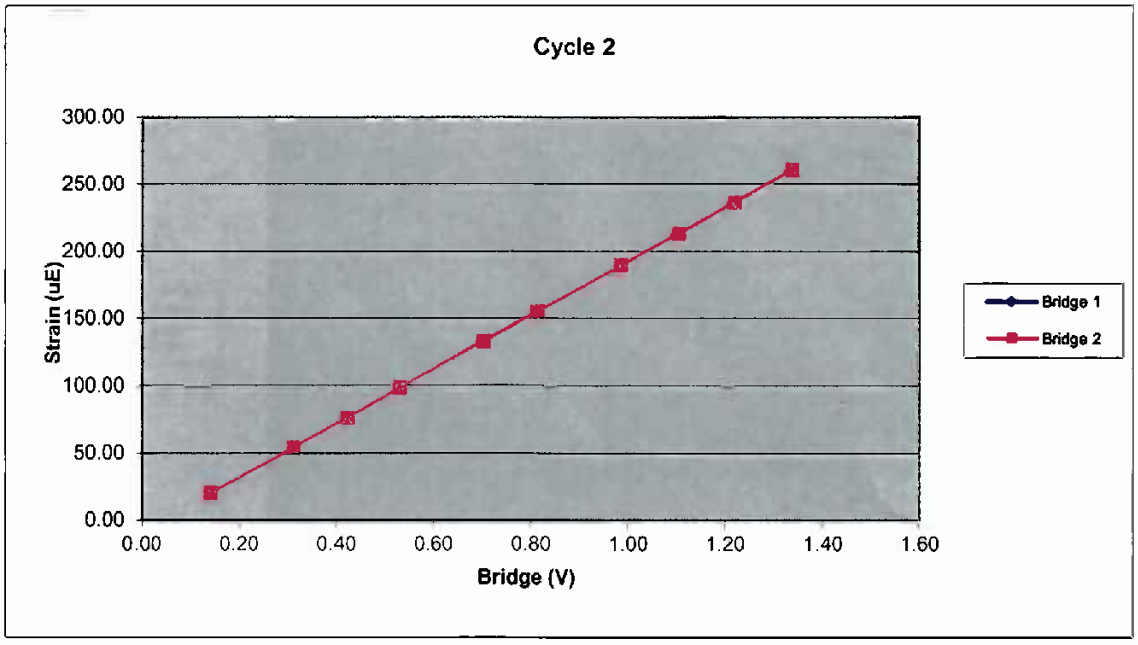
Force Strain Calibration	
EA (Kips)	**35735.87**
Offset	59.29
Correlation	0.999995



528AWJ		Cycle 2		
Sample	**Force (lb)**	**Strain (μE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	1038.71	19.60	0.14	0.14
3	2288.25	53.30	0.31	0.31
4	3093.11	75.49	0.42	0.42
5	3893.00	97.84	0.53	0.53
6	5167.50	132.26	0.70	0.70
7	5988.25	154.39	0.81	0.81
8	7248.72	188.87	0.98	0.98
9	8125.71	212.29	1.10	1.10
10	8976.19	235.45	1.22	1.22
11	9854.85	259.50	1.33	1.34

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7381.92**	**Force Calibration (lb/V)**	**7365.94**
Offset	**-0.76**	Offset	**4.69**
Correlation	**0.999998**	Correlation	**0.999999**
Strain Calibration (μE/V)	**200.83**	**Strain Calibration (μE/V)**	**200.40**
Offset	**-8.59**	Offset	**-8.44**
Correlation	**0.999997**	Correlation	**0.999996**

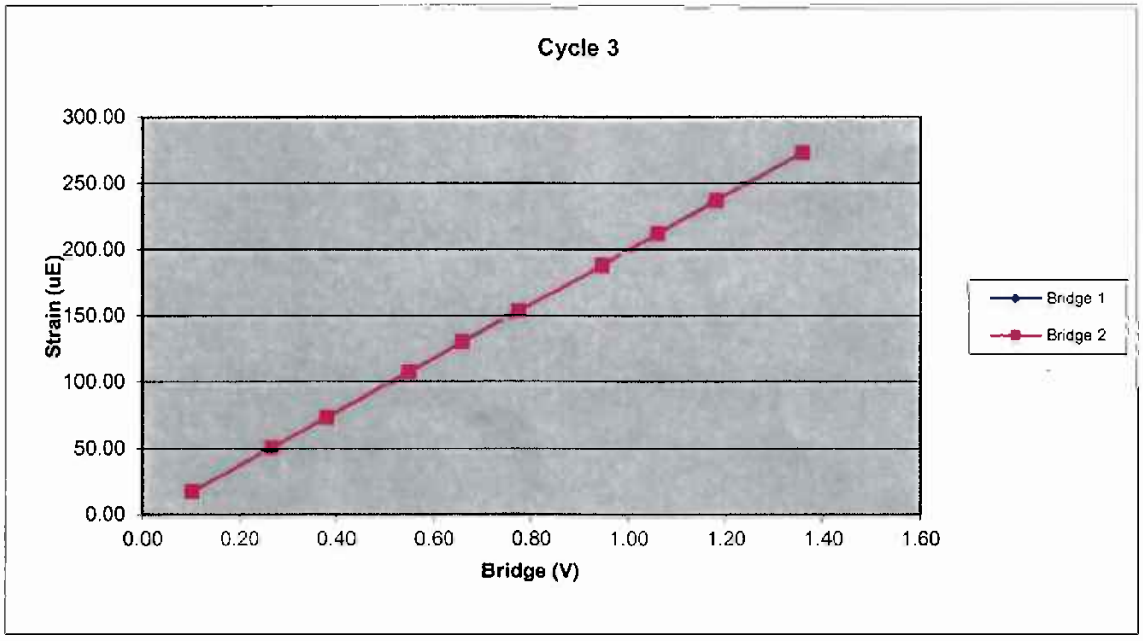
Force Strain Calibration	
EA (Kips)	**36756.34**
Offset	**315.07**
Correlation	**0.999995**



528AWJ		Cycle 3		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	734.68	18.74	0.10	0.10
3	1943.58	51.94	0.26	0.26
4	2781.29	75.07	0.38	0.38
5	4027.81	108.88	0.55	0.55
6	4829.55	131.78	0.66	0.66
7	5689.29	155.36	0.77	0.77
8	6956.49	190.12	0.95	0.95
9	7799.46	214.09	1.06	1.06
10	8693.90	238.78	1.18	1.18
11	10007.88	275.06	1.36	1.36

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7366.71**	**Force Calibration (lb/V)**	**7364.49**
Offset	**-6.17**	Offset	**-9.40**
Correlation	**0.999998**	Correlation	**0.999999**
Strain Calibration (µE/V)	**203.78**	**Strain Calibration (µE/V)**	**203.72**
Offset	**-2.08**	Offset	**-2.17**
Correlation	**0.999989**	Correlation	**0.999993**

Force Strain Calibration	
EA (Kips)	**36149.33**
Offset	**69.26**
Correlation	**0.999994**



Bridge Excitation (V) 5
Shunt Resitor (ohm) 60.4k

Calibration Factors	528AWJ		
Bridge 1 (µE/V)	203.51	Bridge 2 (µE/V)	203.28
EA Factor (Kips)	36213.85	Area (in^2)	1.21

Calibrated by: _____
Calibrated Date: 7/18/2022

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Accelerometer Calibration Certificate
Pile Dynamics, Inc.

Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No:	K10959	**Temperature:**	79.0 °F
Model:	PR	**Humidity:**	50%
Calibrated on:	Channel 3 on 8G 5161 LE		

Ref Acc 1:	72517! 1049 g's/volt	**Cal on:**	24Mar2022
Ref Acc 2:	72505! 1035 g's/volt	**Cal on:**	24Mar2022

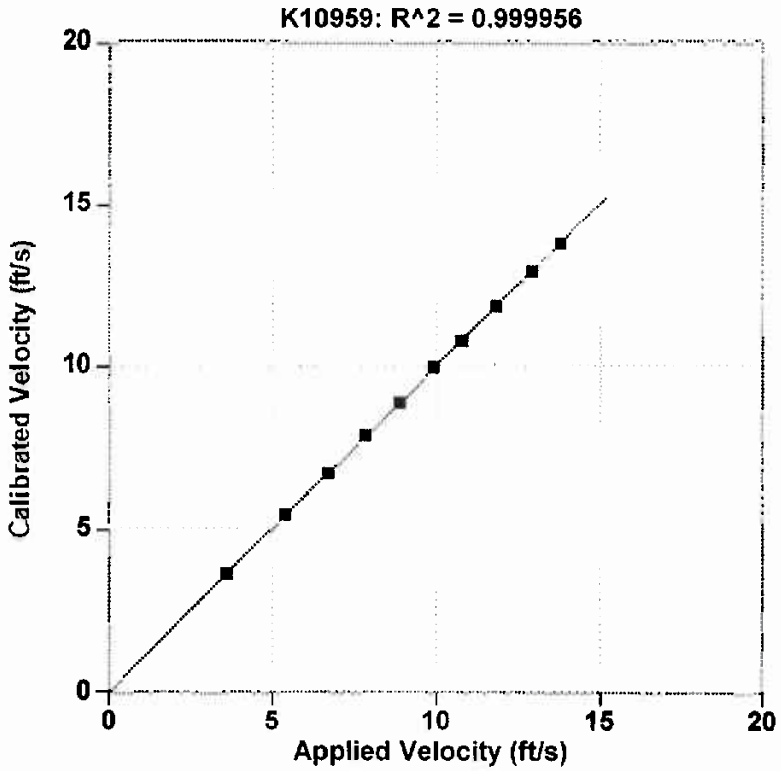
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

PDA CALIBRATION FACTOR

413.8 mv/5000g
(82.8 µv/g)
R^2: 0.999956 [Chip programmed]

Operator: William Johnson

Signed



Reference Velocity	S/N K10959 Velocity
ft/s	ft/s
3.605	3.589
5.397	5.412
6.705	6.699
7.841	7.862
8.877	8.913
9.904	9.929
10.746	10.721
11.807	11.815
12.910	12.889
13.783	13.762

Maximum Acceleration: 935 g's

Accelerometer Calibration Certificate
Pile Dynamics, Inc.

Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No:	K10960	**Temperature:**	79.0 °F
Model:	PR	**Humidity:**	50%
Calibrated on:	Channel 3 on 8G 5161 LE		

Ref Acc 1:	72517! 1049 g's/volt	**Cal on:**	24Mar2022
Ref Acc 2:	72505! 1035 g's/volt	**Cal on:**	24Mar2022

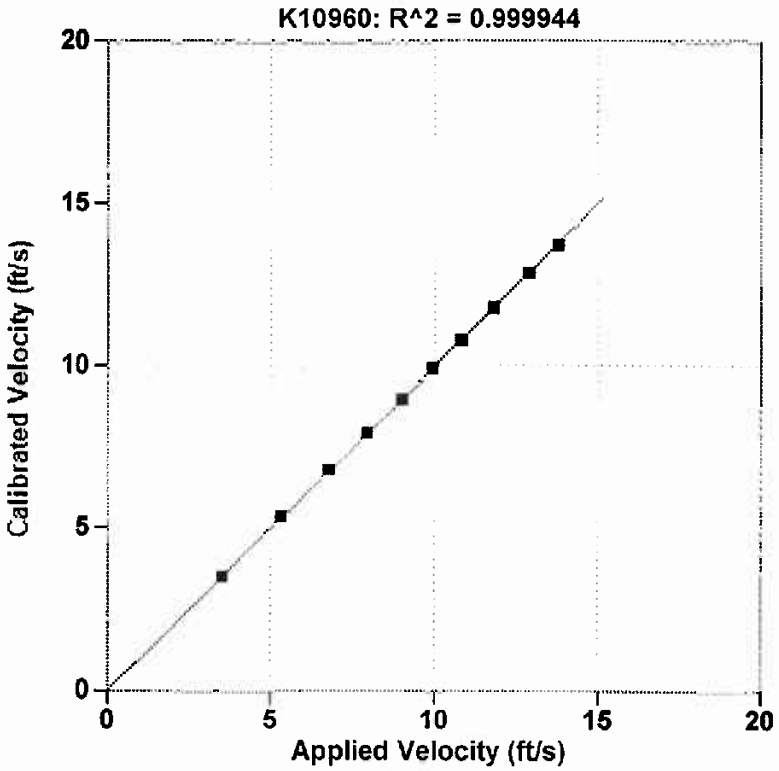
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

PDA CALIBRATION FACTOR

419.9 mv/5000g
(84.0 µv/g)
R^2: 0.999944 [Chip programmed]

Operator: William Johnson

Signed



Reference Velocity	S/N K10960 Velocity
ft/s	ft/s
3.513	3.540
5.322	5.345
6.769	6.796
7.933	7.937
8.998	9.037
9.912	9.923
10.788	10.775
11.781	11.779
12.877	12.863
13.771	13.732

Maximum Acceleration: 934 g's

Accelerometer Calibration Certificate
Pile Dynamics, Inc.

Calibrated by Pile Dynamics, Inc.
Calibration performed on 14Jun2022

Serial No:	K11957	**Temperature:**	79.0 °F
Model:	PR	**Humidity:**	50%
Calibrated on:	Channel 3 on 8G 5161 LE		

Ref Acc 1:	72517! 1049 g's/volt	**Cal on:**	24Mar2022
Ref Acc 2:	72505! 1035 g's/volt	**Cal on:**	24Mar2022

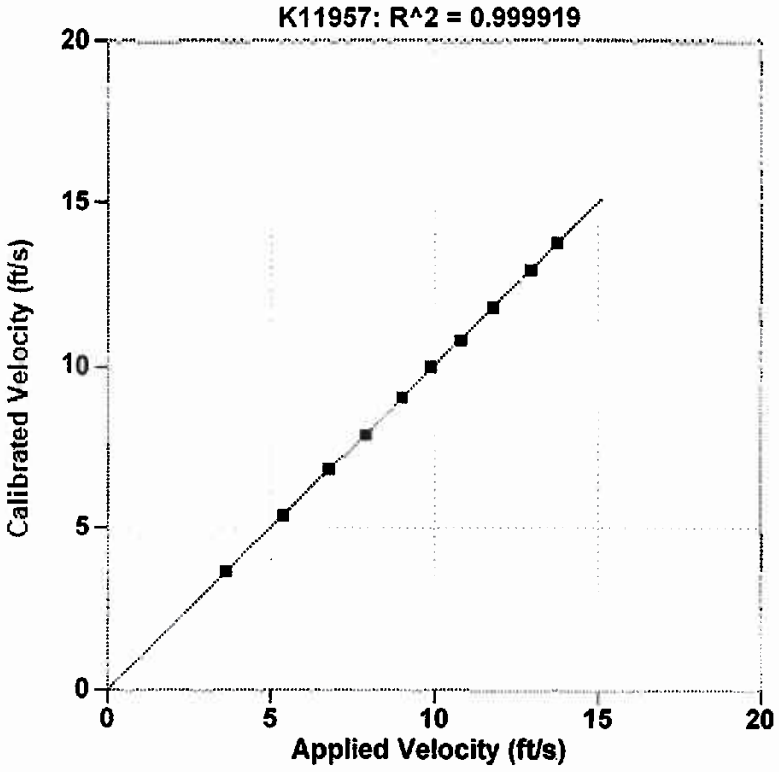
Reference accelerometer calibrations are traceable to the United States National Institute of Standards and Technology (NIST).

PDA CALIBRATION FACTOR

409.6 mv/5000g
(81.9 µv/g)
R^2: 0.999919 [Chip programmed]

Operator: William Johnson

Signed



Reference Velocity ft/s	S/N K11957 Velocity ft/s
3.643	3.661
5.377	5.363
6.761	6.783
7.895	7.905
8.973	8.989
9.864	9.918
10.780	10.730
11.763	11.749
12.920	12.894
13.735	13.746

Maximum Acceleration: 931 g's

APPENDIX IV

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

Pile Dynamics, Inc.

This documents that

Robert E. Kral
Carolinas Geotechnical Group

has on May 20, 2016 achieved the rank of

ADVANCED

on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended*** **that Individuals at the Advanced level seek Master or Expert levels through additional study within six years of the date of this document.**

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. **This certificate can be verified at www.PDAproficiencytest.com.** The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate.

Steven A. Hall, Executive Director
Pile Driving Contractors Association

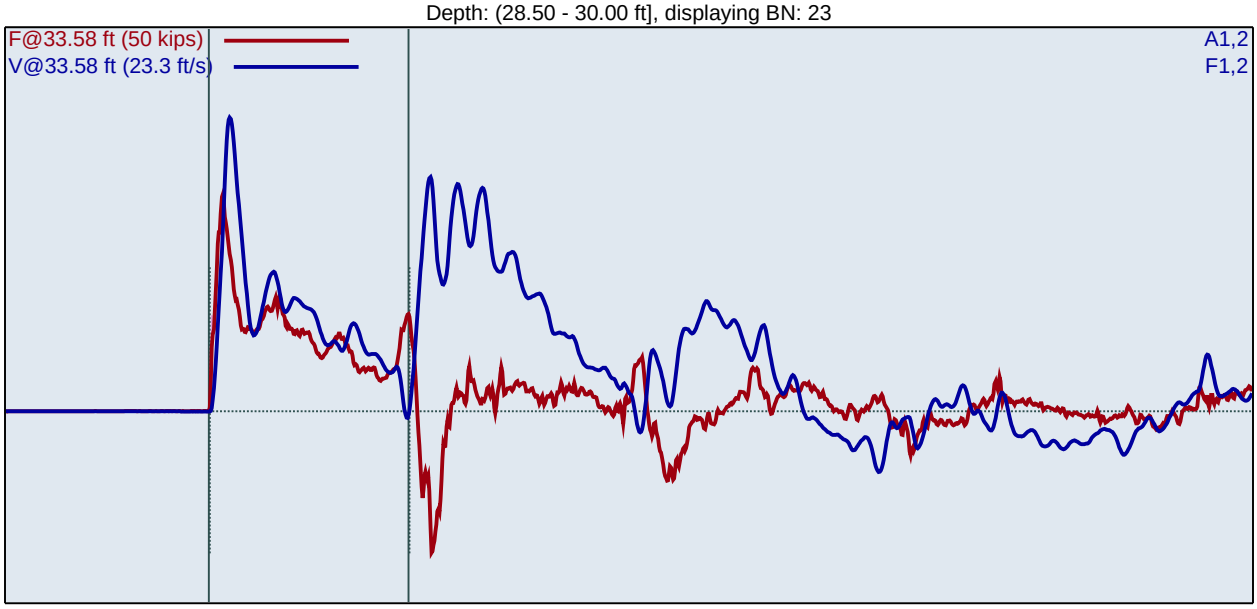
Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2072

CME 750X ATV - SN322938 (R-58)
H. Forbes
AR: 1.20 in^2
LE: 33.58 ft
WS: 16807.9 ft/s

S&ME Annual Testing
Test date: 8/7/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (28.50 - 30.00 ft], displaying BN: 23



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	28.60	5	1.9	28	17.5	1.20	23.5	1.20	288.9	82.6
2	28.70	5	50.3	29	17.6	1.20	24.1	1.20	286.6	81.9
3	28.80	5	50.3	29	17.8	1.20	24.6	1.20	289.0	82.6
4	28.90	5	50.4	27	17.2	1.20	22.4	1.20	290.4	83.0
5	29.00	5	50.3	29	18.1	1.20	24.0	1.20	290.3	82.9
6	29.06	8	50.4	29	18.1	0.84	24.5	0.75	291.6	83.3
7	29.13	8	50.4	28	17.6	0.83	23.4	0.75	289.2	82.6
8	29.19	8	50.5	28	16.6	0.81	23.2	0.75	287.1	82.0
9	29.25	8	50.4	28	17.9	0.80	23.0	0.75	290.6	83.0
10	29.31	8	50.5	28	17.5	0.81	23.0	0.75	285.5	81.6
11	29.38	8	50.3	28	17.6	0.83	23.6	0.75	287.7	82.2
12	29.44	8	50.4	29	17.8	0.85	24.2	0.75	283.7	81.1
13	29.50	8	50.4	28	17.8	0.90	23.3	0.75	290.0	82.9
14	29.54	12	50.4	29	17.6	0.95	24.3	0.50	286.2	81.8
15	29.58	12	50.6	30	18.1	0.91	25.1	0.50	289.9	82.8
16	29.63	12	50.3	30	18.1	0.84	24.6	0.50	289.8	82.8
17	29.67	12	50.5	29	18.3	0.81	24.0	0.50	291.2	83.2
18	29.71	12	50.2	30	18.2	0.82	24.7	0.50	293.3	83.8
19	29.75	12	50.3	28	18.3	0.80	23.2	0.50	291.2	83.2
20	29.79	12	50.3	30	17.6	0.79	24.6	0.50	289.4	82.7
21	29.83	12	50.4	29	18.0	0.79	24.4	0.50	292.0	83.4
22	29.88	12	50.4	28	18.1	0.83	23.7	0.50	294.1	84.0
23	29.92	12	50.4	28	17.9	0.80	23.6	0.50	292.2	83.5
24	29.96	12	50.4	29	18.1	0.81	24.2	0.50	292.9	83.7
25	30.00	12	50.4	29	17.8	0.80	24.1	0.50	296.0	84.6

Average	50.4	29	17.8	0.83	23.9	0.60	290.2	82.9
Std Dev	0.1	1	0.4	0.04	0.6	0.12	3.0	0.8
Maximum	50.6	30	18.3	0.95	25.1	0.75	296.0	84.6
Minimum	50.2	28	16.6	0.79	23.0	0.50	283.7	81.1

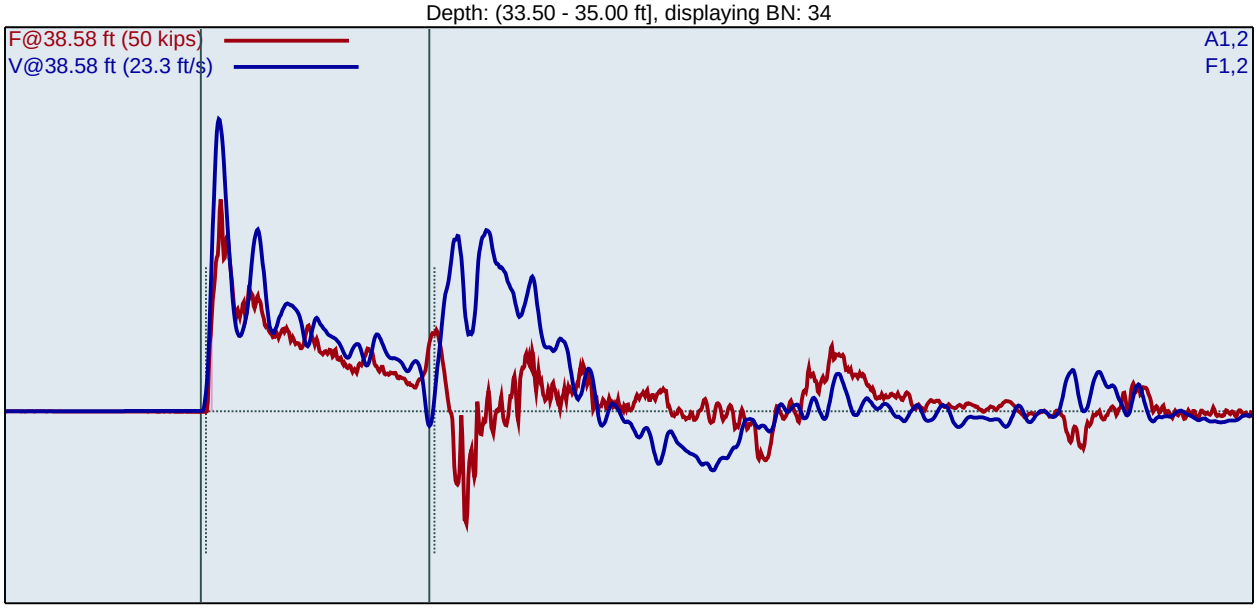
N-value: 20

Sample Interval Time: 28.54 seconds.

CME 750X ATV - SN322938 (R-58)
H. Forbes
AR: 1.20 in^2
LE: 38.58 ft
WS: 16807.9 ft/s

S&ME Annual Testing
Test date: 8/7/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 34



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	33.55	11	56.3	29	16.4	1.09	23.9	0.55	296.5	84.7
2	33.59	11	51.7	29	16.8	0.77	24.4	0.55	303.4	86.7
3	33.64	11	52.0	28	17.1	0.68	23.7	0.55	302.0	86.3
4	33.68	11	51.7	28	17.6	0.66	23.7	0.55	304.4	87.0
5	33.73	11	52.0	29	17.0	0.64	23.8	0.55	301.2	86.1
6	33.77	11	51.6	29	17.7	0.63	24.3	0.55	307.0	87.7
7	33.82	11	51.8	27	17.0	0.61	22.8	0.55	295.1	84.3
8	33.86	11	51.9	28	16.6	0.61	23.5	0.55	302.0	86.3
9	33.91	11	51.9	29	17.2	0.61	24.3	0.55	304.6	87.0
10	33.95	11	51.9	29	17.5	0.60	23.8	0.55	302.9	86.6
11	34.00	11	51.8	28	16.7	0.59	23.5	0.55	300.3	85.8
12	34.04	12	51.9	28	17.5	0.57	23.3	0.50	297.2	84.9
13	34.08	12	51.7	28	17.3	0.58	23.1	0.50	304.7	87.1
14	34.13	12	52.1	28	17.7	0.59	23.1	0.50	304.3	87.0
15	34.17	12	51.7	29	17.4	0.57	23.8	0.50	304.2	86.9
16	34.21	12	51.9	29	17.3	0.56	24.0	0.50	304.2	86.9
17	34.25	12	51.9	28	16.6	0.54	23.6	0.50	298.8	85.4
18	34.29	12	51.8	29	16.7	0.53	23.8	0.50	298.8	85.4
19	34.33	12	51.9	28	17.0	0.54	23.4	0.50	300.8	85.9
20	34.38	12	51.8	28	17.0	0.52	23.7	0.50	299.1	85.5
21	34.42	12	51.8	28	17.3	0.52	23.1	0.50	299.0	85.4
22	34.46	12	51.7	28	17.5	0.53	23.7	0.50	301.5	86.1
23	34.50	12	52.0	28	17.6	0.53	23.5	0.50	301.1	86.0
24	34.54	13	51.6	28	17.7	0.53	23.1	0.46	304.2	86.9
25	34.58	13	52.0	29	17.6	0.53	23.8	0.46	301.4	86.1

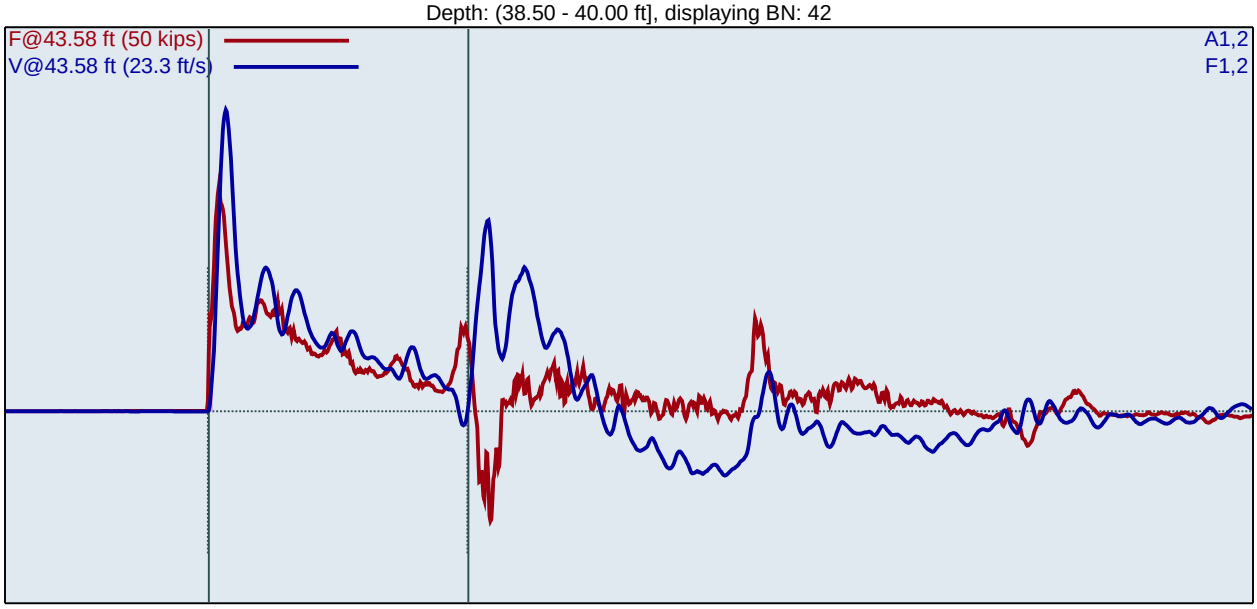
26	34.62	13	51.6	28	17.8	0.52	23.1	0.46	300.3	85.8
27	34.65	13	52.0	27	17.9	0.51	22.8	0.46	301.3	86.1
28	34.69	13	51.8	28	17.8	0.52	22.9	0.46	299.5	85.6
29	34.73	13	51.7	27	18.0	0.52	22.8	0.46	302.9	86.6
30	34.77	13	52.0	28	17.8	0.51	23.1	0.46	298.1	85.2
31	34.81	13	51.6	26	17.0	0.52	21.7	0.46	297.8	85.1
32	34.85	13	51.9	26	17.7	0.52	21.4	0.46	297.4	85.0
33	34.88	13	51.8	26	16.5	0.53	21.3	0.46	296.5	84.7
34	34.92	13	51.8	28	17.8	0.53	23.0	0.46	302.7	86.5
35	34.96	13	51.7	26	17.9	0.51	21.6	0.46	299.8	85.6
36	35.00	13	51.9	25	17.7	0.50	21.1	0.46	302.3	86.4
		Average	51.8	28	17.4	0.53	22.9	0.48	300.7	85.9
		Std Dev	0.1	1	0.4	0.02	0.8	0.02	2.5	0.7
		Maximum	52.1	29	18.0	0.59	24.0	0.50	304.7	87.1
		Minimum	51.6	25	16.5	0.50	21.1	0.46	296.5	84.7
				N-value: 25						

Sample Interval Time: 40.46 seconds.

CME 750X ATV - SN322938 (R-58)
H. Forbes
AR: 1.20 in^2
LE: 43.58 ft
WS: 16807.9 ft/s

S&ME Annual Testing
Test date: 8/7/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft], displaying BN: 42



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	38.54	13	59.6	28	18.3	0.97	23.7	0.46	296.6	84.7
2	38.58	13	51.2	28	18.2	0.80	23.0	0.46	299.5	85.6
3	38.62	13	51.5	28	17.9	0.76	22.9	0.46	295.4	84.4
4	38.65	13	51.1	28	18.2	0.74	23.4	0.46	298.5	85.3
5	38.69	13	51.3	28	18.4	0.72	23.2	0.46	297.5	85.0
6	38.73	13	51.3	28	17.4	0.70	23.3	0.46	295.4	84.4
7	38.77	13	51.3	27	18.2	0.68	22.9	0.46	294.9	84.3
8	38.81	13	51.5	29	18.0	0.66	24.5	0.46	297.0	84.9
9	38.85	13	51.7	29	18.2	0.64	24.3	0.46	298.7	85.3
10	38.88	13	51.7	27	17.9	0.62	22.9	0.46	297.2	84.9
11	38.92	13	51.7	29	18.1	0.61	23.8	0.46	297.1	84.9
12	38.96	13	51.7	29	18.2	0.59	24.3	0.46	295.6	84.5
13	39.00	13	51.5	29	18.3	0.59	23.9	0.46	297.1	84.9
14	39.04	14	51.8	29	17.9	0.57	24.1	0.43	297.1	84.9
15	39.07	14	51.5	29	18.4	0.56	24.3	0.43	297.6	85.0
16	39.11	14	51.7	28	18.2	0.56	23.6	0.43	297.2	84.9
17	39.14	14	51.5	28	18.1	0.55	23.6	0.43	295.0	84.3
18	39.18	14	51.6	28	17.8	0.55	23.7	0.43	297.3	85.0
19	39.21	14	51.7	28	18.1	0.54	23.3	0.43	294.4	84.1
20	39.25	14	51.6	29	18.1	0.54	24.2	0.43	296.3	84.7
21	39.29	14	51.6	28	18.0	0.53	23.0	0.43	294.3	84.1
22	39.32	14	51.5	30	17.8	0.53	25.1	0.43	296.6	84.7
23	39.36	14	51.8	28	17.8	0.52	23.1	0.42	293.8	84.0
24	39.39	14	51.5	30	17.8	0.52	24.7	0.43	298.5	85.3
25	39.43	14	51.7	27	17.7	0.52	22.7	0.43	295.1	84.3

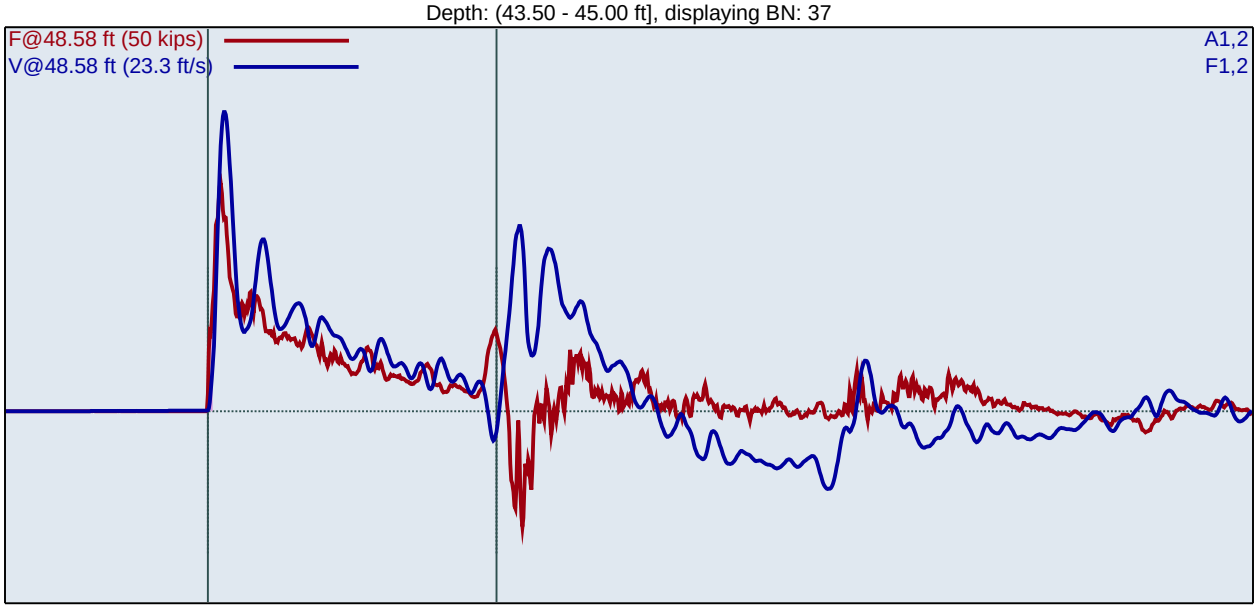
26	39.46	14	51.5	29	17.7	0.51	24.1	0.43	295.8	84.5
27	39.50	14	51.7	28	18.0	0.51	22.9	0.43	296.6	84.7
28	39.53	17	51.6	30	17.8	0.51	24.8	0.35	295.8	84.5
29	39.56	17	51.5	27	17.5	0.50	22.4	0.35	295.9	84.6
30	39.59	17	51.7	29	17.9	0.50	24.0	0.35	294.0	84.0
31	39.62	17	51.4	28	18.1	0.50	23.5	0.35	297.6	85.0
32	39.65	17	51.8	26	17.2	0.49	21.9	0.35	292.2	83.5
33	39.68	17	51.5	29	17.8	0.49	23.9	0.35	293.9	84.0
34	39.71	17	51.5	28	17.7	0.49	23.3	0.35	295.9	84.5
35	39.74	17	51.6	30	17.7	0.49	25.0	0.35	295.7	84.5
36	39.76	17	51.5	27	17.8	0.48	22.8	0.35	294.0	84.0
37	39.79	17	51.7	30	17.7	0.48	25.2	0.35	296.7	84.8
38	39.82	17	51.6	28	17.9	0.47	23.7	0.35	296.8	84.8
39	39.85	17	51.7	29	17.9	0.47	24.5	0.35	295.7	84.5
40	39.88	17	51.5	29	18.0	0.47	24.3	0.35	296.8	84.8
41	39.91	17	51.8	28	17.9	0.46	23.6	0.35	296.0	84.6
42	39.94	17	51.6	29	18.3	0.46	24.3	0.35	295.4	84.4
43	39.97	17	51.7	28	17.2	0.46	23.0	0.35	293.6	83.9
44	40.00	17	51.5	29	17.5	0.45	24.1	0.35	297.9	85.1
		Average	51.6	29	17.8	0.51	23.8	0.39	295.8	84.5
		Std Dev	0.1	1	0.3	0.03	0.8	0.04	1.5	0.4
		Maximum	51.8	30	18.4	0.57	25.2	0.43	298.5	85.3
		Minimum	51.4	26	17.2	0.45	21.9	0.35	292.2	83.5
					N-value: 31					

Sample Interval Time: 49.95 seconds.

CME 750X ATV - SN322938 (R-58)
H. Forbes
AR: 1.20 in^2
LE: 48.58 ft
WS: 16807.9 ft/s

S&ME Annual Testing
Test date: 8/7/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (43.50 - 45.00 ft], displaying BN: 37



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	43.55	10	59.9	29	17.7	1.08	24.5	0.60	304.6	87.0
2	43.60	10	51.9	28	17.5	0.78	23.7	0.60	298.4	85.2
3	43.65	10	51.8	30	17.9	0.77	24.7	0.60	302.6	86.4
4	43.70	10	52.0	29	18.4	0.77	24.3	0.60	308.2	88.1
5	43.75	10	51.8	30	18.4	0.71	25.2	0.60	305.0	87.1
6	43.80	10	51.9	29	18.1	0.71	24.4	0.60	303.5	86.7
7	43.85	10	51.9	30	18.4	0.70	24.9	0.60	310.5	88.7
8	43.90	10	52.0	30	18.2	0.68	24.6	0.60	305.7	87.3
9	43.95	10	51.5	29	17.8	0.67	24.5	0.60	309.1	88.3
10	44.00	10	51.9	31	18.4	0.67	26.0	0.60	312.2	89.2
11	44.04	12	51.9	30	18.1	0.64	25.3	0.50	306.2	87.5
12	44.08	12	51.7	29	17.9	0.62	24.0	0.50	309.0	88.3
13	44.13	12	51.9	30	18.0	0.59	24.8	0.50	301.6	86.2
14	44.17	12	51.6	31	18.3	0.60	25.5	0.50	313.4	89.5
15	44.21	12	52.0	30	18.2	0.58	24.9	0.50	302.7	86.5
16	44.25	12	51.7	30	17.9	0.59	24.9	0.50	311.4	89.0
17	44.29	12	51.8	30	18.3	0.59	25.2	0.50	309.4	88.4
18	44.33	12	51.8	30	17.9	0.59	25.2	0.50	312.3	89.2
19	44.38	12	51.8	29	17.9	0.57	24.4	0.50	303.9	86.8
20	44.42	12	51.7	30	17.8	0.56	24.9	0.50	305.4	87.3
21	44.46	12	51.7	29	17.9	0.56	24.3	0.50	304.9	87.1
22	44.50	12	52.1	29	17.7	0.56	24.3	0.50	305.3	87.2
23	44.53	17	51.7	31	18.1	0.56	25.7	0.35	306.8	87.7
24	44.56	17	52.1	29	17.8	0.55	24.6	0.35	305.1	87.2
25	44.59	17	51.4	30	18.3	0.56	24.8	0.35	311.8	89.1

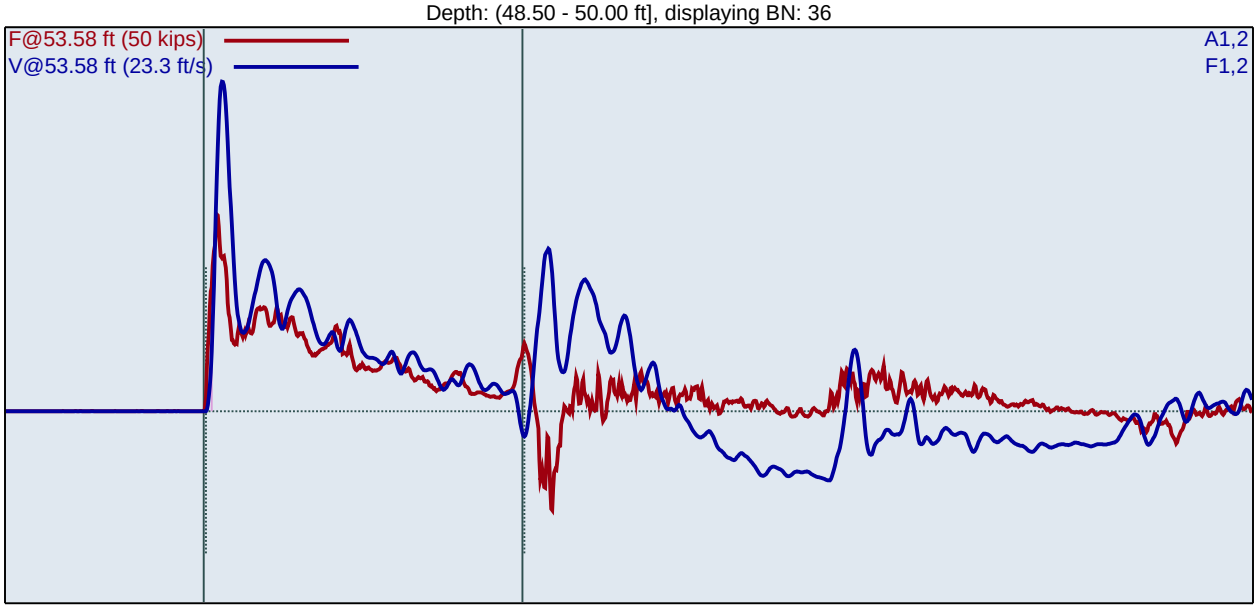
26	44.62	17	52.1	29	17.6	0.54	24.2	0.35	300.3	85.8
27	44.65	17	51.7	29	17.6	0.53	24.1	0.35	306.0	87.4
28	44.68	17	51.9	29	17.9	0.53	24.0	0.35	303.5	86.7
29	44.71	17	51.7	29	16.9	0.53	24.0	0.35	301.9	86.3
30	44.74	17	51.6	27	17.1	0.52	22.1	0.35	302.1	86.3
31	44.76	17	52.0	29	17.7	0.49	23.9	0.35	297.0	84.8
32	44.79	17	51.7	28	18.0	0.49	23.6	0.35	297.5	85.0
33	44.82	17	51.9	29	17.7	0.50	24.0	0.35	301.9	86.3
34	44.85	17	51.6	29	18.0	0.50	23.9	0.35	302.8	86.5
35	44.88	17	51.7	29	17.8	0.51	24.5	0.35	306.2	87.5
36	44.91	17	51.6	29	17.8	0.51	24.1	0.35	306.3	87.5
37	44.94	17	51.9	30	18.2	0.50	24.8	0.35	307.4	87.8
38	44.97	17	52.0	29	17.8	0.50	24.5	0.35	304.8	87.1
39	45.00	17	51.7	28	17.3	0.49	23.3	0.35	305.2	87.2
		Average	51.8	29	17.8	0.55	24.4	0.41	305.2	87.2
		Std Dev	0.2	1	0.3	0.04	0.7	0.07	4.0	1.1
		Maximum	52.1	31	18.3	0.64	25.7	0.50	313.4	89.5
		Minimum	51.4	27	16.9	0.49	22.1	0.35	297.0	84.8
					N-value: 29					

Sample Interval Time: 43.93 seconds.

CME 750X ATV - SN322938 (R-58)
H. Forbes
AR: 1.20 in^2
LE: 53.58 ft
WS: 16807.9 ft/s

S&ME Annual Testing
Test date: 8/7/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (48.50 - 50.00 ft], displaying BN: 36



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	48.56	8	52.4	27	19.9	1.03	22.4	0.75	312.1	89.2
2	48.63	8	52.1	26	19.2	0.92	21.7	0.75	309.0	88.3
3	48.69	8	51.8	27	20.0	0.89	22.5	0.75	316.4	90.4
4	48.75	8	52.0	27	19.6	0.82	22.6	0.75	309.3	88.4
5	48.81	8	51.9	27	19.9	0.81	22.7	0.75	314.9	90.0
6	48.88	8	51.9	27	19.7	0.77	22.5	0.75	310.8	88.8
7	48.94	8	52.1	27	19.9	0.77	22.6	0.75	314.0	89.7
8	49.00	8	52.0	27	19.8	0.76	22.8	0.75	313.9	89.7
9	49.04	12	52.2	27	19.6	0.67	22.7	0.50	309.4	88.4
10	49.08	12	51.9	28	19.6	0.65	23.2	0.50	309.7	88.5
11	49.13	12	52.0	28	19.4	0.64	23.3	0.50	311.6	89.0
12	49.17	12	51.9	27	19.3	0.64	22.7	0.50	311.2	88.9
13	49.21	12	52.0	27	19.4	0.63	22.5	0.50	309.2	88.3
14	49.25	12	51.8	28	19.4	0.62	23.2	0.50	310.9	88.8
15	49.29	12	51.9	27	19.3	0.62	22.8	0.50	310.3	88.7
16	49.33	12	52.0	28	19.6	0.61	23.0	0.50	310.0	88.6
17	49.38	12	51.8	27	19.6	0.60	22.5	0.50	306.8	87.7
18	49.42	12	52.0	26	20.0	0.60	21.5	0.50	310.1	88.6
19	49.46	12	51.8	26	19.1	0.59	21.9	0.50	309.8	88.5
20	49.50	12	52.0	26	19.9	0.58	21.8	0.50	309.4	88.4
21	49.53	18	51.8	27	19.9	0.60	22.1	0.33	318.1	90.9
22	49.56	18	52.0	27	19.8	0.56	22.3	0.33	306.3	87.5
23	49.58	18	51.9	27	18.7	0.59	22.9	0.33	317.4	90.7
24	49.61	18	51.9	26	19.7	0.56	22.0	0.33	305.1	87.2
25	49.64	18	51.9	26	19.5	0.57	21.7	0.33	312.1	89.2

26	49.67	18	51.5	24	19.1	0.55	20.2	0.33	303.5	86.7
27	49.69	18	52.1	26	19.9	0.56	21.8	0.33	311.5	89.0
28	49.72	18	51.7	25	20.0	0.55	21.2	0.33	311.9	89.1
29	49.75	18	52.0	26	20.3	0.54	21.8	0.33	310.6	88.7
30	49.78	18	51.8	26	19.5	0.53	21.7	0.33	304.6	87.0
31	49.81	18	52.0	24	20.4	0.53	20.4	0.33	312.1	89.2
32	49.83	18	51.9	26	20.1	0.53	22.1	0.33	311.7	89.1
33	49.86	18	52.2	26	19.2	0.51	21.4	0.33	302.3	86.4
34	49.89	18	51.8	25	20.3	0.51	21.0	0.33	310.3	88.6
35	49.92	18	51.7	25	20.1	0.50	21.2	0.33	308.1	88.0
36	49.94	18	51.9	26	20.0	0.50	21.4	0.33	309.2	88.4
37	49.97	18	51.5	26	20.6	0.51	21.5	0.33	313.8	89.6
38	50.00	18	51.9	25	19.9	0.49	21.0	0.33	303.3	86.7
		Average	51.9	26	19.7	0.57	22.0	0.40	309.7	88.5
		Std Dev	0.2	1	0.4	0.05	0.8	0.08	3.6	1.0
		Maximum	52.2	28	20.6	0.67	23.3	0.50	318.1	90.9
		Minimum	51.5	24	18.7	0.49	20.2	0.33	302.3	86.4
					N-value: 30					

Sample Interval Time: 42.70 seconds.

Summary of SPT Test Results

Project: CME 750X ATV - SN322938 (R-58), Test Date: 8/7/2017

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR (%)
33.58	28.50	30.00	**5-8-12**	**20**	**28**	50.4	29	17.8	0.83	23.9	0.60	290.2	82.9
38.58	33.50	35.00	**11-12-13**	**25**	**35**	51.8	28	17.4	0.53	22.9	0.48	300.7	85.9
43.58	38.50	40.00	**13-14-17**	**31**	**44**	51.6	29	17.8	0.51	23.8	0.39	295.8	84.5
48.58	43.50	45.00	**10-12-17**	**29**	**41**	51.8	29	17.8	0.55	24.4	0.41	305.2	87.2
53.58	48.50	50.00	**8-12-18**	**30**	**42**	51.9	26	19.7	0.57	22.0	0.40	309.7	88.5
			Overall Average Values:			51.6	28	18.2	0.58	23.4	0.44	301.0	86.0
			Standard Deviation:			0.5	1	0.9	0.11	1.2	0.10	7.3	2.1
			Overall Maximum Value:			52.2	31	20.6	0.95	25.7	0.75	318.1	90.9
			Overall Minimum Value:			50.2	24	16.5	0.45	20.2	0.33	283.7	81.1

Report of SPT Energy Measurements
S&ME CME-55 Truck (SN 328245)
Fayetteville, North Carolina
S&ME Project No. 6235-17-009

Prepared for:

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

Prepared by:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, NC 28273

May 1, 2017

May 1, 2017

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

Attention: Mr. Shunyi (Chris) Chen, Ph.D., P.E.

cc: Ms. Cheryl A. Youngblood, L.G.

Reference: **Report of SPT Energy Measurements**
S&ME CME-55 Truck (SN 328245)
Fayetteville, North Carolina
S&ME Project No. 6235-17-009

Dear Mr. Chen:

We have completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer mounted on our CME-55 Truck drill rig with a serial number of 328245. This service was performed by our Mr. Robert E. Kral on April 4, 2017 between the times of 11:39 AM and 12:40 PM. SPT energy testing was performed in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation, Geotechnical Engineering Unit's requirements. The testing procedures, equipment used during testing, and detailed results are presented in this report.

1.0 Dynamic Testing Methodology

Testing was performed using a model PAX (Serial No. 3733L) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA records and interprets data from two piezoresistive accelerometers (Serial Nos. K5641 and K5642) bolted to a 2-foot long AWJ drill rod (SN203) internally instrumented with two strain transducers. The instrumented AWJ drill rod has a cross-sectional area of 1.20 square inches, an outside diameter of approximately 1.75 inches, and an inside diameter of 1.375 inches at the gage location. Calibration sheets for the accelerometers and the instrumented rod are included in the Appendix. The accelerometers and strain gages, which are mounted on opposing axes near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces, computing the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. All results are recorded and displayed in real time for each blow.

2.0 Testing and Observations

S&ME personnel were on site on April 4, 2017 to observe and perform testing during SPT sampling on the CME-55 truck mounted rig operated by Ted Miller of S&ME. The measurements were taken during drilling operations at the Fayetteville Outer Loop (TIP U-2519AA) project in Fayetteville, North Carolina. The measurements were obtained during the SPT sampling of Soil Test Boring Y2_2800. SPT energy measurements were recorded during four intervals at depths of approximately 57.6, 62.6, 67.6, and 72.6 ft below the existing ground surface. The information presented in the tables below summarizes the equipment tested and tooling used for this Report of SPT Energy Measurements.

Table 2-1: Drill Rig Information

Manufacturer	CME
Model	55
Serial Number	328245
Operator	Ted Miller
Carrier	Truck

Table 2-2: Hammer Information

Model / Type	CME / Auto
Serial Number	N/A
Anvil Height (inches)	11.5
Anvil Diameter (inches)	2.5
Drop Height (inches)	30
Ram Weight (pounds)	140
Ram Serial Number	N/A

Table 2-3: Drilling and Instrumented Rod Information

Drill Rod Type	AWJ
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.20
Typical Length (feet)	5 and 10
Instrumented Rod Type	AWJ (SN 203)
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.20
Total Instrumented Rod Length (feet)	2.0
Length Below Gages (feet)	0.88
Split Spoon Length (feet)	2.88

The reported blow counts, obtained by the drill rig personnel, are presented with the energy data in Table 3-1 and on the Field and Boring Logs in the Appendix. A representative graph of force and normalized velocity vs. time for a typical blow and the following list of plots and tables are incorporated into the Appendix.

3.0 Dynamic Testing Results

Based on the test data, the automatic hammer on the CME-55 truck mounted rig operated at a rate of about 51.6 to 52.2 blows per minute (bpm) during dynamic testing. The measured transferred hammer energy (EFV) was generally in the range of about 267.1 to 307.3 ft-lbs, which corresponds to Energy Transfer Ratio (ETR) values of about 76.3% to 87.8%, respectively. The SPT Energy Measurement Data Summary tables in the Appendix present the test data from every hammer blow at each sampling interval along with representative force and velocity traces for each test interval. The reported blow counts, obtained by the drill rig personnel, and a summary of the test data and average computed hammer energy and transfer ratio values are provided in Table 3-1. Plots and tables of the following are also included in the Appendix and present the test data with depth for each test interval:

- Penetration vs. BLC
- Penetration vs. FMX
- Penetration vs. EFV
- Penetration vs. CSX
- Penetration vs. VMX
- Penetration vs. ETR
- Average ETR vs. Rod Length
- ETR vs. Rod Length

Table 3-1: Summary of Dynamic Testing Results

Data Set ID	Instrumentation to Sampler Tip Length (ft)	Sample Depth (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Residual)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (percent)
1	63.76	57.6 - 59.1	7-10-9 / 19	SAND	51.9	286.9	82.0
2	68.76	62.6 - 64.1	9-10-12 / 22	SAND	52.0	298.6	85.3
3	73.76	67.6 - 69.1	6-13-17 / 30	SAND	51.9	295.9	84.5
4	78.76	72.6 - 74.1	6-11-10 / 21	SAND	51.9	294.8	84.2
				Overall Average	**51.9**	**294.4**	**84.1**

The average hammer rate, transferred energy, and transfer ratio were calculated for each depth interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e. the blows that determine the N-value) were included when computing these average values. **The overall average transferred hammer energy for the automatic hammer on the CME-55 truck mounted rig (for all the depth intervals tested) was 294.4 foot-pounds, with an average ETR of 84.1%.**

4.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

5.0 Closing

S&ME appreciates the opportunity to provide this report to the North Carolina Department of Transportation Geotechnical Engineering Unit. Please let us know if you have any questions concerning this report.

Sincerely,

S&ME, Inc.

R. Heath Forbes, P.E. (SC)
Geotechnical Project Manager

NORTH CAROLINA PROFESSIONAL SEAL 042642 ENGINEER ROBERT E. KRAL
rkral@sandmeinc.com
2017.05.01 17:16:49 -05'00'

Robert E. Kral, P.E.
Transportation Services Project Manager
N.C. Registration No. 042642

Senior Reviewed By: Kristen H. Hill, L.G., P.E.

Appendices:

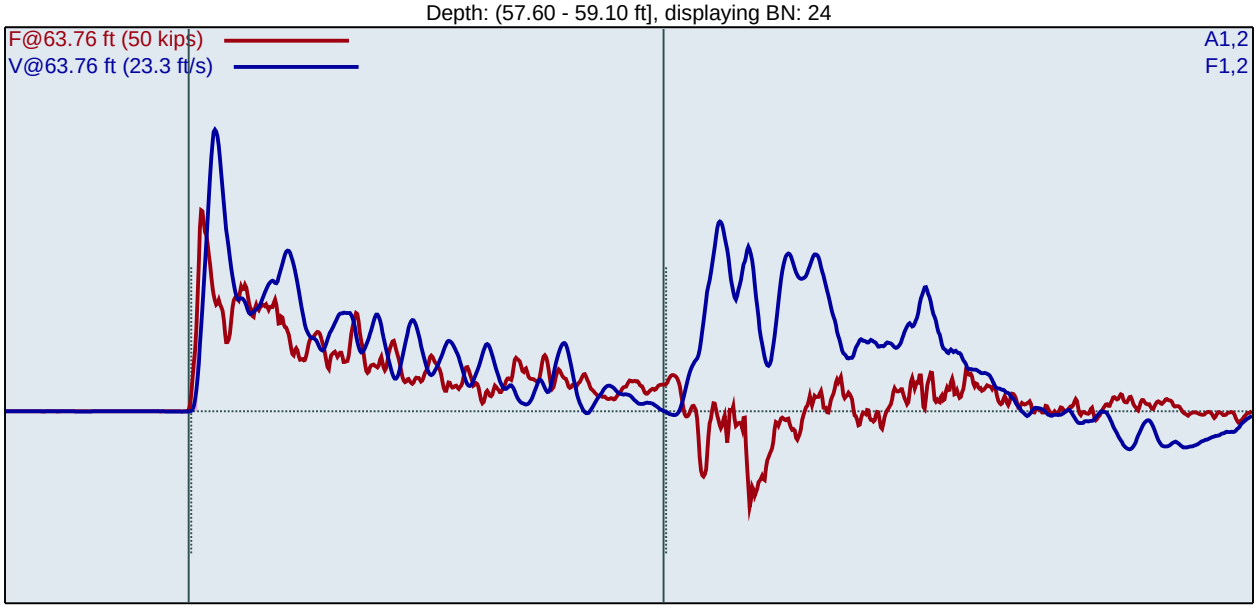
- Appendix I - CME 55 (SN 328245) SPT Energy Measurements Summary Plots and Tables
- Appendix II - Field Log and Boring Log
- Appendix III - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix IV - Certificate of Proficiency

Appendix I

CME55 Truck (SN 328245)
R. Kral
AR: 1.20 in^2
LE: 63.76 ft
WS: 16807.9 ft/s

28+00, 20LT
Test date: 4/4/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (57.60 - 59.10 ft], displaying BN: 24



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

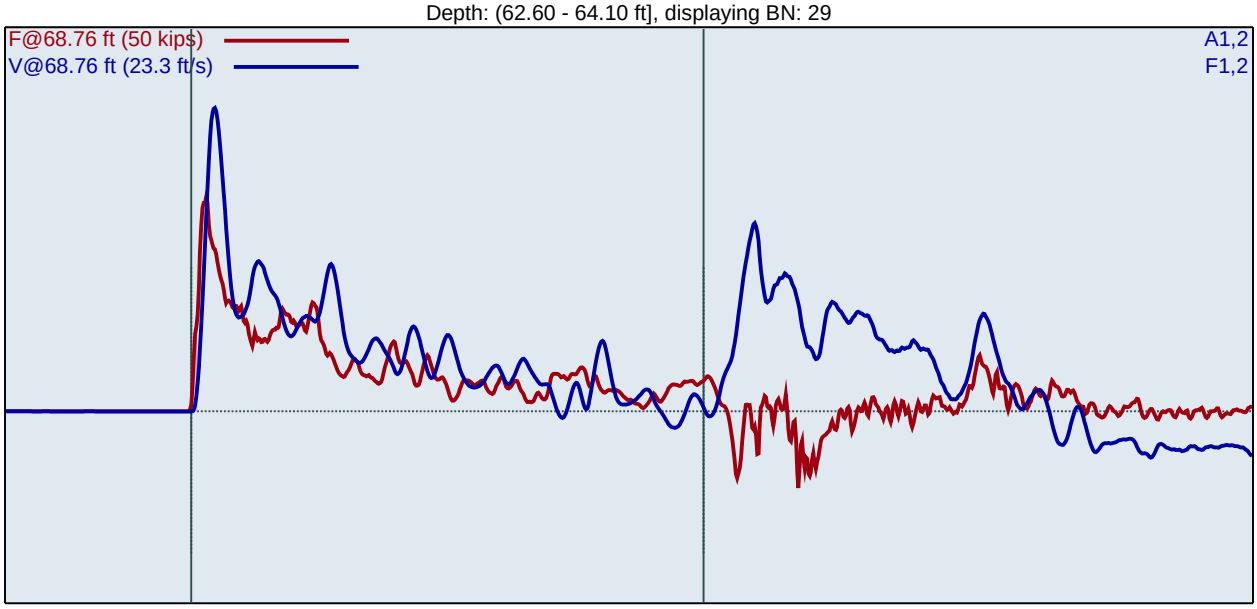
BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	57.67	7	60.7	27	14.5	1.02	22.9	0.78	247.9	70.8
2	57.74	7	52.7	27	14.5	1.03	22.2	0.82	266.7	76.2
3	57.81	7	52.0	27	14.5	0.84	22.7	0.81	255.9	73.1
4	57.89	7	51.8	27	14.6	0.82	22.7	0.81	266.4	76.1
5	57.96	7	52.2	27	14.9	0.81	22.6	0.81	264.2	75.5
6	58.03	7	52.0	27	15.1	0.83	22.8	0.82	275.9	78.8
7	58.10	7	52.1	27	15.5	0.86	22.7	0.83	286.6	81.9
8	58.15	10	51.9	27	15.9	0.70	22.9	0.57	280.6	80.2
9	58.20	10	51.9	27	15.8	0.67	22.5	0.56	275.1	78.6
10	58.25	10	52.0	27	15.9	0.67	22.6	0.56	273.4	78.1
11	58.30	10	51.9	28	16.0	0.68	23.0	0.57	275.0	78.6
12	58.35	10	52.0	28	16.3	0.78	23.2	0.56	290.9	83.1
13	58.40	10	51.7	28	16.5	0.69	23.1	0.57	279.9	80.0
14	58.45	10	52.2	28	16.5	0.67	23.5	0.57	274.3	78.4
15	58.50	10	51.7	27	16.6	0.77	22.8	0.57	292.7	83.6
16	58.55	10	52.1	27	16.5	0.75	22.5	0.57	290.2	82.9
17	58.60	10	52.2	27	16.3	0.74	22.6	0.57	287.9	82.3
18	58.66	9	51.7	27	16.3	0.76	22.2	0.63	294.5	84.2
19	58.71	9	52.0	27	16.3	0.73	22.2	0.65	289.5	82.7
20	58.77	9	51.9	25	16.5	0.74	20.8	0.64	292.3	83.5
21	58.82	9	51.9	27	16.2	0.72	22.3	0.64	290.6	83.0
22	58.88	9	51.9	26	17.3	0.71	21.9	0.64	295.6	84.5
23	58.93	9	52.2	27	16.8	0.71	22.3	0.64	290.4	83.0
24	58.99	9	51.9	26	17.1	0.71	21.8	0.64	291.7	83.4
25	59.04	9	52.0	25	16.9	0.71	21.1	0.64	293.0	83.7

26	59.10	9	51.9	25	16.1	0.70	20.6	0.64	293.7	83.9
		Average	51.9	27	16.4	0.72	22.3	0.60	286.9	82.0
		Std Dev	0.1	1	0.4	0.03	0.8	0.04	7.5	2.1
		Maximum	52.2	28	17.3	0.78	23.5	0.65	295.6	84.5
		Minimum	51.7	25	15.8	0.67	20.6	0.56	273.4	78.1
					N-value: 19					

Sample Interval Time: 28.81 seconds.

CME55 Truck (SN 328245) — 28+00, 20LT
R. Kral — Test date: 4/4/2017
AR: 1.20 in^2 — SP: 0.492 k/ft3
LE: 68.76 ft — EM: 30000 ksi
WS: 16807.9 ft/s

Depth: (62.60 - 64.10 ft], displaying BN: 29



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	62.66	9	61.1	27	16.9	0.69	22.6	0.61	261.9	74.8
2	62.71	9	52.2	27	17.0	0.69	22.8	0.62	269.8	77.1
3	62.77	9	52.1	28	17.2	0.70	23.0	0.63	277.9	79.4
4	62.82	9	51.7	28	17.1	0.67	23.7	0.63	275.2	78.6
5	62.88	9	52.1	30	17.7	0.67	24.6	0.63	280.4	80.1
6	62.93	9	51.9	29	18.1	0.73	24.2	0.64	295.0	84.3
7	62.99	9	52.1	27	18.1	0.68	22.7	0.63	289.4	82.7
8	63.04	9	52.0	28	17.9	0.68	23.6	0.63	284.1	81.2
9	63.10	9	51.8	27	17.8	0.72	22.1	0.64	291.3	83.2
10	63.15	10	52.1	26	17.7	0.68	22.1	0.57	288.0	82.3
11	63.20	10	51.8	27	17.9	0.64	22.6	0.56	281.8	80.5
12	63.25	10	52.0	26	17.5	0.72	21.9	0.56	297.4	85.0
13	63.30	10	51.7	26	17.7	0.73	21.9	0.56	296.1	84.6
14	63.35	10	52.1	26	17.4	0.67	21.6	0.57	291.3	83.2
15	63.40	10	51.8	27	17.8	0.67	22.4	0.57	291.6	83.3
16	63.45	10	52.1	27	17.9	0.71	22.4	0.57	299.7	85.6
17	63.50	10	52.0	27	18.0	0.62	22.7	0.57	286.6	81.9
18	63.55	10	51.9	28	18.1	0.67	23.0	0.58	300.7	85.9
19	63.60	10	52.0	27	17.9	0.68	22.5	0.57	297.1	84.9
20	63.64	12	51.8	28	18.5	0.68	23.5	0.48	300.2	85.8
21	63.68	12	51.9	28	18.5	0.68	23.6	0.48	304.5	87.0
22	63.73	12	51.9	28	18.6	0.67	23.3	0.48	305.1	87.2
23	63.77	12	52.2	28	18.3	0.67	23.4	0.47	304.9	87.1
24	63.81	12	51.8	28	18.4	0.67	23.1	0.47	306.8	87.7
25	63.85	12	52.2	28	18.2	0.64	23.0	0.47	301.2	86.1

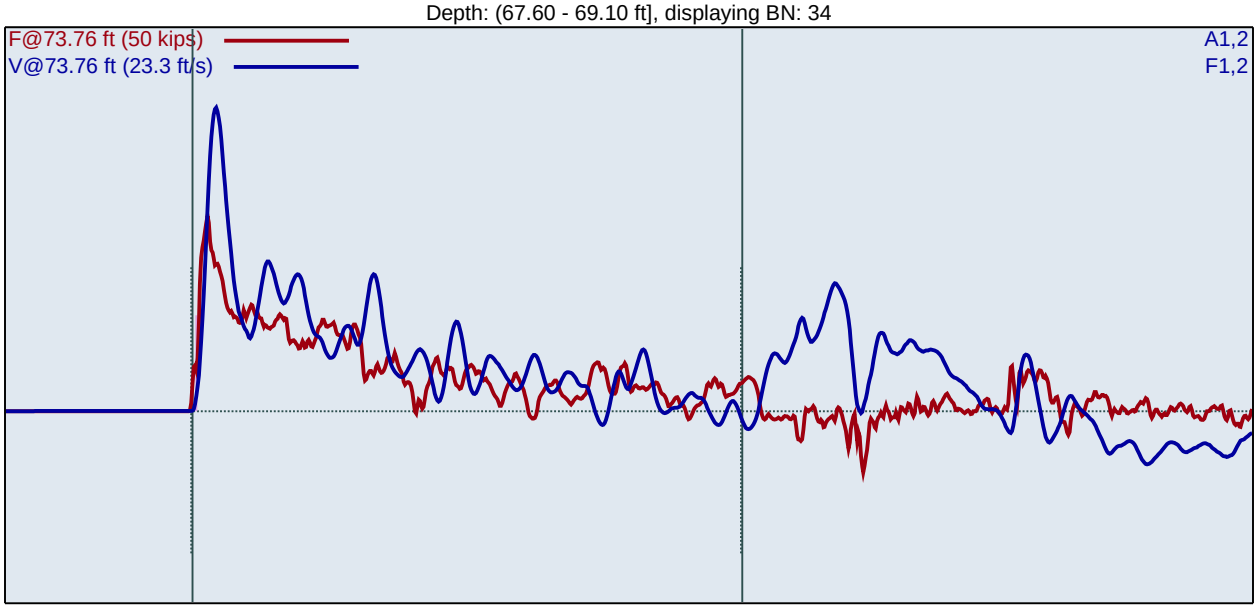
26	63.89	12	51.8	28	18.2	0.64	23.1	0.47	300.9	86.0
27	63.93	12	52.0	28	18.3	0.64	23.1	0.47	301.1	86.0
28	63.98	12	51.9	28	18.4	0.65	23.0	0.47	306.1	87.4
29	64.02	12	51.9	28	18.4	0.64	23.3	0.47	304.6	87.0
30	64.06	12	52.1	28	18.4	0.64	23.0	0.47	303.1	86.6
31	64.10	12	51.9	27	18.2	0.63	22.9	0.47	301.4	86.1
		Average	52.0	27	18.1	0.67	22.8	0.52	298.6	85.3
		Std Dev	0.1	1	0.3	0.03	0.5	0.05	6.7	1.9
		Maximum	52.2	28	18.6	0.73	23.6	0.58	306.8	87.7
		Minimum	51.7	26	17.4	0.62	21.6	0.47	281.8	80.5
					N-value: 22					

Sample Interval Time: 34.59 seconds.

CME55 Truck (SN 328245)
R. Kral
AR: 1.20 in^2
LE: 73.76 ft
WS: 16807.9 ft/s

28+00, 20LT
Test date: 4/4/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (67.60 - 69.10 ft], displaying BN: 34



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	67.68	6	107.6	26	17.9	1.46	22.0	0.93	302.9	86.5
2	67.77	6	52.5	27	18.4	1.25	22.6	0.94	298.6	85.3
3	67.85	6	51.6	26	17.8	1.10	22.0	0.95	295.1	84.3
4	67.93	6	52.1	27	18.0	1.00	22.3	0.97	297.0	84.8
5	68.02	6	52.0	27	18.1	0.96	22.3	0.96	298.5	85.3
6	68.10	6	51.7	27	18.2	0.97	22.3	0.97	297.2	84.9
7	68.14	13	52.0	26	17.9	0.81	21.8	0.43	296.1	84.6
8	68.18	13	52.0	26	18.3	0.62	21.4	0.42	274.8	78.5
9	68.22	13	51.8	26	18.2	0.59	22.1	0.42	274.6	78.5
10	68.25	13	52.2	25	18.2	0.55	20.8	0.42	267.1	76.3
11	68.29	13	52.0	25	18.3	0.57	21.0	0.42	271.7	77.6
12	68.33	13	51.9	26	18.1	0.59	21.4	0.43	282.2	80.6
13	68.37	13	51.8	25	17.7	0.61	20.6	0.44	291.8	83.4
14	68.41	13	51.7	25	17.5	0.54	20.8	0.44	289.3	82.7
15	68.45	13	52.1	26	18.2	0.53	21.4	0.44	298.8	85.4
16	68.48	13	51.9	24	17.6	0.53	19.7	0.44	294.4	84.1
17	68.52	13	51.9	25	18.0	0.52	20.5	0.44	296.4	84.7
18	68.56	13	51.6	24	17.8	0.52	20.2	0.44	300.1	85.7
19	68.60	13	52.1	24	17.4	0.51	20.3	0.44	298.5	85.3
20	68.63	17	51.8	24	17.3	0.51	19.7	0.33	299.4	85.5
21	68.66	17	52.1	24	17.5	0.52	20.1	0.34	298.9	85.4
22	68.69	17	51.8	26	18.3	0.49	21.3	0.33	296.4	84.7
23	68.72	17	51.9	24	17.7	0.53	20.2	0.33	302.2	86.3
24	68.75	17	51.9	25	17.7	0.54	20.7	0.33	302.7	86.5
25	68.78	17	51.9	23	17.3	0.54	19.5	0.33	300.3	85.8

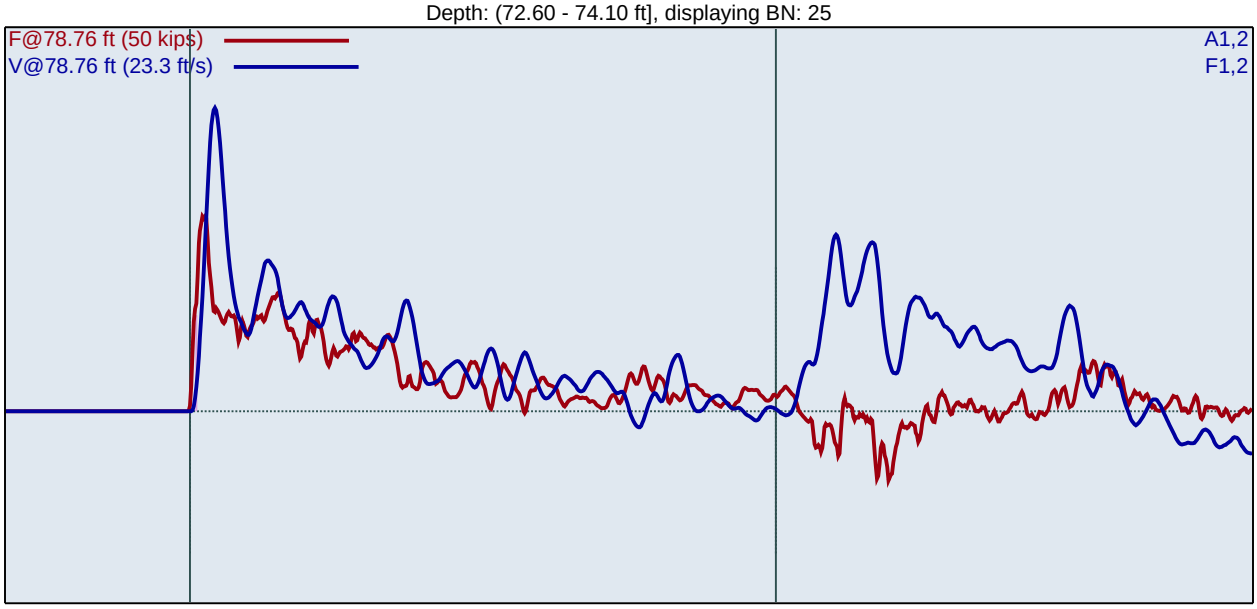
26	68.81	17	51.8	25	17.6	0.54	20.7	0.33	302.2	86.3
27	68.84	17	52.0	26	18.3	0.53	21.8	0.33	305.8	87.4
28	68.86	17	52.1	24	17.8	0.55	20.0	0.33	302.1	86.3
29	68.89	17	51.9	26	18.4	0.54	21.5	0.33	305.1	87.2
30	68.92	17	52.1	26	17.8	0.54	21.5	0.33	298.9	85.4
31	68.95	17	51.8	26	18.6	0.53	21.6	0.33	301.3	86.1
32	68.98	17	51.8	25	18.2	0.54	21.2	0.33	301.2	86.1
33	69.01	17	51.6	25	18.1	0.54	20.8	0.33	304.1	86.9
34	69.04	17	51.9	25	18.5	0.54	21.2	0.33	305.7	87.3
35	69.07	17	51.6	25	17.9	0.55	20.8	0.33	306.3	87.5
36	69.10	17	51.7	26	18.1	0.54	21.3	0.33	307.3	87.8
		Average	51.9	25	17.9	0.55	20.9	0.38	295.9	84.5
		Std Dev	0.2	1	0.4	0.06	0.7	0.05	10.7	3.1
		Maximum	52.2	26	18.6	0.81	22.1	0.44	307.3	87.8
		Minimum	51.6	23	17.3	0.49	19.5	0.33	267.1	76.3
					N-value: 30					

Sample Interval Time: 40.39 seconds.

CME55 Truck (SN 328245)
R. Kral
AR: 1.20 in^2
LE: 78.76 ft
WS: 16807.9 ft/s

28+00, 20LT
Test date: 4/4/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (72.60 - 74.10 ft], displaying BN: 25



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	72.68	6	60.7	26	18.7	1.34	21.6	0.94	303.1	86.6
2	72.77	6	52.6	25	17.9	1.18	20.9	0.95	297.0	84.9
3	72.85	6	52.2	27	17.8	1.01	22.1	0.96	292.2	83.5
4	72.93	6	52.0	24	17.9	1.00	19.9	0.96	290.9	83.1
5	73.02	6	51.9	23	18.0	0.96	19.2	0.96	297.6	85.0
6	73.10	6	52.1	24	18.4	0.96	20.0	0.96	296.8	84.8
7	73.15	11	51.8	23	18.1	0.76	19.4	0.50	296.0	84.6
8	73.19	11	52.1	24	18.6	0.76	20.2	0.50	297.6	85.0
9	73.24	11	51.7	25	18.9	0.74	20.8	0.51	298.2	85.2
10	73.28	11	52.2	24	18.3	0.72	19.8	0.51	297.6	85.0
11	73.33	11	52.0	24	19.1	0.71	20.1	0.51	297.5	85.0
12	73.37	11	52.2	25	19.4	0.71	21.1	0.51	296.2	84.6
13	73.42	11	51.7	23	18.5	0.72	19.5	0.51	295.7	84.5
14	73.46	11	51.9	26	18.9	0.72	21.9	0.51	298.1	85.2
15	73.51	11	52.1	25	19.6	0.72	20.8	0.51	297.2	84.9
16	73.55	11	51.8	26	19.0	0.71	21.7	0.51	294.0	84.0
17	73.60	11	52.0	26	20.0	0.72	21.8	0.51	299.1	85.5
18	73.65	10	52.0	26	19.3	0.71	21.4	0.57	294.4	84.1
19	73.70	10	52.1	25	19.1	0.70	20.6	0.57	290.9	83.1
20	73.75	10	51.7	25	20.2	0.70	21.0	0.57	297.5	85.0
21	73.80	10	52.0	27	19.1	0.69	22.3	0.58	290.9	83.1
22	73.85	10	52.0	25	18.9	0.70	21.2	0.58	293.6	83.9
23	73.90	10	52.0	26	18.8	0.69	21.4	0.58	292.7	83.6
24	73.95	10	52.1	25	18.9	0.68	20.9	0.58	288.9	82.5
25	74.00	10	51.6	25	18.4	0.68	21.1	0.58	288.7	82.5

26	74.05	10	52.1	25	18.9	0.69	21.0	0.57	294.1	84.0
27	74.10	10	51.8	25	19.2	0.68	20.7	0.58	291.6	83.3
		Average	51.9	25	19.0	0.71	20.9	0.54	294.8	84.2
		Std Dev	0.2	1	0.5	0.02	0.7	0.03	3.1	0.9
		Maximum	52.2	27	20.2	0.76	22.3	0.58	299.1	85.5
		Minimum	51.6	23	18.1	0.68	19.4	0.50	288.7	82.5
					N-value: 21					

Sample Interval Time: 29.95 seconds.

Summary of SPT Test Results

Project: CME55 Truck (SN 328245), Test Date: 4/4/2017

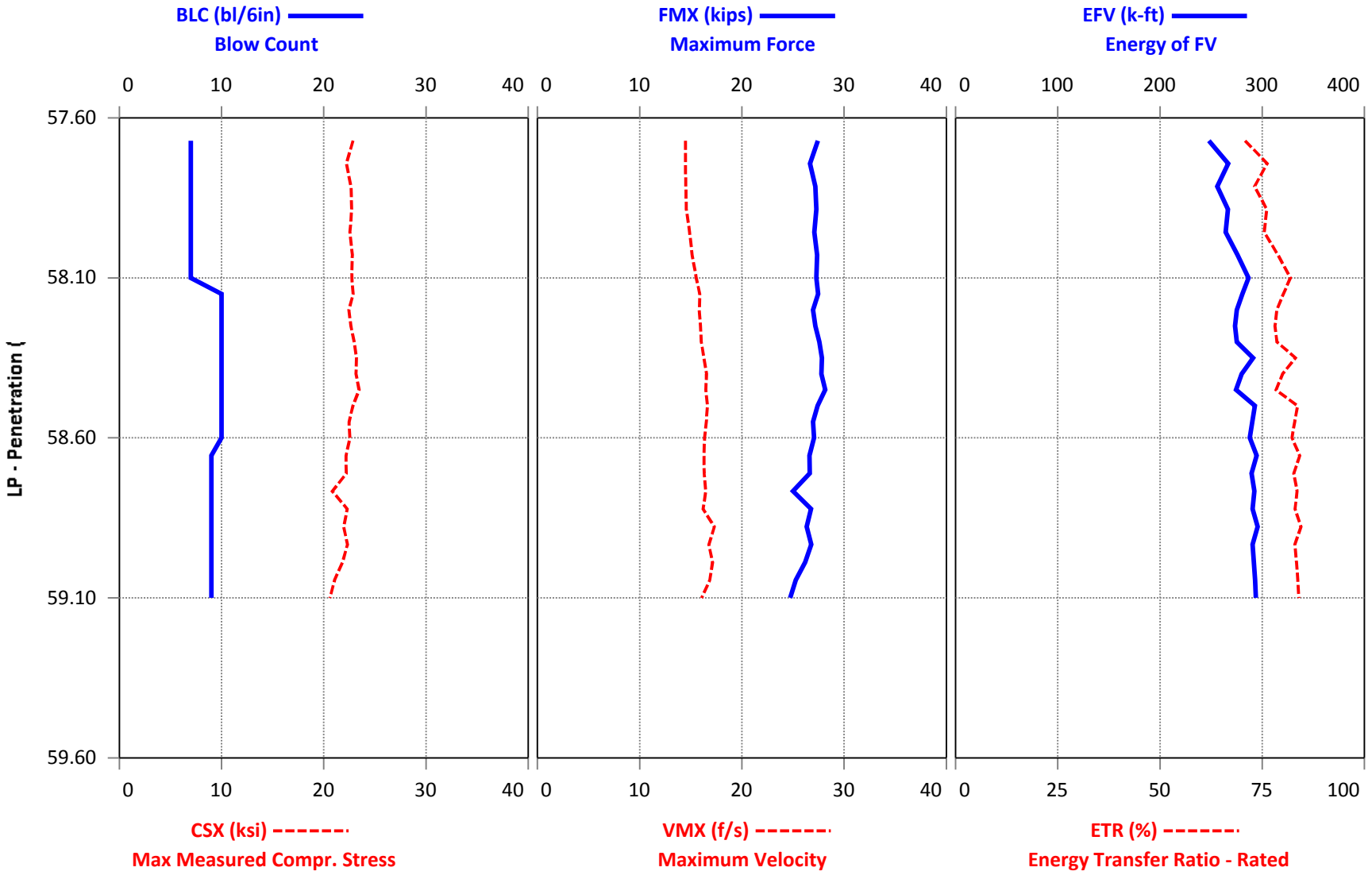
BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR (%)
63.76	57.60	59.10	**7-10-9**	**19**	**26**	51.9	27	16.4	0.72	22.3	0.60	286.9	82.0
68.76	62.60	64.10	**9-10-12**	**22**	**30**	52.0	27	18.1	0.67	22.8	0.52	298.6	85.3
73.76	67.60	69.10	**6-13-17**	**30**	**42**	51.9	25	17.9	0.55	20.9	0.38	295.9	84.5
78.76	72.60	74.10	**6-11-10**	**21**	**29**	51.9	25	19.0	0.71	20.9	0.54	294.8	84.2
				Overall Average Values:		51.9	26	17.9	0.65	21.6	0.49	294.4	84.1
				Standard Deviation:		0.2	1	1.0	0.08	1.1	0.10	8.9	2.5
				Overall Maximum Value:		52.2	28	20.2	0.81	23.6	0.65	307.3	87.8
				Overall Minimum Value:		51.6	23	15.8	0.49	19.4	0.33	267.1	76.3

Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

S&ME Printed: 25-April-2017 Test started: 04-April-2017

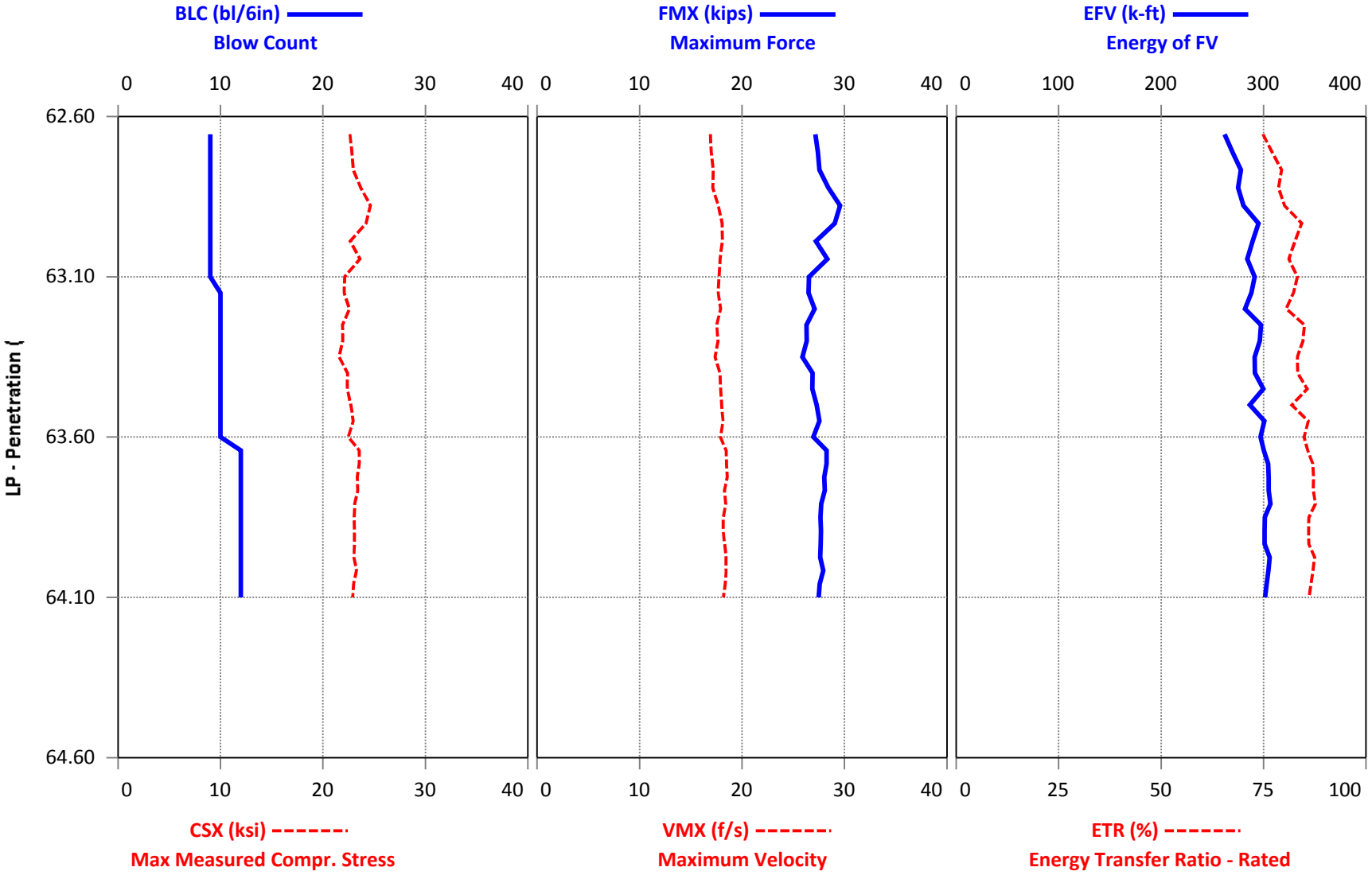
CME55 Truck (SN 328245) - 57.6 to 59.1 ft
28+00, 20LT



Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

S&ME Printed: 25-April-2017 Test started: 04-April-2017

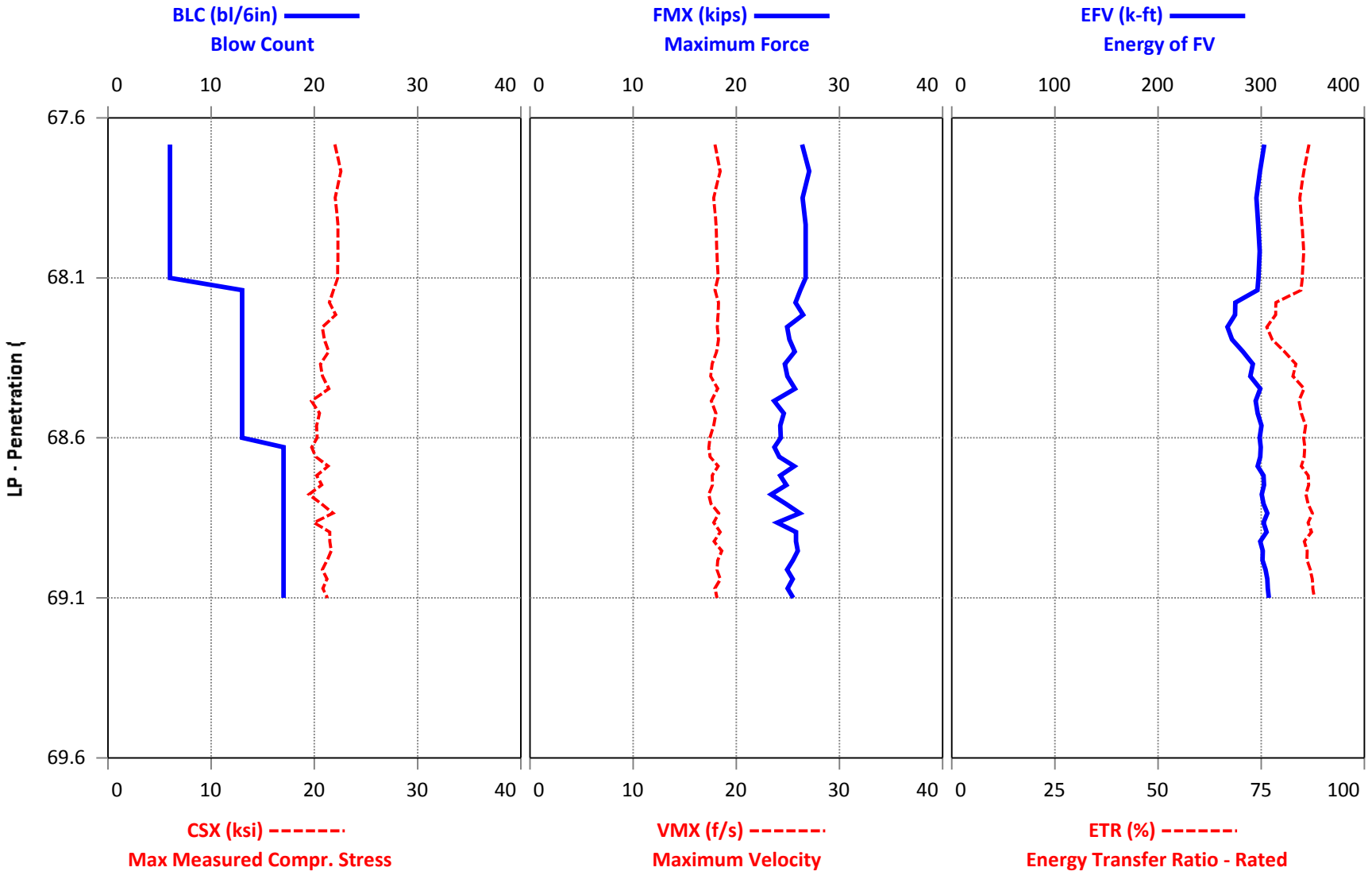
CME55 Truck (SN 328245) - 62.6 to 64.1 ft
28+00, 20LT



Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

S&ME Printed: 25-April-2017 Test started: 04-April-2017

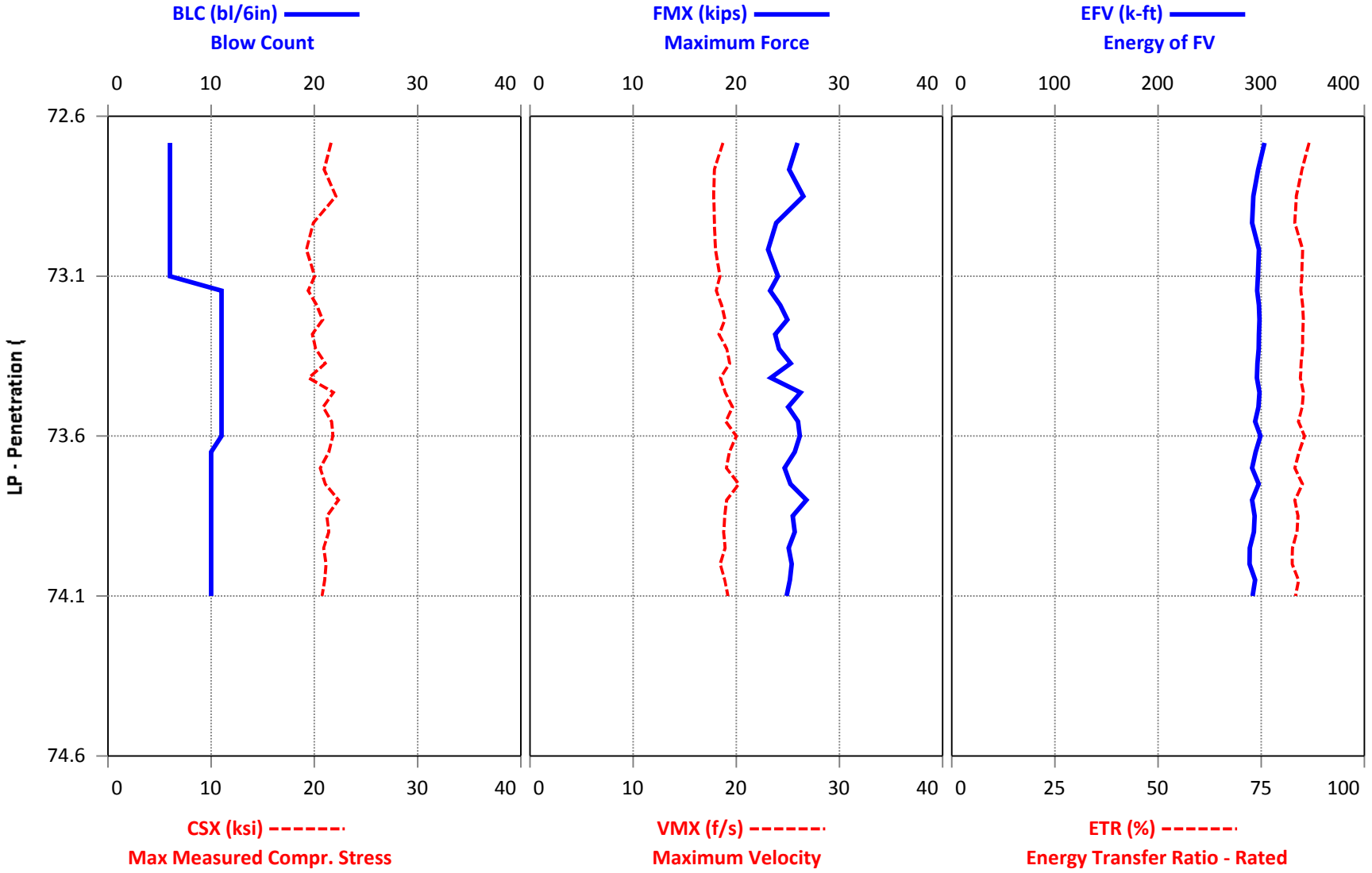
CME55 Truck (SN 328245) - 67.6 to 69.1 ft
28+00, 20LT

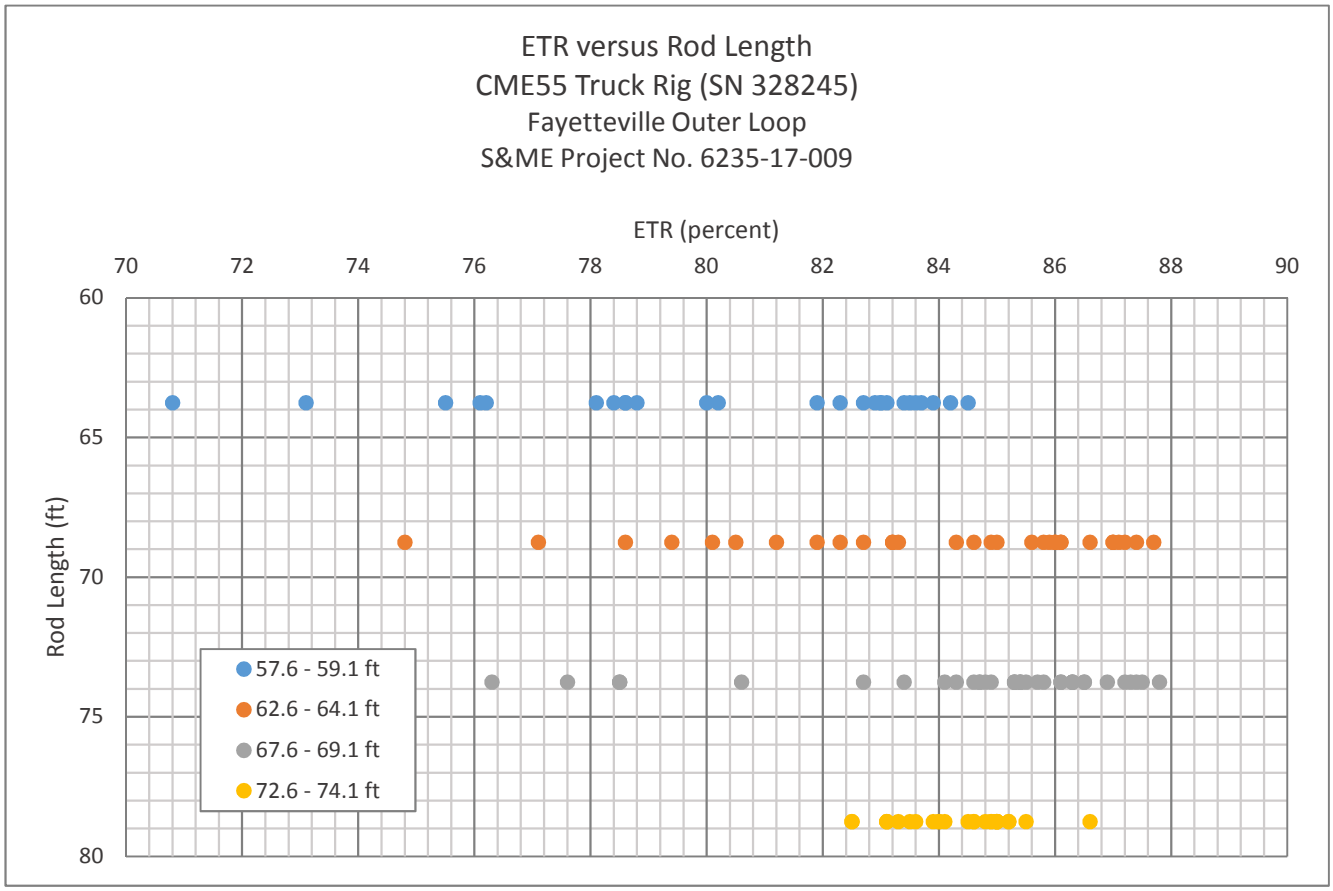


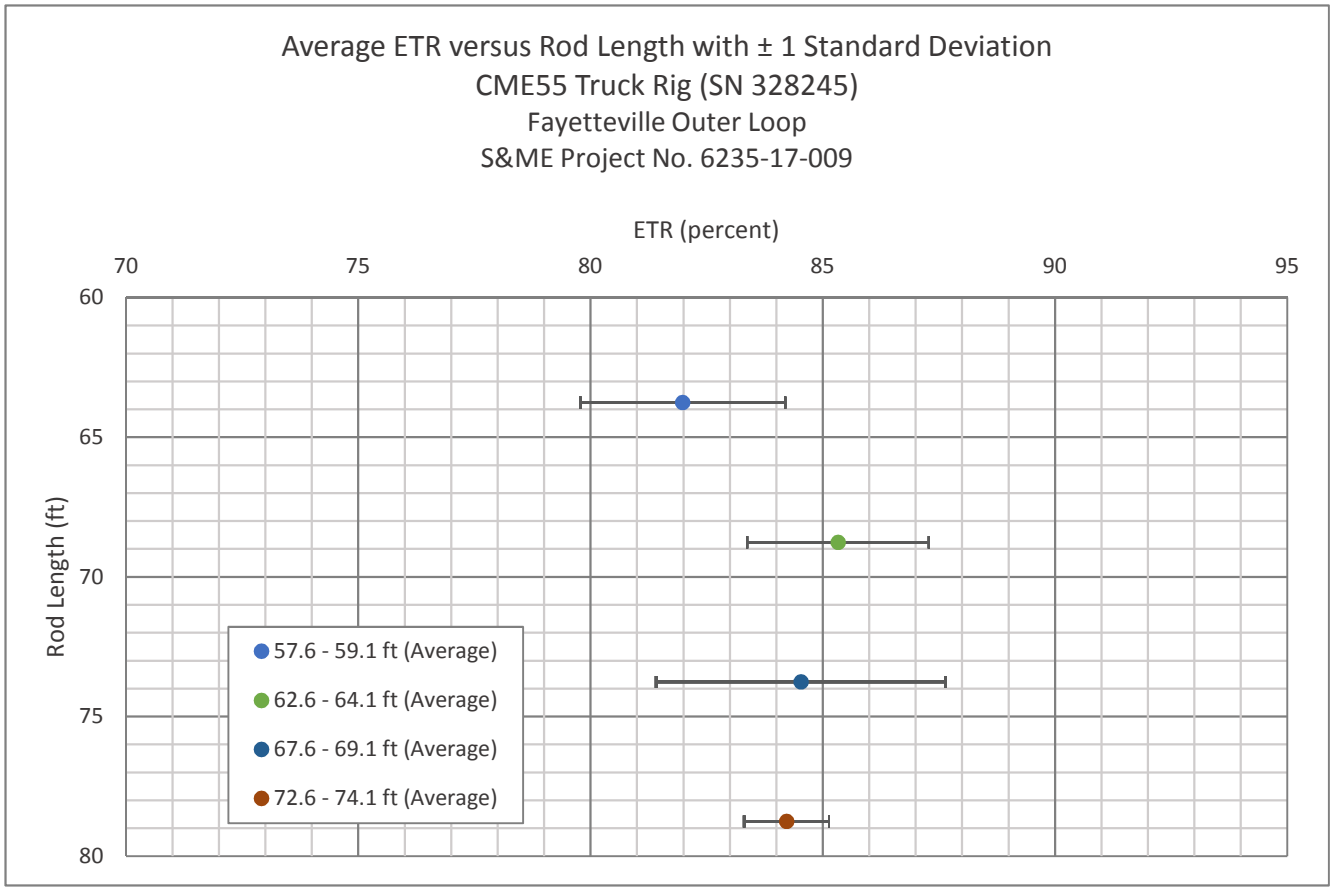
Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

S&ME Printed: 25-April-2017 Test started: 04-April-2017

CME55 Truck (SN 328245) - 72.6 to 74.1 ft
28+00, 20LT




ETR versus Rod Length
CME55 Truck Rig (SN 328245)
Fayetteville Outer Loop
S&ME Project No. 6235-17-009
ETR (percent)
70
72
74
76
78
80
82
84
86
88
90
Rod Length (ft)
60
65
70
75
80
57.6 - 59.1 ft
62.6 - 64.1 ft
67.6 - 69.1 ft
72.6 - 74.1 ft


Average ETR versus Rod Length with ± 1 Standard Deviation
CME55 Truck Rig (SN 328245)
Fayetteville Outer Loop
S&ME Project No. 6235-17-009
ETR (percent)
70
75
80
85
90
95
Rod Length (ft)
60
65
70
75
80
57.6 - 59.1 ft (Average)
62.6 - 64.1 ft (Average)
67.6 - 69.1 ft (Average)
72.6 - 74.1 ft (Average)

Appendix II

Form No. QA-SPTEEVAL-01
Revision No. 2
Revision Date: 05-24-16

SPT Energy Evaluation Form

S&ME

Project: FAYETTEVILLE OUTER LOOP
Project No.: 6235-17-009
Boring No.: 28+00 20 LEFT -Y2-
Date (s): 4/4/17
Weather: PARTLY CLOUDY / 70°F
Drill Rod Type: AWJ

On-site Personnel

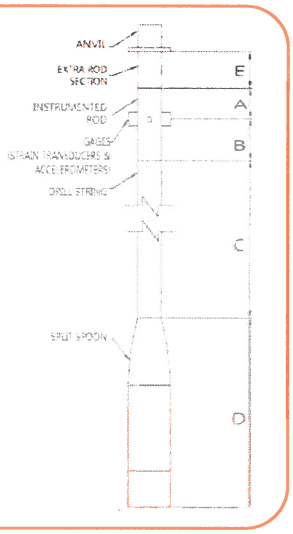
Drilling Company: S&ME
Rig Oper./Helper: T. MILLER / A. PLATTENBURG
Rig Engr/Geologist: J. SWARTLEY
Analyzer Oper.: R. KRAL

Rig/Hammer Info

Drill Rig Make/Model: CME 55
Carrier Type: TRUCK
Rig Serial No.: 328245
Hammer Type/Model: CME - AUTO
Hammer Serial No.: 328245
Hammer Drop System: AUTOMATIC
Lubrication Condition: PER. MANUFACTURER
Manufacturer Recommended Operation Rate (bpm): 50
Drop Height ~~from Calibration Record~~ (in.): 30
Hammer Weight ~~from Calibration Record~~ (lbs): 140
Anvil Dimension (in.): 11.5
Drilling Method: MUD ROTARY

Rod Info

(A + E) Impact Surface to Gages Length: 1.5 ft
(B) Instr. Rod Length below Gages: 0.88 ft
(A) + (B) Instr. Rod Length: 2 ft
(D) Spoon Length: 2.68 ft
(E) Rod Length Above Instr. Rod (if applicable): 0.38 ft
Instr. Rod S/N: 203 AWJ
Instr. Rod Outside Dia.: 1.75 in.
Instr. Rod Area: 1.20 in²
PDA Make/Model: PAX
PDA Serial No.: 3733L
Calib. Pulse Test (y/n): Y



Gage Information

Gage		Serial No.	Calibration No.	
Accel.	A3	K5641	~~358~~ 376	
	A4	K5642	~~314~~ 324	
Strain	F3	203 AWJ 1	~~211.46~~	212.63
	F4	203 AWJ 2	~~210.87~~	212.32

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (Military)	Length of Drill String (ft) (C)	(LE) Length Below Gages (ft) (B)+(C)+(D)	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts 6"	12"	18"	N Value	Drop Height In Tolerance (y/n)
~~4/4~~	~~33.5 TO 35.0~~	~~1038/1041~~	~~35~~	~~38.76~~		~~WOH~~	~~WOH~~	~~WOH~~	~~0~~	~~N/A~~
~~4/4~~	~~38.5 TO 40.0~~	~~1050/1054~~	~~40~~	~~43.76~~		~~3~~	~~2~~	~~4~~	~~3~~	~~4~~
	~~37.6 TO 39.1~~	~~1139~~								
4/4	57.6 TO 59.6	1139/1140	60	63.76	52	7	10	9	19	Y
4/4	62.6 TO 64.1	1157/1158	65	68.76	52	9	10	12	22	Y
4/4	67.6 TO 69.1	1218/1219	70	73.76	52	6	13	17	30	Y
4/4	72.6 TO 74.1	1239/1240	75	78.76	52	6	11	10	21	Y

Comments: (1) **If there are any nonconformances or deficiencies identified during the testing, immediately pause the drilling and testing activities and notify the Site Manager** and **describe them in the space below;** (2) **Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions** (e.g. verticality, weather, or lubrication between trials). Drop height tolerance is ± 1 inch. Drop height verified by Rig Geologist/Engineer at time of SPT Energy measurement for CME hammers and at the beginning of the day for Diedrich hammers; (3) Note any changes in rod diameter along drill string and record locations of short rod sections; (4) Prepare a sketch or take a picture of the instrumented drill rod assembly and indicate the approximate relative location and orientation of the strain gauges, accelerometers, and LE Datum; (5) Note: Identify all attached pages, including photographs, with the Project No., Boring No., and date.

ROB KRAL — Prepared By (print/signature), SPT Energy Lead
4/4/17 — Date
Reviewed By (print/signature), Site Manager
Date

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.S5	**TIP** U-2519AA	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP FROM I-95 TO SOUTH OF SR 1118 (PARKTON RD.)			**GROUND WTR (ft)**
BORING NO. Y2_2800	**STATION** 28+00	**OFFSET** 20 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 184.7 ft	**TOTAL DEPTH** 104.1 ft	**NORTHING** 421,505	**EASTING** 2,013,281	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME275 CME-55 89% 01/15/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Contract Driller	**START DATE** 04/04/17	**COMP. DATE** 04/04/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
185										184.7 GROUND SURFACE	0.0
	184.1	0.6	7	5	4	9		M		184.1 **ROADWAY EMBANKMENT** (PAVEMENT)	0.6
	182.1	2.6	3	4	4	8		M		TAN, ORANGE AND GRAY, SILTY SAND	
180											
	177.1	7.6	7	6	8	14		M			
175											
	172.1	12.6	6	3	5	8		M			
170											
	167.1	17.6	9	8	3	11		M			
165										164.7 **COASTAL PLAIN**	20.0
	162.1	22.6	3	3	4	7	SS-78	W		ORANGE, RED AND GRAY, SANDY SILT (MIDDENDORF FORMATION)	
160										158.7 GRAY AND RED, SILTY SAND	26.0
	157.1	27.6	9	10	10	20		Sat.			
155										153.7 ORANGE AND TAN, SILTY CLAY	31.0
	152.1	32.6	WOR	WOR	WOH	0	SS-79	W			
150										148.7 ORANGE SAND	36.0
	147.1	37.6	3	2	1	3	SS-80	Sat.			
145											
	142.1	42.6	1	1	2	3		Sat.			
140										138.7 **COASTAL PLAIN**	46.0
	137.1	47.6	5	9	11	20		W		GRAY, SILTY CLAY (BLACK CREEK FORMATION)	
135										133.7 GRAY, SILTY SAND	51.0
	132.1	52.6	7	8	17	25		Sat.		131.7 GRAY, SILTY CLAY	53.0
130										128.7 GRAY, SILTY SAND AND SAND	56.0
	127.1	57.6	7	10	9	19		Sat.			
125											
	122.1	62.6	9	10	12	22		Sat.			
120											
	117.1	67.6	6	13	17	30		Sat.			
115											
	112.1	72.6	6	11	10	21		Sat.			
110										108.7	76.0
	107.1	77.6	6	9	9	18		Sat.			
105											

DRAFT

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 34817.1.S5	**TIP** U-2519AA	**COUNTY** CUMBERLAND	**GEOLOGIST** Contract Geologist	
SITE DESCRIPTION FAYETTEVILLE OUTER LOOP FROM I-95 TO SOUTH OF SR 1118 (PARKTON RD.)				**GROUND WTR (ft)**
BORING NO. Y2_2800	**STATION** 28+00	**OFFSET** 20 ft LT	**ALIGNMENT** -Y2-	**0 HR.** N/A
COLLAR ELEV. 184.7 ft	**TOTAL DEPTH** 104.1 ft	**NORTHING** 421,505	**EASTING** 2,013,281	**24 HR.** 23.0
DRILL RIG/HAMMER EFF./DATE SME275 CME-55 89% 01/15/2016		**DRILL METHOD** Mud Rotary		**HAMMER TYPE** Automatic
DRILLER Contract Driller	**START DATE** 04/04/17	**COMP. DATE** 04/04/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) / DEPTH (ft)
105						Match Line				
	102.1	82.6	6	10	10	20		Sat.		
100										98.7 / 86.0 GRAY, SILTY CLAY
	97.1	87.6	5	8	14	22		W		
95										
	92.1	92.6	5	12	14	26		W		
90										
	87.1	97.6	7	8	9	17		W		
85										
	82.1	102.6	8	13	15	28		W		80.6 / 104.1 Boring Terminated at Elevation 80.6 ft IN VERY STIFF CLAY (COASTAL PLAIN)

DRAFT

Appendix III

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

PDI Certificate of Calibration

PDI Accelerometer Calibration

Model PR-Kicher Serial # K5641

Cal Date: 27Feb17 Cal Due : 27Feb19

Temperature: 64.5 deg. F Humidity 30 %

Calibrated at
Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, OH 44139

Manufactured by Pile Dynamics, Inc.

Procedure used: PDA Accelerometer Calibration Procedure 2016-6, Revision 20160422

Equipment was found to be

✓ in tolerance As Received _____ out of tolerance As Received

✓ in tolerance As Returned _____ out of tolerance As Returned

PDI Calibration: .0752 mv/5000g

Calibration Standards Utilized
Hopkinson Bar Force Calibration F2, verified on 25APR16

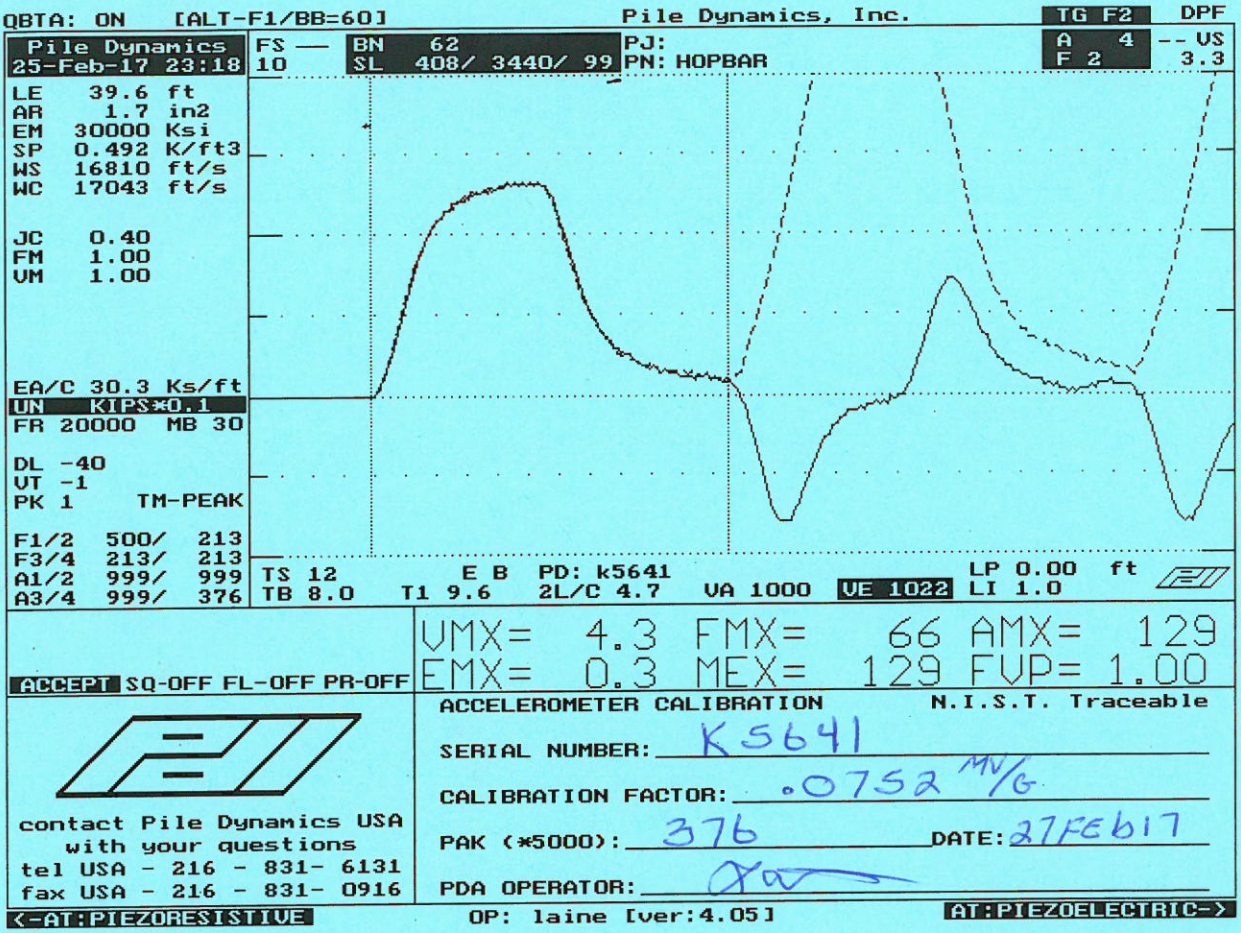
PDI HopBar DOS PAK, serial number 1273K, verified on 25 APR 16

Calibration performed by: L. M. Wright
Laine Wright, Technician

Reviewed by: Robert Sprenger
Robert Sprenger, Production Manager

Accelerometer CC-5 Issued 20160426

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com



Smart Sensor

Smart Chip Programmed By RMW **on** 27FEB17 **CRC Value** 3C62

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

PDI Certificate of Calibration

PDI Accelerometer Calibration

Model PR-Kicher Serial # K5642

Cal Date: 27Feb17 Cal Due : 27Feb19

Temperature: 64.5 deg. F Humidity 30 %

Calibrated at
Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, OH 44139

Manufactured by Pile Dynamics, Inc.

Procedure used: PDA Accelerometer Calibration Procedure 2016-6, Revision 20160422

Equipment was found to be

✓ in tolerance As Received _____ out of tolerance As Received

✓ in tolerance As Returned _____ out of tolerance As Returned

PDI Calibration: .0648 mv/5000g

Calibration Standards Utilized
Hopkinson Bar Force Calibration F2, verified on 25APR16

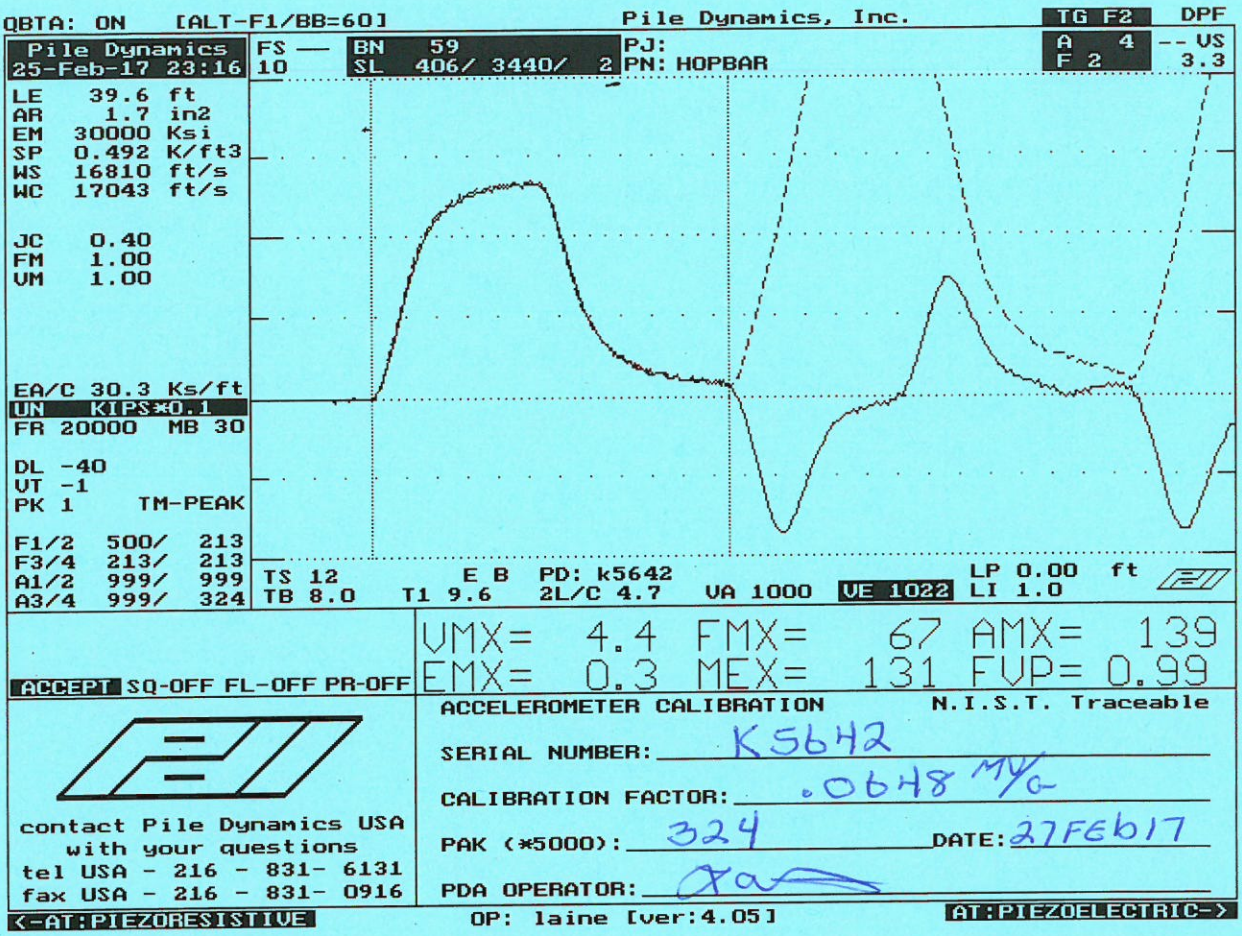
PDI HopBar DOS PAK, serial number 1273K, verified on 25Apr16

Calibration performed by: L. M. Wright
Laine Wright, Technician

Reviewed by: Robert Sprenger
Robert Sprenger, Production Manager

Accelerometer CC-5 Issued 20160426

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com



Smart Sensor

Smart Chip Programmed By J.M.W. **on** 27 **CRC Value** 4A8A

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

PDI Certificate of Calibration

PDI SPT Drill Rod Serial # 203 AWJ

Cal Date: 3-6-17 Cal Due : 3-6-19

Temperature: 69.2 deg. F Humidity 42 %

Manufactured by Pile Dynamics, Inc.
Calibrated at: Pile Dynamics, Inc., 30725 Aurora Road, Cleveland, OH 44139
Procedure used: SPT Drill Rod Calibration Procedure 2016-4, Revision 20160422
Calibration Data: Attach SPT Rod Data Sheet DS-17

Equipment was found to be
✓ in tolerance As Received _____ out of tolerance As Received

✓ in tolerance As Returned _____ out of tolerance As Returned

Calibration Standards Utilized

1. PDI SPT Calibration Signal Conditioning Unit #000001, verified on 20160302
2. PDI Load Cell #75, Certificate #3482090006
3. Capacitec Displacement Sensor #2034, Certificate #3482090004
4. Capacitec Displacement Sensor #2040, Certificate #3482090004
5. Capacitec Displacement Mainframe #4004-671, Certificate #3482090004
6. Brown & Sharpe Digital Caliper #8G028506, Certificate #3482090001
7. National Instruments USB-6210 DAQ serial number 159AFDE, Certificate #3482090002

Calibration performed by:

David Burrell Technician

Reviewed by:

Robert Sprenger, Production Manager

SPT CC-16 Issued 20160425

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

SPT Calibration Data Sheet Revision number 20160426
Use Calibration Procedure Number 2016-8, Revision 20160422

SPT Drill Rod Data

Serial Number: 203 AWJ Calibration Date: 3-6-17

Temperature: 69.2 °F Humidity: 42 %

Calibration performed in accordance with PDI SPT Calibration Procedure 2016-4, Revision 20160422

As Received (circle one): Operational - Malfunctioning - Damaged

Calibration data
Pre-Load: 1. 8152 2. 8045 3. 8081

Total Load: 1. 18645 2. 17966 3. 9859

Common typical theoretical EA values based on SPT Rod Type:
AW: 35400 NW: 43100 or 68100 N3: 70800 BW:52344

EA Theoretical 35,400 EA Measured 36076.68 Error 1.91 %
Within 4% Tolerance: Y / N

Alternative EA verification: Measure wall thickness, calculate area and multiply by 30000. (use spreadsheet for calculation)

Calibration values
Channel 1: As Found: (last cal): 215.76 As Left: 212.63 Within 5% Tolerance: Y / N
Channel 2: As Found: (last cal): 215.53 As Left: 212.32 Within 5% Tolerance: Y / N
EA: As Found: (last cal): 35465 As Left: 36076.68 Difference: 1.7 %

Calibration performed by:

David Burrell, Technician

Reviewed by:

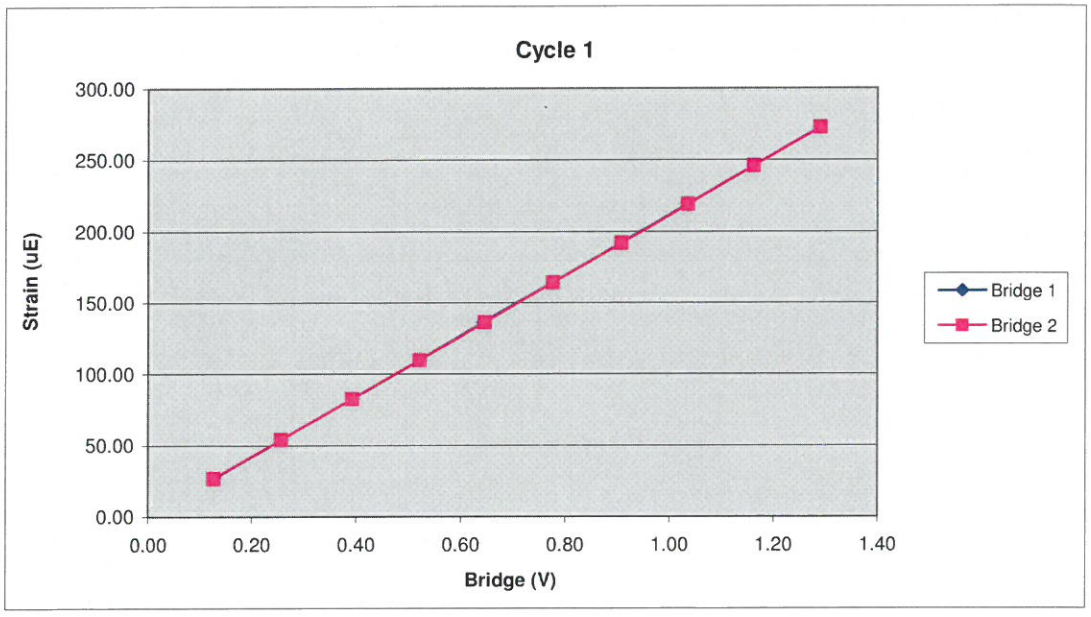
Robert Sprenger, Production Manager

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com

203AWJ		Cycle 1		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	980.36	26.90	0.13	0.13
3	1968.60	54.22	0.26	0.26
4	3007.18	82.91	0.39	0.39
5	3992.07	109.88	0.52	0.52
6	4933.68	136.53	0.64	0.65
7	5952.40	164.15	0.78	0.78
8	6953.03	191.85	0.91	0.91
9	7927.29	218.90	1.04	1.04
10	8900.18	245.69	1.16	1.16
11	9893.92	272.74	1.29	1.29

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7662.50**	**Force Calibration (lb/V)**	**7652.99**
Offset	-1.78	Offset	1.71
Correlation	0.999999	Correlation	0.999997
Strain Calibration (µE/V)	**211.52**	**Strain Calibration (µE/V)**	**211.26**
Offset	-0.14	Offset	-0.05
Correlation	0.999998	Correlation	0.999999

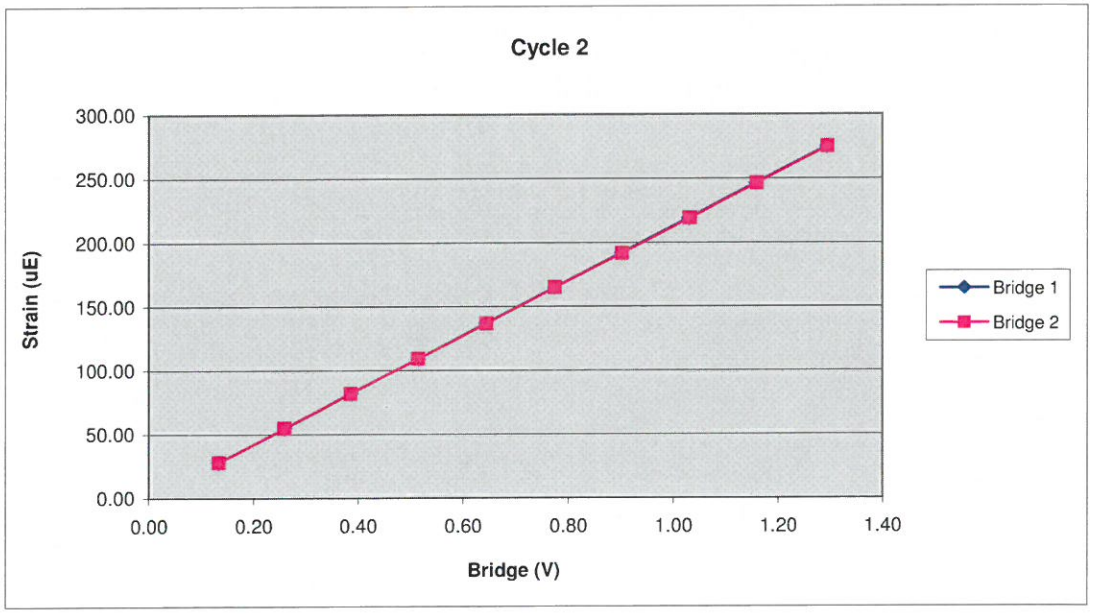
Force Strain Calibration	
EA (Kips)	**36225.50**
Offset	3.39
Correlation	0.999997



203AWJ		Cycle 2		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	1014.59	28.23	0.13	0.13
3	1983.94	54.87	0.26	0.26
4	2963.12	81.94	0.39	0.39
5	3939.16	109.15	0.51	0.51
6	4924.05	136.83	0.64	0.64
7	5932.34	164.92	0.77	0.78
8	6919.00	191.62	0.90	0.90
9	7908.80	219.00	1.03	1.03
10	8881.89	246.36	1.16	1.16
11	9921.85	274.90	1.29	1.29

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7681.97**	**Force Calibration (lb/V)**	**7665.41**
Offset	**-11.43**	Offset	**-6.15**
Correlation	**0.999999**	Correlation	**0.999998**
Strain Calibration (µE/V)	**212.92**	**Strain Calibration (µE/V)**	**212.46**
Offset	**-0.28**	Offset	**-0.14**
Correlation	**0.999998**	Correlation	**0.999998**

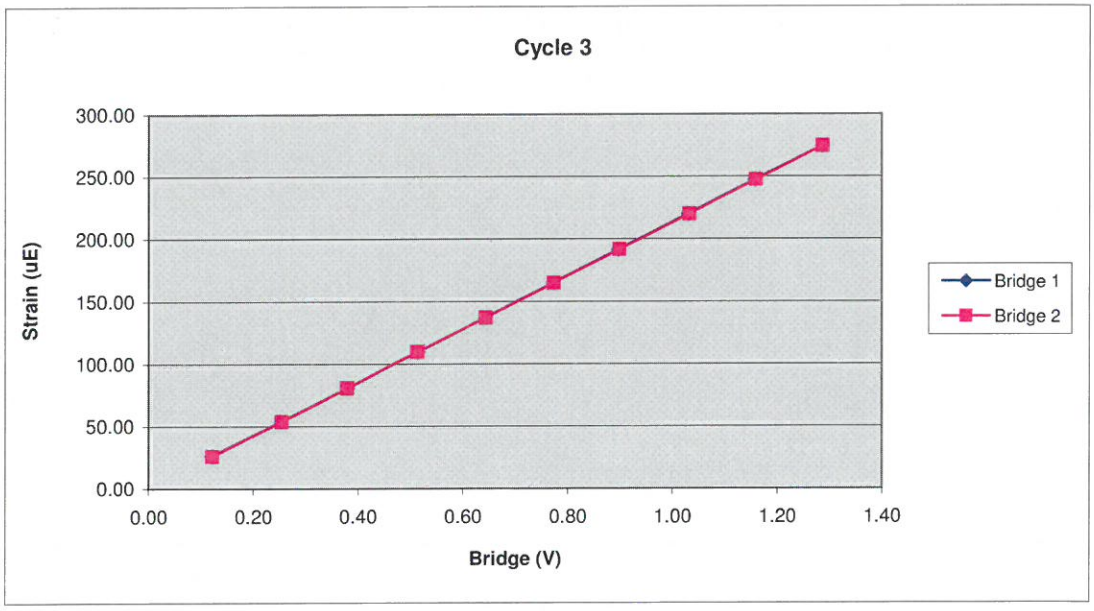
Force Strain Calibration	
EA (Kips)	**36079.71**
Offset	**-1.25**
Correlation	**0.999996**



203AWJ		Cycle 3		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	931.98	26.11	0.12	0.12
3	1944.40	53.79	0.25	0.25
4	2911.39	80.73	0.38	0.38
5	3940.93	109.71	0.51	0.51
6	4935.26	137.15	0.64	0.64
7	5929.39	164.84	0.77	0.77
8	6888.90	191.71	0.90	0.90
9	7914.90	219.99	1.03	1.03
10	8887.40	247.28	1.16	1.16
11	9859.30	274.46	1.29	1.29

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7667.78**	**Force Calibration (lb/V)**	**7660.59**
Offset	**2.72**	Offset	**1.09**
Correlation	**0.999999**	Correlation	**1.000000**
Strain Calibration (µE/V)	**213.44**	**Strain Calibration (µE/V)**	**213.24**
Offset	**-0.06**	Offset	**-0.11**
Correlation	**0.999998**	Correlation	**0.999997**

Force Strain Calibration	
EA (Kips)	**35924.82**
Offset	**4.97**
Correlation	**0.999998**



Bridge Excitation (V) 5
Shunt Resitor (ohm) 60.4k

Calibration Factors	203AWJ		
Bridge 1 (µE/V)	212.63	Bridge 2 (µE/V)	212.32
EA Factor (Kips)	36076.68	Area (in^2)	1.20

Calibrated by: David Hussey
Calibrated Date: 2/24/2017

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Appendix IV

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

Pile Dynamics, Inc.

This documents that

Robert E. Kral
AMEC Foster Wheeler

has on May 20, 2016 achieved the rank of

ADVANCED

on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended*** **that Individuals at the Advanced level seek Master or Expert levels through additional study within four years of the date of this document.**

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. **This certificate can be verified at www.PDAproficiencytest.com.** The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate.

Steven A. Hall, Executive Director
Pile Driving Contractors Association

Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2072

Report of SPT Energy Measurements
S&ME Diedrich D-50 Track (SN 382)
Winston-Salem, North Carolina
S&ME Project No. 6235-17-020

PREPARED FOR:

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

PREPARED BY:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, NC 28273

September 1, 2017

September 1, 2017

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

Attention: Dr. Shunyi (Chris) Chen, Ph.D., P.E.

Cc: Ms. Cheryl A. Youngblood, L.G.

Reference: **Report of SPT Energy Measurements**
S&ME Diedrich D-50 Track (SN 382)
Winston-Salem, North Carolina
S&ME Project No. 6235-17-020

Dear Dr. Chen:

We have completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer mounted on our Diedrich D-50 track-mounted drill rig with a serial number of 382. This service was performed by our Mr. Robert E. Kral, P.E. on August 22, 2017. SPT energy testing was performed in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation, Geotechnical Engineering Unit's requirements. The testing procedures, equipment used during testing, and detailed results are presented in this report.

1.0 Dynamic Testing Methodology

Testing was performed using a model PAX (Serial No. 3733L) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA records and interprets data from two piezoresistive accelerometers (Serial Nos. K5641 and K5642) bolted to a 2.67-foot long BW drill rod (SN102) internally instrumented with two strain transducers. The BW instrumented drill rod length included one BW box to BWJ pin and one BWJ box to BW pin sub. The instrumented BW drill rod has a cross-sectional area of 1.80 square inches, an outside diameter of approximately 2.125 inches, and an inside diameter of 1.75 inches at the gage location. The accelerometers and strain gages, which are mounted on opposing axis near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces, computing the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. All results are recorded and displayed in real-time for each blow. Calibration sheets for the accelerometers and the instrumented rod are included in the Appendix.

2.0 Testing and Observations

S&ME personnel were on site on August 22, 2017, to observe and perform testing during SPT sampling on the Diedrich D-50 track-mounted rig operated by Justin Millwood of S&ME. The measurements were taken during drilling operations for the NCDOT R-2247CD Winston-Salem Northern Beltway Design-Build project in Winston-Salem, North Carolina. The measurements were obtained during the SPT sampling of Soil Test Boring Y25ARPB_2200. SPT energy measurements were recorded during four intervals at depths of approximately 33½, 38½, 43½, and 48½ ft below the existing ground surface. The information presented in the tables below summarizes the equipment tested and tooling used during the SPT Energy Measurements.

Table 2-1: Drill Rig Information

Manufacturer	Diedrich
Model	D-50
Serial Number	382
Operator	Justin Millwood
Carrier	Track

Table 2-2: Hammer Information

Model / Type	CME / Auto
Serial Number	382
Anvil Height (inches)	11.5
Anvil Diameter (inches)	2.5
Drop Height (inches)	30
Ram Weight (pounds)	140
Ram Serial Number	N/A

Table 2-3: Drilling and Instrumented Rod Information

Drill Rod Type	BWJ
OD (inches)	2.125
ID (inches)	1.75
Cross-Sectional Area (in^2)	1.80
Typical Lengths (feet)	5 and 10
Instrumented Rod Type	BW (SN 102)
OD (inches)	2.125
ID (inches)	1.75
Cross-Sectional Area (in^2)	1.80
Total Instrumented Rod Length (feet)	2.67
Length Below Gages (feet)	1.42
Split-Spoon Length (feet)	2.95

3.0 Dynamic Testing Results

The total rod length from the instrumentation to the tip of the split-spoon sampler was determined by adding 4.62 ft to the required drill rod length at each sample depth. Based on the test data, the automatic hammer on the Diedrich D-50 track-mounted rig operated at a rate of about 41.1 to 41.9 blows per minute (bpm) during dynamic testing. The measured transferred hammer energy (EFV) was generally in the range of about 282.2 to 320.4 ft-lbs, which corresponds to Energy Transfer Ratio (ETR) values of about 80.6% to 91.5%, respectively. The SPT Energy Measurement Data Summary tables in the Appendix present the test data from every hammer blow at each sampling interval along with representative force and velocity traces for each test interval. The reported blow counts, obtained by the drill rig personnel, and a summary of the test data and average computed hammer energy and transfer ratio values are provided in Table 3-1. Plots and tables of the following are also included in the Appendix and present the test data with depth for each test interval:

- Penetration vs. BLC
- Penetration vs. FMX
- Penetration vs. EFV
- Penetration vs. CSX
- Penetration vs. VMX
- Penetration vs. ETR
- Average ETR vs. Rod Length
- ETR vs. Rod Length

Table 3-1: Summary of Dynamic Testing Results

Data Set ID	Sample Depth (ft)	Drill Rod Length (ft)	Instrumentation to Sampler Tip Length (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Coastal Plain)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (%)
1	33½ - 35	34	38.62	3-3-4 / 7	Sandy CLAY	41.5	297.2	84.9
2	38½ - 40	39	43.62	3-4-4 / 8	Sandy SILT	41.6	297.0	84.9
3	43½ - 45	44	48.62	4-6-11 / 17	Sandy SILT	41.5	303.8	86.8
4	48½ - 50	49	53.62	4-7-10 / 17	Sandy SILT	41.6	307.0	87.7
					Overall Average	**41.6**	**302.9**	**86.5**

The average hammer rate, transferred energy, and transfer ratio were calculated for each depth interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e. the blows that determine the N-value) were included when computing the average values shown in Table 3-1. The overall average transferred hammer energy for the automatic hammer on the Diedrich D-50 track-mounted rig (for all the depth intervals tested) was 302.9 foot-pounds, with an average ETR of 86.5%.

4.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

5.0 Closing

S&ME appreciates the opportunity to provide this report to the North Carolina Department of Transportation Geotechnical Engineering Unit. Please let us know if you have any questions concerning this report.

Sincerely,

S&ME, Inc.

Gregory J. Canivan, P.E.
Technical Principal

NORTH CAROLINA PROFESSIONAL SEAL 042642 ENGINEER ROBERT E. KRAL
rkral@smeinc.com
2017.09.01 16:37:43 -05'00'

Robert E. Kral, P.E.
Transportation Services Project Manager
N.C. Registration No. 042642

Appendices:

- Appendix I - Diedrich D-50 (SN 382) SPT Energy Measurements Summary Plots and Tables
- Appendix II - Field Log and Borelog Report
- Appendix III - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix IV - Certificate of Proficiency

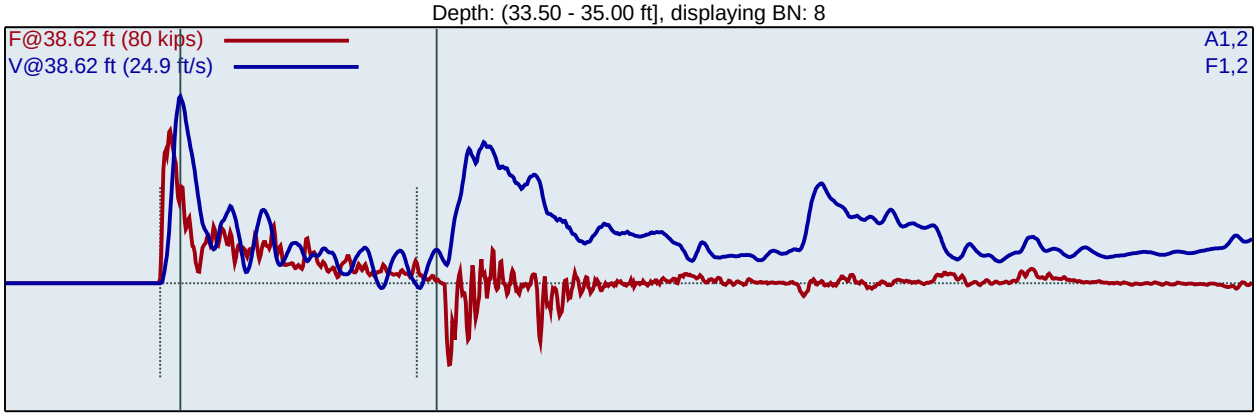
Appendices

Appendix I

DIEDRICH D50 (SN382)
R. KRAL
AR: 1.80 in^2
LE: 38.62 ft
WS: 16807.9 ft/s

Y25ARPB_2200
Test date: 8/22/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 8



BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	33.67	3	1.9	45	14.5	2.25	24.9	2.00	261.5	74.7
2	33.83	3	41.1	46	16.5	2.26	25.8	2.00	301.0	86.0
3	34.00	3	41.9	46	18.1	2.17	25.5	2.00	312.3	89.2
4	34.17	3	41.5	46	17.0	2.00	25.3	2.00	298.7	85.3
5	34.33	3	41.4	49	18.1	2.00	27.2	2.00	304.9	87.1
6	34.50	3	41.6	48	16.9	2.00	26.5	2.00	288.7	82.5
7	34.63	4	41.5	48	17.5	1.51	26.5	1.50	295.4	84.4
8	34.75	4	41.6	48	18.2	1.50	26.5	1.50	299.8	85.7
9	34.88	4	41.1	48	17.3	1.50	26.8	1.50	295.9	84.5
10	35.00	4	41.8	49	18.1	1.50	27.2	1.50	297.0	84.9
		Average	41.5	48	17.6	1.72	26.6	1.71	297.2	84.9
		Std Dev	0.2	1	0.5	0.25	0.6	0.25	4.5	1.3
		Maximum	41.8	49	18.2	2.00	27.2	2.00	304.9	87.1
		Minimum	41.1	46	16.9	1.50	25.3	1.50	288.7	82.5

N-value: 7

Sample Interval Time: 13.01 seconds.

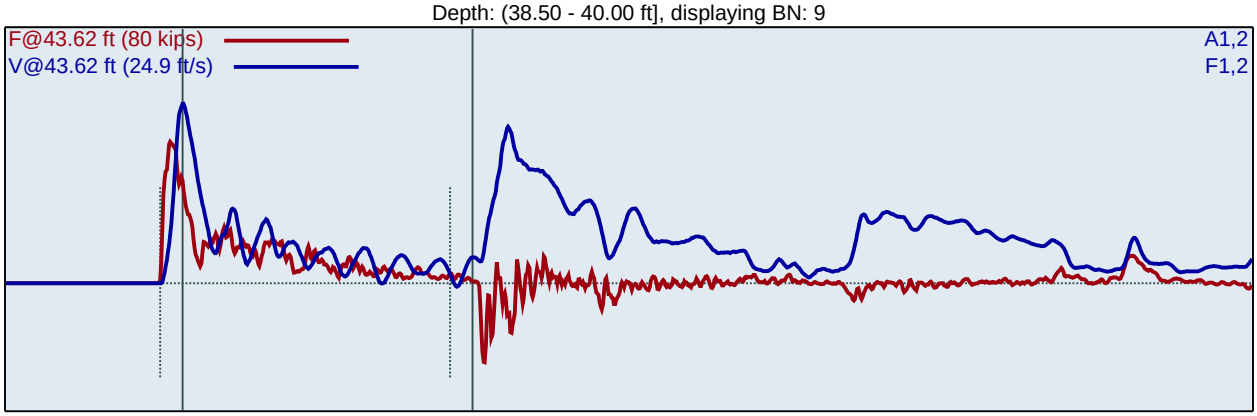
DIEDRICH D50 (SN382)
R. KRAL

Y25ARPB_2200
Test date: 8/22/2017

AR: 1.80 in^2
LE: 43.62 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft], displaying BN: 9



BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	38.67	3	1.9	49	19.1	2.24	27.1	2.00	303.1	86.6
2	38.83	3	41.6	49	18.1	2.24	27.2	2.00	294.2	84.1
3	39.00	3	41.5	49	18.0	2.00	27.2	2.00	305.3	87.2
4	39.13	4	41.8	49	17.6	1.62	27.2	1.50	288.4	82.4
5	39.25	4	41.2	49	16.9	1.52	27.2	1.50	282.2	80.6
6	39.38	4	41.7	46	17.4	1.50	25.4	1.50	298.0	85.1
7	39.50	4	41.7	48	18.0	1.50	26.6	1.50	295.8	84.5
8	39.63	4	41.5	44	17.4	1.50	24.7	1.50	300.4	85.8
9	39.75	4	41.5	44	17.5	1.50	24.6	1.50	301.5	86.2
10	39.88	4	41.5	45	17.9	1.50	25.1	1.50	305.1	87.2
11	40.00	4	41.5	44	18.1	1.50	24.6	1.50	304.7	87.1
		Average	41.6	46	17.6	1.52	25.7	1.50	297.0	84.9
		Std Dev	0.2	2	0.4	0.04	1.1	0.00	7.5	2.1
		Maximum	41.8	49	18.1	1.62	27.2	1.50	305.1	87.2
		Minimum	41.2	44	16.9	1.50	24.6	1.50	282.2	80.6

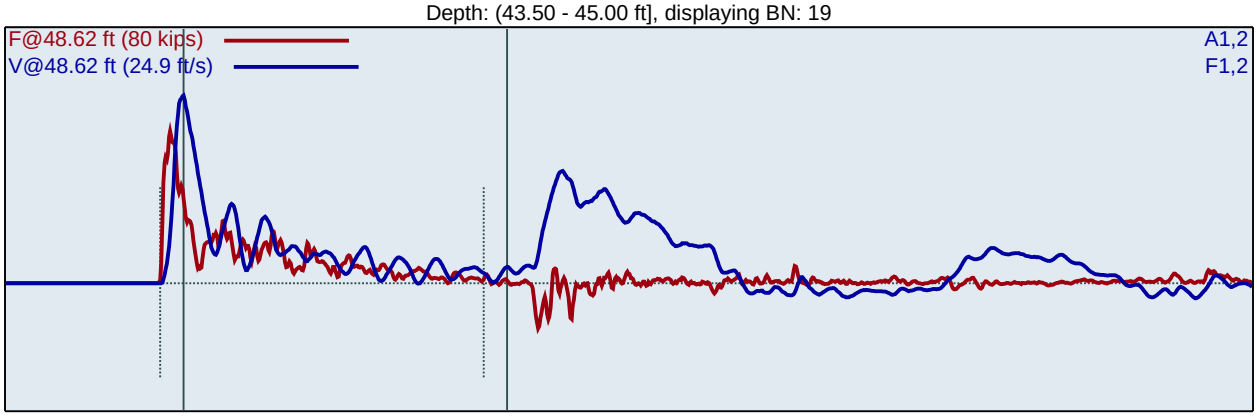
N-value: 8

Sample Interval Time: 14.41 seconds.

DIEDRICH D50 (SN382)
R. KRAL
AR: 1.80 in^2
LE: 48.62 ft
WS: 16807.9 ft/s

Y25ARPB_2200
Test date: 8/22/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (43.50 - 45.00 ft], displaying BN: 19



BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	43.63	4	1.9	48	17.5	1.50	26.8	1.50	290.4	83.0
2	43.75	4	41.5	46	16.8	1.56	25.4	1.50	291.6	83.3
3	43.88	4	41.7	43	17.0	1.78	23.7	1.50	301.8	86.2
4	44.00	4	41.7	45	18.2	1.55	24.9	1.50	315.4	90.1
5	44.08	6	41.8	43	17.5	1.29	24.0	1.00	307.6	87.9
6	44.17	6	41.4	44	17.6	1.14	24.3	1.00	311.0	88.9
7	44.25	6	41.5	46	18.3	1.08	25.5	1.00	314.4	89.8
8	44.33	6	41.7	43	17.5	1.09	24.1	1.00	308.2	88.1
9	44.42	6	41.4	44	18.1	1.07	24.4	1.00	314.7	89.9
10	44.50	6	41.6	43	18.0	1.06	23.8	1.00	313.5	89.6
11	44.55	11	41.9	45	18.3	0.90	24.8	0.55	303.9	86.8
12	44.59	11	41.3	43	17.4	0.84	24.0	0.55	307.3	87.8
13	44.64	11	41.7	43	17.5	0.74	24.1	0.55	296.0	84.6
14	44.68	11	41.4	45	17.9	0.69	24.7	0.55	296.1	84.6
15	44.73	11	41.4	45	17.4	0.66	24.9	0.55	291.2	83.2
16	44.77	11	41.4	45	18.2	0.65	25.1	0.55	304.5	87.0
17	44.82	11	41.7	44	17.7	0.62	24.4	0.55	304.3	86.9
18	44.86	11	41.4	43	17.4	0.59	24.0	0.55	299.6	85.6
19	44.91	11	41.4	47	18.3	0.59	26.4	0.55	302.2	86.3
20	44.95	11	41.7	47	18.0	0.56	26.3	0.55	290.0	82.9
21	45.00	11	41.3	46	17.8	0.56	25.4	0.55	301.0	86.0
		Average	41.5	44	17.8	0.83	24.7	0.71	303.8	86.8
		Std Dev	0.2	1	0.3	0.24	0.8	0.22	7.4	2.1
		Maximum	41.9	47	18.3	1.29	26.4	1.00	314.7	89.9
		Minimum	41.3	43	17.4	0.56	23.8	0.55	290.0	82.9

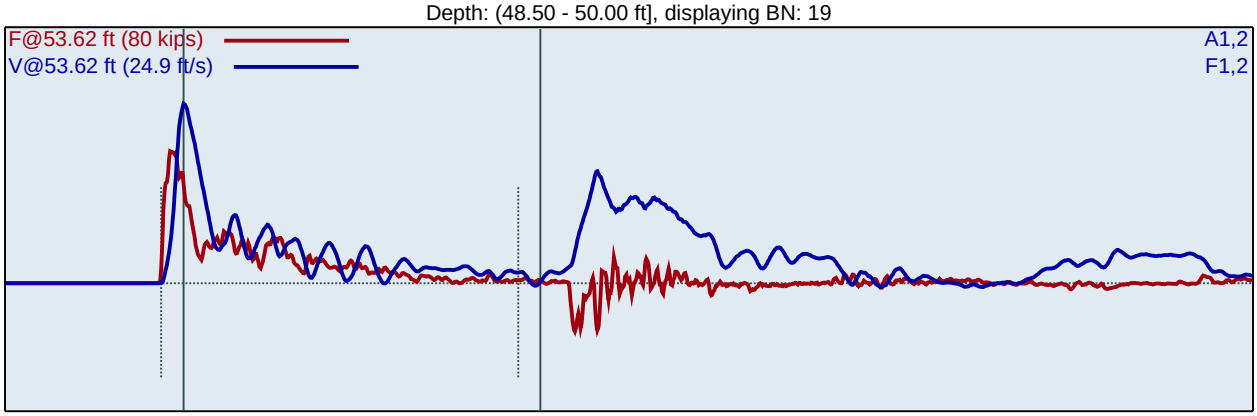
N-value: 17

Sample Interval Time: 28.83 seconds.

DIEDRICH D50 (SN382)
R. KRAL
AR: 1.80 in^2
LE: 53.62 ft
WS: 16807.9 ft/s

Y25ARPB_2200
Test date: 8/22/2017
SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (48.50 - 50.00 ft], displaying BN: 19



BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR (%)
1	48.63	4	1.9	44	15.2	1.70	24.5	1.50	263.8	75.4
2	48.75	4	41.7	41	16.6	1.64	22.9	1.50	302.0	86.3
3	48.88	4	41.5	41	16.9	1.54	22.7	1.50	307.1	87.7
4	49.00	4	41.4	42	16.4	1.50	23.1	1.50	303.6	86.8
5	49.07	7	41.6	42	16.6	1.10	23.5	0.86	302.3	86.4
6	49.14	7	41.8	41	16.9	1.03	23.0	0.86	303.8	86.8
7	49.21	7	41.7	42	16.6	0.98	23.2	0.86	295.3	84.4
8	49.29	7	41.3	42	17.2	0.99	23.5	0.86	312.3	89.2
9	49.36	7	41.7	43	17.6	0.94	23.8	0.86	311.4	89.0
10	49.43	7	41.9	42	17.3	0.91	23.4	0.86	308.2	88.1
11	49.50	7	41.3	42	17.6	0.89	23.4	0.86	319.1	91.2
12	49.55	10	41.9	41	17.5	0.73	22.7	0.60	314.7	89.9
13	49.60	10	41.6	42	17.1	0.70	23.3	0.60	302.7	86.5
14	49.65	10	41.5	43	18.3	0.73	23.7	0.60	320.4	91.5
15	49.70	10	41.5	42	17.0	0.70	23.1	0.60	305.3	87.2
16	49.75	10	41.8	41	17.5	0.71	22.7	0.60	309.9	88.6
17	49.80	10	41.6	41	17.1	0.69	22.8	0.60	298.7	85.4
18	49.85	10	41.5	42	17.8	0.68	23.1	0.60	305.8	87.4
19	49.90	10	41.6	41	17.5	0.67	22.9	0.60	303.0	86.6
20	49.95	10	41.5	42	17.2	0.67	23.5	0.60	300.2	85.8
21	50.00	10	41.5	42	17.5	0.66	23.6	0.60	306.3	87.5
		Average	41.6	42	17.3	0.81	23.2	0.71	307.0	87.7
		Std Dev	0.2	1	0.4	0.15	0.3	0.13	6.7	1.9
		Maximum	41.9	43	18.3	1.10	23.8	0.86	320.4	91.5
		Minimum	41.3	41	16.6	0.66	22.7	0.60	295.3	84.4

N-value: 17

Sample Interval Time: 28.80 seconds.

Summary of SPT Test Results

Project: DIEDRICH D50 (SN382), Test Date: 8/22/2017

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

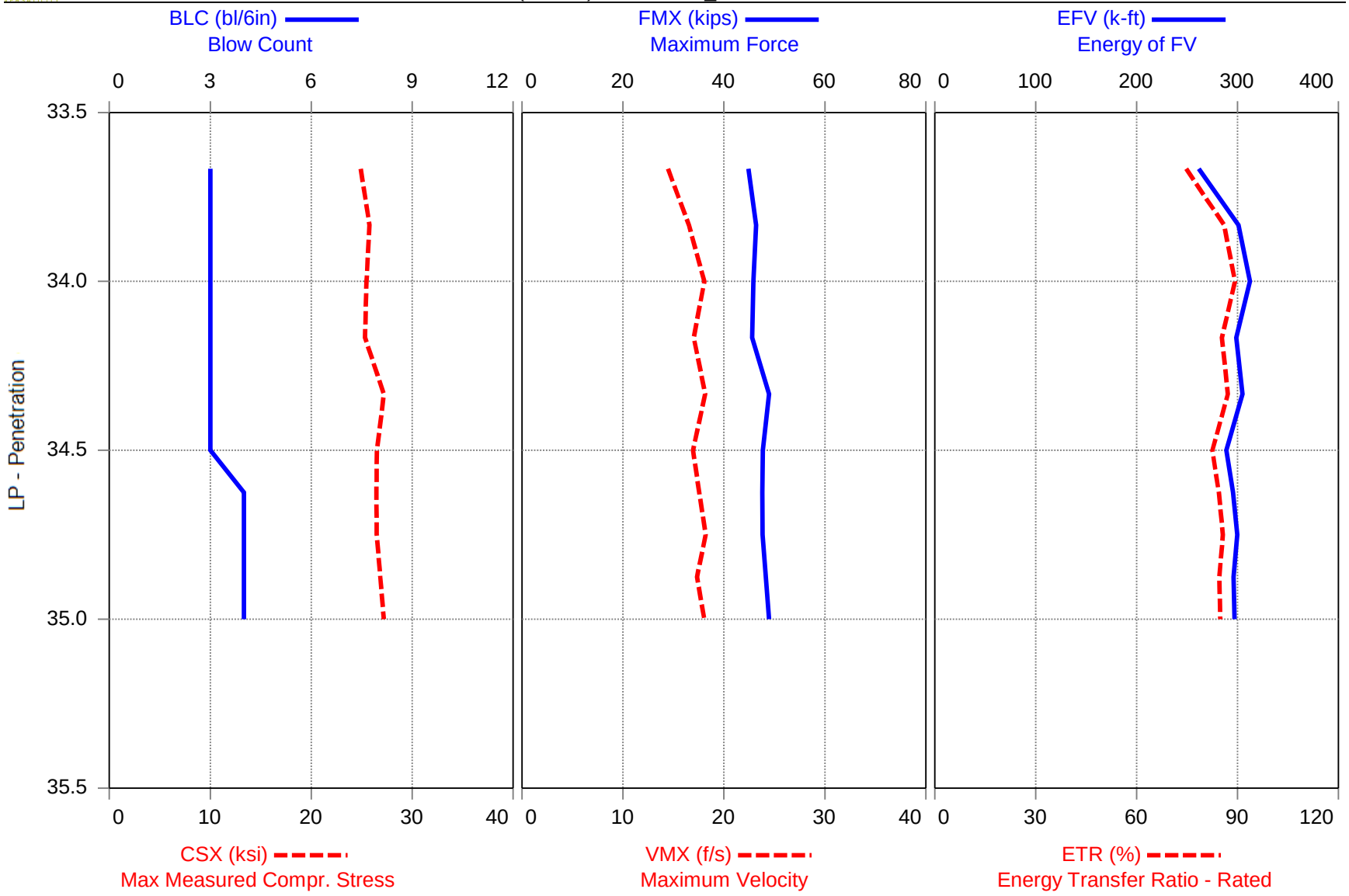
Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR (%)
38.62	33.50	35.00	**3-3-4**	**7**	**10**	41.5	48	17.6	1.72	26.6	1.71	297.2	84.9
43.62	38.50	40.00	**3-4-4**	**8**	**11**	41.6	46	17.6	1.52	25.7	1.50	297.0	84.9
48.62	43.50	45.00	**4-6-11**	**17**	**24**	41.5	44	17.8	0.83	24.7	0.71	303.8	86.8
53.62	48.50	50.00	**4-7-10**	**17**	**24**	41.6	42	17.3	0.81	23.2	0.71	307.0	87.7
				Overall Average Values:		41.6	44	17.6	1.06	24.6	0.98	302.9	86.5
				Standard Deviation:		0.2	2	0.4	0.41	1.4	0.45	7.9	2.3
				Overall Maximum Value:		41.9	49	18.3	2.00	27.2	2.00	320.4	91.5
				Overall Minimum Value:		41.1	41	16.6	0.56	22.7	0.55	282.2	80.6

Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

Printed: 31-August-2017

Test started: 22-August-2017

DIEDRICH D50 (SN382) - Y25ARPB_2200, 33.5 to 35

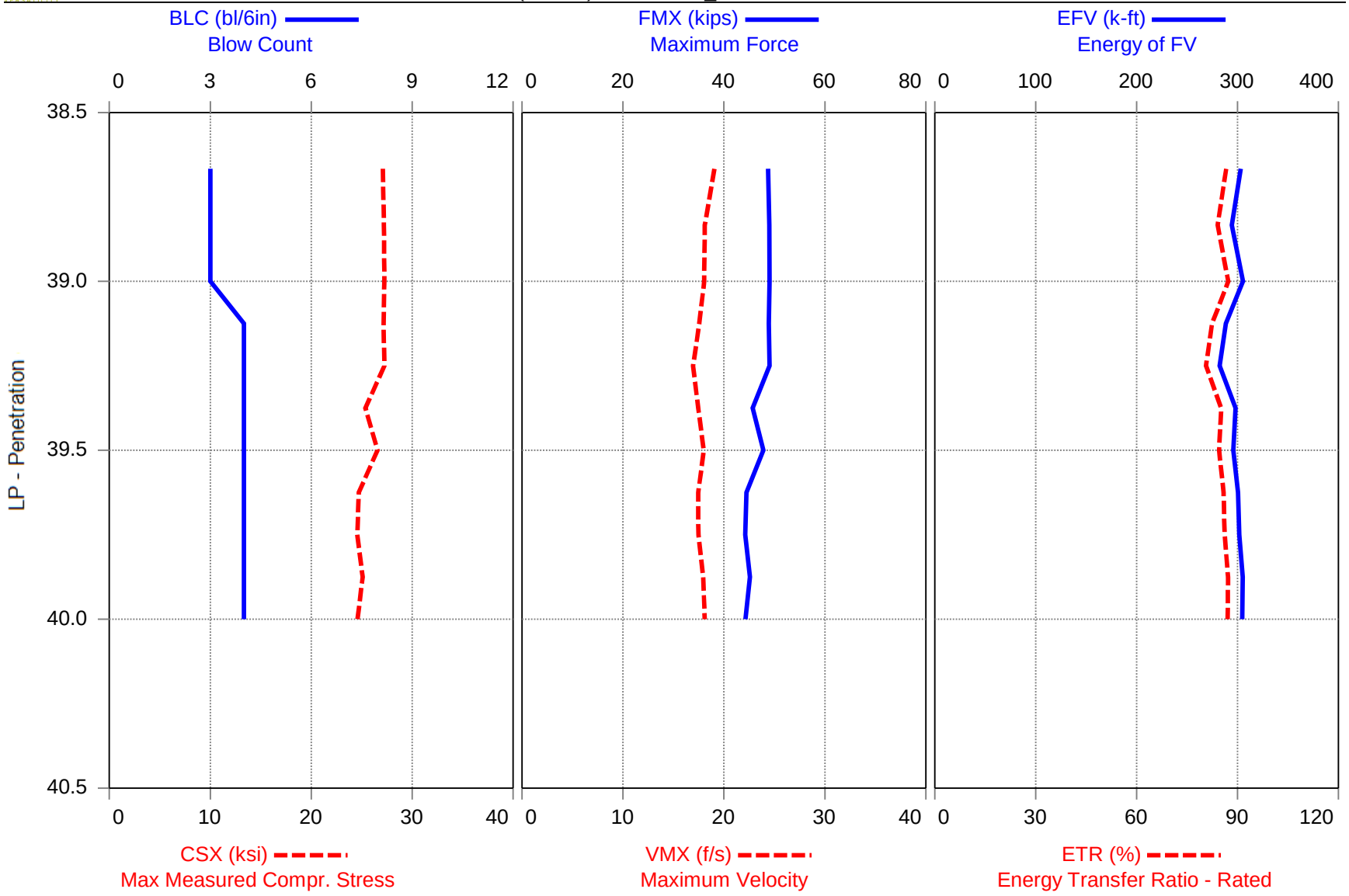


Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

Printed: 31-August-2017

Test started: 22-August-2017

DIEDRICH D50 (SN382) - Y25ARPB_2200, 38.5 to 40

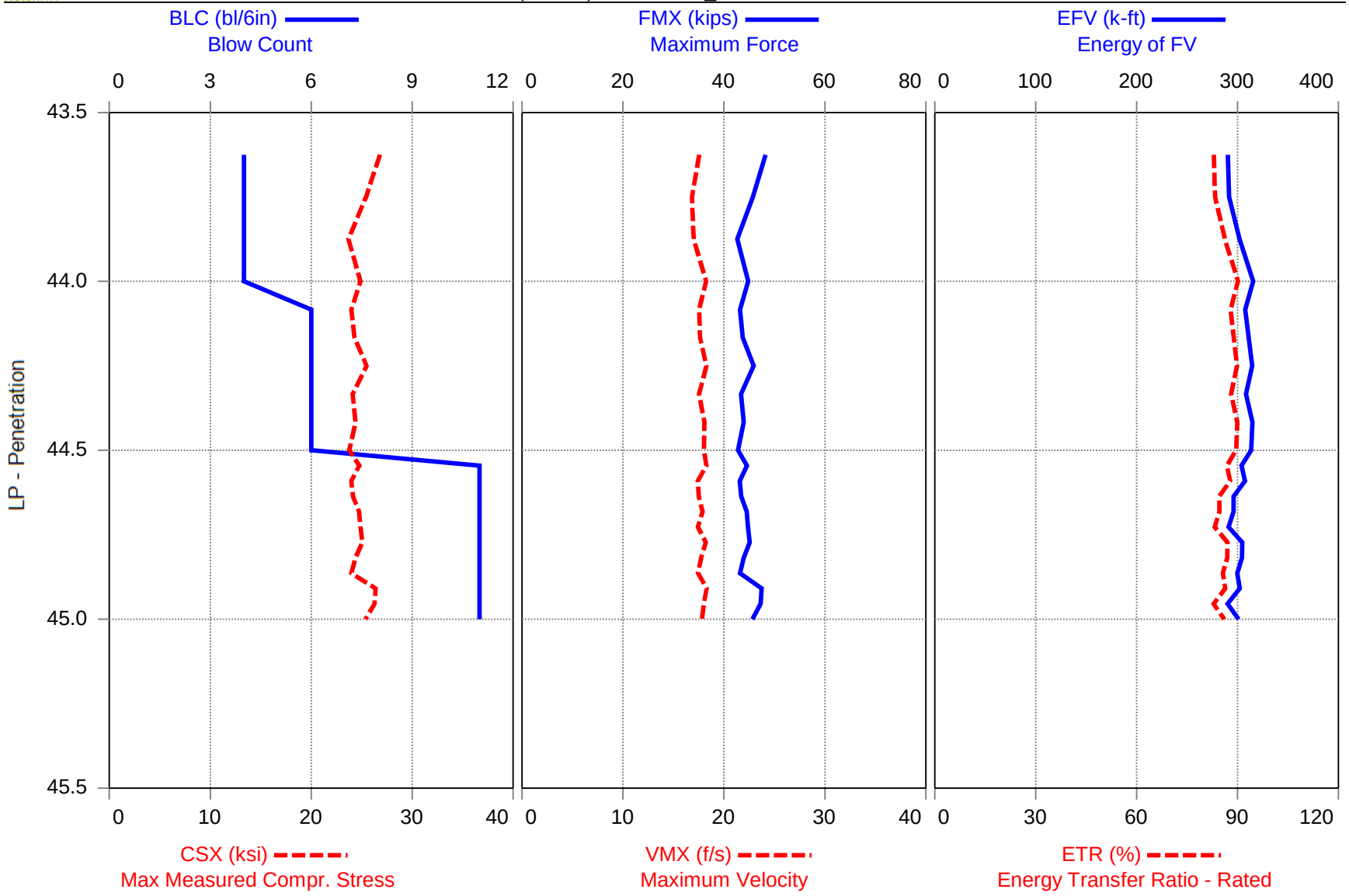


Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

Printed: 31-August-2017

Test started: 22-August-2017

DIEDRICH D50 (SN382) - Y25ARPB_2200, 43.5 to 45

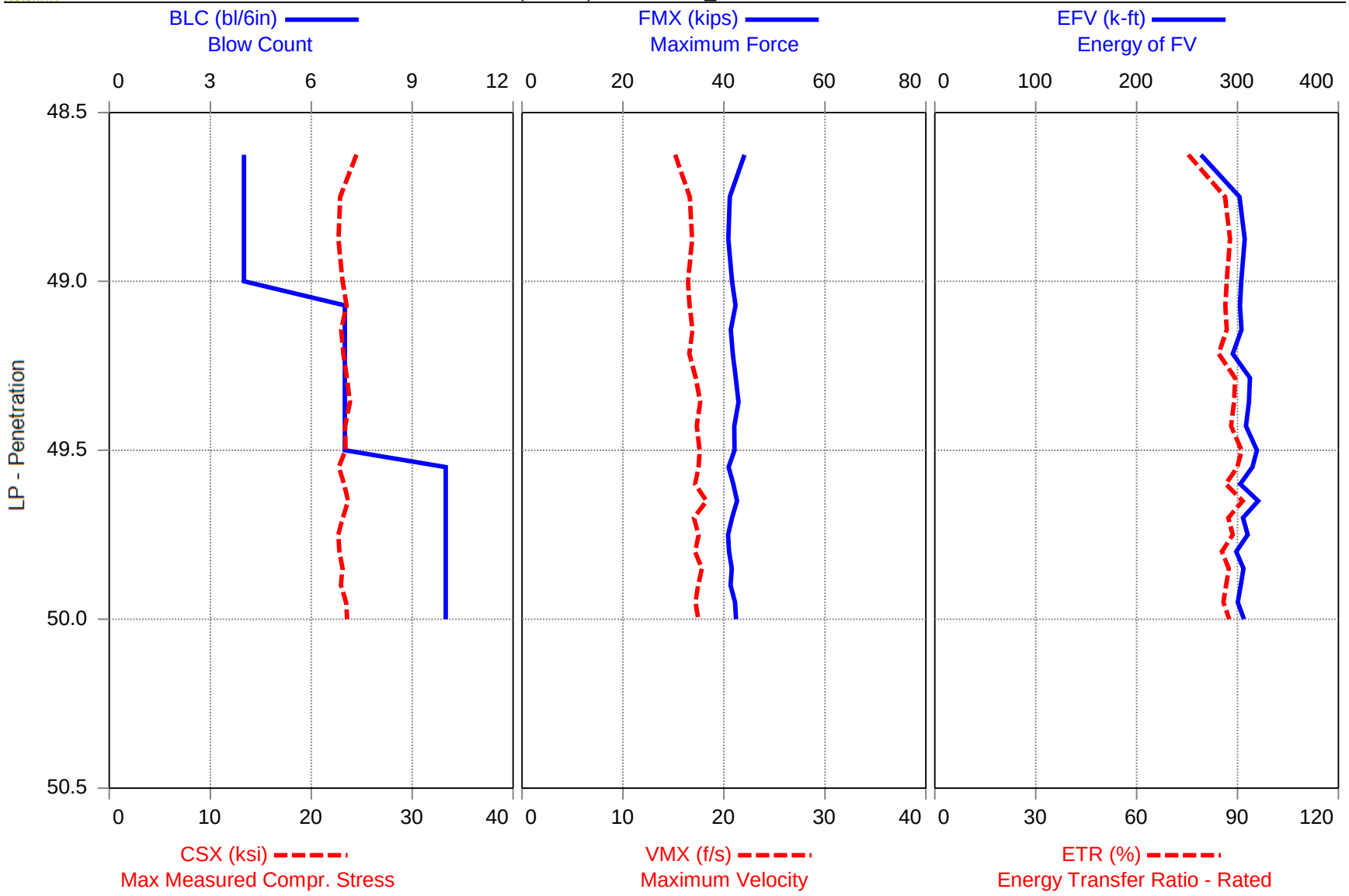


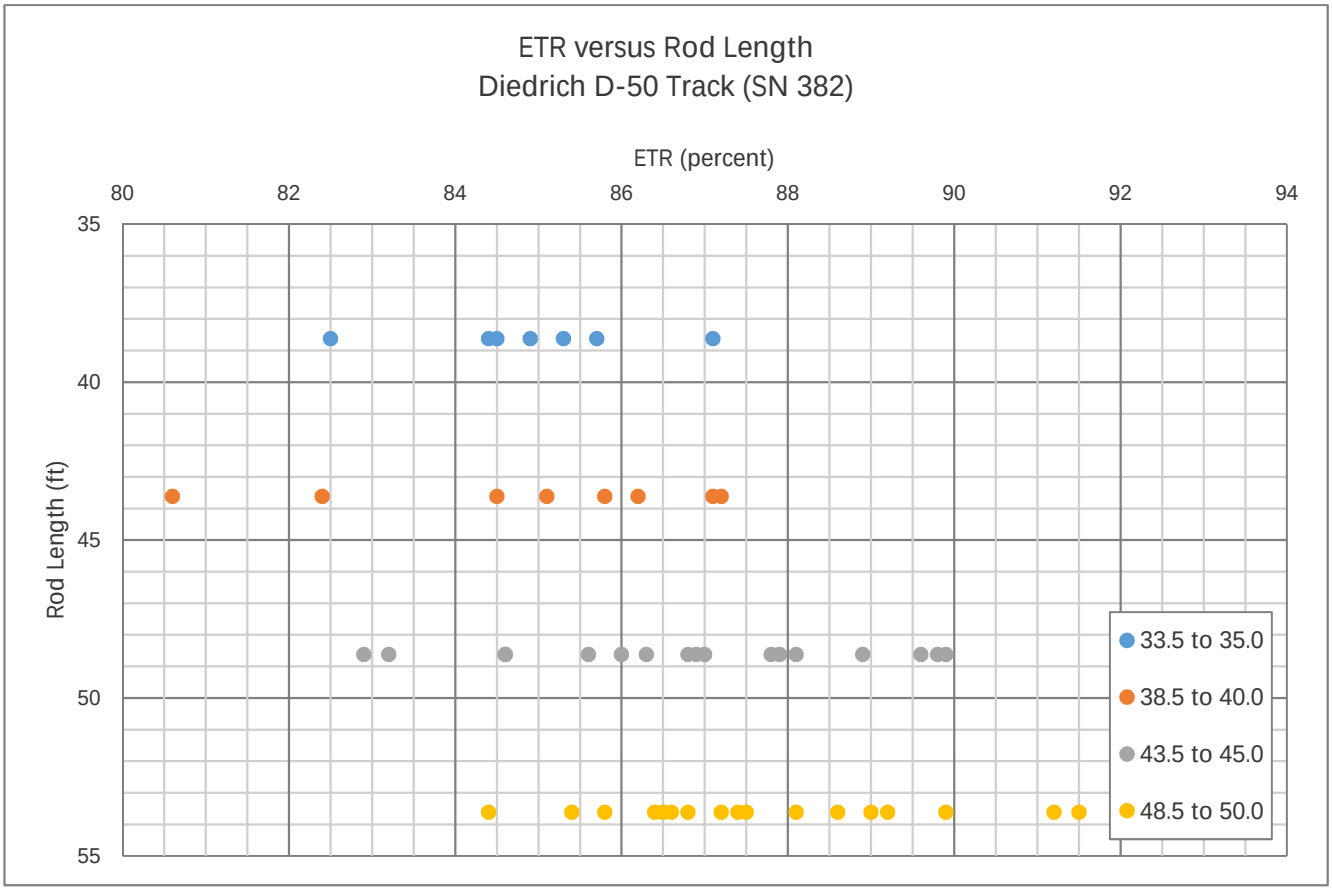
Pile Dynamics, Inc. - PDIPLOT2 Ver 2016.2.57.6 - Case Method & iCAP® Results

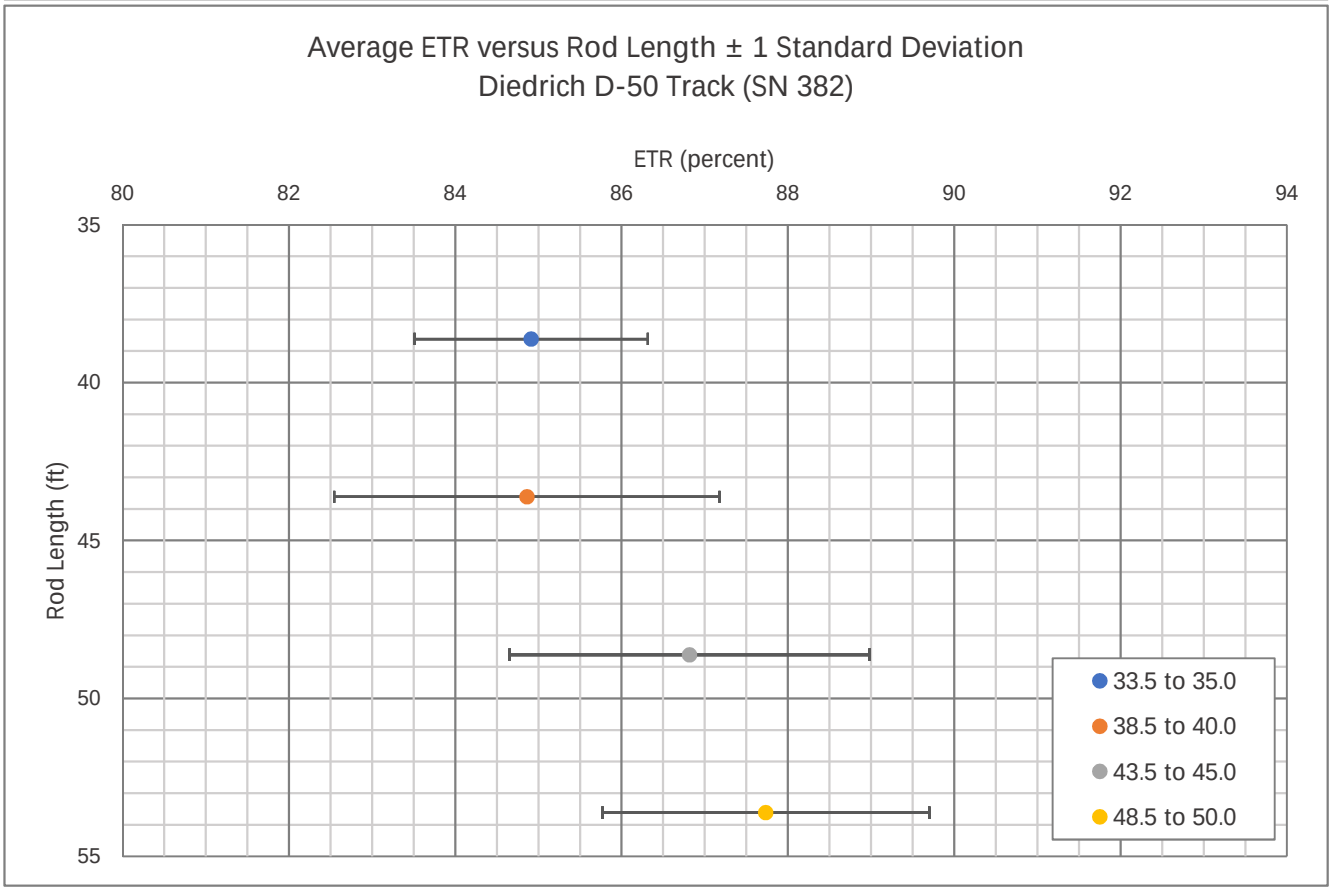
Printed: 31-August-2017

Test started: 22-August-2017

DIEDRICH D50 (SN382) - Y25ARPB_2200, 48.5 to 50




ETR versus Rod Length
Diedrich D-50 Track (SN 382)
ETR (percent)
80
82
84
86
88
90
92
94
Rod Length (ft)
35
40
45
50
55
33.5 to 35.0
38.5 to 40.0
43.5 to 45.0
48.5 to 50.0


Average ETR versus Rod Length ± 1 Standard Deviation
Diedrich D-50 Track (SN 382)
ETR (percent)
80
82
84
86
88
90
92
94
Rod Length (ft)
35
40
45
50
55
33.5 to 35.0
38.5 to 40.0
43.5 to 45.0
48.5 to 50.0

Appendix II

SPT Energy Evaluation Form

S&ME

Project: R-2247 **Date (s):** 8/22/17
Project No.: 6235-17-020 **Weather:** 90° SUNNY
Boring No.: Y25AR2B-2200 **Drill Rod Type:** BWJ

On-site Personnel

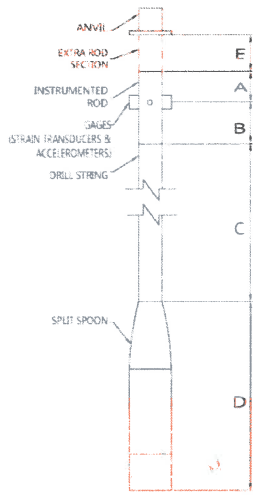
Drilling Company: S&ME, INC.
Rig Oper./Helper: JUSTIN MILLWOOD
Rig Engr/Geologist: FINLEY LLOYD
Analyzer Oper.: BOB KRAL

Rig/Hammer Info

Drill Rig Make/Model: DIEDRICH D-50
Carrier Type: TRACK (MST-8000)
Rig Serial No.: 382
Hammer Type/Model: DIEDRICH
Hammer Serial No.: 382
Hammer Drop System: AUTO
Lubrication Condition: PER MANUFACTURER
Manufacturer Recommended Operation Rate (bpm): 45
Drop Height ~~from Calibration Record~~ (in.): 30
Hammer Weight ~~from Calibration Record~~ (lbs): 140
Anvil Dimension (in.): 30
Drilling Method: HSA

Rod Info

(A + E) Impact Surface to Gages Length: 1.67 ft
(B) Instr. Rod Length below Gages: 1.42 ft
(A) + (B) Instr. Rod Length: 2.67 ft
(D) Spoon Length: 2.95 ft
(E) Rod Length Above Instr. Rod (if applicable): 0.42 ft
Instr. Rod S/N: 102BW-2
Instr. Rod Outside Dia.: 2.125 in.
Instr. Rod Area: 1.80 in^2
PDA Make/Model: PAX
PDA Serial No.: 3733L
Calib. Pulse Test (y/n): Y



Gage Information

Gage		Serial No.	Calibration No.
Accel.	A3	5641	376
	A4	5642	320
Strain	F3	102BW-1	211.49
	F4	102BW-2	211.97

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (Military)	Length of Drill String (ft) (C)	(LE) Length Below Gages (ft) (B)+(C)+(D)	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts 6"	12"	18"	N Value	Drop Height In Tolerance (y/n)	
8/22	33.5 To 35.0	11:35 / 11:35	34	38.62	41	3	3	4	7	Y	SA. CL
8/22	38.5 To 40.0	11:44 / 11:44	39	43.62	41	3	4	4	8	Y	SA. SI
8/22	43.5 To 45.0	11:53 / 11:53	44	48.62	41	4	6	11	17	Y	SA. SI
8/22	48.5 To 50.0	12:00 / 12:01	49	53.62	41	4	7	10	17	Y	SA. SI

Comments: (1) **If there are any nonconformances or deficiencies identified during the testing, immediately pause the drilling and testing activities and notify the Site Manager** and describe them in the space below; (2) Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions (e.g. verticality, weather, or lubrication between trials). Drop height tolerance is ± 1 inch. Drop height verified by Rig Geologist/Engineer at time of SPT Energy measurement for CME hammers and at the beginning of the day for Diedrich hammers; (3) Note any changes in rod diameter along drill string and record locations of short rod sections; (4) Prepare a sketch or take a picture of the instrumented drill rod assembly and indicate the approximate relative location and orientation of the strain gauges, accelerometers, and LE Datum; (5) Note: Identify all attached pages, including photographs, with the Project No., Boring No., and date.

Prepared By (print/signature)
SPT Energy Lead

8/22/17
Date

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 34409.3.23	**TIP** R-2247	**COUNTY** FORSYTH	**GEOLOGIST** Lloyd, F.	
SITE DESCRIPTION US 421 / Peace Haven Road - R-2247 CD				**GROUND WTR (ft)**
BORING NO. Y25ARPB_2200	**STATION** 22+00	**OFFSET** 10 ft LT	**ALIGNMENT** Y25ARPB	**0 HR.** 47.5 FIAD
COLLAR ELEV. N/A	**TOTAL DEPTH** 50.0 ft	**NORTHING** N/A	**EASTING** N/A	**24 HR.** N/A
DRILL RIG/HAMMER EFF./DATE SME382 DIEDRICH D50 86.5% 8/22/2017		**DRILL METHOD** H.S. Augers		**HAMMER TYPE** Automatic
DRILLER Millwood, J.	**START DATE** 08/22/17	**COMP. DATE** 08/22/17	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
										GROUND SURFACE	0.0
		1.0								**ROADWAY EMBANKMENT**	
			5	4	5	9	SS-2032	M		Gray and Tan, Silty Fine to Medium SAND with Mica	3.0
		3.5	2	3	4	7	SS-2033	M		Orange and Tan, Fine Sandy SILT with Mica, with Some Clay, Sparse Organics, and Rock Fragments at 14', with 2" Seam of Fine to Coarse Sand at 19.5'	
		6.0	2	3	4	7	SS-2034	M			
		8.5	3	3	5	8	SS-2035	M		Only 6" Recovery at 3.5'-5'	
		13.5	4	3	5	8	SS-2036	M			
		18.5	4	4	5	9	SS-2037	M			
		23.5	2	2	4	6	SS-2038	M		Red, Clayey SILT with Sand	24.0 25.0
		28.5								Tan Red, Fine Sandy SILT with Mica	
			2	2	4	6	SS-2039	W		Red Gray to Gray Tan, CLAY, Trace Organics at 33.5'	29.0
		33.5	3	3	4	7	SS-2040	W			
		38.5								**RESIDUAL**	37.0
			3	4	4	8	SS-2041	W		Gray SILT, Highly Micaceous	39.0
		43.5								Light Green and Tan, Clayey SILT, with Sand	42.0
			4	6	11	17	SS-2042	W		Gray Tan, Fine Sandy SILT, Trace Mica, with 2" White Silt Seam at 44'	
		48.5	4	7	10	17	SS-2043	W			50.0
										Boring Terminated at Depth 50.0 ft in Very Stiff Sandy SILT	

DRAFT

Appendix III

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

PDI Certificate of Calibration

PDI Accelerometer Calibration

Model PR-Kicher Serial # K5641

Cal Date: 27Feb17 Cal Due : 27Feb19

Temperature: 64.5 deg. F Humidity 30 %

Calibrated at
Pile Dynamics, Inc.
30725 Aurora Road
Cleveland, OH 44139

Manufactured by Pile Dynamics, Inc.

Procedure used: PDA Accelerometer Calibration Procedure 2016-6, Revision 20160422

Equipment was found to be

✓ in tolerance As Received _____ out of tolerance As Received

✓ in tolerance As Returned _____ out of tolerance As Returned

PDI Calibration: .0752 mv/5000g

Calibration Standards Utilized
Hopkinson Bar Force Calibration F2, verified on 25APR16

PDI HopBar DOS PAK, serial number 1273K, verified on 25 APR 16

Calibration performed by: L. M. Wright
Laine Wright, Technician

Reviewed by: Robert Sprenger
Robert Sprenger, Production Manager

Accelerometer CC-5 Issued 20160426

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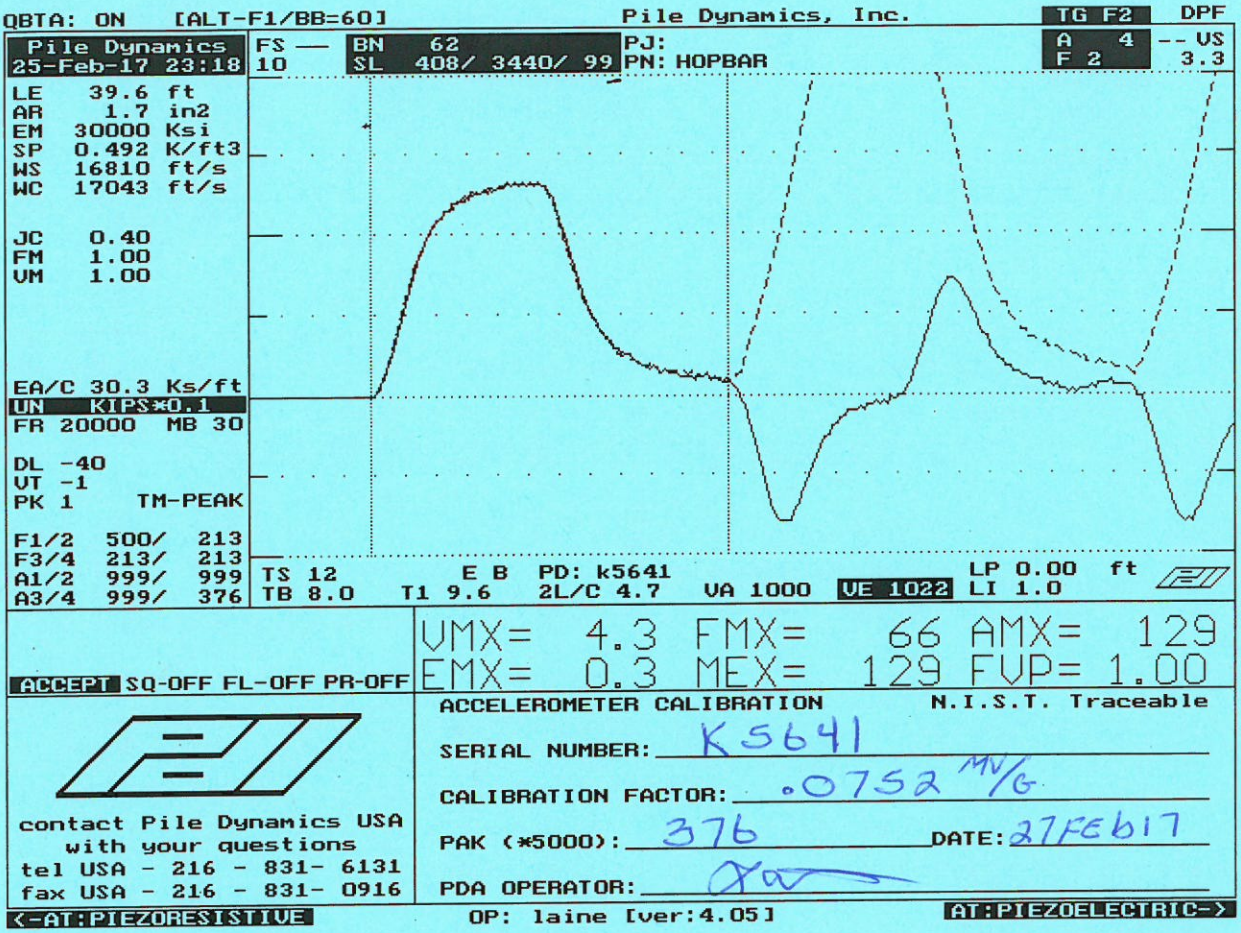
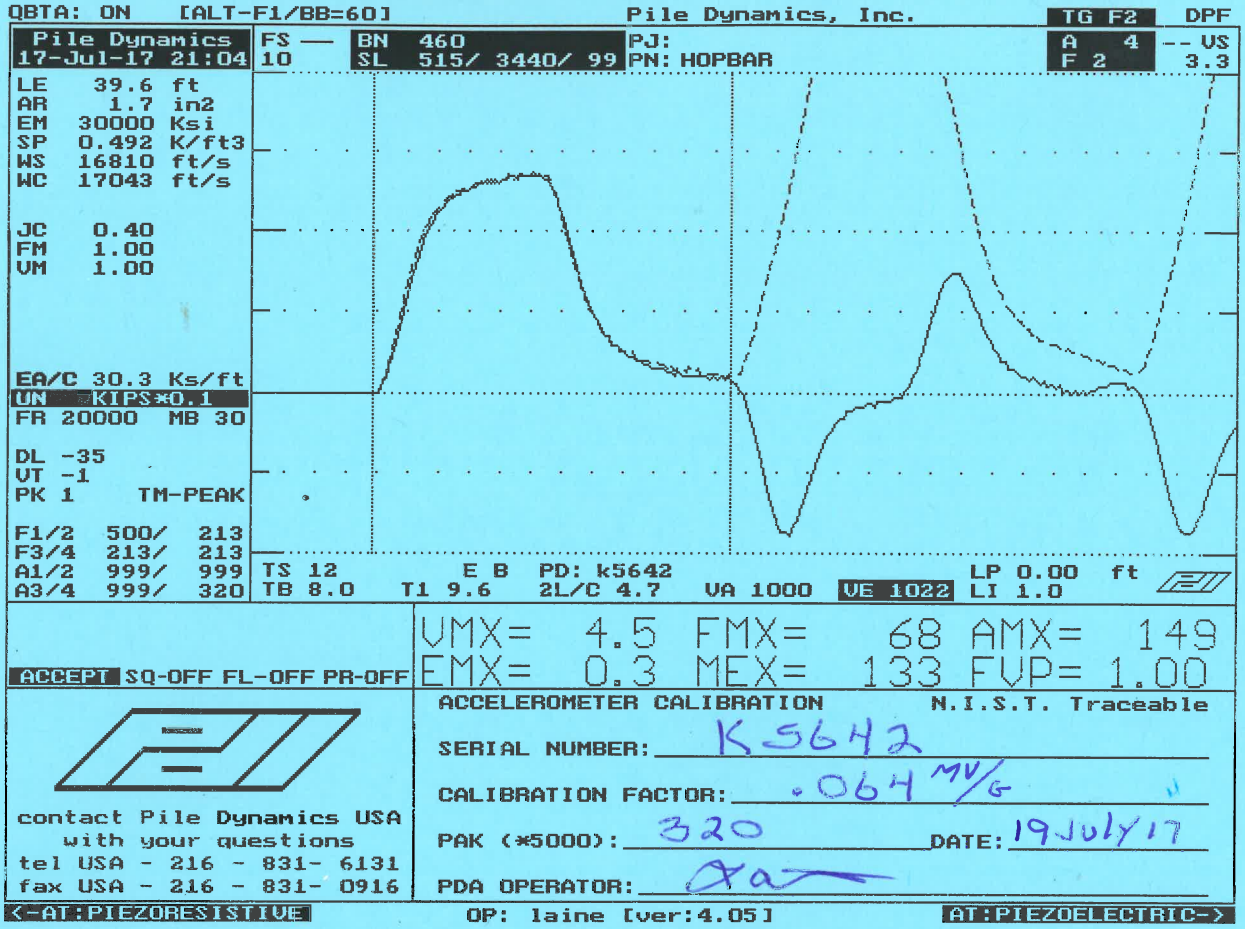
E-mail: info@pile.com • www.pile.com



Smart Sensor

Smart Chip Programmed By RMW **on** 27FEB17 **CRC Value** 3C62



Smart Sensor

Smart Chip Programmed By D.M.W. **on** 19July17 **CRC Value** 73CE

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

PDI Certificate of Calibration

PDI SPT Drill Rod Serial # 102 BW

Cal Date: 2-27-17 Cal Due : 2-27-19

Temperature: 69.2 deg. F Humidity 42 %

Manufactured by Pile Dynamics, Inc.
Calibrated at: Pile Dynamics, Inc., 30725 Aurora Road, Cleveland, OH 44139
Procedure used: SPT Drill Rod Calibration Procedure 2016-4, Revision 20160422
Calibration Data: Attach SPT Rod Data Sheet DS-17

Equipment was found to be
✓ in tolerance As Received _____ out of tolerance As Received

✓ in tolerance As Returned _____ out of tolerance As Returned

Calibration Standards Utilized

1. PDI SPT Calibration Signal Conditioning Unit #000001, verified on 20160302
2. PDI Load Cell #75, Certificate #3482090006
3. Capacitec Displacement Sensor #2034, Certificate #3482090004
4. Capacitec Displacement Sensor #2040, Certificate #3482090004
5. Capacitec Displacement Mainframe #4004-671, Certificate #3482090004
6. Brown & Sharpe Digital Caliper #8G028506, Certificate #3482090001
7. National Instruments USB-6210 DAQ serial number 159AFDE, Certificate #3482090002

Calibration performed by:

David Burrell Technician

Reviewed by:

Robert Sprenger, Production Manager

SPT CC-16 Issued 20160425

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com

Pile Dynamics, Inc.

Quality Assurance for Deep Foundations

SPT Calibration Data Sheet Revision number 20160426
Use Calibration Procedure Number 2016-8, Revision 20160422

SPT Drill Rod Data

Serial Number: 102 BW Calibration Date: 2-27-17

Temperature: 69.2 °F Humidity: 42 %

Calibration performed in accordance with PDI SPT Calibration Procedure 2016-4, Revision 20160422

As Received (circle one) : Operational - Malfunctioning - Damaged

Calibration data
Pre-Load: 1. 8032 2. 8103 3. 8051

Total Load: 1. 17944 2. 18025 3. 17918

Common typical theoretical EA values based on SPT Rod Type:
AW: 35400 NW: 43100 or 68100 N3: 70800 BW:52344

EA Theoretical 52344 EA Measured 53973.2 Error 3.11 %
Within 4% Tolerance: Y / N

Alternative EA verification: Measure wall thickness, calculate area and multiply by 30000. (use spreadsheet for calculation)

Calibration values
Channel 1: As Found: (last cal): 218.03 As Left: 211.49 Within 5% Tolerance: Y / N
Channel 2: As Found: (last cal): 216.99 As Left: 211.97 Within 5% Tolerance: Y / N
EA: As Found: (last cal): 52603.8 As Left: 53973.2 Difference: 2.6 %

Calibration performed by:

David Burrell, Technician

Reviewed by:

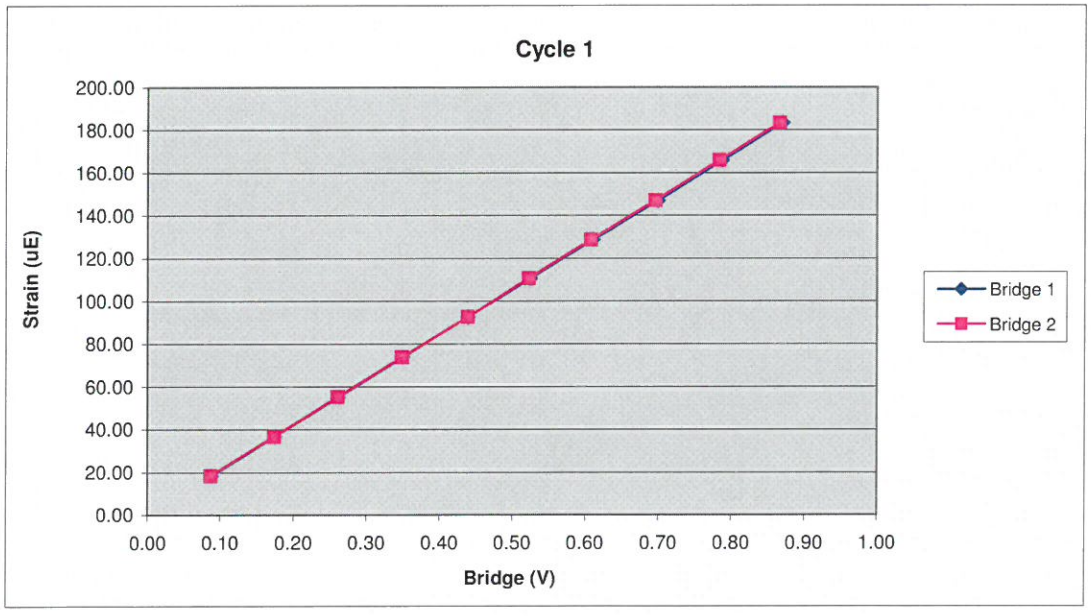
Robert Sprenger, Production Manager

30725 Aurora Road • Cleveland, Ohio 44139 USA • +1-216-831-6131 • Fax +1-216-831-0916
E-mail: info@pile.com • www.pile.com

102BW		Cycle 1		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	994.33	18.41	0.09	0.09
3	1984.92	36.66	0.17	0.17
4	2976.10	55.17	0.26	0.26
5	3978.50	73.79	0.35	0.35
6	4997.02	92.56	0.44	0.44
7	5967.75	110.67	0.52	0.52
8	6936.11	128.65	0.61	0.61
9	7949.72	147.12	0.70	0.70
10	8958.80	165.80	0.79	0.78
11	9912.81	183.41	0.87	0.87

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**11383.56**	**Force Calibration (lb/V)**	**11443.76**
Offset	-3.84	Offset	-11.61
Correlation	0.999997	Correlation	0.999997
Strain Calibration (µE/V)	**210.68**	**Strain Calibration (µE/V)**	**211.79**
Offset	0.00	Offset	-0.14
Correlation	0.999996	Correlation	0.999998

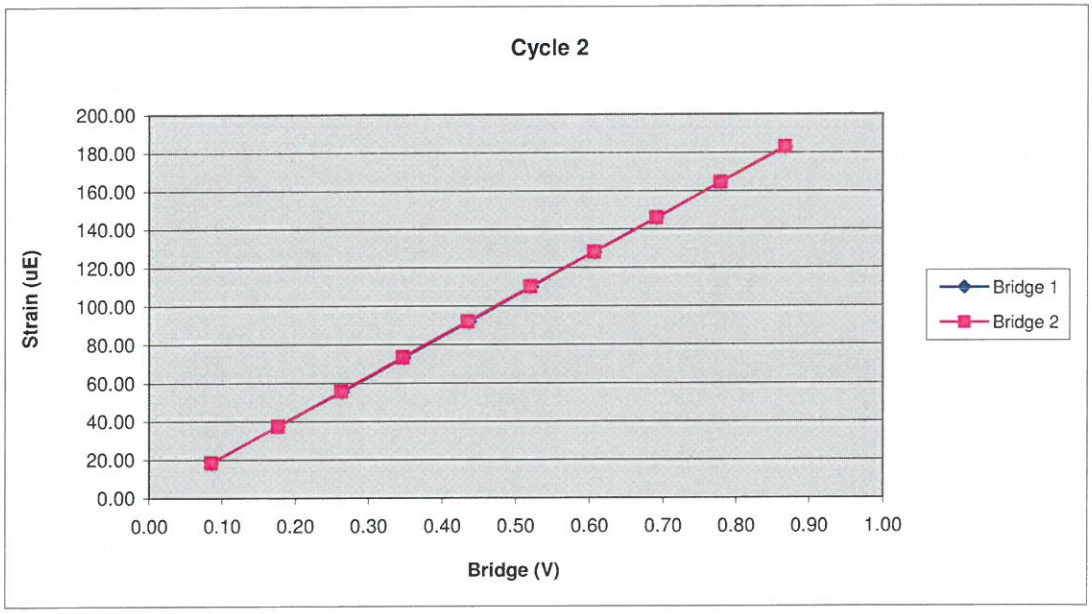
Force Strain Calibration	
EA (Kips)	**54033.05**
Offset	-3.88
Correlation	0.999998



102BW		Cycle 2		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	990.79	18.37	0.09	0.09
3	2024.07	37.45	0.18	0.18
4	3007.38	55.54	0.26	0.26
5	3968.86	73.37	0.35	0.35
6	4989.55	92.06	0.44	0.43
7	5960.67	110.16	0.52	0.52
8	6939.65	128.18	0.61	0.61
9	7913.13	145.93	0.69	0.69
10	8905.30	164.37	0.78	0.78
11	9922.44	182.88	0.87	0.87

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**11435.73**	**Force Calibration (lb/V)**	**11435.98**
Offset	**0.17**	Offset	**9.08**
Correlation	**0.999999**	Correlation	**0.999999**
Strain Calibration (µE/V)	**210.77**	**Strain Calibration (µE/V)**	**210.77**
Offset	**0.16**	Offset	**0.33**
Correlation	**0.999997**	Correlation	**0.999998**

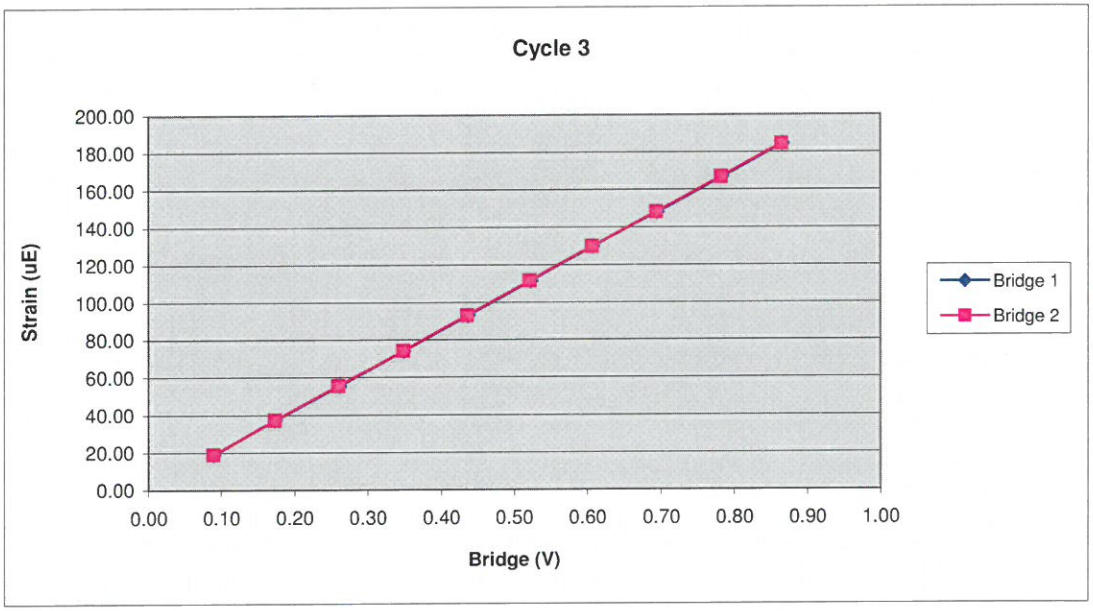
Force Strain Calibration	
EA (Kips)	**54256.99**
Offset	**-8.56**
Correlation	**0.999999**



102BW		Cycle 3		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	996.69	18.87	0.09	0.09
3	1961.32	37.18	0.17	0.17
4	2957.81	55.62	0.26	0.26
5	3966.89	74.24	0.35	0.35
6	4987.58	93.01	0.44	0.44
7	5947.49	111.39	0.52	0.52
8	6915.46	129.65	0.61	0.61
9	7914.71	148.00	0.70	0.69
10	8927.52	166.74	0.78	0.78
11	9867.37	184.37	0.87	0.86

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**11424.35**	**Force Calibration (lb/V)**	**11442.09**
Offset	**-20.96**	Offset	**-14.35**
Correlation	**0.999998**	Correlation	**0.999997**
Strain Calibration (µE/V)	**213.02**	**Strain Calibration (µE/V)**	**213.35**
Offset	**0.00**	Offset	**0.12**
Correlation	**0.999995**	Correlation	**0.999996**

Force Strain Calibration	
EA (Kips)	**53629.74**
Offset	**-20.93**
Correlation	**0.999994**



Bridge Excitation (V) 5
Shunt Resitor (ohm) 60.4k

Calibration Factors	102BW		
Bridge 1 (µE/V)	211.49	Bridge 2 (µE/V)	211.97
EA Factor (Kips)	53973.26	Area (in^2)	1.80

Calibrated by: David Brunell
Calibrated Date: 2/27/2017

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

Traceable to N.I.S.T.

Appendix IV

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

Pile Dynamics, Inc.

This documents that

Robert E. Kral
S&ME, Inc.

has on May 20, 2016 achieved the rank of

ADVANCED

on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended*** **that Individuals at the Advanced level seek Master or Expert levels through additional study within six years of the date of this document.**

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. **This certificate can be verified at www.PDAproficiencytest.com.** The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate.

Steven A. Hall, Executive Director
Pile Driving Contractors Association

SEAL

Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2072