Geotechnical Baseline Report (GBLR)
I-85 Bridge Over Rocky Creek
Greenville County, South Carolina
SCDOT Project ID P038111
S&ME Project ID 1426-15-009

PREPARED FOR:

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August 29, 2019 (Rev.)

August 29, 2019

Michael Baker International
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Attention: Ms. Reneé Tison, P.E.

Reference: **Geotechnical Baseline Report (GBLR)**
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Greenville County, South Carolina
SCDOT Project ID P038111
S&ME Project #1426-15-009

Dear Ms. Tison:

S&ME, Inc. (S&ME) is pleased to submit this Geotechnical Base Line Report (GBLR) to provide geotechnical information and preliminary geotechnical recommendations to Michael Baker International (MBI) and the South Carolina Department of Transportation (SCDOT) for the referenced project. The Agreement for our services was initially established through the Task Order between MBI and S&ME dated May 11, 2016 (for I-85 Widening, MM54-60); however, the project was subsequently postponed in May 2017. In January 2019, the project scope was reduced to the proposed I-85 Bridge Over Rocky Creek, with revised project limits bounded by approximate Sta. 406+37 to Sta. 425+15. On March 7, 2019, the project limits were increased to extend the southbound outer lane approximately 2000 feet south (to approximate Sta. 386+00). Our scope of services, as initially outlined in the 2016 Task Order and subsequently revised through correspondence with MBI during the period of January through March 2019, was performed in general accordance with the *SCDOT Geotechnical Design Manual* (GDM), Version 2.0 (2019).

The enclosed report includes (1) a description of observed site conditions, (2) methods and results of field tests and sampling, (3) laboratory tests of recovered samples, and (4) design and construction considerations for informational purposes only. This revised report includes data from supplemental CPT soundings, requested by SCDOT and performed on August 8, 2019 (following previous submission of the report on June 4, 2019).

We appreciate the opportunity to be of service to Michael Baker International and SCDOT as your Geotechnical Consultant for this project. If you have any questions or need any further information in regard to this report, please contact us at 864-297-9944.

Sincerely,
S&ME, Inc.

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Appendices

1.0 Project Information

Project information was provided through e-mail and telephone correspondence between Ms. Reneé Tison, P.E. and Mr. Stephen Ross, P.E. (of MBI) and Mr. Gant Taylor, P.E. (of S&ME) during the period of January through March 2019, along with the following:

- Review of multiple preliminary plans, provided by MBI in January 2019, including: the *Conceptual Plan and Profile*, *Proposed 169'-3" Width Stages 1 & 2*, *Proposed 169'-3" Width Stages 1 & 2*, and *I-85 Cross-Sections* for the project area;
- Multiple site reconnaissance visits by S&ME personnel during the field work between February 22 and April 11, 2019; and
- Review of aerial photographs of the site and the 1983 USGS Topographic Map of the area, available from Google Earth™ and the Greenville County GIS.
- Review of available roadway plans and cross-sections, and data from previous Geotechnical Exploration Reports in this area (by others), provided by Ms. Kimberly Bishop, P.E. and Mr. Trapp Harris, P.E. (of SCDOT) during the period of March 12 through May 23, 2019. The previous Reports included the *Geotechnical Data Report for I-85/I-385 Interchange Improvements* by Florence & Hutcheson/ICA (dated January 25, 2013), and the *Final Roadway Geotechnical Engineering Report* by ECS Carolinas, LLP (dated September 2015).

The proposed construction for this project includes improvements and widening of the section of Interstate 85 (I-85) in the vicinity of its crossing over Rocky Creek, located southwest of I-85 Exit 54 (Pelham Road interchange). The approximate project boundaries are from Station 406+37 to Station 425+15 on the northbound side, and from approximate Station 386+00 to Station 425+15 on the southbound side. On March 7, 2019, the project limits were increased to extend the southbound outer lane approximately 2000 feet south. The widening will consist of increasing the total number of lanes from six to eight lanes (four in each direction), by adding a travel lane in each direction (primarily widening to the outside paved/grassed shoulder). As shown on the *Conceptual Plan and Profile* drawing, the primary features of this project include construction of a new 210-foot long, two-span bridge over Rocky Creek (to replace the existing four-barreled box culvert near Station 413+73), and two associated MSE retaining walls. "MSE Wall No. 1" will be approximately 180 feet in length, constructed along the northwest corner of the western bridge approach, and "MSE Wall No. 2" will be approximately 110 feet in length, constructed along the southeast corner of the eastern bridge approach.

Our proposed exploration scope was outlined in the document titled *S&ME Proposed Boring Location Plans* (dated January 20, 2019, which served as our Subsurface Investigation Plan), as discussed with Ms. Tison and Mr. Harris during a scoping meeting on January 22, 2019. As previously noted, the project scope was expanded on March 7, 2019 to include two additional borings along the approximately 2000-foot extension of the southbound outer lane. After submittal of a previous version of this report (dated June 4, 2019), on July 31, 2019 we were requested by Mr. Harris to perform supplemental CPT soundings near the four "corners" of the proposed bridge (generally near both ends of each end bent). The primary purpose of the CPT soundings was to further evaluate the low-consistency fill and alluvial soils encountered in the previous soil test borings. Our services were performed in general accordance with the *SCDOT Geotechnical Design Manual* (GDM), Version 2.0 (2019), and the referenced modified/approved scope.

The objective of this exploration was to explore subsurface conditions along the referenced section of the I-85 alignment (with a focus on the new bridge bents and associated retaining walls), as they pertain to the proposed

roadway and structure improvements. The field and laboratory testing of this exploration provides geotechnical baseline data to be utilized for preliminary design and estimating as part of a future design-build letting process.

This report presents a general discussion of preliminary design and construction issues anticipated for the proposed construction. While this report presents our field and laboratory testing data as well some design considerations, as requested by the SCDOT, it does not provide a level of exploration or recommendations in sufficient detail to support final design recommendations.

Based on the above information, we understand SCDOT is planning to construct a new 210-foot long, two-span bridge over Rocky Creek, to replace the existing four-barreled box culvert near Station 413+73. The new bridge will be constructed between approximate Station 412+30 (start) and Station 414+40 (end). To support the 105-foot long spans, deep foundations will be installed to support the two end bents (likely with driven piles) and one interior bent (likely with drilled shafts or driven piles). With an out-to-out width of approximately 169 feet, the staged bridge construction will likely require at least four stages to maintain adequate traffic flow through the construction zone. Installation of temporary shoring will be required to accommodate new bridge construction in close proximity to existing/remaining traffic lanes.

From our observations during site reconnaissance and review of the USGS Topographic Map, it appears much of the bridge project area near the existing culvert is within a relatively wide alluvial floodplain of Rocky Creek. Although we are not aware of the date of original culvert construction, it appears the natural alignment of Rocky Creek was altered to promote flow through the culvert oriented perpendicular to I-85. The existing four-barreled, reinforced concrete box culvert has units measuring 8 feet by 10 feet in cross-sectional area, with total rectangular plan dimensions of approximately 42 feet by 152 feet. Near the I-85 centerline, the culvert bears near Elev. 838 feet, with an inlet grade near Elev. 839 feet at the north end of the culvert, and an outlet grade near Elev. 836 feet at the south end. This area is located in a relatively straight portion of I-85, near the flat bottom of a vertical curve. Construction of the bridge will also result in a change of the vertical alignment of I-85, with a typical grade increase of approximately 4 to 5 feet higher than current grades. Also, the alignment of Rocky Creek centerline will be shifted approximately 50 to 100 feet southwest of the existing culvert (on a skew), to be re-channeled between the western End Bent 1 and Interior Bent 2.

2.0 Exploration Procedures and Site Conditions

Representatives of S&ME's professional staff were present at the site on multiple dates during the period of February 22 through August 8, 2019, to conduct site reconnaissance and observe the following field testing (described in further detail in the following sections):

- Ten soil test borings (STB), labeled BR-1 through BR-3 (at the proposed bridge bents), RW-1 and RW-2 (at the proposed MSE Wall locations), and R-1 through R-5 (at roadway embankment locations). The borings included Standard Penetration Tests (SPT) at typical designated intervals. Upon encountering drill bit refusal, bridge borings BR-1 through BR-3 were followed by NQ rock coring to depths of approximately 19 to 24 feet below refusal levels;
- Multiple undisturbed (UD) samples were obtained from offset borings near borings BR-1, BR-3, and RW-2 (although laboratory testing was assigned on only three UD samples, we collected additional UD samples to ensure sufficient sample material for laboratory testing of the soft alluvium and fill soils);
- Multiple bulk samples were obtained from the augered cuttings from borings BR-1, BR-2, RW-1, R-2, and R-5, to depths ranging from 6 to 15 feet below the ground surface;

- Cone Penetration Test (CPT) soundings at four locations (labeled CPT-1 through CPT-4), generally located near both ends of each end bent of the proposed bridge. A total of eight soundings (including several offsets) were extended to CPT "cone refusal", at depths ranging from approximately 11 to 25 feet; and
- One geophysical testing survey, labeled SW-1, using surface wave analysis by both MASW and MAM methods, located near the northeast corner of the eastern bridge approach.

2.1 Testing Locations and Elevations

The boring locations were initially established in the field by our personnel, using the furnished preliminary project plans for reference, and our handheld GPS unit (generally accurate to within about 3 feet). The borings were all located within current SCDOT right-of-way, and specifically within an active construction zone for the "I-85/I-385 Interchange Improvements" project. The approximate boring locations are shown on the Boring Location Plans (Figures 1 and 2) in Appendix I. Photographs of each boring location are also presented in Appendix I, to provide physical context of the surrounding topography and ground conditions at the time of exploration. After completion of drilling, we subcontracted a licensed professional surveyor (Infrastructure Consulting & Engineering) to survey the boring elevations and locations/coordinates. Because the CPT soundings were performed after the ICE survey was completed, the CPT locations/coordinates and elevations were estimated based on measuring distances from nearby surveyed boring locations (in very close proximity and elevation)

Several borings were located in close proximity to the travel lanes of I-85, requiring temporary lane closures. On the northbound side on I-85, the borings were located in an active construction zone, but behind temporary concrete barriers. Some of the boring locations on this northbound shoulder were influenced by topographic constraints associated with the main construction access/haul road. Due to ongoing grading activities, we coordinated our field work operations with the site contractor. Shortly following completion of our borings on the northbound shoulder, we observed some additional fine grading activities (resulting in minor cut or fill) had been performed in the vicinity of boring locations. However, immediately prior to the surveying of the boring locations on May 29, 2019, we observed the ground surface level at each boring location was similar to its level at the time of drilling.

A summary of soil test locations (stations/offsets, based on the existing I-85 mainline centerline), depths, and ground surface elevations is presented on the *Test Location Summary Table* in Appendix II, and in Table 2-1 below. The table in Appendix II also presents the surveyed coordinates for the boring locations in SC State Plane Northing/Easting and Latitude/Longitude decimal degrees.

Table 2-1: Soil Testing Location Table

Test No.	Test Hole Local	Station	Offset (ft)	Elevation (ft)	Total Depth (ft)
BR-1	Bridge / Road	412+72	63 - R	855.4	50.6 (1)
BR-2	Bridge / Road	413+37	6 - L	855.4	61.5 (1)
BR-3	Bridge / Road	414+20	92 - L	847.9	50.8 (1)
RW-1	MSE Wall / Road	410+90	89 - L	849.7	34.0 (2)
RW-2	MSE Wall / Road	415+78	77 - R	849.9	33.5 (2)
R-1	Road	409+10	63 - R	860.1	20.0
R-2	Road	417+24	112 - L	849.5	20.0

R-3	Road	419+17	76 - R	850.6	20.0
R-4	Road	401+28	57 - L	869.4	20.0
R-5	Road	393+14	46 - L	877.8	17.0 (2)
CPT-1	Bridge / Road	412+68	63 - R	855	11.4 (3)
CPT-1A	Bridge / Road	412+64	63 - R	855	25.0 (3)
CPT-2	Bridge/MSE Wall	410+86	89 - L	850	16.2 (3)
CPT-2A	Bridge/MSE Wall	410+82	89 - L	850	16.8 (3)
CPT-3	Bridge / Road	414+24	92 - L	848	14.9 (3)
CPT-3A	Bridge / Road	414+28	92 - L	848	15.2 (3)
CPT-3B	Bridge / Road	414+32	92 - L	848	14.5 (3)
CPT-4	Bridge / Road	414+70	63 - R	854	20.5 (3)
SW-1 (MASW/MAM)	Bridge / Road	415+26 (4)	96 - L (4)	848 (average)	100

Notes: (1) Total depth includes coring
(2) Depth of refusal (not cored)
(3) Depth of CPT "cone refusal"
(4) Array centered at this Station/Offset

2.2 Soil Test Borings

S&ME drilled ten soil test borings, with soil sampling and penetration testing performed in general accordance with ASTM D 1586 "Standard Test Method for Penetration Test and Split Barrel Sampling of Soils". The borings were performed using both truck- and ATV-mounted drill rigs equipped with automatic SPT hammers, using both hollow stem augers and rotary wash boring methods to advance the holes. Split-spoon samples were generally obtained continuously to a depth of 10 feet, and then at 5-foot intervals thereafter. Bridge borings BR-1 through BR-3 were drilled to practical refusal (refusal of the drill bit and/or split-spoon) at depths ranging from approximately 28 to 37 feet below the ground surface (and then continued deeper with coring, as described below). Retaining wall borings RW-1 and RW-2 were terminated upon encountering auger refusal at depths of 34.0 feet and 33.5 feet below the ground surface, respectively. Roadway borings R-1 through R-4 were terminated at the planned depth of 20 feet. Upon penetrating apparent "boulder fill", roadway boring R-5 encountered auger refusal at a depth of approximately 17 feet on material that could not be conclusively discerned as either a large boulder or mass rock. Two offset auger borings, performed approximately 17 feet south (labeled "R-5A" on the boring log) and 38 feet north (R-5B) of boring R-5, encountered generally similar fill conditions, and were terminated upon auger refusal at depths of 18 feet and 25.5 feet, respectively.

Upon encountering practical refusal in the bridge borings (BR-1 through BR-3), steel casing was then installed to the refusal depth, and rock coring was performed using an NQ-2 core barrel and wireline retrieval system. Coring extended 19.3 to 24.2 feet into the refusal materials. Upon completion of coring, the rock core samples were placed in standard core boxes and characterized in the field. The core boxes were then transported to our laboratory, where the cores were further classified and evaluated in general accordance with GDM specifications. Total boring/coring depths in the bridge borings ranged from 50.6 to 61.5 feet, as noted in Table 2-2 below.

Table 2-2: Rock Coring Summary at Bridge Borings

Boring No.	Refusal Depth (ft)	Length of Rock Coring (ft)	Total Depth (ft)
BR-1	28.1	22.5	50.6
BR-2	37.3	24.2	61.5
BR-3	31.5	19.3	50.8

As shown on the Subsurface Profiles in Appendix I, and the Soil Test Logs in Appendix II, the bridge and retaining wall borings generally encountered existing fill above alluvium and residuum, sequentially, underlain by partially weathered rock (PWR) and refusal material. Depth to PWR varied from 26 to 36 feet below the ground surface, and the depth to refusal materials ranged from 28 to 37 feet. Rock coring recovery (REC) varied from 83 to 100 percent, and the Rock Quality Designation (RQD) varied from 42 to 100 percent. Based on evaluation of the recovered core specimens, the Rock Mass Rating (RMR) varied from 23 to 70, and the Geological Strength Index (GSI) varied from 40 to 90, indicating variable rock quality conditions at the three boring locations near the bridge bents. Unconfined compressive strength tests were performed on thirteen intact rock core samples (one sample selected from each NQ-# core run). The core testing resulted in unconfined compressive strengths ranging from 3,450 psi to 28,320 psi. Rock quality and compressive strength can vary significantly with depth and location (as apparent from the test data).

After completion of the drilling, the subsurface water level and/or hole cave depth was measured in each boring at the time of boring (TOB), and approximately 24 hours after boring completion (where feasible). These water levels are reported on the individual Soil Test Logs in Appendix II. Some borings were located in/near high traffic areas, so they were backfilled at the time of drilling for safety precautions. The boreholes were backfilled with a combination of soil cuttings and/or bentonite hold-plug material (no borings were located within active travel lanes). Also, a mechanical hole plug was installed in each boring to help reduce borehole settlement. Borings drilled through existing shoulder pavements (BR-2 and R-5) were also capped with a layer of asphalt cold patch.

In addition to the SPT sampling, we obtained UD samples and bulk samples of the auger cuttings from multiple borings (or offset borings), as summarized in Table 2-3 below:

Table 2-3: UD Samples and Bulk Samples

Boring No.	UD Sample Depths (ft)	Bulk Sample Depths (ft)
BR-1	9-11, 19-21	0-7
BR-2	---	1-7, 7-15
BR-3	2-4, 6-8 (“UD-2”), 8-10 (“UD-3”)	---
RW-1	---	0-6
RW-2	8-10 (“UD-1”)	---
R-2	---	0-6
R-5	---	0-12

Our Geotechnical Engineer and Staff Professional classified the soil samples in the field as they were obtained. We visually and manually classified the soils in general accordance with the Unified Soil Classification System (USCS) and the procedures described in GDM Chapter 6. After completing the field work, the extracted samples (split-

spoon, bulk soil, rock core, and UD tube samples) were transported to our laboratory for subsequent physical testing.

SPT hammer energy measurements were previously performed with a Pile Driving Analyzer (PDA) on each drill rig's automatic hammer used to perform the SPT borings on this project. The Standard Penetration Resistance (N) values indicated on the logs are field-measured values and were not adjusted for overburden stress, rod length, borehole diameter, or hammer efficiency. The hammer energy ratio is indicated on the individual boring logs, and the extracted table from each hammer's PDA Hammer Efficiency Report is included in Appendix II.

As previously noted, others have performed geotechnical explorations at this project site, as documented in the *Geotechnical Data Report for I-85/I-385 Interchange Improvements* by Florence & Hutcheson/ICA (dated January 25, 2013), and the *Final Roadway Geotechnical Engineering Report* by ECS Carolinas, LLP (dated September 2015). From these reports, we have extracted the Soil Test Logs for previous borings located within the subject project limits, and included them in Appendix II for reference. The approximate locations of these previous borings are also depicted on the Boring Location Plans (Figures 1 and 2) in Appendix I.

2.3 CPT Soundings

We performed Cone Penetration Test (CPT) soundings at four locations (labeled CPT-1 through CPT-4) shown on Figure 2 in Appendix I, using a track-mounted Gyrotrack CPT rig. In a CPT sounding (ASTM D 5778), an electronically instrumented cone penetrometer is hydraulically pushed through the soil to measure point stress, pore water pressure, and sleeve friction. The CPT data is used to determine soil stratigraphy and to estimate soil parameters such as pre-consolidation stress, friction angle, and undrained shear strength. The primary purpose of the CPT soundings was to further evaluate the low-consistency fill and alluvial soils encountered in the soil test borings. The CPT test data is presented on the CPT Sounding Logs in Appendix II.

Each sounding was terminated upon encountering "cone refusal", at depths ranging from 25 feet to less than 5 feet. At each location other than CPT-4, we performed offset soundings upon encountering initial refusal. When comparing to the SPT logs, shallow refusal at CPT-1 (near boring BR-1) was apparently caused by rock fragments and/or possibly larger cobbles in the fill embankment; however, offset sounding CPT-1A extended to refusal (likely dense residuum or PWR) at a depth of 25 feet. At CPT-2 (near boring RW-1), two soundings encountered shallow refusal at depths of approximately 16 and 17 feet, apparently on gravel and/or larger cobbles in the alluvial soil zone. Similarly at CPT-3 (near boring BR-3), three soundings encountered shallow refusal at a depth of approximately 15 feet, apparently on gravel and/or larger cobbles in the alluvial soil zone. CPT-4 (approximately 100 feet southwest of boring RW-2) encountered refusal at a depth of 20.5 feet, apparently in medium dense residual soil). In addition to the eight Sounding Logs in Appendix II, we attempted four other soundings that encountered shallow refusal in fill at depths less than 5 ft (likely on large rock fragments); however, these logs were excluded.

2.4 Geophysical Testing

Shear wave velocities of the subsurface materials in the upper 100 feet were measured using surface wave methods. Specifically, we performed testing using a combination of MASW (Multi-Channel Analysis of Surface Waves) and Microtremor Array Measurements (MAM). MASW and MAM utilize the Rayleigh-type surface waves ("ground roll") of both active and passive sources, respectively, recorded by multiple receivers (geophones) deployed on an even spacing and connected to a common recording seismograph. Performing both MASW and MAM provides the greater depth of penetration using microtremor analyses (low frequency surface waves)

without sacrificing resolution at shallower depths from MASW (higher frequency surface waves). An MASW survey consists of recording different frequency surface waves generated from an active energy source (e.g. sledgehammer striking a metal plate) traveling across a linear array. An MAM survey consists of recording different frequency surface waves generated from a passive energy source (e.g. background noise, vehicles, etc.) typically traveling across a non-linear array. As previously stated, this testing was conducted between borings BR-3 and R-2, at the northeast corner of the eastern bridge approach (near End Bent 3). The approximate test location (labeled "SW-1") is indicated on the Boring Location Plan (Figure 2) in Appendix I.

The MASW was conducted using a Geometrics ES-3000 seismograph equipped with sixteen (16) 4.5-Hz vertical geophones along a linear array with geophones at a set spacings of both 5 feet and 10 feet. The MAM survey was conducted using a Geometrics ES-3000 seismograph equipped with eleven (11) 4.5-Hz vertical geophones along an "L-shaped" array with geophones at a set spacing of 20 feet. Data analysis was conducted using the OYO Corporation's SeisImager/SW™ software (Pickwin™ and WaveEq™). The results of the MASW and MAM were combined to produce a single one-dimensional Shear Wave Velocity Profile at the noted bridge location, and the Profile is contained in Appendix II.

3.0 Classification of Recovered Soil Samples

Recovered soil samples were initially classified in general accordance with ASTM D2488 *Standard Practice for Description and Identification of Soils (Visual-Manual Method)*. After laboratory testing was completed, the classifications were revised to be provided in general accordance with ASTM D2487 *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*, AASHTO M145 *Recommended Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes*, and the procedures described in GDM Chapter 6.

Interpreted subsurface conditions encountered by the STBs are shown on the Soil Test Logs in Appendix II. Three generalized subsurface cross-sectional profiles of the site soils are attached as Figures 3 through 5 in Appendix I. Table 3-1 below summarizes the general soil profile at the proposed bridge site, based on the findings of borings BR-1, BR-2, BR-3, RW-1, and RW-2:

Table 3-1: Soil Stratification Table

Geologic Formation	Elevation at Top of Layer (ft)	Depth to Top of Layer (ft)	USCS Soil Types	SPT-N Values (bpf)	Comments
Fill	855 - 847	0	SM, SC, ML, CL	1 - 32	Existing embankment
Alluvium	844 - 839	6 - 16	SP-SM, SC, SM, CL	0 - 14	Eroded/deposited along Rocky Creek
Residuum	835 - 828	16 - 24	SM	3 - 23	Weathered in-place from parent rock
Partially Weathered Rock (PWR)	829 - 818	26 - 36	SM	100+	Very dense, soil transition to rock
Refusal Material (Rock)	827 - 815	28 - 37	Crystalline Rock	N/A (cored)	Granodiorite, Gneissic Granite, Biotite Gneiss Sillimanite Schist

This Table and the Appendix records represent our interpretation of the subsurface conditions, based on observations and the field/laboratory test data at the time of exploration. Stratification lines on the boring records represent approximate boundaries between soil types; actual transitions may be gradual and the thicknesses of the strata will vary across the site.

4.0 Laboratory Physical Tests

We performed laboratory tests on selected split-spoon, UD, and bulk soil samples. Index property testing consisting of Atterberg limits, #200 sieve wash, grain size analysis (some with hydrometer), natural moisture content, and corrosion series tests were performed on select split-spoon soil samples to aid in classifying and characterizing the soils. Atterberg limits tests were performed only on soil samples that had greater than 25 percent material (by weight) passing the #200 sieve. Several samples from boring BR-2 were subjected to full grain analysis (with and without hydrometer) to provide additional particle size distribution data for scour analysis.

Two UD samples were subjected to consolidated-undrained (CU) triaxial compression testing with pore pressure measurements ("UD-1" in boring RW-2, in very soft fill at depth of 8-10 feet; and "UD-3" in boring BR-3, in very soft alluvial clay at depth of 8-10 feet). One UD sample was subjected to one-dimensional consolidation testing ("UD-2" in boring BR-3, in very soft alluvial clay at depth of 6-8 feet). For each of these UD samples, a representative specimen was subjected to Atterberg limits, full grain size analysis (with #200 sieve wash), and natural moisture content.

The bulk samples obtained at boring BR-2 were combined to form a composite blend of the soil material from depths of 1 to 12 feet below the ground surface. This material was selected because it represents the soil that will be excavated during removal of the existing culvert and re-channelization of the creek. The bulk sample was subjected to Atterberg limits, full grain size analysis (with #200 sieve wash), natural moisture content, moisture-density (standard Proctor) testing, and direct shear strength testing. The direct shear test specimens were remolded to 95% of the standard Proctor maximum density, at approximately 2% over optimum moisture content.

Corrosion series (resistivity, pH, sulfate, chloride) tests were performed on split-spoon samples from borings BR-1 (depth of 6 to 25 feet) and BR-3 (depth of 6 to 15 feet). For each boring, several consecutive samples (near/below the subsurface water level) were blended to yield a composite sample with adequate quantity to complete the assigned tests. In addition, unconfined compressive strength testing was performed on thirteen intact rock core samples obtained from Borings BR-1 through BR-3.

As previously mentioned, the samples were classified in accordance with the USCS and AASHTO guidelines. Index property test results are presented in the *Summary of Laboratory Results* tables and individual test data sheets in Appendix III, as well as on the Soil Test Logs in Appendix II. Appendix III also contains graphical plots of the Atterberg limits data, graphical plots of Index Properties versus Depth, detailed reports for the UD sample tests (CU Triaxial Shear, and Consolidation) and bulk sample tests, a summary table presenting the Corrosion Series test results, and a description of the Laboratory Test Procedures. Unconfined compressive strength test results for the rock core specimens are provided in Appendix IV, along with photographs of the rock core samples. The remaining soil and rock core samples will be retained at our laboratory until SCDOT requests them or until completion of the bridge construction project.

Testing was performed in general accordance with ASTM or AASHTO test procedures, with quantities indicated in Table 4-1 below:

Table 4-1: Laboratory Testing Summary

Boring No.	Procedure / Guideline	Quantity
Atterberg Limits	AASHTO T89/90	35
#200 Sieve Wash	ASTM D1140 / AASHTO T11	39
Full Sieve Analysis	ASTM D6913	6
Sieve Analysis w/ Hydrometer	AASHTO T88	3
Natural Moisture Content	ASTM D2216 / AASHTO T265	44
Laboratory Compaction (Standard Proctor)	ASTM D698 / AASHTO T99	1
Direct Shear	AASHTO T236	1
CU Triaxial Shear (with Pore Pressure Measurements)	ASTM D4767	2
Consolidation	ASTM D2435	1
Corrosion Series	AASHTO T288/289	2
Unconfined Compressive Strength of Rock Cores	ASTM D7012 (Method C)	13

5.0 Earthquake Design Considerations

Seismic-induced ground shaking at the foundation is the effect taken into account by "2008 SCDOT Seismic Design Specifications for Highway Bridges." Other effects, including landslides or soil liquefaction, are not addressed in the specifications but must also be considered for certain performance category structures.

Bridge structures on the state highway system have been classified as Operational I, II, or III structures as defined in Section 3.2 of the SCDOT Seismic Design Specifications. We are not aware of the Operational Classification for the proposed bridge structure, but anticipate it will require an evaluation for the Safety Evaluation Earthquake (SEE) and Functional Evaluation Earthquake (FEE).

5.1 Ground Motion

The "2008 SCDOT Seismic Design Specifications for Highway Bridges" use two different earthquake motions. The Functional Evaluation Earthquake (FEE) is defined as an earthquake with a 15 percent probability of exceedance in 75 years. The Safety Evaluation Earthquake (SEE) is an earthquake with a 3 percent probability of exceedance in 75 years. Performance criteria required subsequent to each earthquake are tabulated in terms of service levels and damage levels in Section 3.2.3 of the SCDOT Seismic Design Specifications.

For this baseline report, we did not request the Acceleration Design Response Spectrum (ADRS) from the SCDOT Geotechnical Design Section, as we understand (from our correspondence with Mr. Harris on April 8, 2019) that SCDOT has generated the ADRS curve and provided that information in the Request For Proposals (RFP). The Seismic Design Category (SDC), and values of S_{DS}, S_{D1}, and PGA for each structure are determined from the ADRS output for the FEE and SEE earthquakes.

5.2 Site Stiffness

We calculated the site stiffness ($V^*_{s,H}$), following the procedures outlined in GDM Sections 12.3 and 12.4, and based on the results of the shear wave velocity testing (by MASW/MAM). As indicated on the Shear Wave Velocity Profile (SW-1) in Appendix II, and as corroborated by the refusal depths in five borings at the bridge site, the B-C boundary depth was determined to be approximately 32.9 feet. For the soil column above the B-C boundary depth, the average shear wave velocity (site stiffness, $V^*_{s,H}$) was calculated as 526 feet per second.

The other step in project site classification is a check for the four conditions described for Site Class F, which would require a site specific seismic response analysis. The four conditions, (1) peats and highly organic clays; (2) very high plasticity clays (H>10 ft with PI>75); (3) very thick soft/medium stiff clays (H>120 ft); and (4) soft soil layer (H>10 ft, with PI>20, w>40%, *and* s_u<500 psf), were not evident in the borings performed.

5.3 Liquefaction Potential

The general potential for liquefaction of sands below explored roadway embankments and bridge abutments for this project was qualitatively assessed based on various screening criteria (SPT "N" values, CPT sounding data, and fines contents of the recovered SPT soil samples). Based on our experience with multiple other projects in Greenville County, the typical magnitudes of Peak Ground Acceleration (PGA) within the project corridor site are relatively low. Also, no known published references exist which document sand boil features associated with historic or prehistoric earthquake activity in the South Carolina Piedmont. However, based on the qualitative screening criteria, there are materials in the alluvial zone that were deemed to be potentially susceptible to soil shear strength loss (SSL) conditions during a seismic event. The Design-Phase geotechnical engineer will need to perform the appropriate liquefaction/SSL triggering analysis for inclusion in the subsequent BGER.

6.0 Design and Construction Considerations

As defined in Section 21 of the GDM, the scope of geotechnical interpretation and discussion to be included in a GBLR is limited to "very preliminary engineering recommendations." Issues specifically called out in GDM Section 21 are general recommendations concerning foundations and/or ground improvement requirements.

A generalized subsurface profile of the borings conducted at this structure (facing northeast) is shown as Figure 3 in Appendix I to help illustrate the following preliminary recommendations for bridge foundation support. Assuming a 210-foot total bridge length with two 105-foot long spans, this arrangement would likely result in heavy column loads for the interior bent. The use of shallow foundations does not appear feasible for this bridge, as the significant thickness and moderate to low consistency of the fill/alluvial/residual soils below the end abutments and interior bent foundation would likely induce intolerable consolidation settlements. Therefore, installation of deep foundations will be required to support this bridge. Additional exploration will be required during the project design phase to complete the evaluation and recommendations for the bridge foundations.

Acceptable driven pile types include steel H-piles, steel pipe piles, prestressed concrete piles, or composite piles of shapes and dimensions typically used by the SCDOT and listed in Table 16-2 of the GDM. Because these types would bear in very dense/hard PWR, group settlements would be very small. Each of these pile types appear technically feasible for use at either end bents or interior bents; however, the use of prestressed concrete piles can be problematic and are not typically used in the Piedmont due to the variable PWR/rock surface and potential for encountering PWR/rock lenses in the residual soil zone.

H-piles driven to bear in very dense/hard PWR below about elevation 827 feet (End Bent 1) to 817 feet (End Bent 3) would begin to develop substantial capacity in end bearing. Pipe piles driven either open- or close-ended will develop very high axial resistance at similar elevations. Precast concrete piles may require a driving shoe or stinger if driven to these elevations. Drilled piles described in Section 16.5 of the GDM do not appear necessary at this location. However, assuming a top-of-pile elevation near 854 feet for End Bent 1, the results of boring BR-1 indicate a pile bearing elevation near 827 feet, resulting in a pile length of about 27 feet. Depending on detailed lateral pile capacity analysis (considering the low consistency of the deeper fill, alluvium, and upper residuum at this location), drilled piles could be required if the rock/refusal levels are found to be higher at other locations along this bent.

We anticipate much of the spill-through embankment for the bridge approaches will be graded prior to pile installation, and most of each end bent area will be excavated down to plan bottom-of-pile cap elevation (as the bottom-of-cap elevation is roughly 4 feet lower than current roadway grades). However, at the ends of both end bents (in areas where the new bridge is wider than the current roadway embankment limits), grading will require some fill placement to raise current grades up to plan bottom-of-pile cap elevation. Following pile installation and end bent construction, the end bent areas will be graded with additional fill to achieve plan final subgrade elevation (planned finished grades are roughly 4 feet higher than current roadway grades). Placement of 4 to 10+ feet of fill (greatest at the outer portions of the approach embankments) will induce some consolidation settlement of the underlying alluvial/residual subgrade soils. This consolidation settlement can induce "downdrag" (negative skin friction) loading on these piles, so calculation of the pile loading demand will need to include the additional downdrag load. Also, the design-phase geotechnical evaluation should include a detailed slope stability analysis for the end bent slopes (particularly for the thick zones of low-consistency fill/alluvium/residuum encountered in borings BR-1 and BR-3 below approximate elevation 847 feet).

We anticipate the widened interstate lane configuration will require the northwest approach embankment of End Bent 1, and the southeast approach embankment of End Bent 3, to be contained by Mechanically Stabilized Earth (MSE) retaining walls. Based on planned final grades, we expect the MSE wall height will be approximately 12 to 15 feet. Foundation piles for the referenced ends of these end bents will be located within the reinforced zone of this abutment MSE wall. Per SCDOT Supplemental Technical Specification SC-M-713 (May 2014) for MSE wall construction, piles should be installed prior to installation of the MSE wall at the end bent abutment, following excavation of the wall area to near its plan wall foundation subgrade elevation. Following initial pile installation (and prior to MSE wall construction), the piles should be sleeved/encased for protection during placement and compaction of the wall backfill. Similar to the opposite bridge approaches, placement of 12+ feet of fill for the MSE Walls will induce consolidation settlement of the underlying subgrade soils. However, because the piles will have been installed prior to fill placement, they will be subject to downdrag loading caused by the subgrade settlement. Therefore, the pile loading demand for the referenced abutment piles (at the ends near the MSE Walls) will need to include the additional downdrag load.

Evaluation of subgrade settlement magnitude was not included in the GBLR scope; however, based on the height of the approach embankment (10 to 15 feet) and thickness of the compressible soil zone below the embankments and walls, we anticipate subgrade consolidation settlement could exceed several inches. Depending on performance criteria for the MSE wall and approach slab/embankment, some ground improvement could be required prior to MSE wall construction. Typical ground improvement methods for reducing settlement (when undercutting is not practical) include: soil mixing, injection grouting, fortifying the subgrade with stone columns or controlled-modulus columns, and installation of a deep foundation system (micropiles, continuous flight auger piles, driven timber piles).

Drilled shafts may be preferable for support of interior bent foundations since their use would preclude requirement for excavation of a pile cap. Rock strata is relatively shallow (average elevation near 818 feet), so drilled shafts would derive axial resistance primarily through a combination of side friction in PWR/rock sockets below approximate elevation 820 feet, end bearing in rock, and to a lesser extent from side friction in the residual soils above. Depending on the axial and lateral load demands, longer/wider rock sockets could provide additional resistance. Permanent steel casing will be required in the upper portions of the shafts, and the dimensions and length of casing will depend on the shaft length and arrangement of reinforcing steel. Based on the depth to PWR/rock to seal the casing from groundwater intrusion below elevation 840 feet, installation of full-depth casing could be considered. Otherwise, considering the modest N-values of the soils below groundwater elevation, use of drilling slurry will be required for shaft excavation using the "wet construction method".

7.0 Limitations and Closing

Environmental assessment of soils, water, wetland, and endangered species was not included in our scope of services for this project.

This Geotechnical Base Line Report has been prepared in general accordance with *SCDOT Geotechnical Design Manual*, Version 2.0 (2019) and with generally accepted geotechnical engineering practice for specific application to this project. The preliminary recommendations and conclusions in this report are based on the applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made. The Geotechnical Engineer of Record for the project must review the data submitted in this report and develop their own interpretation of the testing results as they apply to design.

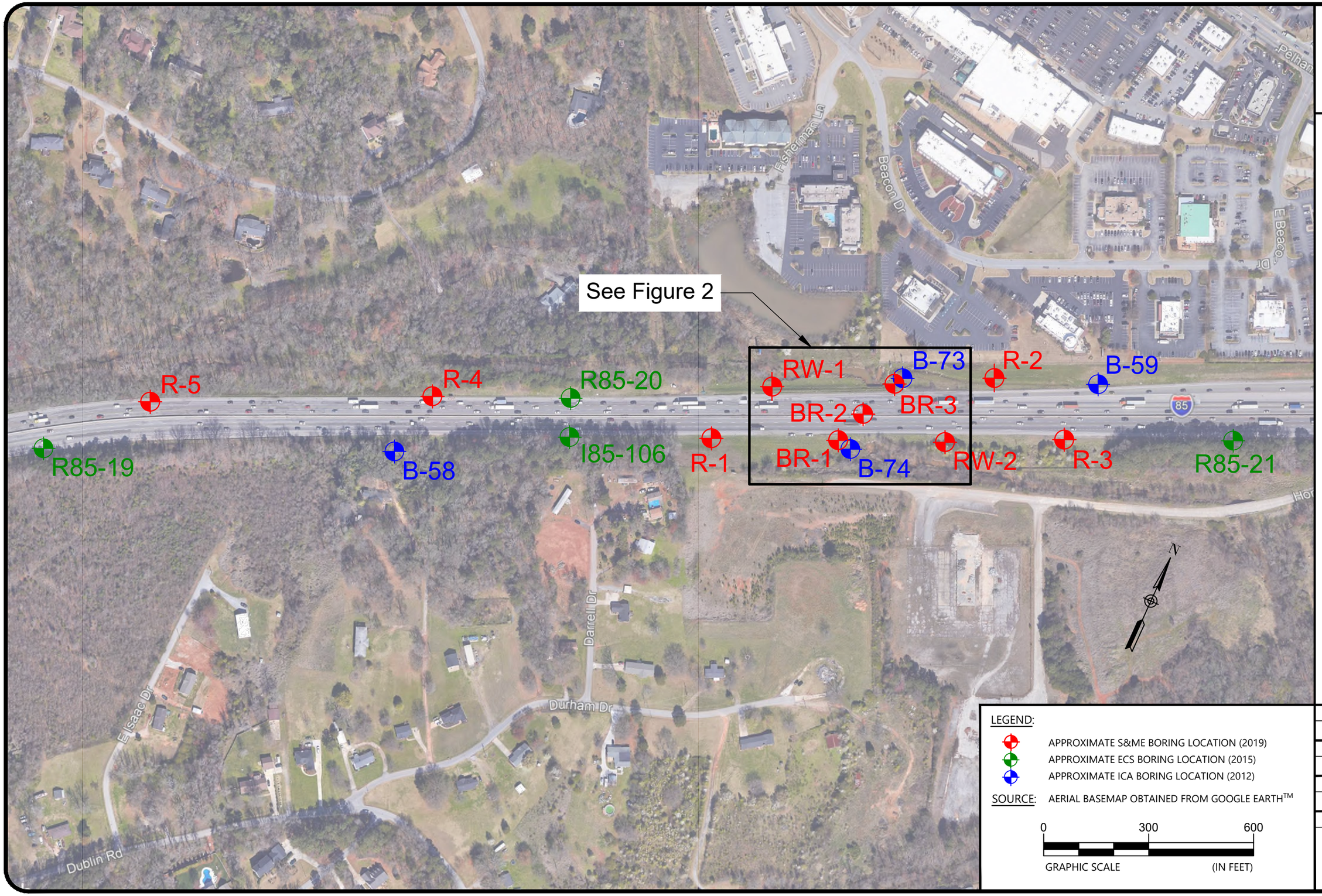
The nature and extent of variations between the borings will not become evident until construction. If variations appear evident, then we will need to re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the structures are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing by the submitting engineers.

APPENDIX

APPENDIX I

FIGURES

Boring Location Plan (Project Limits) – Figure 1
Boring Location Plan (Bridge) – Figure 2
Subsurface Profile (Bridge Borings) – Figure 3
Subsurface Profile (SB Shoulder Borings) – Figure 4
Subsurface Profile (NB Shoulder Borings) – Figure 5
Photographs of Boring Locations

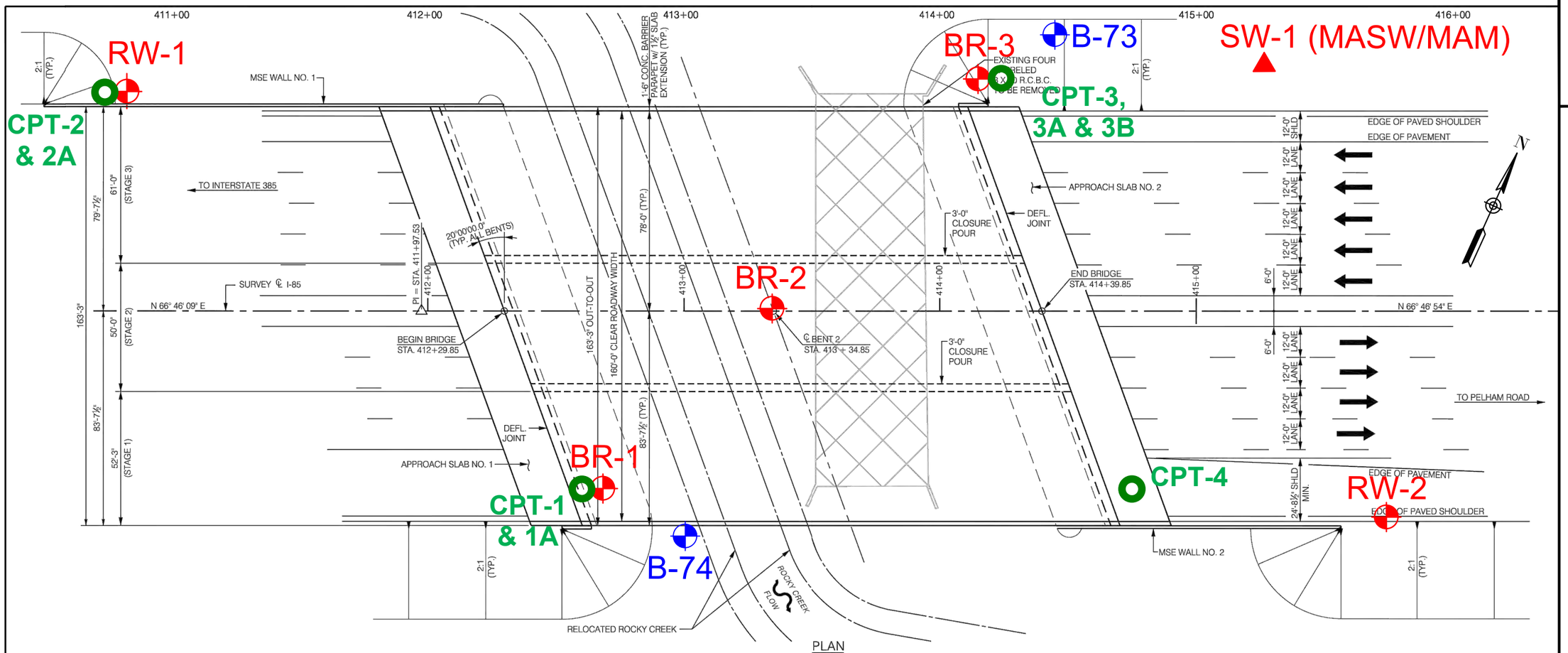


BORING LOCATION PLAN (PROJECT LIMITS)

I-85 BRIDGE OVER ROCKY CREEK
SCDOT PROJECT ID: P038111
GREENVILLE COUNTY, SOUTH CAROLINA

SCALE:	AS SHOWN
DATE:	MAY 2019
PROJECT NUMBER	1426-15-009
FIGURE NO.	1

Drawing path: T:\Projects\2019\GEO\SCDOT Rocky Creek\Working Documents\Graphics\Rocky Creek Boring Location Plan.dwg



BORING LOCATION PLAN (BRIDGE)

I-85 BRIDGE OVER ROCKY CREEK
SCDOT PROJECT ID: P038111
GREENVILLE COUNTY, SOUTH CAROLINA

LEGEND:

- APPROXIMATE S&ME BORING LOCATIONS (2019)
- APPROXIMATE ICA BORING LOCATIONS (2012)

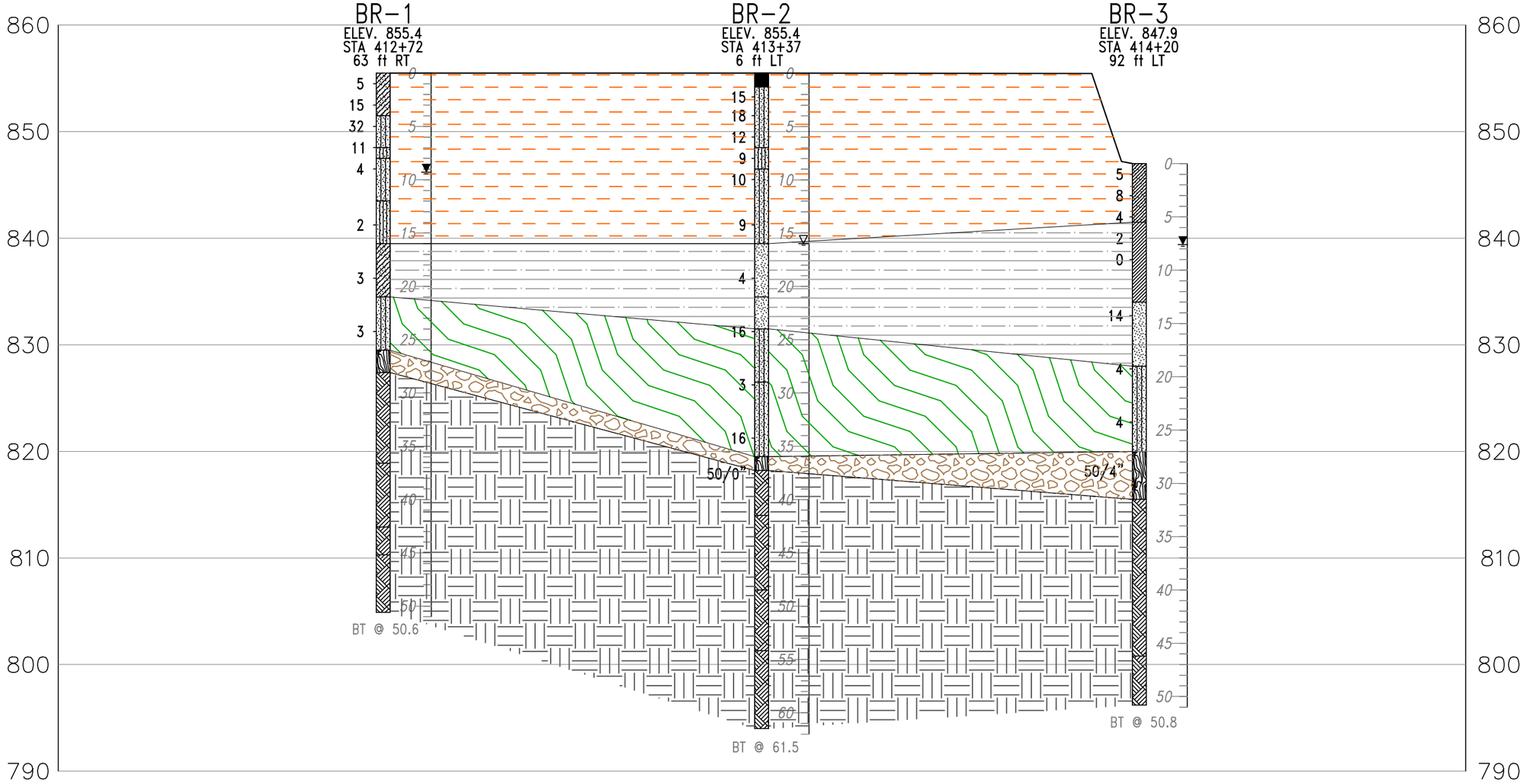
SOURCE:

CONCEPTUAL LAYOUT 2 - BRIDGE PLAN AND PROFILE PREPARED BY MICHAEL BAKER INTERNATIONAL, NOVEMBER 2018

0 40 80
GRAPHIC SCALE (IN FEET)

SCALE:	AS SHOWN
DATE:	MAY 2019
PROJECT NUMBER	1426-15-009
FIGURE NO.	2

Drawing path: T:\Projects\2019\GEO\SCDOT Rocky Creek\Working Documents\Graphics\Rocky Creek Boring Location Plan.dwg



FILL

ALLUVIUM

RESIDUUM

PARTIALLY WEATHERED ROCK

REFUSAL MATERIAL (ROCK)

Water Level at Time of Boring

Water Level after 24 Hours

Hole Caved

B-3 Boring Number
123.0 Elevation at GS

10 Standard Penetration Test (blows per foot).

12in Undisturbed Sample Recovery in Inches

NQ Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation

BT Boring Termination Depth

NOTE: THE DEPICTED STRATIGRAPHY IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY AND IS NOT WARRANTED. SEPARATIONS BETWEEN DIFFERENT STRATA MAY BE GRADUAL AND LIKELY VARY CONSIDERABLY FROM THOSE SHOWN. PROFILES BETWEEN NEARBY BORINGS HAVE BEEN ESTIMATED USING REASONABLE ENGINEERING CARE AND JUDGMENT. THE ACTUAL SUBSURFACE CONDITIONS WILL VARY BETWEEN BORING LOCATIONS.

Drawing path: T:\Projects\2019\GEO\SCDOT Rocky Creek\Working Documents\Graphics\Bridge.dwg

SUBSURFACE PROFILE (BRIDGE BORINGS)

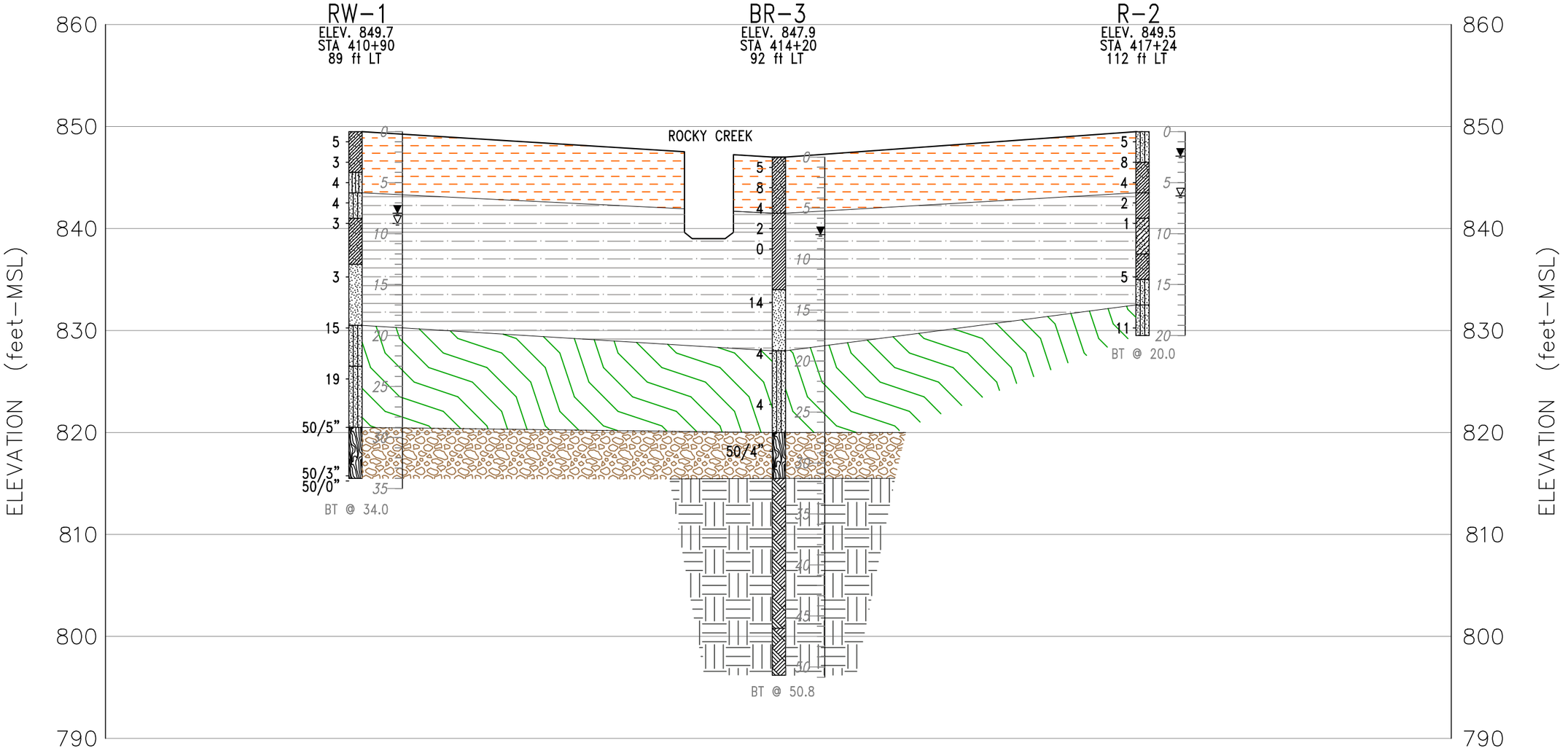
I-85 BRIDGE OVER ROCKY CREEK
SCDOT PROJECT ID: P038111
GREENVILLE COUNTY, SOUTH CAROLINA

SCALE:
NOT TO SCALE

DATE:
MAY 2019

PROJECT NUMBER
1426-15-009

FIGURE NO.
3



FILL

ALLUVIUM

RESIDUUM

PARTIALLY WEATHERED ROCK

REFUSAL MATERIAL (ROCK)

Water Level at Time of Boring

Water Level after 24 Hours

Hole Caved

B-3 Boring Number
123.0 Elevation at GS

10 Standard Penetration Test (blows per foot).

12in Undisturbed Sample Recovery in Inches

NQ Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation

BT Boring Termination Depth

NOTE: THE DEPICTED STRATIGRAPHY IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY AND IS NOT WARRANTED. SEPARATIONS BETWEEN DIFFERENT STRATA MAY BE GRADUAL AND LIKELY VARY CONSIDERABLY FROM THOSE SHOWN. PROFILES BETWEEN NEARBY BORINGS HAVE BEEN ESTIMATED USING REASONABLE ENGINEERING CARE AND JUDGMENT. THE ACTUAL SUBSURFACE CONDITIONS WILL VARY BETWEEN BORING LOCATIONS.

Drawing path: T:\Projects\2019\GEO\SCDOT Rocky Creek\Working Documents\Graphics\Bridge.dwg

SUBSURFACE PROFILE (SB SHOULDER BORINGS)

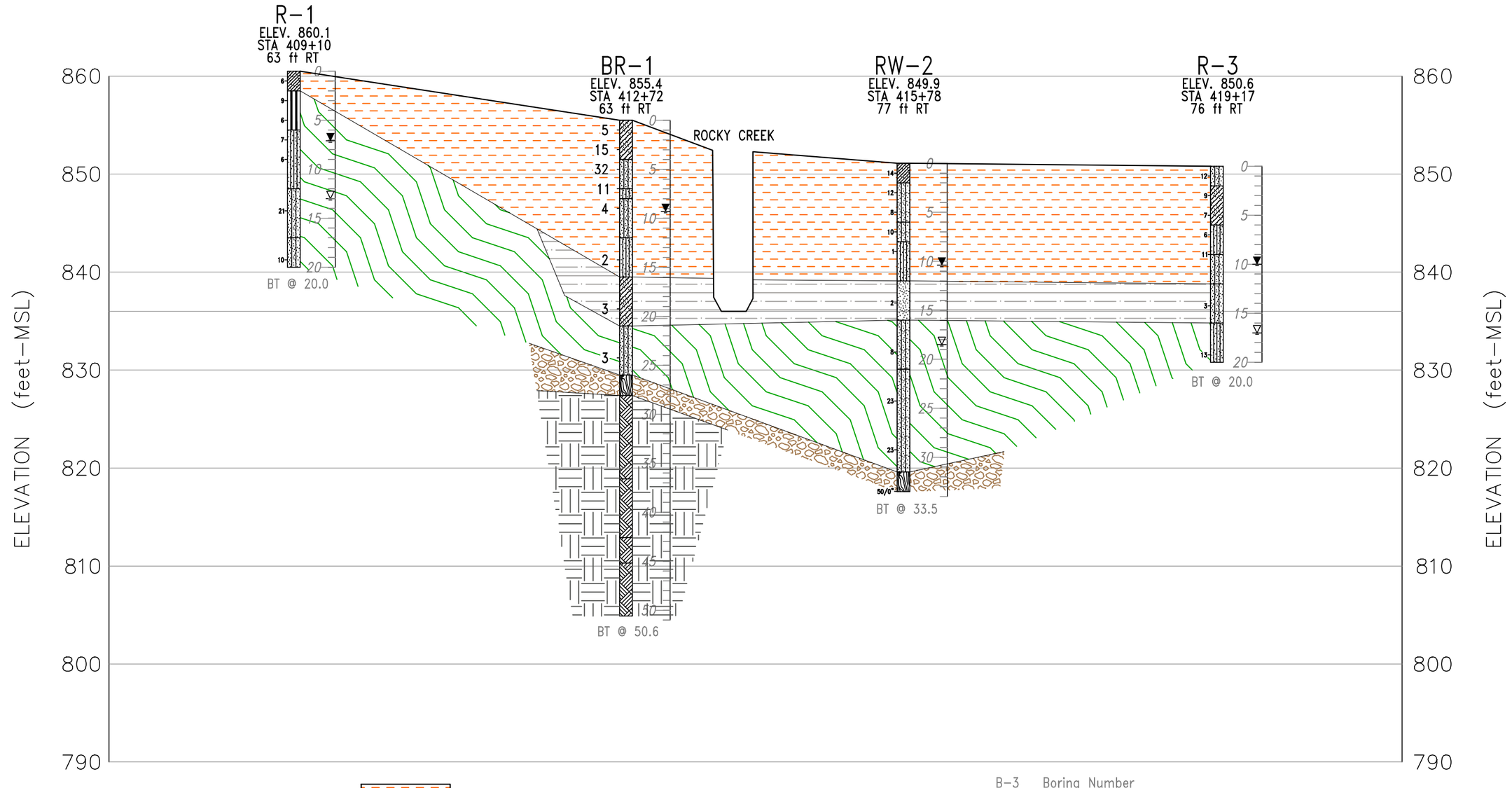
I-85 BRIDGE OVER ROCKY CREEK
SCDOT PROJECT ID: P038111
GREENVILLE COUNTY, SOUTH CAROLINA

SCALE:
NOT TO SCALE

DATE:
MAY 2019

PROJECT NUMBER
1426-15-009

FIGURE NO.
4



FILL

ALLUVIUM

RESIDUUM

PARTIALLY WEATHERED ROCK

REFUSAL MATERIAL (ROCK)

Water Level at Time of Boring

Water Level after 24 Hours

Hole Caved

B-3 Boring Number
123.0 Elevation at GS

10 Standard Penetration Test (blows per foot).

12in Undisturbed Sample Recovery in Inches

NQ Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation

BT Boring Termination Depth

NOTE: THE DEPICTED STRATIGRAPHY IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY AND IS NOT WARRANTED. SEPARATIONS BETWEEN DIFFERENT STRATA MAY BE GRADUAL AND LIKELY VARY CONSIDERABLY FROM THOSE SHOWN. PROFILES BETWEEN NEARBY BORINGS HAVE BEEN ESTIMATED USING REASONABLE ENGINEERING CARE AND JUDGMENT. THE ACTUAL SUBSURFACE CONDITIONS WILL VARY BETWEEN BORING LOCATIONS.

SUBSURFACE PROFILE (NB SHOULDER BORINGS)

I-85 BRIDGE OVER ROCKY CREEK
SCDOT PROJECT ID: P038111
GREENVILLE COUNTY, SOUTH CAROLINA

SCALE:
NOT TO SCALE

DATE:
MAY 2019

PROJECT NUMBER
1426-15-009

FIGURE NO.
5

Drawing path: T:\Projects\2019\GEO\SCDOT Rocky Creek\Working Documents\Graphics\Bridge.dwg

Photographs of Boring Locations
I-85 Bridge Over Rocky Creek
0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC
SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Photo 1

Date: 3/14/19

Photographer: Josh Gathro

Notes: Boring BR-1

Photo 2

Date: 3/25/19

Photographer: Josh Gathro

Notes: Boring BR-2

Photographs of Boring Locations
I-85 Bridge Over Rocky Creek
0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC
SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Photo 3

Date: 3/11/19

Photographer: Josh Gathro

Notes: Boring BR-3

Photo 4

Date: 4/11/19

Photographer: Josh Gathro

Notes: Boring RW-1

Photographs of Boring Locations
I-85 Bridge Over Rocky Creek
0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC
SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Photo 5

Date: 3/13/19

Photographer: Jordan Titus

Notes: Boring RW-2

Photo 6

Date: 3/14/19

Photographer: Josh Gathro

Notes: Boring R-1

Photographs of Boring Locations
I-85 Bridge Over Rocky Creek
0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC
SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Photo 7

Date: 3/11/19

Photographer: Josh Gathro

Notes: Boring R-2

Photo 8

Date: 3/13/19

Photographer: Jordan Titus

Notes: Boring R-3

Photographs of Boring Locations
I-85 Bridge Over Rocky Creek
0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC
SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Photo 9

Date: 4/12/19

Photographer: Josh Gathro

Notes: Boring R-4

Photo 10

Date: 4/11/19

Photographer: Josh Gathro

Notes: Boring R-5

APPENDIX II

FIELD DATA

Test Location Summary Table
Legend to Soil Classification and Symbols
Soil Test Logs (S&ME, for GBLR, 16 pages)
Soil Test Logs (Previous Explorations, 9 pages)
CPT Logs (8 pages)
Shear Wave Velocity Profile
Drill Rig Hammer Efficiency Reports
Field Test Procedures

TEST LOCATION SUMMARY TABLE

I-85 Bridge Over Rocky Creek

Greenville County, South Carolina

SCDOT Project ID: P038111; S&ME Project ID: 1426-15-009

Boring Number	Depth (ft)	Elevation (ft)	Station	Offset (ft)	Surveyed Coordinates			
					Northing	Easting	Latitude	Longitude
BR-1	50.6	855.4	412+72	63 - R	1101957	1619432	34.855494	-82.268465
BR-2	61.5	855.4	413+37	6 - L	1102047	1619465	34.855741	-82.268360
BR-3	50.8	847.9	414+20	92 - L	1102159	1619507	34.856050	-82.268224
RW-1	34.0	849.7	410+90	89 - L	1102025	1619205	34.855672	-82.269226
RW-2	33.5	849.9	415+78	77 - R	1102066	1619719	34.855801	-82.267513
R-1	20.0	860.1	409+10	63 - R	1101814	1619099	34.855090	-82.269569
R-2	20.0	849.5	417+24	112 - L	1102296	1619778	34.856437	-82.267326
R-3	20.0	850.6	419+17	76 - R	1102199	1620030	34.856179	-82.266483
R-4	20.0	869.4	401+28	57 - L	1101617	1618334	34.855414	-82.269714
R-5	17.0	877.8	393+14	46 - L	1101282	1617589	34.853577	-82.274578
R-5A	18.0	877.9	392+98	45 - L	1101274	1617574	34.853553	-82.274628
R-5B	25.5	877.4	393+52	45 - L	1101298	1617624	34.853621	-82.274465
CPT Number	**Refusal Depth (ft)**	**Elevation (ft)**	**Station**	**Offset (ft)**	**Estimated Coordinates**			
					Northing	**Easting**	**Latitude**	**Longitude**
CPT-1	11.4	855	412+68	63 - R	--	--	34.855489	-82.268482
CPT-1A	25.0	855	412+64	63 - R	--	--	34.855485	-82.268493
CPT-2	16.2	850	410+86	89 - L	--	--	34.855670	-82.269237
CPT-2A	16.8	850	410+82	89 - L	--	--	34.855665	-82.269252
CPT-3	14.9	848	414+24	92 - L	--	--	34.856055	-82.268217
CPT-3A	15.2	848	414+28	92 - L	--	--	34.856063	-82.268205
CPT-3B	14.5	848	414+32	92 - L	--	--	34.856070	-82.268193
CPT-4	20.5	854	414+70	63 - R	--	--	34.855711	-82.267844

Notes:

1. Boring locations surveyed by Infrastructure Consulting & Engineering on 5/29/2019 (BR-2 N/E data updated 8/13/2019).
2. CPT locations/coordinates and elevations were estimated based on measuring distances from nearby boring locations, which had been surveyed by Infrastructure Consulting & Engineering (per Note 1 above).

LEGEND TO SOIL CLASSIFICATION AND SYMBOLS

SOIL TYPES (USCS CLASSIFICATION)

(Shown in Graphic Log)


Fill


Asphalt


Concrete


Topsoil


Gravel (GW, GM, GP)


Sand (SW, SP)


Silt (ML)


Clay (CL, CH)


Organic (OL, OH)


Silty Sand (SM)


Clayey Sand (SC)


Sandy Silt (ML)


Clayey Silt (MH)


Sandy Clay (CL, CH)


Silty Clay (CL, CH)


Partially Weathered Rock


Cored Rock

WATER LEVELS

(Shown in Water Level Column)

▽ = Water Level At Termination of Boring
▼ = Water Level Taken After 24 Hours
◄ = Loss of Drilling Water
HC = Hole Cave

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Soft	0 to 2
Soft	3 to 4
Firm	5 to 8
Stiff	9 to 15
Very Stiff	16 to 30
Hard	31 to 50
Very Hard	Over 50

RELATIVE DENSITY OF COHESIONLESS SOILS

RELATIVE DENSITY	STD. PENETRATION RESISTANCE BLOWS/FOOT
Very Loose	0 to 4
Loose	5 to 10
Medium Dense	11 to 30
Dense	31 to 50
Very Dense	Over 50

SAMPLER TYPES

(Shown in Samples Column)

- Shelby Tube
- Split Spoon
- Rock Core
- No Recovery

CONSTITUENT MODIFIERS

Trace: <5%
Few: 5 to <15%
Little: 15 to <30%
Some: 30 to <50%
Mostly: 50 to 100%

TERMS

Standard Penetration Resistance - The Number of Blows of 140 lb. Hammer Falling 30 in. Required to Drive 1.4 in. I.D. Split Spoon Sampler 1 Foot. As Specified in ASTM D-1586.

REC - Total Length of Rock Recovered in the Core Barrel Divided by the Total Length of the Core Run Times 100%.

RQD - Total Length of Sound Rock Segments Recovered that are Longer Than or Equal to 4" (mechanical breaks excluded) Divided by the Total Length of the Core Run Times 100%.

TOB - Termination of Boring

N.E. - Not Encountered

SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	BR-1
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Titus (S&ME)	**Boring Location:**	412+72	**Offset:**	63 ft RT	**Alignment:**	Mainline CL
Elev.:	855.4 ft	**Latitude:**	34.855494	**Longitude:**	-82.268465	**Date Started:**	3/13/2019
Total Depth:	50.6 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	22.5 ft	**Date Completed:**	3/14/2019
Bore Hole Diameter (in):	2.95"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	RW / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** N/A (RW)	**24HR**	9.3 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	Top of Ground (No Topsoil)								
		Fill - Loose to medium dense, moist, red and brown, fine to coarse, clayey SAND (SC/A-6), layer of crushed stone, trace roots, layer of sandy silt in SS-2 NMC=19, LL=35, PL=24, PI=11, %200=39		0.0	SS-1	2	2	3	3	5
				2.0	SS-2	5	6	9	10	15
	4.0	**Fill** - Medium dense, wet, tan, brown and white, fine to coarse, silty SAND (SM/A-2), some gravel (which likely amplified N value); NMC=14, %200=14		4.0	SS-3	9	20	12	8	32
850.4				6.0	SS-4	5	6	5	8	11
	7.0	**Fill** - Stiff, moist, red brown, mica., fine to medium, sandy SILT (ML/A-4)		8.0	SS-5	2	2	2	2	4
	8.0	**Fill** - Very loose, moist to very moist, red and brown, sl. micaceous, fine to coarse, silty SAND (SM/A-7-5), trace gravel NMC=30, LL=44, PL=32, PI=12, %200=44								
845.4				13.5	SS-6	2	1	1		2
	12.0	**Fill** - Very soft, very moist, red and brown, sl. micaceous, fine to coarse, sandy SILT (ML/A-4), trace gravel, some clay								
840.4	16.0	**Alluvium** - Very loose, very moist, dark gray and brown, sl. micaceous, clayey SAND (SC/A-4), with silt, roots and decaying organic matter NMC=35, LL=34, PL=24, PI=10, %200=48		18.5	SS-7	0	0	3		3
835.4	21.0	**Residuum** - Very loose, wet, gray and white, slightly micaceous, fine to medium, silty SAND (SM/A-2-4) NMC=39, LL=35, PL=26, PI=9, %200=30		23.5	SS-8	1	1	2		3
830.4	26.0	**Partially Weathered Rock** - Very dense (based on observed rate of drilling); not sampled								
	28.1	Refusal encountered at 28.1 feet; commenced NQ rock coring: **Granodiorite** - white, gray and black, very		28.1	NQ-1					

● SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

REC = RQD = 100%, q_u=24,600 psi

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:	P038111	**County:**	Greenville	**Boring No.:**	BR-1		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Titus (S&ME)	**Boring Location:**	412+72	**Offset:**	63 ft RT	**Alignment:**	Mainline CL
Elev.:	855.4 ft	**Latitude:**	34.855494	**Longitude:**	-82.268465	**Date Started:**	3/13/2019
Total Depth:	50.6 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	22.5 ft	**Date Completed:**	3/14/2019
Bore Hole Diameter (in):	2.95"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	RW / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** N/A (RW)	**24HR**	9.3 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
		fine to medium, massive texture, quartz--biotite-plagioclase-sulfides-muscovite, fresh to slightly weathered (staining at depths 33.9 and 34.6 ft), VH-H, J (dipping 0-40 deg), VC-C, partly open to very wide, Pl-Ir-St, SR-VR, No, granitic pegmatite at 35.1-35.3 ft RMR (28.1-36.6 ft)=70 (Class II); GSI=75-80		30.6	NQ-2			REC=99%, RQD=95%, q_u=28,320 psi
820.4	36.6	**Granite Pegmatite with layers of Sillimanite Schist** - white and gray with yellowish-tan, medium to very coarse, thickly foliated, quartz-plagioclase--sillimanite-biotite-garnet, slight to fresh weathering, H-MH, J (dipping 0-25 deg; 75 and 50 deg fractures at 37.8 and 38.6 ft), VC, open to very wide, St-Ir, SR-VR, two healed joints, fracture frequency greatest between 37.8 and 39.5 ft; RMR (36.6-42.6 ft)=31 (Class IV); GSI=40-45		35.6	NQ-3			REC=98%, RQD=74%, q_u=16,545 psi
815.4	42.6	**Sillimanite Schist** - dark brown, gray and white, fine to very coarse, very thinly to thinly foliated, sillimanite-quartz-mica--chlorite-garnet, slight to fresh weathering, H-LH, J (dipping 0-60 deg), VC, open to extremely wide (void from 44.2-44.6 ft), SR, No; RMR (42.6-45.2 ft)=23 (Class IV); GSI=40-45		40.6	NQ-4			REC=90%, RQD=61%, q_u=6,765 psi
810.4	45.2	**Gneissic Granite** - gray and white, fine to coarse, thinly foliated, quartz-biotite-garnet--chlorite-sulfides, fresh to slightly weathered, MH-H, J (dipping 0-35 deg), VC, tight to moderately open, Ir, SR-R, No RMR (45.2-50.6 ft)=67 (Class II); GSI=75-80		45.6	NQ-5			REC=100%, RQD=100%
805.4	50.6	Coring Terminated at 50.6 feet						
800.4								

SC_DOT 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

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:	P038111			**County:**	Greenville	**Boring No.:**	BR-2
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	413+37	**Offset:**	6 ft LT	**Alignment:**	Mainline CL
Elev.:	855.4 ft	**Latitude:**	34.855741	**Longitude:**	-82.26836	**Date Started:**	3/25/2019
Total Depth:	61.5 ft	**Soil Depth:**	37.3 ft	**Core Depth:**	24.2 ft	**Date Completed:**	3/25/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 750X	**Drill Method:**	HSA / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	84.0%
Core Size:	NQ	**Driller:**	S. Gowan	**Groundwater:**	**TOB** 16 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
	0.0	Top of Pavement							
		Asphalt - 15 inches (no stone base)							
	1.3	**Fill** - Medium dense, brown, gray and tan, fine to medium, silty SAND (SM/A-4), trace rock fragments, layer of coarse sand at 3.5 ft, foot of micaceous sandy silt at 4-5 ft Bulk-"1A" (1-7 ft): NMC=16 SS-3: NMC=16, LL=29, PL=24, PI=5, %200=38	1.5	SS-1	6	8	7		15
			3.0	SS-2	8	9	9	7	18
850.4			5.0	SS-3	6	6	6	6	12
	7.0	**Fill** - Stiff, red and brown, slightly micaceous, fine to medium, sandy SILT (ML/A-4), trace rock fragments	7.0	SS-4	3	4	5	7	9
	9.0	**Fill** - Loose, slightly moist, gray, brown and tan, fine to coarse, silty SAND (SM/A-4), trace rock fragments, seams of silt, clay layers in SS-6 Bulk-1 (1-15 ft, SC/A-6): LL=33, PL=22, PI=11, %200=47 Bulk-"1B" (7-15 ft): NMC=19 SS-6: NMC=19, LL=30, PL=24, PI=6, %200=43	9.0	SS-5	3	4	6	8	10
845.4			13.5	SS-6	5	4	5		9
840.4	16.0 ▽	**Alluvium** - Very loose, wet, gray and tan, medium to fine, poorly graded SAND with silt (SP-SM/A-3), slight organic odor, thin layer of fine sandy silt with organics NMC=28, %200=7	18.5	SS-7	2	2	2		4
835.4	21.0	**Alluvium** - Medium dense, wet, tan, fine to medium, poorly graded SAND with silt (SP-SM/A-3) NMC=22, %200=9	23.5	SS-8	6	8	8		16
	24.0	**Residuum** - Medium dense to very loose, moist, light gray, dark gray and tan, micaceous, fine to coarse, silty SAND (SM/A-1-b), rock fragments at 28.5 ft NMC=16, %200=15							
830.4			28.5	SS-9	4	1	2		3
	29.0	Very loose to medium dense, moist, gray,							

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	

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SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	BR-2
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	413+37	**Offset:**	6 ft LT	**Alignment:**	Mainline CL
Elev.:	855.4 ft	**Latitude:**	34.855741	**Longitude:**	-82.26836	**Date Started:**	3/25/2019
Total Depth:	61.5 ft	**Soil Depth:**	37.3 ft	**Core Depth:**	24.2 ft	**Date Completed:**	3/25/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 750X	**Drill Method:**	HSA / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	84.0%
Core Size:	NQ	**Driller:**	S. Gowan	**Groundwater:**	**TOB** 16 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	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		yellow brown to dark brown, micaceous, fine, silty SAND (SM/A-2-4) NMC=30, LL=29, PL=24, PI=5, %200=34	33.5	SS-10	4	6	10		16	●
820.4	36.0	**Partially Weathered Rock** - Very dense (based on rate of drilling); not sampled	37.3							
	37.3	Refusal encountered at 37.3 feet; commenced NQ rock coring:	37.3	SS-11	50/0"				50/0"	>>●
		Granodiorite - gray, white, and black, very fine to coarse, weakly foliated, quartz--biotite-muscovite-sillimanite-chlorite-sulfides, fresh to slightly weathered, H-MH, J (dipping 0-35 deg), V (dipping 25-80 deg), VC, tight to wide apertures, T-N width, St-Pl-Ir, S-VR, Pa-Fi-No; RMR (37.3-41.5 ft)=44 (Class III); GSI=60-65		NQ-1						REC=100%, RQD=46%, q_u=15,717 psi
815.4	41.5		39.3	NQ-2						REC=83%, RQD=42%, q_u=17,589 psi
		Sillimanite Schist with layers of Gneiss - gray, brown, and white, fine to very coarse, very thin to thin foliations, quartz-sillimanite--muscovite-chlorite-sulfides, slight to fresh weathering, H-LH, J (dipping 0-35 deg), VC, partly open to extremely wide (void from 42.8-43.2 ft), Wa-Ir, SR, few jt. surf. friable; RMR (41.5-48.5 ft)=29 (Class IV); GSI=60	44.3	NQ-3						REC=100%, RQD=63%, q_u=5,899 psi
810.4	48.5									
		Granite Pegmatite - gray and yellowish tan, fine to very coarse, thickly foliated, quartz-plagioclase-sillimanite-mica-sulfides, fresh weathering, VH-H, T (dipping 0-40 deg), VC-C, tight to open, Ir-Wa, R-SR, No, moderately fractured 48.8-49.3 ft, few strands of mineral alignment; RMR (48.5-49.3 ft)=15 (Class V); GSI=55	49.3	NQ-4						REC=99%, RQD=94%, q_u=6,950 psi
805.4		RMR (49.3-54.2 ft)=65 (Class II); GSI=85-90								
	54.2		54.3	NQ-5						REC=99%, RQD=58%, q_u=14,706 psi
800.4		**Biotite Gneiss with Schist** - white, gray, and brown, very fine to coarse, thin to thick foliations, quartz-biotite-chlorite-muscovite--sillimanite-sulfides-graphite (surface coating of graphite present at locations between 57.2-59.3 ft), fresh to moderately weathered, H-LH (some friability at 56.7 ft), J (dipping 0-40 deg), V (dipping 0-20 deg), VC, partly open to very wide, T-VN, Pl-Ir,	59.3							

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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:	P038111	**County:**	Greenville	**Boring No.:**	BR-2		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	413+37	**Offset:**	6 ft LT	**Alignment:**	Mainline CL
Elev.:	855.4 ft	**Latitude:**	34.855741	**Longitude:**	-82.26836	**Date Started:**	3/25/2019
Total Depth:	61.5 ft	**Soil Depth:**	37.3 ft	**Core Depth:**	24.2 ft	**Date Completed:**	3/25/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 750X	**Drill Method:**	HSA / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	84.0%
Core Size:	NQ	**Driller:**	S. Gowan	**Groundwater:**	**TOB** 16 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
	61.5	R-SR, Pa-No, fracture frequency greatest between 59.2 and 60.7 ft; RMR (54.2-61.5 ft)=32 (Class IV); GSI=60-65			NQ-6			REC=100%, RQD=23%
		Coring Terminated at 61.5 feet						
790.4								
785.4								
780.4								
775.4								
770.4								

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038111	**County:**	Greenville	**Boring No.:**	BR-3		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	414+20	**Offset:**	92 ft LT	**Alignment:**	Mainline CL
Elev.:	847.9 ft	**Latitude:**	34.85605	**Longitude:**	-82.268224	**Date Started:**	3/11/2019
Total Depth:	50.8 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	19.3 ft	**Date Completed:**	3/12/2019
Bore Hole Diameter (in):	2.95"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	RW / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** N/A (RW)	**24HR**	7.6 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	Top of Ground (2" Topsoil)								
		Fill - Firm to soft, moist to very moist, brown, red and gray, fine to medium, sandy lean CLAY (CL/A-6), trace roots and gravel SS-1: NMC=20, LL=35, PL=21, PI=14, %200=54 SS-3: NMC=26, LL=31, PL=20, PI=11, %200=56		0.0	SS-1	3	2	3	5	5
				2.0	SS-2	4	3	5	5	8
				4.0	SS-3	1	2	2	1	4
842.9	5.5	**Alluvium** - Very soft, very moist, dark gray, fine, lean CLAY with sand (CL/A-6), trace roots and decaying organic matter, seams of medium sand UD-2 (6'-8'): NMC=39, LL=36, PL=22, PI=14, %200=79 SS-5 (8'-10'): NMC=40, LL=33, PL=20, PI=13, %200=79 UD-3 (8'-10'): NMC=31, LL=31, PL=20, PI=11, %200=76		6.0	SS-4	0	1	1	1	2
				8.0	SS-5	0	0	0	0	0
837.9	13.0	**Alluvium** - Medium dense to loose, wet, gray, medium to fine, SAND with silt (SP-SM/A-1), seams of gravel NMC=24, %200=10		13.5	SS-6	3	3	11		14
832.9				18.5	SS-7	3	2	2		4
827.9	19.0	**Residuum** - Very loose, wet, light tan, white and greenish gray, fine to coarse, silty SAND (SM/A-2-4), some rock fragments NMC=26, LL=36, PL=27, PI=9, %200=34		23.5	SS-8	0	1	3		4
822.9	27.0	**Partially Weathered Rock** - Very dense, moist, brown, orange and white, fine to coarse, silty SAND (SM/A-2), trace rock fragments		28.5	SS-9	50/4"				50/4"

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	

SCDOT Soil Test Log

Project ID:	P038111	**County:**	Greenville	**Boring No.:**	BR-3		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	414+20	**Offset:**	92 ft LT	**Alignment:**	Mainline CL
Elev.:	847.9 ft	**Latitude:**	34.85605	**Longitude:**	-82.268224	**Date Started:**	3/11/2019
Total Depth:	50.8 ft	**Soil Depth:**	31.5 ft	**Core Depth:**	19.3 ft	**Date Completed:**	3/12/2019
Bore Hole Diameter (in):	2.95"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	RW / RC	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	NQ	**Driller:**	J. Millwood	**Groundwater:**	**TOB** N/A (RW)	**24HR**	7.6 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
	31.5			31.5				
812.9		Refusal encountered at 31.5 feet; commenced NQ rock coring: **Gneissic Granite** - white and dark gray, fine to very coarse, weakly foliated, quartz--mica-sillimanite-garnet-plagioclase-sulfides, slight to fresh weathering, MH-H, J (dipping 0-40 deg), VC-C, tight to moderately open, Ir, SR-R, few veins throughout RMR (NQ-1,2,3)=67 (Class II); GSI=65-70			NQ-1			REC=97%, RQD=87%, q_u=20,885 psi
				35.8				
807.9					NQ-2			REC=99%, RQD=94%, q_u=15,619 psi
				40.8				
802.9					NQ-3			REC=100%, RQD=86%, q_u=16,478 psi
	46.2			45.8				
		Sillimanite Schist interlayed with Gneiss - white, gray and green, very fine to coarse, very thinly to thinly foliated, quartz--sillimanite-mica-chlorite-sulfides, slightly weathered (2 inches completely weathered at 46.2 ft), H-LH, J (dipping 0-40 deg), VC, partly open to wide, N, Ir, SR-R, Fi			NQ-4			REC=100%, RQD=87%, q_u=3,452 psi
797.9	50.8	RMR (NQ-4)=38 (Class IV); GSI=55						
		Coring Terminated at 50.8 feet						
792.9								

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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:	P038111			**County:**	Greenville	**Boring No.:**	RW-1
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	410+90	**Offset:**	89 ft LT	**Alignment:**	Mainline CL
Elev.:	849.7 ft	**Latitude:**	34.855672	**Longitude:**	-82.269226	**Date Started:**	4/11/2019
Total Depth:	34 ft	**Soil Depth:**	34 ft	**Core Depth:**	0 ft	**Date Completed:**	4/11/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	Independence Drill	**Groundwater:**	**TOB** 9 ft	**24HR**	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	Top of Ground (2" Topsoil)								
		Fill - Firm to soft, gray, brown and red, fine to medium, sandy lean CLAY (CL/A-6), few roots in upper 2 ft, trace rock fragments and silt NMC=25, LL=35, PL=22, PI=13, %200=56		0.0	SS-1	2	2	3	2	5
				2.0	SS-2	1	1	2	2	3
	4.0			4.0						
844.7		**Fill** - Soft, slightly moist, red and brown, fine to medium, sandy SILT (ML/A-5), few rock fragments, seam of sand at 5.5 ft; NMC=29, LL=41, PL=31, PI=10, %200=51			SS-3	4	2	2	3	4
	6.0			6.0						
		Alluvium - Very loose, moist, brown and gray, fine to medium, silty SAND (SM/A-2), layer of clay 7 to 7.5 ft, some sand with silt from 7.5 to 8.5 ft, large wood piece at 6.5 ft; NMC=20, %200=24			SS-4	2	2	2	4	4
	8.5			8.0	SS-5	2	1	2	1	3
839.7		**Alluvium** - Soft, moist, brown and gray, fine, sandy lean CLAY (CL/A-4), trace roots, layer of clayey sand at 9.5 ft NMC=31, LL=29, PL=21, PI=8, %200=55								
	13.0			13.5	SS-6	3	1	2		3
834.7		**Alluvium** - Very loose, wet, gray with brown, fine, SAND with silt (SP-SM/A-2), with gravel seams at top and bottom of layer NMC=30, %200=11								
	19.0			18.5	SS-7	5	6	9		15
829.7		**Residuum** - Medium dense, moist, orange, red and brown, fine to medium, silty SAND (SM/A-2) NMC=19, %200=18								
	23.0			23.5	SS-8	3	8	11		19
824.7		Medium dense, moist, white, brown and tan-red, fine to coarse, silty SAND (SM/A-2), few rock fragments								
	29.0			28.5	SS-9	16	50/5"			50/5"
		Partially Weathered Rock - Very dense,								

SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 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	

SCDOT Soil Test Log

Project ID:	P038111	**County:**	Greenville	**Boring No.:**	RW-1		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	410+90	**Offset:**	89 ft LT	**Alignment:**	Mainline CL
Elev.:	849.7 ft	**Latitude:**	34.855672	**Longitude:**	-82.269226	**Date Started:**	4/11/2019
Total Depth:	34 ft	**Soil Depth:**	34 ft	**Core Depth:**	0 ft	**Date Completed:**	4/11/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	Independence Drill	**Groundwater:**	**TOB** 9 ft	**24HR**	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
		slightly moist, tan, white and orange, fine to coarse, silty SAND (SM/A-2), few rock fragments		33.5			
	34.0			34.0	SS-10	50/3"	50/3" >>
		Boring Terminated upon encountering auger refusal / split-spoon refusal at 34 ft			SS-11	50/0"	50/0" >>
814.7							
809.7							
804.7							
799.7							
794.7							

● 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	

SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	RW-2
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Titus (S&ME)	**Boring Location:**	415+78	**Offset:**	77 ft RT	**Alignment:**	Mainline CL
Elev.:	849.9 ft	**Latitude:**	34.855801	**Longitude:**	-82.267513	**Date Started:**	3/13/2019
Total Depth:	33.5 ft	**Soil Depth:**	33.5 ft	**Core Depth:**	0 ft	**Date Completed:**	3/13/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 18.5 ft	**24HR**	10.4 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	Top of Ground (No Topsoil)								
		Fill - Stiff, dark gray and brown, fine to medium, sandy CLAY (CL/A-6), trace roots, layer crushed stone		0.0	SS-1	6	8	6	7	14
	2.0	**Fill** - Medium dense to loose, slightly moist, brown red, fine to coarse, silty SAND (SM/A-4), with clay, trace roots, layers of gravel		2.0	SS-2	5	6	6	8	12
844.9		NMC=19, LL=33, PL=26, PI=7, %200=38		4.0	SS-3	2	3	5	6	8
	6.0	**Fill** - Loose, sl. moist, brown, orange and gray, mica., fine to medium, silty SAND (SM/A-2-4); NMC=20, LL=33, PL=26, PI=7, %200=30		6.0	SS-4	2	3	7	5	10
	8.0	**Fill** - Very soft, slightly moist, dark brown and red, fine to medium, sandy SILT (ML/A-7-5)		8.0	SS-5	2	0	1	1	1
839.9		UD-1 (8'-10'): NMC=30, LL=47, PL=30, PI=17, %200=60								
	12.0	**Alluvium** - Very loose, wet, dark gray, fine to medium, SAND with silt (SP-SM/A-1), with roots and organics		13.5	SS-6	1	1	1		2
834.9		NMC=44, %200=10								
	16.0	**Residuum** - Loose, very moist, orangish brown, micaceous, fine to medium, silty SAND (SM/A-2-5), trace rock fragments		18.5	SS-7	2	3	5		8
829.9		NMC=52, LL=52, PL=43, PI=9, %200=25								
	21.0	Medium dense, wet to moist, dark brown and red, micaceous, fine to coarse, silty SAND (SM/A-2), lenses of partially weathered rock, more silt in SS-9		23.5	SS-8	6	10	13		23
824.9		NMC=33, %200=22		28.5	SS-9	7	9	14		23

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	

SCDOT Soil Test Log

Project ID:	P038111	**County:**	Greenville	**Boring No.:**	RW-2		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Titus (S&ME)	**Boring Location:**	415+78	**Offset:**	77 ft RT	**Alignment:**	Mainline CL
Elev.:	849.9 ft	**Latitude:**	34.855801	**Longitude:**	-82.267513	**Date Started:**	3/13/2019
Total Depth:	33.5 ft	**Soil Depth:**	33.5 ft	**Core Depth:**	0 ft	**Date Completed:**	3/13/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 18.5 ft	**24HR**	10.4 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
	31.5						
		Partially Weathered Rock - Very dense (based on N value and observed rate of drilling); no recovery in SS-10					
	33.5			33.5	SS-10	50/0"	50/0"
		Boring Terminated upon encountering auger refusal / split-spoon refusal at 33.5 ft					
814.9							
809.9							
804.9							
799.9							
794.9							

● 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 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	R-1
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	409+10	**Offset:**	63 ft RT	**Alignment:**	Mainline CL
Elev.:	860.1 ft	**Latitude:**	34.85509	**Longitude:**	-82.269569	**Date Started:**	3/14/2019
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	0 ft	**Date Completed:**	3/14/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 13 ft	**24HR**	7.1 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	Top of Ground (No Topsoil)								
		Fill - Firm, red, brown and gray, fine to medium, sandy lean CLAY (CL/A-7-6), trace silt, roots and gravel; NMC=19, LL=45, PL=23, PI=22, %200=51		0.0	SS-1	0	4	2	5	6
	2.0			2.0	SS-2	4	4	5	7	9
		Residuum - Stiff to firm, moist, reddish brown, black and yellow, micaceous, fine, sandy elastic SILT (MH/A-5), trace rock fragments		4.0	SS-3	2	2	4	4	6
855.1		NMC=41, LL=54, PL=45, PI=9, %200=51								
	6.0			6.0	SS-4	2	3	4	5	7
		Firm, very moist to wet, brown, tan, with black and white, fine to medium, sandy SILT (ML/A-5), few large rock fragments, micaceous in SS-5		8.0	SS-5	2	3	3	4	6
		NMC=49, LL=43, PL=35, PI=8, %200=52								
850.1										
	12.0			13.5	SS-6	8	11	10		21
		Medium dense, very moist, black, brownish orange and white, fine to coarse, silty SAND (SM/A-2), some rock fragments								
		NMC=16, %200=22								
845.1										
	17.0			18.5	SS-7	2	4	6		10
		Loose, very moist, brown, black and gray, very micaceous, fine to medium, silty SAND (SM/A-4), with rock fragments								
840.1	20.0	Boring Terminated at 20 feet								
835.1										

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 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	R-2
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	417+24	**Offset:**	112 ft LT	**Alignment:**	Mainline CL
Elev.:	849.5 ft	**Latitude:**	34.856437	**Longitude:**	-82.267326	**Date Started:**	3/11/2019
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	0 ft	**Date Completed:**	3/11/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 6.3 ft	**24HR**	2.4 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	Top of Ground (3" Topsoil)								
		Fill - Loose, moist, reddish brown, micaceous, fine to medium, silty SAND (SM/A-7-5), few roots		0.0	SS-1	2	2	3	5	5
		NMC=30, LL=43, PL=31, PI=12, %200=47		2.0						
	3.0	**Fill** - Firm to soft, moist, gray and brown, fine to medium, sandy lean CLAY (CL/A-6)			SS-2	3	3	5	5	8
		NMC=27, LL=37, PL=22, PI=15, %200=59		4.0						
844.5					SS-3	2	2	2	2	4
	6.0	**Alluvium** - Very soft, very moist, gray and olive, sl. mica., fine to med., lean CLAY with sand (CL/A-6), trace roots, sand seams		6.0	SS-4	2	1	1	2	2
		NMC=35, LL=38, PL=24, PI=14, %200=71		8.0						
	8.5	**Alluvium** - Very loose, wet, brown, fine to medium, silty/clayey SAND (SC-SM/A-4)			SS-5	0	0	1	1	1
839.5		NMC=28, LL=25, PL=18, PI=7, %200=36								
	12.0	**Alluvium** - Firm, wet, gray, slightly micaceous, fine to medium, sandy CLAY (CL/A-6), trace roots		13.5	SS-6	0	3	2		5
	14.5	**Alluvium** - Loose, wet, gray to tan, micaceous, fine to medium, silty SAND (SM/A-2)								
834.5										
	17.0	**Residuum** - Medium dense, moist, orange and tan, fine to coarse, silty SAND (SM/A-4)		18.5	SS-7	3	5	6		11
829.5	20.0	Boring Terminated at 20 feet								
824.5										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

SC_DOT 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

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:	P038111			**County:**	Greenville	**Boring No.:**	R-3
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Titus (S&ME)	**Boring Location:**	419+17	**Offset:**	76 ft RT	**Alignment:**	Mainline CL
Elev.:	850.6 ft	**Latitude:**	34.856179	**Longitude:**	-82.266483	**Date Started:**	3/13/2019
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	0 ft	**Date Completed:**	3/13/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	Diedrich D50	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	98.1%
Core Size:	N/A	**Driller:**	J. Millwood	**Groundwater:**	**TOB** 17 ft	**24HR**	10.0 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	Top of Ground (No Topsoil)								
		Fill - Medium dense, sl. moist, red and gray, fine to coarse, silty SAND (SM/A-4), with crushed stone		0.0	SS-1	6	8	4	5	12
	2.0	**Fill** - Loose, slightly moist, gray and brown, slightly micaceous, fine to coarse, clayey SAND (SC/A-6), layers of sandy clay, with few roots and organic odor		2.0	SS-2	4	4	5	7	9
845.6		NMC=19, LL=35, PL=21, PI=14, %200=49		4.0	SS-3	3	3	4	4	7
	6.0	**Fill** - Firm, slightly moist, red brown, slightly micaceous, fine to medium, sandy SILT (ML/A-7-5)		6.0	SS-4	3	3	3	4	6
		NMC=23, LL=43, PL=32, PI=11, %200=50		8.0	SS-5	4	5	6	7	11
	9.0	**Fill** - Medium dense, moist, reddish brown, tan and gray, fine to coarse, silty SAND (SM/A-4), with seams of clay and silt								
840.6										
	12.0	**Possible Alluvium** - Very loose, wet, light tan and red, fine to coarse, silty SAND (SM/A-2), some rock fragments		13.5	SS-6	1	2	1		3
		NMC=24, %200=22								
835.6										
	16.0	**Residuum** - Stiff, slightly moist, brown, red and tan, slightly micaceous, fine to medium, sandy SILT (ML/A-4)		18.5	SS-7	8	5	8		13
830.6	20.0	Boring Terminated at 20 feet								
825.6										

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 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

SCDOT Soil Test Log

Project ID:	P038111	**County:**	Greenville	**Boring No.:**	R-4		
Site Description:	I-85 Bridge Over Rocky Creek			**Route:**	I-85		
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	401+28	**Offset:**	57 ft LT	**Alignment:**	Mainline CL
Elev.:	869.4 ft	**Latitude:**	34.855414	**Longitude:**	-82.269714	**Date Started:**	4/11/2019
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	0 ft	**Date Completed:**	4/11/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	Independence Drill	**Groundwater:**	**TOB** Caved 17'	**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	Top of Ground (2" Topsoil)								
		Fill - Loose to medium dense, red, brown and gray, fine to medium, silty/clayey SAND (SC-SM/A-2-4), seams of silt, few rock fragments and roots NMC=12, LL=19, PL=15, PI=4, %200=34		0.0	SS-1	3	5	4	4	9
				2.0	SS-2	3	4	7	5	11
	4.0			4.0						
864.4		**Residuum** - Loose, orange and brown, fine to medium, silty SAND (SM/A-4); NMC=27, LL=39, PL=31, PI=8, %200=43			SS-3	4	4	6	9	10
	6.0			6.0						
		Medium dense, yellow, tan and brown, slightly micaceous to micaceous, fine to coarse, silty SAND (SM/A-2-4), few rock fragments below 8 ft NMC=23, LL=37, PL=30, PI=7, %200=32			SS-4	3	4	7	11	11
				8.0	SS-5	8	7	6	6	13
859.4										
				13.5						
					SS-6	5	10	11		21
854.4										
				18.5						
					SS-7	5	10	13		23
849.4	20.0	Boring Terminated at 20 feet								
844.4										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

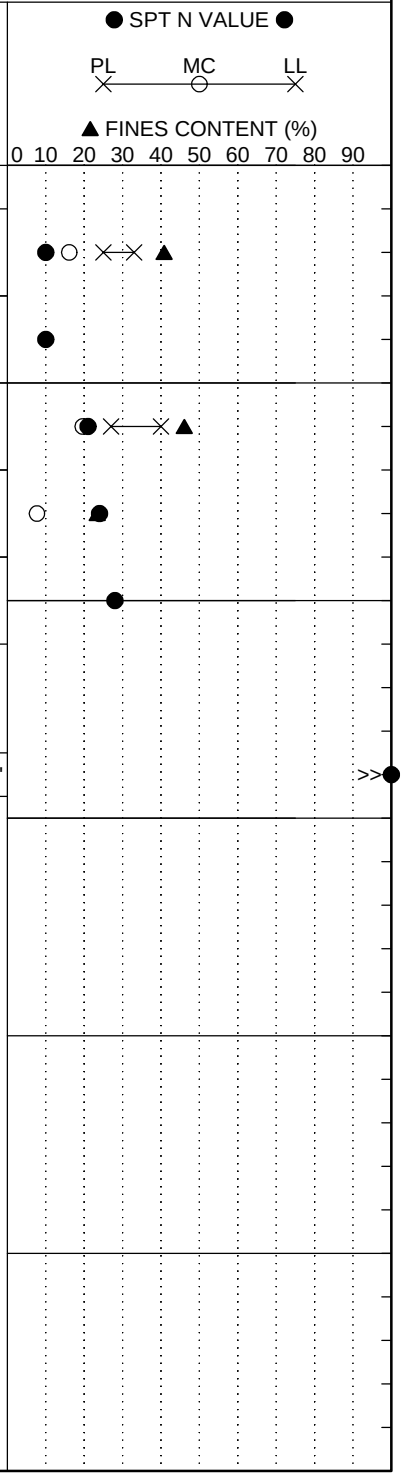
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT 142615009_I85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

SCDOT Soil Test Log

Project ID:	P038111			**County:**	Greenville	**Boring No.:**	R-5
Site Description:	I-85 Bridge Over Rocky Creek					**Route:**	I-85
Eng./Geo.:	J.Gathro (S&ME)	**Boring Location:**	393+14	**Offset:**	46 ft LT	**Alignment:**	Mainline CL
Elev.:	877.8 ft	**Latitude:**	34.853577	**Longitude:**	-82.274578	**Date Started:**	4/11/2019
Total Depth:	17 ft	**Soil Depth:**	17 ft	**Core Depth:**	0 ft	**Date Completed:**	4/11/2019
Bore Hole Diameter (in):	6"	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	Independence Drill	**Groundwater:**	**TOB** Caved 15'	**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	Top of Pavement (2" Asphalt, 7" Stone Base)								
		Fill - Loose, brown and red, slightly micaceous, fine to medium, silty SAND (SM/A-4), trace rock fragments NMC=16, LL=33, PL=25, PI=8, %200=41		1.0	SS-1	6	5	5	6	10
	3.0			3.0						
		Fill - Loose to medium dense, brown, red and gray, slightly micaceous, fine to medium, silty SAND (SM/A-6), layers of clay and gray sand, trace rock fragments NMC=20, LL=40, PL=27, PI=13, %200=46			SS-2	4	3	7	8	10
872.8				5.0	SS-3	7	10	11	10	21
	7.0			7.0						
		Fill - Medium dense, tan, white to brown and gray, fine to coarse, silty SAND (SM/A-2), layers of rock fragments at 8 ft and 10 ft (*likely amplified N values) NMC=8, %200=23			SS-4	15	15	9	6	24
				9.0						
867.8					SS-5	5	6	22	24	28
	13.0									
		Apparent Boulder Fill - Very dense, gray and brown, fine to coarse, gravelly SAND with silt (SP-SM/A-2), some large rock fragments and cobbles (based on observed rate of difficult drilling)		13.5	SS-6	40	50/5"			50/5"
862.8										
	17.0									
		Boring Terminated upon encountering auger refusal at 17 feet (not conclusive whether refusal was caused by large boulder or mass rock).								
857.8		Offset approx. 17 ft south of R-5 (approx. Sta. 392+93), and performed offset auger boring "R-5A" (no sampling, auger probe only). Based on observed rate of drilling, R-5A encountered generally similar fill conditions to depth of 16 ft, possible PWR from 16-18 ft, and auger refusal (possible mass rock) at 18 ft.								
852.8		Then, offset approx. 38 ft north of R-5 (approx. Sta. 393+35), and performed offset auger boring "R-5B" (no sampling, auger probe only). Based on observed rate of drilling, R-5B encountered generally similar fill conditions to depth of 20 ft, possible PWR from 20-25.5 ft, and auger refusal (possible mass rock) at 25.5 ft.								



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	

SOIL TEST LOGS
(PREVIOUS EXPLORATIONS)

Geotechnical Data Report by ICA (2012)
B-73, B-74, B-58, B-59

Final Roadway Geotechnical Engineering Report by ECS (2015)
R85-19, I85-106, R85-20, R85-21

SCDOT Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	S. Berry
Site Description:	I-85/I-385 Interchange Improvements					**Route:**	
Boring No.:	B-73	**Boring Location:**	414+45	**Offset:**	106' Lt.	**Alignment:**	I-85
Elev.:	847.9 ft	**Latitude:**	34.85611	**Longitude:**	82.26817	**Date Started:**	9/25/2012
Total Depth:	30 ft	**Soil Depth:**	30.0 ft	**Core Depth:**	ft	**Date Completed:**	9/25/2012
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45C	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	79%
Core Size:	NA	**Driller:**	C. Frazier	**Groundwater:**	**TOB**		**24HR**

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
	0.0	Loose to medium dense, tan & white, non-reactive, silty SAND (SM/A-4). LL=27, PL=26, PI=1, NMC=16.4, %#200=35.5		2.0	SS-1	3	4	5	9
842.9	5.8			4.0	SS-2	4	6	16	22
		Medium dense to very dense, tan, white & gray, non-reactive, silty SAND (SM/A-2-4). LL=NP, PL=NP, PI=NP, NMC=15.0, %#200=28.4		6.0	SS-3	7	21	26	47
				8.0	SS-4	20	10	13	23
837.9				10.0	SS-5	17	12	11	23
				13.5	SS-6	13	36	22	58
832.9	16.8								
		Very dense, tan & white, non-reactive, silty SAND (SM/A-2-4). LL=NP, PL=NP, PI=NP, NMC=13.7, %#200=30.0		18.5	SS-7	32	50/0.3		50/0.3
827.9									
				23.5	SS-8	50/0.5			50/0.5
822.9									
				28.3	SS-9	20	25	28	53
817.9	30.0	No Refusal & Boring Terminated @ 30.0' (Elev. 817.9).							
812.9									
807.9									
802.9									

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

SC_DOT I-85 I-385 INTERCHANGE IMPROVEMENTS.GPJ SC_DOT.GDT 1/7/13

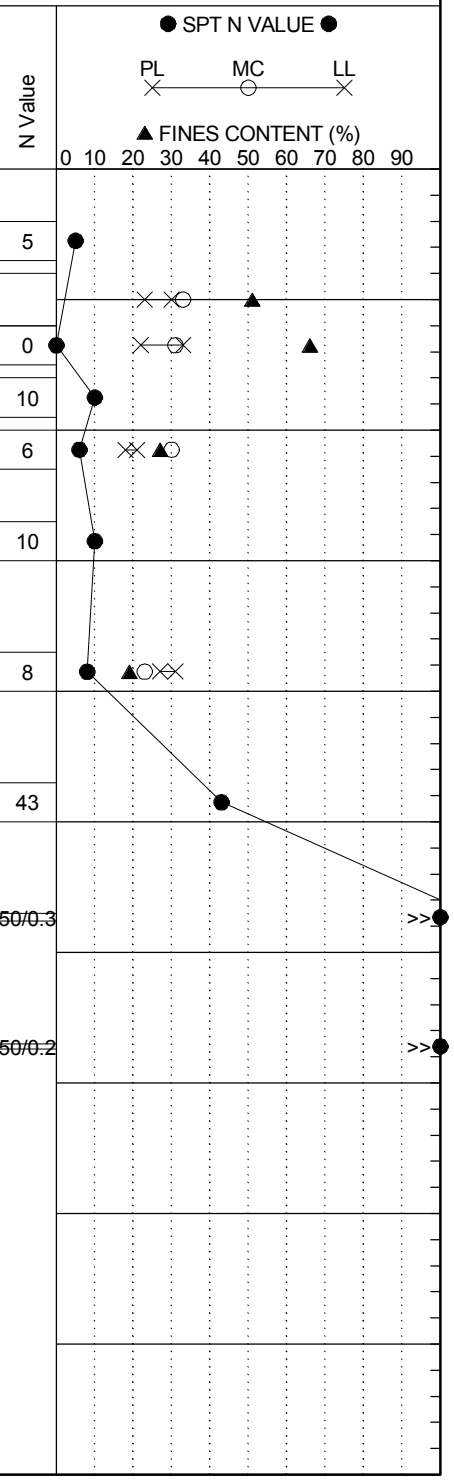
LEGEND

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

SCDOT Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	S. Berry
Site Description:	I-85/I-385 Interchange Improvements					**Route:**	
Boring No.:	B-74	**Boring Location:**	413+00	**Offset:**	88' Rt.	**Alignment:**	I-85
Elev.:	848.9 ft	**Latitude:**	34.85546	**Longitude:**	82.26835	**Date Started:**	10/3/2012
Total Depth:	33.7 ft	**Soil Depth:**	33.7 ft	**Core Depth:**	ft	**Date Completed:**	10/4/2012
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45C	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	NA	**Driller:**	M. Frazier	**Groundwater:**	**TOB**		**24HR**

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
	0.0	Firm, brown, non-reactive, sandy lean CLAY (CL/A-6).		2.0	SS-1	2	2	3	5
	3.8			4.0					
843.9	5.7	Very soft to firm, brown, non-reactive,sandy SILT (ML/A-4). LL=30, PL=23, PI=7, NMC=33.1, %#200=50.9		6.0	ST-1				
	7.8			8.0	SS-2	WOH	WOH	WOH	0
838.9		Very soft, brown, non-reactive, sandy lean CLAY (CL/A-6). LL=33, PL=22, PI=11, NMC=31.0, %#200=66.4		10.0	SS-3	WOH	5	5	10
	12.5			13.5	SS-4	3	3	3	6
833.9		Loose, gray, non-reactive, silty SAND (SM/A-2-4). LL=21, PL=18, PI=3, NMC=30.0, %#200=27.1			SS-5	8	4	6	10
				18.5	SS-6	4	4	4	8
828.9		Loose, white & gray, non-reactive, silty SAND (SM/A-1-b).							
	21.8	LL=31, PL=27, PI=4, NMC=23.4, %#200=18.9		23.5	SS-7	8	14	29	43
823.9		Dense to very dense, black & gray, non-reactive, silty SAND (SM/A-2-4). LL=33, PL=33, PI=NP, NMC=16.1, %#200=21.3		28.5	SS-8	50/0.3			50/0.3
818.9									
	33.7			33.5	SS-9	50/0.2			50/0.2
813.9		No Refusal & Boring Terminated @ 33.7' (Elev. 815.2).							
808.9									
803.9									



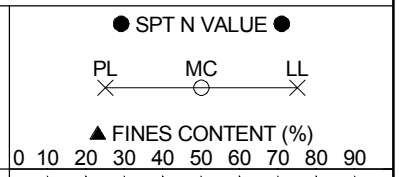
LEGEND

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

SCDOT Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	S. Berry
Site Description:	I-85/I-385 Interchange Improvements					**Route:**	
Boring No.:	B-58	**Boring Location:**	399+98	**Offset:**	99' Rt.	**Alignment:**	I-85
Elev.:	863.8 ft	**Latitude:**	34.85398	**Longitude:**	82.2723	**Date Started:**	9/25/2012
Total Depth:	15 ft	**Soil Depth:**	15.0 ft	**Core Depth:**	ft	**Date Completed:**	9/25/2012
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45C	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	86%
Core Size:	NA	**Driller:**	M. Frazier	**Groundwater:**	**TOB**		**24HR**

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
	0.0	Loose, tan & red, non-reactive, silty SAND (SM/A-2-7).		2.0					
		LL=66, PL=46, PI=20, NMC=34.4, %#200=19.7			SS-1	2	5	5	10
	3.8			4.0					
858.8					SS-2	3	3	4	7
	5.8	Loose, red, non-reactive, silty SAND (SM/A-2-4).		6.0					
		LL=NP, PL=NP, PI=NP, NMC=35.7, %#200=27.0			SS-3	2	3	3	6
				8.0					
					SS-4	2	3	2	5
853.8		Very loose to loose, gray, tan & black, non-reactive, silty SAND (SM/A-2-5).		10.0					
		LL=59, PL=55, PI=4, NMC=42.6, %#200=18.5			SS-5	2	2	3	5
				13.5					
	15.0				SS-6	2	2	2	4
848.8		No Refusal & Boring Terminated @ 15.0' (Elev. 848.8).							
843.8									
838.8									
833.8									
828.8									
823.8									
818.8									



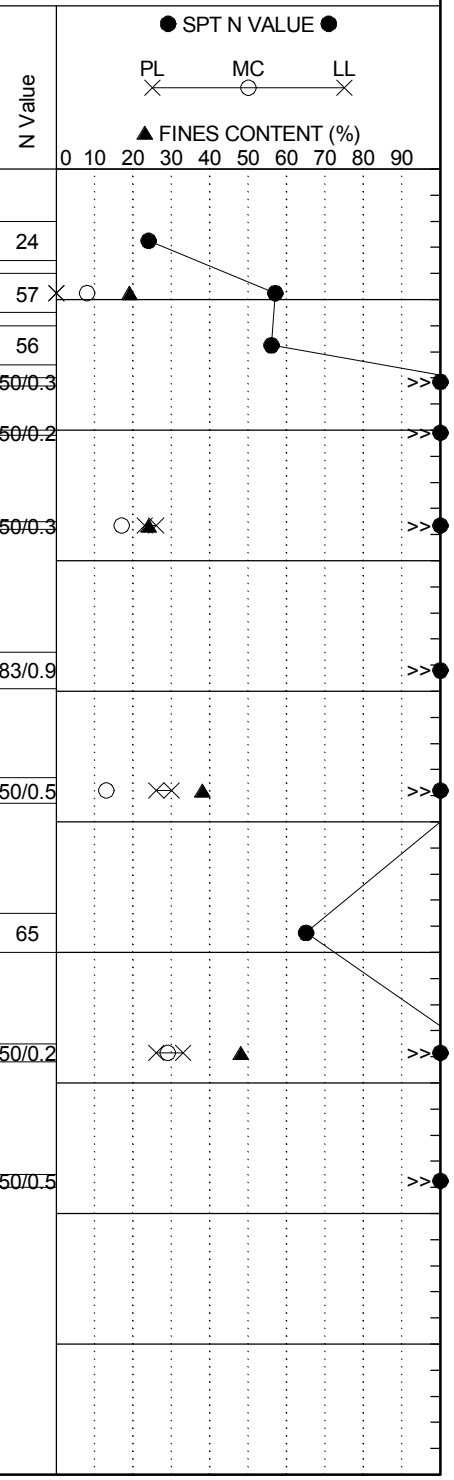
LEGEND

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

SCDOT Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	S. Berry
Site Description:	I-85/I-385 Interchange Improvements					**Route:**	
Boring No.:	B-59	**Boring Location:**	420+11	**Offset:**	94' Lt.	**Alignment:**	I-85
Elev.:	850.6 ft	**Latitude:**	34.85671	**Longitude:**	82.26643	**Date Started:**	10/3/2012
Total Depth:	39 ft	**Soil Depth:**	39.0 ft	**Core Depth:**	ft	**Date Completed:**	10/4/2012
Bore Hole Diameter (in):	4	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 45C	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	79%
Core Size:	NA	**Driller:**	C. Frazier	**Groundwater:**	**TOB**		**24HR**

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
	0.0	Medium dense to very dense, tan, red, white & brown, non-reactive, silty SAND (SM/A-2-4). LL=NP, PL=NP, PI=NP, NMC=8.4, %#200=19.4		2.0	SS-1	4	9	15	24
845.6				4.0	SS-2	17	23	34	57
				6.0	SS-3	21	27	29	56
				8.0	SS-4	50/0.3			50/0.3
	9.8								
840.6		Very dense, tan & white, non-reactive, silty SAND (SM/A-2-4). LL=26, PL=23, PI=3, NMC=17.3, %#200=24.2		10.0	SS-5	50/0.2			50/0.2
				13.5	SS-6	50/0.3			50/0.3
835.6									
	16.8								
		Very dense, tan, brown, gray, black & white, non-reactive, silty SAND (SM/A-4). LL=30, PL=26, PI=4, NMC=12.6, %#200=38.2		18.5	SS-7	17	33	50/0.4	83/0.9
830.6									
				23.3	SS-8	20	50/0.5		50/0.5
825.6									
				28.5	SS-9	12	27	38	65
820.6									
	31.8								
		Very dense, tan & gray, non-reactive, silty SAND (SM/A-4). LL=33, PL=26, PI=7, NMC=28.6, %#200=48.3		33.5	SS-10	10	50/0.2		50/0.2
815.6									
	39.0			38.5	SS-11	50/0.5			50/0.5
		No Refusal & Boring Terminated @ 39.0' (Elev. 811.6).							
810.6									
805.6									



LEGEND

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

SC_DOT I-85 I-385 INTERCHANGE IMPROVEMENTS.GPJ SC_DOT.GDT 1/7/13

Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	Blake Ellis
Site Description:	I-85 and I-385 Interchange Design					**Route:**	I-85 / I-385
Boring No.:	R85-19	**Boring Location:**	389+99	**Offset:**	RT 53	**Alignment:**	I-85
Elev.:	874.5 ft.	**Latitude:**	34.85291328	**Longitude:**	-82.27532862	**Date Started:**	3/15/2015
Total Depth:	11.5 ft.	**Soil Depth:**	11.5 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	3/15/2015
Bore Hole Diameter (in):	3-7/8	**Sampler Configuration**		**Liner Required:**	No	**Liner Used:**	NA
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	88%
Core Size:	NA	**Driller:**	TE	**Groundwater:**	**TOB** N.E.	**24 HR**	N.O.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows / foot) / PL MC LL / FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
0.0		Approximately 19 inches of asphalt.								
		Medium dense, moist, reddish brown and brown, fine to medium grained, with mica, CLAYEY SAND (SC, A-7-6(3)), FILL, LL=46 PL=27 PI=19 NMC=21.1 %#200=40.2		1.5	SS-1	5	7	7	14	
5.0	870.0	Medium dense, moist, white and dark brown, fine to coarse grained, with mica, SILTY SAND (SM, A-2), RESIDUUM		3.5	SS-2	16	12	12	24	
		Dense, moist, dark brown and white, fine to medium grained, with mica, SILTY SAND (SM, A-1-b(0)), RESIDUUM, LL=NP PL=NP PI=NP NMC=17.1 %#200=14.8		5.5	SS-3	6	10	24	34	
		Dense, RESIDUUM		7.5	SS-4	26	21	13	34	
10.0	865.0	Very dense, moist, dark brown and brown, fine to medium grained, with mica, SILTY SAND (SM, A-2-4(0)), RESIDUUM, LL=NP PL=NP PI=NP NMC=22.0 %#200=22.0		9.5	SS-5	13	25	32	57	
		Boring Terminated at 11.5 feet.								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	Stephen Wright
Site Description:	Group 2 Borings					**Route:**	I85
Boring No.:	I85-106	**Boring Location:**	404+97.31	**Offset:**	65.68 RT	**Alignment:**	I85
Elev.:	865.2 ft.	**Latitude:**	34.85463047	**Longitude:**	-82.27081137	**Date Started:**	9/16/2015
Total Depth:	40.0 ft.	**Soil Depth:**	40 ft.	**Core Depth:**	0 ft.	**Date Completed:**	9/16/2015
Bore Hole Diameter (in):	3-7/8	**Sampler Configuration**		**Liner Required:**	N/A	**Liner Used:**	N/A
Drill Machine:	CME 550	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	83%
Core Size:	N/A	**Driller:**	Southern Drill	**Groundwater:**	**TOB** 32 ft.	**24 HR**	N.O.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
0.0	865.0	Stiff to very stiff, moist, light brown to yellow brown, SANDY SILT (RESIDUUM)		1.0	SS-1	3	4	6	10
				3.0	SS-2	4	5	7	12
5.0	860.0			5.0	SS-3	3	4	6	10
				7.0	SS-4	5	7	9	16
10.0	855.0	Medium dense, moist, white and light brown, fine grained SILTY SAND (RESIDUUM)		9.0	SS-5	6	8	10	18
		Very stiff, moist, light orangish brown, SANDY SILT (RESIDUUM)		13.5	SS-6	5	8	8	16
15.0	850.0								
				18.5	SS-7	7	10	12	22
20.0	845.0								
		Dense, moist, red brown and brown, fine grained SILTY SAND (RESIDUUM)		23.5	SS-8	8	13	20	33
25.0	840.0								
				28.5	SS-9	10	16	21	37
30.0									

● SPT N VALUE (blows / foot)

PL MC LL

▲ FINES CONTENT (%) ▲

10 20 30 40 50 60 70 80 90

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	Stephen Wright
Site Description:	Group 2 Borings					**Route:**	I85
Boring No.:	I85-106	**Boring Location:**	404+97.31	**Offset:**	65.68 RT	**Alignment:**	I85
Elev.:	865.2 ft.	**Latitude:**	34.85463047	**Longitude:**	-82.27081137	**Date Started:**	9/16/2015
Total Depth:	40.0 ft.	**Soil Depth:**	40 ft.	**Core Depth:**	0 ft.	**Date Completed:**	9/16/2015
Bore Hole Diameter (in):	3-7/8	**Sampler Configuration**		**Liner Required:**	N/A	**Liner Used:**	N/A
Drill Machine:	CME 550	**Drill Method:**	HSA	**Hammer Type:**	Automatic	**Energy Ratio:**	83%
Core Size:	N/A	**Driller:**	Southern Drill	**Groundwater:**	**TOB** 32 ft.	**24 HR**	N.O.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows / foot) / PL MC LL / ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
30.0	835.0									
		Very stiff to stiff, moist, dark brown, SANDY SILT (RESIDUUM)								
35.0	830.0			33.5	SS-10	9	10	9	19	●
40.0				38.5	SS-11	4	7	6	13	●
		Boring terminated at 40.0 feet.								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	Blake Ellis
Site Description:	I-85 and I-385 Interchange Design					**Route:**	I-85 / I-385
Boring No.:	R85-20	**Boring Location:**	405+04	**Offset:**	LT 58	**Alignment:**	I-85
Elev.:	865.0 ft.	**Latitude:**	34.85494252	**Longitude:**	-82.27096949	**Date Started:**	3/15/2015
Total Depth:	10.0 ft.	**Soil Depth:**	10.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	3/15/2015
Bore Hole Diameter (in):	3-7/8	**Sampler Configuration**		**Liner Required:**	No	**Liner Used:**	NA
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	88%
Core Size:	NA	**Driller:**	TE	**Groundwater:**	**TOB** 10.0 ft.*	**24 HR**	N.O.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
0.0	865.0	Approximately 4 inches of topsoil. Loose, moist, brown and dark brown, fine to medium grained, with organics, SILTY SAND (SM, A-2-4(0)), FILL, LL=NP PL=NP PI=NP NMC=14.2 %#200=25.6		0.0	SS-1	2	4	3	7
		Medium dense, dark brown and brown, with mica, FILL		2.0	SS-2	5	8	9	17
5.0	860.0	Dense, moist, light brown and brown, fine to medium grained, with mica and oranics, SILTY SAND (SM, A-2-4(0)), RESIDUUM, LL=NP PL=NP PI=NP NMC=18.9 %#200=27.7		4.0	SS-3	11	14	17	31
		Medium dense, dark brown and white, with mica, RESIDUUM		6.0	SS-4	6	7	11	18
		Medium dense, brown and light brown, with mica, RESIDUUM		8.0	SS-5	5	10	18	28
10.0	855.0	Boring Terminated at 10.0 feet. *Observed at time of borehole completion.							

● SPT N VALUE (blows / foot)

PL MC LL

▲ FINES CONTENT (%) ▲

10 20 30 40 50 60 70 80 90

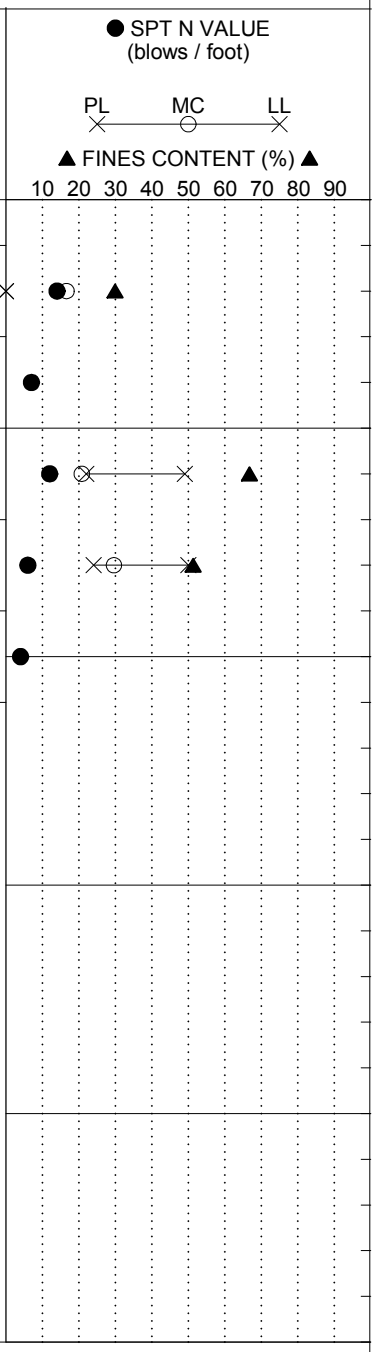
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

Soil Test Boring Log

File No.:	23.038111	**Project No. (PIN):**		**County:**	Greenville	**Eng./Geo.:**	Michael Davis
Site Description:	I-85 and I-385 Interchange Design					**Route:**	I-85 / I-385
Boring No.:	R85-21	**Boring Location:**	423+99	**Offset:**	RT 59	**Alignment:**	I-85
Elev.:	856.6 ft.	**Latitude:**	34.85676061	**Longitude:**	-82.26503824	**Date Started:**	5/12/2015
Total Depth:	11.0 ft.	**Soil Depth:**	11.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	5/12/2015
Bore Hole Diameter (in):	3-7/8	**Sampler Configuration**		**Liner Required:**	No	**Liner Used:**	NA
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	79%
Core Size:	NA	**Driller:**	SCI	**Groundwater:**	**TOB** 9.0 ft.	**24 HR**	N.O.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
0.0		Approximately 12 inches of asphalt.							
	855.0	Medium dense, moist, reddish brown and dark brown, fine to medium grained, SILTY SAND (SM, A-2-4(0)), FILL, LL=NP PL=NP PI=NP NMC=16.6 %#200=29.9		1.0	SS-1	6	8	6	14
		Loose, mica, FILL		3.0	SS-2	2	3	4	7
5.0				5.0	SS-3	7	6	6	12
	850.0	Stiff, moist, reddish brown, brown, tan and white, with mica, SANDY LEAN CLAY (CL, A-7-6(17)), RESIDUUM, LL=49 PL=22 PI=27 NMC=20.8 %#200=66.8		7.0	SS-4	1	3	3	6
▼ 10.0		Firm, moist, brown and reddish brown, with mica, SANDY FAT CLAY (CH, A-7-6(10)), RESIDUUM, LL=50 PL=24 PI=26 NMC=29.6 %#200=51.3		9.0	SS-5	1	1	3	4
		Soft, wet, brown, RESIDUUM							
		Boring Terminated at 11.0 feet.							



LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

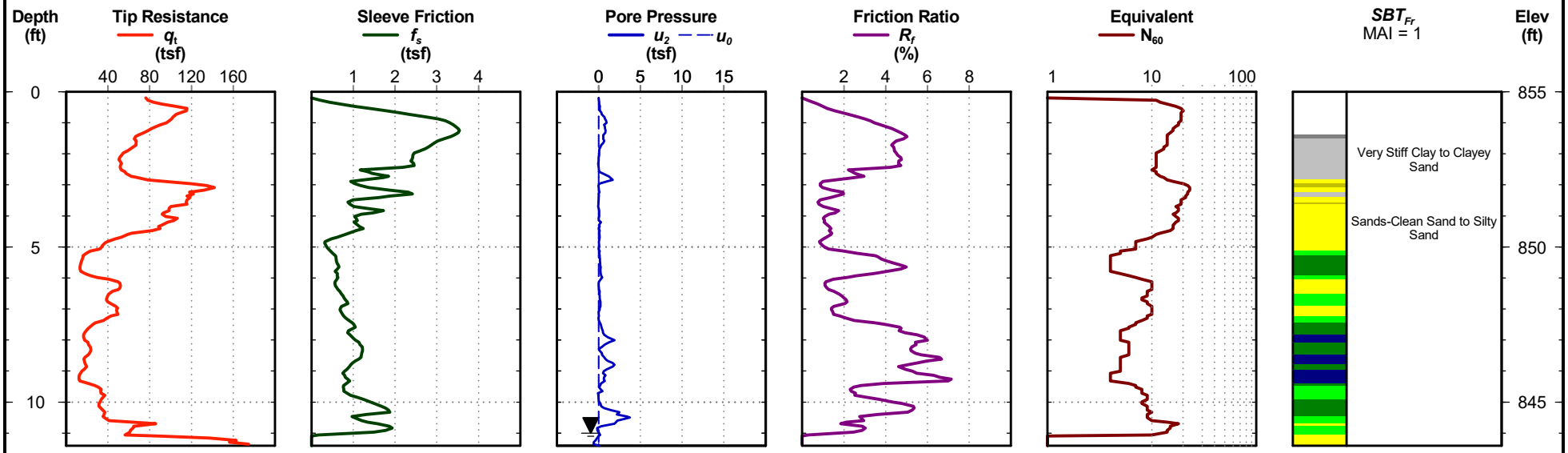
Cone Penetration Test

CPT-1

Date: Aug. 8, 2019
Water Depth TOB: 11 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.855489
Longitude: -82.268482
Elevation: 855 ft

Total Depth: 11.4 ft
Termination Criteria: Max Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-1b(003)_PD.ECP

CPT-1

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

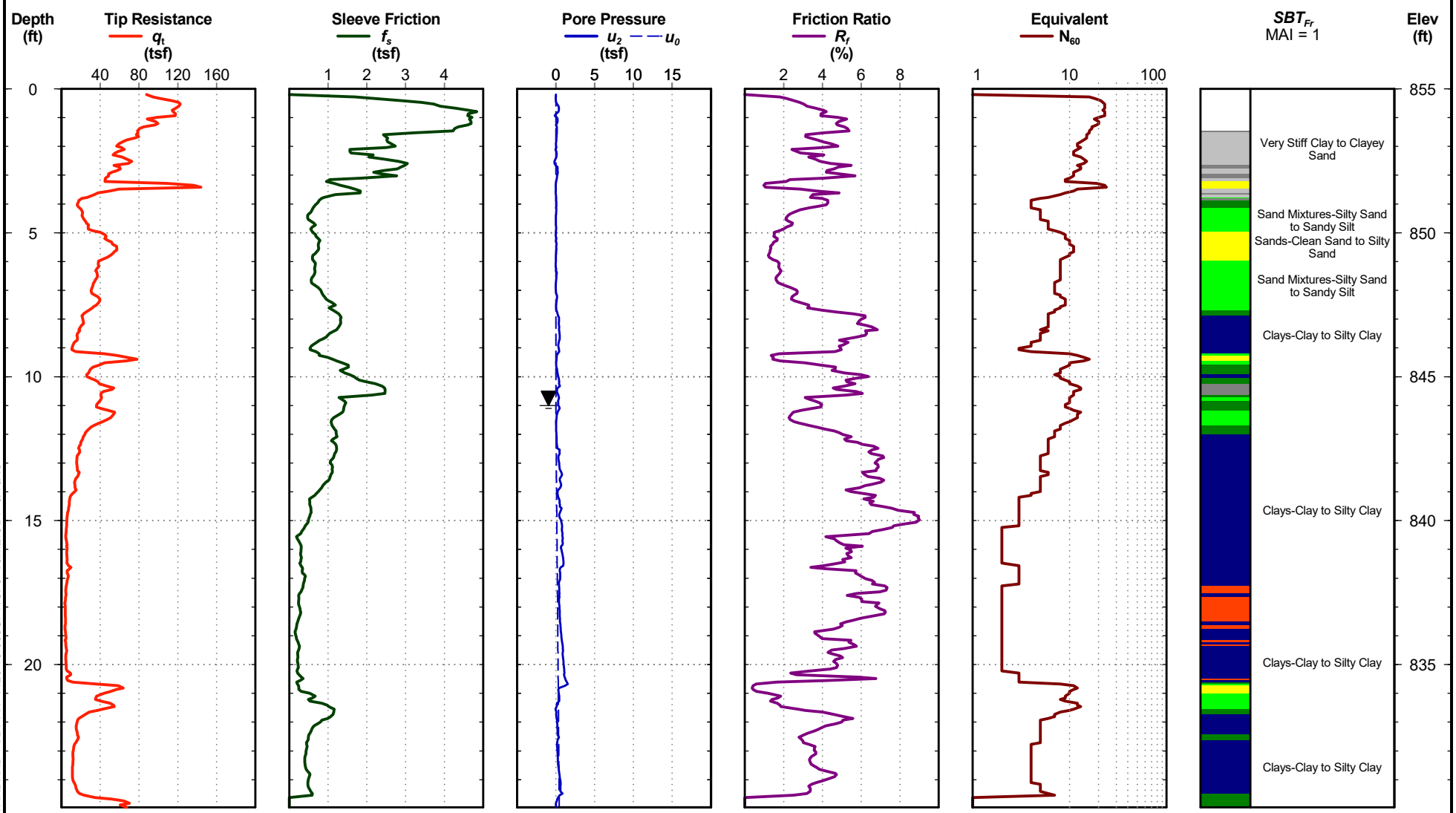
Cone Penetration Test

CPT-1A

Date: Aug. 8, 2019
Water Depth TOB: 11 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.855485
Longitude: -82.268493
Elevation: 855 ft

Total Depth: 25.0 ft
Termination Criteria: Max Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-1e(006)_PD.ECP

CPT-1A

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

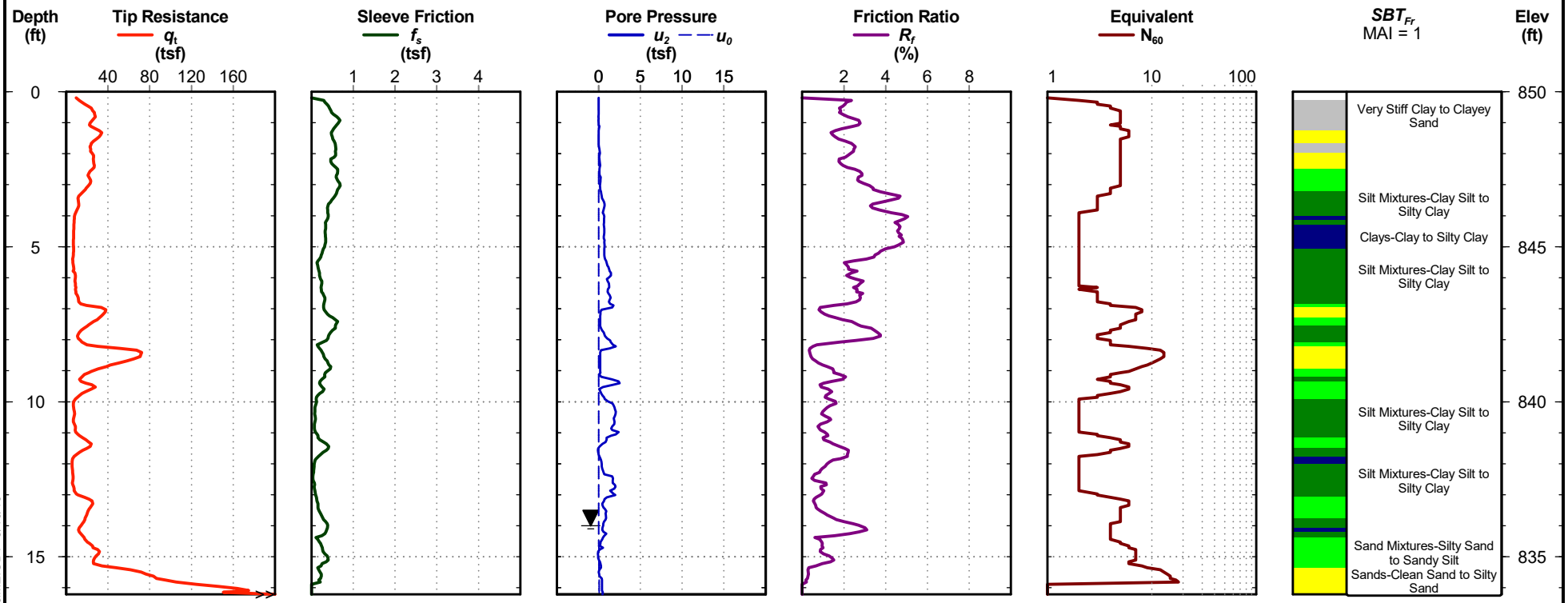
Cone Penetration Test

CPT-2

Date: Aug. 8, 2019
Water Depth TOB: 14 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.85567
Longitude: -82.269237
Elevation: 850 ft

Total Depth: 16.2 ft
Termination Criteria: Max Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-2(008)_PD.ECP

CPT-2

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

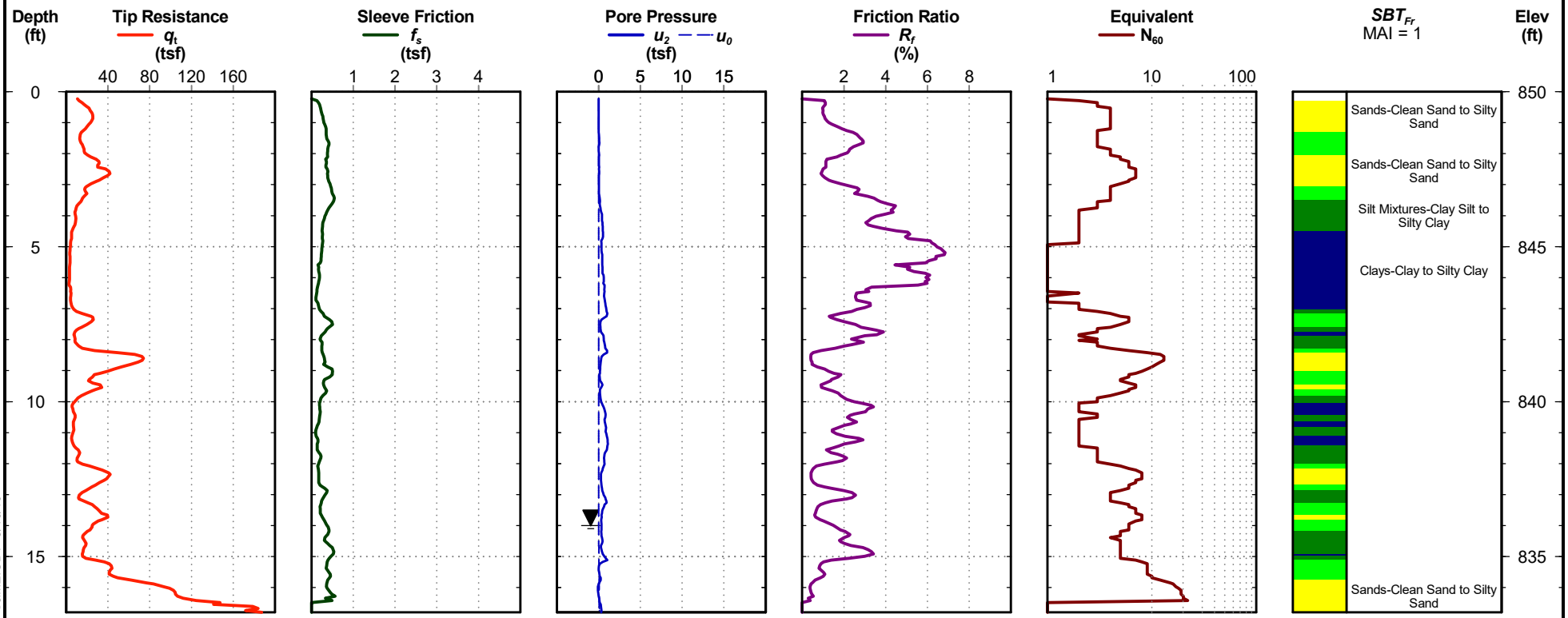
Cone Penetration Test

CPT-2A

Date: Aug. 8, 2019
Water Depth TOB: 14 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.855665
Longitude: -82.269252
Elevation: 850 ft

Total Depth: 16.8 ft
Termination Criteria: Max Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-2a(009)_PD.ECP

CPT-2A

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

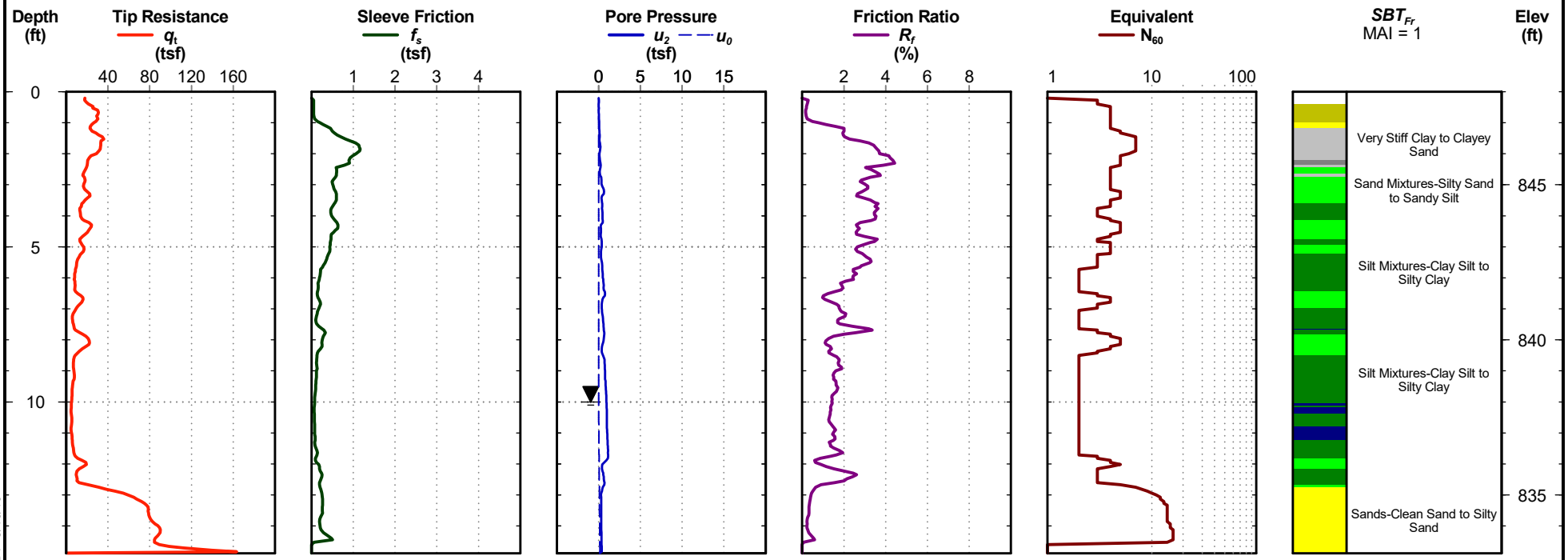
Cone Penetration Test

CPT-3

Date: Aug. 8, 2019
Water Depth TOB: 10 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.856055
Longitude: -82.268217
Elevation: 848 ft

Total Depth: 14.9 ft
Termination Criteria: Max Force
Cone Size: 1.75



Electronic Filename: CPT-3(010)_PD.ECP

CPT-3

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

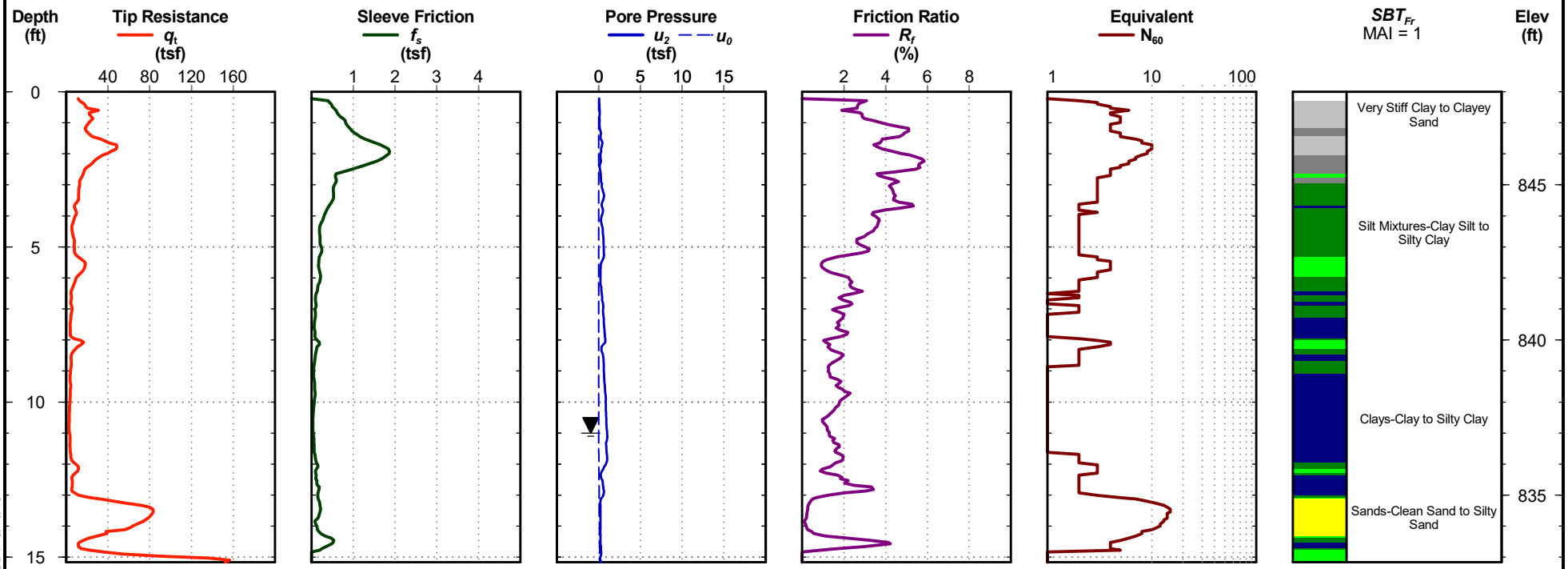
Cone Penetration Test

CPT-3A

Date: Aug. 8, 2019
Water Depth TOB: 11 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.856063
Longitude: -82.268205
Elevation: 848 ft

Total Depth: 15.2 ft
Termination Criteria: Max Force
Cone Size: 1.75



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Electronic Filename: CPT-3a(011)_PD.ECP

CPT-3A

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

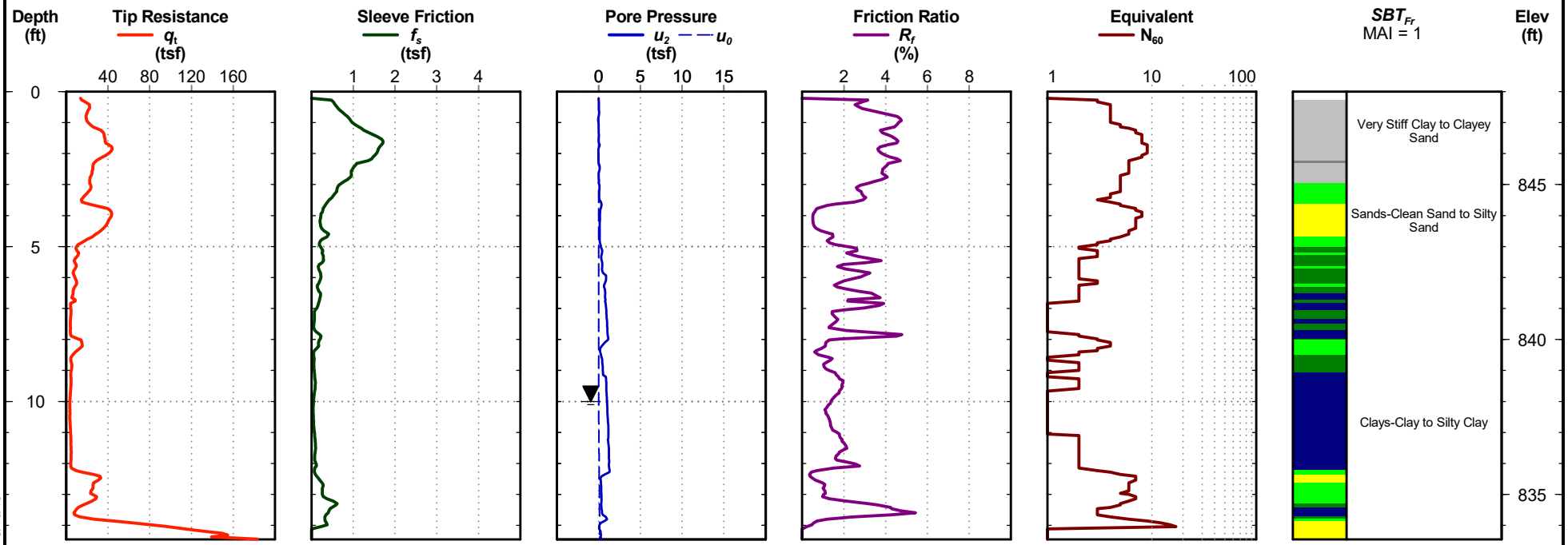
Cone Penetration Test

CPT-3B

Date: Aug. 8, 2019
Water Depth TOB: 10 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.85607
Longitude: -82.268193
Elevation: 848 ft

Total Depth: 14.5 ft
Termination Criteria: Max Force
Cone Size: 1.75



CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-3b(012)_PD.ECP

CPT-3B

I-85 Bridge Over Rocky Creek
Greenville, SC
S&ME Project No: 1426-15-009

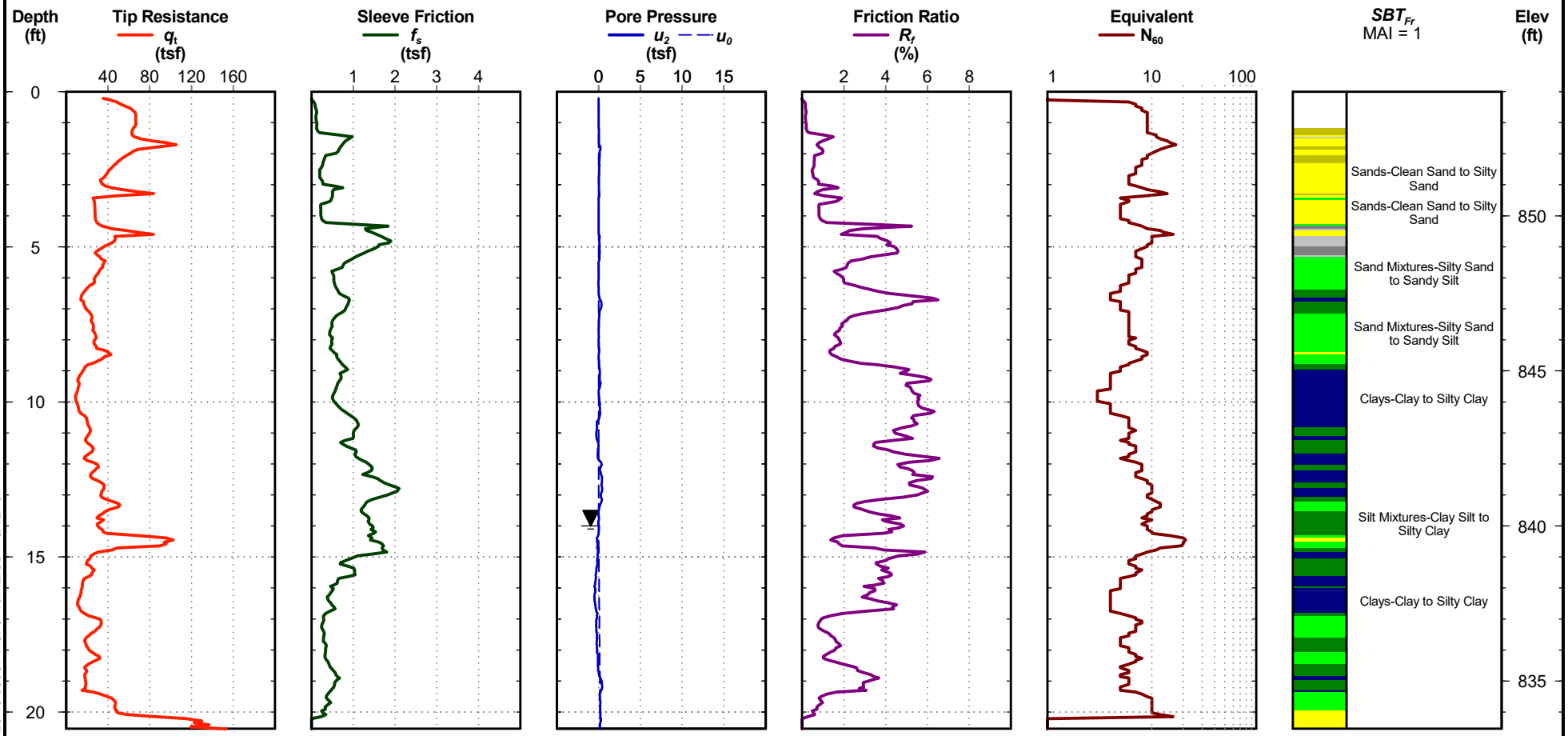
Cone Penetration Test

CPT-4

Date: Aug. 8, 2019
Water Depth TOB: 14 ft
Rig/Operator: Morooka / D. Watson

Latitude: 34.855711
Longitude: -82.267844
Elevation: 854 ft

Total Depth: 20.5 ft
Termination Criteria: Max Force
Cone Size: 1.75

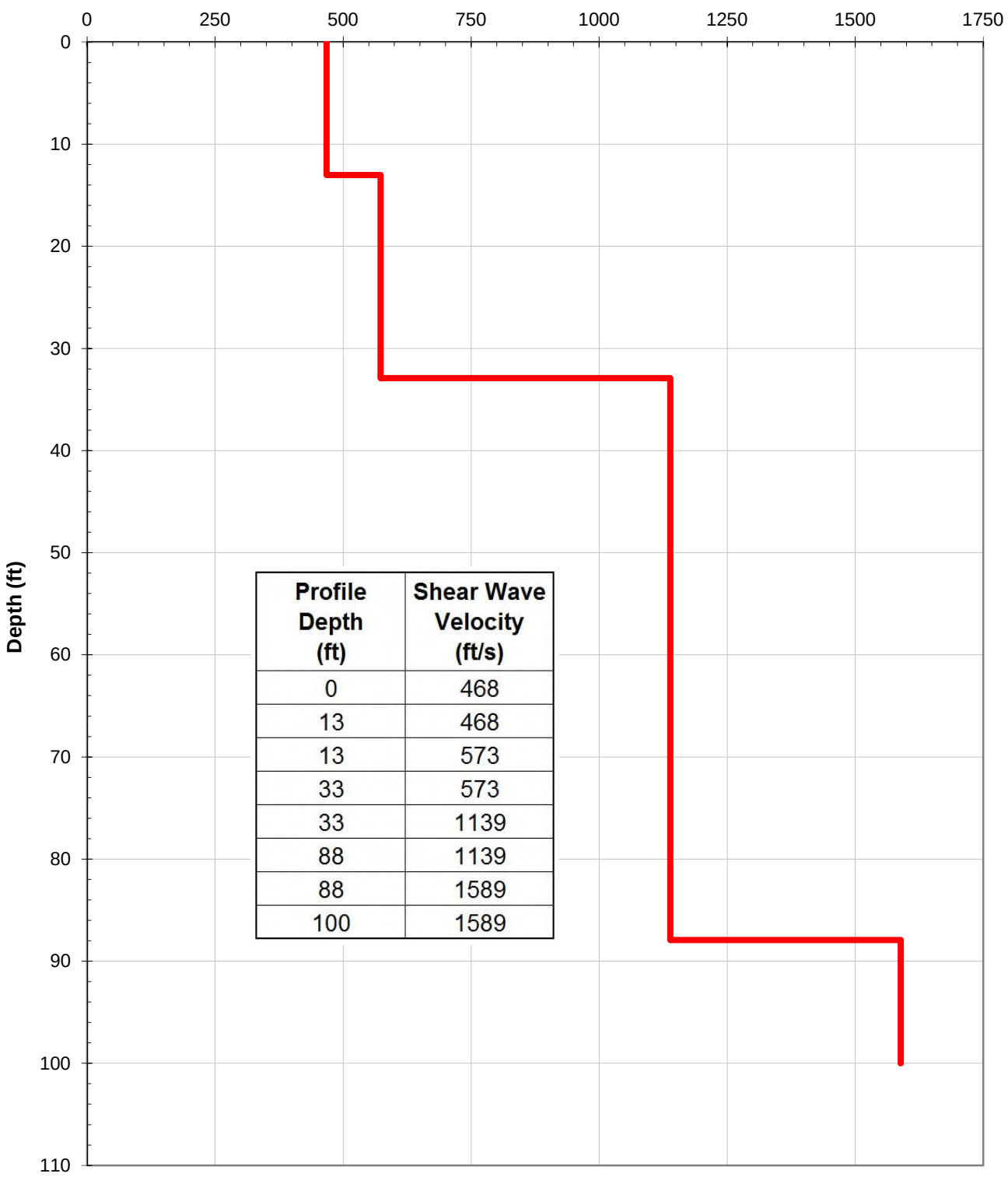


CPT REPORT - STANDARD - SBT FR 1426-15-009CPT.GPJ S&ME.GDT 8/16/19

Electronic Filename: CPT-4(007)_PD.ECP

CPT-4

Shear Wave Velocity Profile SW-1
I-85 Bridge Over Rocky Creek
Greenville County, South Carolina
S&ME Project #1426-15-009



Profile Depth (ft)	Shear Wave Velocity (ft/s)
0	468
13	468
13	573
33	573
33	1139
88	1139
88	1589
100	1589

Summary of SPT Test Results

Project: DIEDRICH D-50 SN382, Test Date: 2/15/2019

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 %
33.35	28.20	29.70	**1-3-5**	**8**	**13**	41.8	44	20.4	1.78	24.2	1.50	338	96.5
53.35	48.20	49.70	**3-4-4**	**8**	**13**	41.6	42	20.9	1.66	23.2	1.50	337	96.4
58.35	53.20	54.70	**6-8-10**	**18**	**29**	41.2	41	20.4	0.78	22.8	0.67	340	97.3
63.35	58.20	59.70	**20-21-24**	**45**	**73**	41.7	43	20.2	0.49	23.7	0.27	347	99.1
			Overall Average Values:			41.6	43	20.3	0.81	23.5	0.61	343	98.1
			Standard Deviation:			0.4	1	0.6	0.50	0.8	0.49	6	1.8
			Overall Maximum Value:			42.3	47	22.4	2.46	25.6	2.00	355	101.4
			Overall Minimum Value:			40.6	40	19.1	0.45	21.8	0.25	326	93.2

Summary of SPT Test Results

Project: CME-750X (SN 322938), Test Date: 4/25/2019

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 %
48.65	43.50	45.00	**12-14-15**	**29**	**40**	48.5	24	17.9	0.58	20.2	0.41	280	80.0
68.50	63.50	65.00	**22-23-21**	**44**	**61**	51.0	24	21.1	0.44	19.9	0.27	295	84.4
73.65	68.50	70.00	**17-18-16**	**34**	**47**	51.1	25	19.6	0.58	21.1	0.35	303	86.5
78.65	73.50	75.00	**17-17-19**	**36**	**50**	51.0	26	18.1	0.53	22.2	0.29	295	84.4
			Overall Average Values:			50.5	25	19.3	0.52	20.8	0.33	294	84.0
			Standard Deviation:			1.0	2	1.5	0.07	1.3	0.06	8	2.3
			Overall Maximum Value:			51.5	29	22.4	0.66	24.5	0.43	308	88.0
			Overall Minimum Value:			48.2	21	15.9	0.40	17.8	0.20	271	77.3

Summary of SPT Test Results

Project: CME-55 Truck (SN331845), Test Date: 2/13/2019

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
DFN: Final Displacement
CSX: Compression Stress Maximum
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 DFN in	Average CSX ksi	Average EFV ft-lb	Average ETR %
39.27	33.50	35.00	**6-5-8**	**13**	**17**	42.4	30	15.0	0.96	0.92	24.4	271	77.5
44.27	38.50	40.00	**8-10-9**	**19**	**25**	38.3	30	15.5	0.67	0.63	24.2	269	76.8
49.27	43.50	45.00	**3-6-9**	**15**	**20**	46.2	30	16.0	0.90	0.80	24.4	289	82.5
54.27	48.50	50.00	**5-11-20**	**31**	**41**	46.2	30	16.6	0.52	0.39	24.7	289	82.6
			Overall Average Values:			43.6	30	15.9	0.70	0.62	24.5	281	80.3
			Standard Deviation:			3.3	0	0.6	0.22	0.25	0.3	10	2.8
			Overall Maximum Value:			46.4	31	17.0	1.33	1.20	25.4	295	84.3
			Overall Minimum Value:			38.3	29	14.6	0.43	0.30	23.6	266	75.9

SOIL BORING AND SAMPLING PROCEDURES

INTRODUCTION

The American Society for Testing and Materials (ASTM) publishes standard methods to explore soil, rock and ground water conditions in Practice D-420-98, "*Standard Guide to Site Characterization for Engineering Design and Construction Purposes.*" The boring and sampling plan must consider the geologic or topographic setting. While the scope and extent of the exploration may vary with the objectives of the client, each exploration includes the following key tasks:

- Reconnaissance of the Project Area
- Preparation of Exploration Plan
- Layout and Access to Field Sampling Locations
- Field Sampling and Testing of Earth Materials
- Laboratory Evaluation of Recovered Field Samples
- Evaluation of Subsurface Conditions

The standard methods do not apply to all conditions or to every site. Nor do they replace education and experience, which together make up engineering judgment. Finally, ASTM D 420 does not apply to environmental investigations.

RECONNAISSANCE OF THE PROJECT AREA

Where practical, we review available topographic maps, county soil surveys, reports of nearby investigations and aerial photographs when preparing the boring and sampling plan. Then we walked over the site to note land use, topography, ground cover, and surface drainage. We observed general access to proposed sampling points and noted any existing structures.

PREPARATION OF EXPLORATION PLAN

The exploration plan or drilling assignment sheet consists of a set of written directions to the drillers or to other field exploration staff. The plan tabulates the minimum depth of borings, method of drilling and stabilizing the boring, sampling methods and depths, procedures for backfilling, and procedures to be followed if certain subsurface conditions were encountered.

The location, number and depth of the borings, the method of drilling, and the method and depths of sampling were discussed prior to commencement of the exploration and were outlined in our initial proposal. This scope of work formed the basis of the initial exploration plan attached in the appendices.

Utility Locator Service

State law requires that we notify the Palmetto Utility Protection Service (PUPS) before we drill or excavate at any site. PUPS is operated by the major water, sewer, electrical, telephone, CATV, and natural gas suppliers of South Carolina. PUPS forwards our location request to the participating utilities. Location crews then mark buried lines with colored flags within 72 hours. They do not mark utility lines beyond junction boxes or meters. We check proposed sampling points for conflicts with marked utilities, overhead power lines, tree limbs, or man-made structures during the site walkover.

Utility Checks with Owner

Where the site lies beyond junction boxes or meters these areas will not be checked by the utility location crews dispatched in response to our utility locate request. In these cases we check proposed sampling points for conflicts during the site walkover with a representative of the facility.

Federal, State and Local Regulatory Permitting

S&ME did not attempt to obtain federal or state permits for any part of its work unless specifically described in the accompanying report. S&ME also assumes that in circumstances where we are directed by the client to perform sampling or borings at specific locations - that these locations have been determined by the client to be in compliance with applicable regulatory statues.

Health and Safety Plan

A job-specific health and safety plan is not prepared for geotechnical explorations at sites with no known environmental contamination. Geotechnical explorations are conducted under the S&ME general health and safety plan.

Drilling Assumed to be Permitted at Designated Locations

S&ME assumes permission to perform borings or other exploratory work is conveyed either with notice to proceed by the client. Where S&ME personnel are denied access to proposed boring or sample locations upon or following arrival at the site, they are instructed to demobilize pending resolution of any dispute.

S&ME also assumes that contamination of the soils or ground water of the site has not occurred unless otherwise specifically indicated by the client in advance of our exploration. S&ME will not perform intrusive exploration in any area known to contain hazardous wastes except under a plan specifically prepared in advance. Where suspected hazardous materials are unexpectedly encountered, S&ME suspends all work and evacuates the area immediately until a determination can be made as to the nature of the material encountered.

Use of S&ME Data From Other Projects

Where previous S&ME boring or sounding data pertinent to the project is known to exist and can be readily retrieved, such data is incorporated into our evaluation process. Boring or sounding data, in-situ tests or laboratory data may be incorporated into the cross sections presented in the report. Boring and sounding records and laboratory records may also be included in the appendices or in summary tables embedded in the report.

Where boring or sounding records predate the computerized database record system now in use, records included in the report will be paper hard copies of the records in their original forms. In most cases S&ME will not re-enter the data into the database to produce a new record in the current format.

Use of Other Firms' Boring and Sounding Data

While S&ME may review this data as part of planning of our exploration, such data will not be incorporated into our evaluation unless the data is independently verified by S&ME using parallel borings or other appropriate means, except under some very limited circumstances which will be detailed in the text of the project report.

Other firms' boring or sounding records typically can not be read by the computerized database record system now in use by S&ME. Foreign boring or sounding records included in the report will be paper hard copies of the records in their original forms. In most cases S&ME will not re-enter foreign data into the S&ME database to produce a new record in the current format.

Use of Building Plans and Construction Data

Where S&ME is provided as-built building plans, pile driving records, PDA data or other construction data pertinent to the project, such data is incorporated into our evaluation process. However, S&ME can typically not independently verify the accuracy of as-built data.

S&ME

SOIL BORING AND SAMPLING PROCEDURES (continued)

FIELD LAYOUT AND SAMPLE POINT ELEVATIONS

The type of site plan provided to us determines largely how well the sampling locations can be depicted on the site. We normally locate sampling points using very rough field methods. The report will indicate the type of layout plan we use to locate each sampling point, how we approximate each sampling point elevation, and how we stake the sampling point location in the field.

Layout Plan

There are typically five alternative means available to depict sampling point locations. Which one is used depends on the type of drawing or map provided to us by the client or his designer.

(1) No Plan or Sketch Provided – Where the client provides no plan of the site, we will prepare a sketch using large scale aerial photographs, USGS topographic maps, or plain paper as a base. The sketch is not to scale. The "Boring Location Plan" will depict only very a general location of each sampling point relative to the proposed construction.

(2) Unscaled Sketch – Where the client provides only an unscaled sketch of the site indicating proposed structures, we attempt to reproduce that sketch as the "Boring Location Plan." We will plot the sampling points on the sketch. But we can not warrant that the sketch depicts the true positions of the sampling points relative to one another, to physical features on the site, or to the actual dimensions of the structure.

(3) Scaled Survey Property Plat – Where the client provides a scaled survey property plat that shows property corners and major site features, we attempt to reproduce the plat as the "Boring Location Plan." We will plot sample points at their approximately locations using reconnaissance methods described below. But plotted locations depicted on the plan are not warranted.

(4) Scaled Topographic Site Survey – Where a topographic site survey plan is provided, indicating the general orientation or outline of proposed structures, S&ME attempts to reproduce this drawing with sampling points indicated in their approximate positions subject to the limitations of the method used in staking the locations, using normal care and diligence in plotting the positions. We emphasize that the plotted positions are not exact.

(5) Scaled Building Layout Plan – Where we are provided a building layout plan indicating numbered column lines prior to commencement of field work, we attempt to reproduce the plan with sampling points approximately plotted relative to the column lines.

Sampling Point Elevations

S&ME does not directly measure ground surface elevation at the sample points, unless this is included in the contract, We estimate sample point elevations in several ways, which we describe below. The attached report states the method used.

(1) No Elevation Information Provided – Where a topographic site plan is not available, we do not show elevations. Boring data and strata are stated in terms of depth below ground on all boring records.

(2) Interpolation From Large Scale Topographical Maps – We may get a rough elevation for each boring from a large-scale topographic quadrangle map of the area. We use this method only on very rough sites, with large differences in elevation. We do this only to profile uneven ground. Elevations are "illustration only" and do not accurately show site contours.

(3) Interpolation From Topographic Site Plan – We interpolate the elevation of each boring from the plotted contours on topographic site plans. We use the care and judgment ordinarily exercised in similar work. We consider sample point elevations accurate only to the degree that the contours shown on the plans reflect actual site topography.

(4) Use of Spirit Level – S&ME may use a spirit level to measure ground surface elevations at sampling point locations. S&ME establishes a temporary benchmark on the site as a reference point for the survey. This is done only when specifically stated in our proposal as part of our scope of work for the project,

S&ME uses the degree of care normally exercised for rough layout work, but we do not attempt to tie survey loops back to the origin. Boring elevations must be considered approximate and not exact.

(5) Leveling Survey by Others - Top-of-ground elevations are surveyed by others at sampling point locations. They then provide the elevations to us for us to use to complete our report. We do not independently verify any of the surveyed elevations.

Staking of Sampling Points in the Field

Since S&ME does not provide surveying services, typically we provide only rough staking of sample point locations, unless specifically required in our contracted scope of services. The report will describe the means used to locate sampling points in the field.

(1) Reconnaissance Methods - Locations are stepped off from existing site features, turning rough right angles from existing features marked on the site plan. Locations are marked with small colored flags with the sampling point numbers inscribed.

(2) Rough Measurement - Sampling points are laid out by measuring distances from existing site features with a measuring wheel and by turning rough right angles from existing features. Locations were marked in the field with small colored flags.

(3) Handheld Global Positioning System – Sampling points are laid out using a hand-held Global Positioning System (GPS) device. The GPS measures from a base coordinate on the site provided to us before beginning field work. The device used is considered accurate within 1 meter of the true coordinate.

(4) Surveyed and Marked by Others Prior to Exploration – Sampling points are staked by others. Sampling point numbers shown on the attached "Boring Location Plan" match markings on the survey stakes at each boring location. Offsets from staked locations are indicated on the sampling point records.

(5) Surveyed and Marked by Others Subsequent to Exploration – Sampling point locations are surveyed by others after drilling and sampling was completed. Sampling point numbers shown on the attached "Boring Location Plan" match markings left on the survey stakes or flags at each sampling point location by our crew. Sampling point locations on the "Boring Location Plan" are accurate only to the degree of surveying accuracy used by the surveyor.

S&ME

SOIL BORING AND SAMPLING PROCEDURES (continued)

ACCESS TO SAMPLING LOCATIONS

We perform all borings at marked location stakes unless they are offset because of slopes, ditches, overhead power or other obstructions. Where we must offset from the stake, we indicate the offset distance and relative direction on the field boring record. The final Soil Test Boring Record and the attached "Boring Location Plan" in the Appendix indicates all offsets.

(1) ATV Access Over Sloping Ground - All-terrain-mounted drilling and sampling equipment allows movement to the sampling points over sloping ground. This requires careful alignment and positioning of the rig on the face of the slope during both ascent and descent. The crew moves only over a marked access route to each staked boring location. They attempt to move only on firm ground and they avoid rutting or disturbing the surface as much as possible. We do not attempt to repair any ruts or other disturbance unless required by our contract.

(2) Access Restricted by Stacked Construction Materials S&ME makes no attempt to pick up or move construction materials obstructing access to the borings. In these cases we offset the borings from the stakes to provide safe clearance between the drilling equipment and the material.

(3) Access Restricted by Soft, Marshy Ground - Truck-mounted drilling and sampling equipment can usually only access soft, marshy sites on existing roads or paths - dirt, gravel, pavement. Where they need to move on natural ground, the crew will move only over marked routes to the staked boring locations. They will attempt to move only on firm ground and will limit rutting or disturbance of the ground surface as much as they can. S&ME's field crew also will avoid cutting or taking apart any fences to reach any of the staked borings, except where the landowner specifically grants permission.

(4) Access Restricted by Locked Gates or Fences – Where access to sampling points is prevented by gates or fences, we defer performing these borings until the end of field work. In the meantime we attempt to obtain access through the land owner. S&ME will make no attempt to cut locks or disassemble any fencing to access boring locations.

(5) Access Restricted by Parked Vehicles – Where parked cars or trucks restrict our access to sampling points, we defer performing these borings until the parking locations are empty. At that time we place a traffic cone in the vacated spot until the boring can be performed. Where this can not be done, we offset the boring to the closest feasible location that does not block traffic.

(6) Access Restricted by Overhead Utilities - Access to one or more of the sampling points may be restricted by close clearances to energized utilities. In this case we make no attempt to perform the boring at the staked location. We offset the boring a sufficient distance to provide a minimum clearance or we abandon the boring.

(7) Access Along Highways – Where a sampling point lies close to heavy traffic, we perform lane or shoulder closures using the signage layout shown in state department of transportation work zone safety guidelines. Closures may be either two-lane or four-lane, and may include flagmen or police.

We may need to shift traffic to opposing lanes or establish one-way traffic during the lane closure period. Public notice of all work is made to the media before any operation which requires shifting lanes. Supplemental traffic control, including floggers, barriers and flashing signs are also required.

(8) Use of Temporary Work Barriers Required – We may place traffic cones, stanchions and rope, tape, or wooden barricades when drilling in public areas. This is to prevent people from approaching the rig. We then remove these barriers when the rig is moved. .

(9) Access by ATV, Vegetation Pushed Over - Where the site is lightly to moderately covered with small brush or saplings, flagged sampling points may be accessed by either a truck-mounted or all-terrain tractor mounted drill rig by pushing over underbrush or saplings as required. It is understood in our contract that no attempt will be made to restore the access route to its original condition. To the extent possible, the crew avoids pushing over man-made plantings such as crops, ornamental shrubs or fruit trees.

(10) Heavy Vegetation, Dozer Clearing - A crawler-mounted bulldozer is often needed to get to staked boring locations in heavy woods. The dozer follows flags or other marks that our personnel place along the access route. The operator attempts to clear small brush and saplings to the minimum extent possible to allow passage of the equipment.

We do not attempt to topple or fell large trees or snags, nor do we attempt to strip or grub the surface. Felled vegetation is pushed to the side of the path to allow equipment to pass but is not stacked or burned. Unless specifically stated as part of our contract, no attempt is made to restore the route to its original condition.

FIELD SAMPLING AND TESTING OF EARTH MATERIALS

In general, soil test borings, cone penetration or dilatometer soundings, or other sampling methods were advanced at the marked locations by methods as described more fully below.

All borings or soundings were advanced approximately at their assigned locations and to their assigned depths in the exploration plan, subject to the limitations in staking described above, except as specifically described in the text summary.

Numbering of Borings and Soundings

Soil test borings are usually denoted "B-" on the boring location plan except as specifically described in the report text. CPT soundings are denoted "C-", Marchetti dilatometer soundings "D-", hand auger borings "HA-", and machine excavated test pits or trenches "TP-". Temporary or permanent piezometers are denoted "P-."

Drilling and Direct Push Sounding Procedures

Procedures used to perform soil test borings, hand auger borings, test pits, CPT soundings, or other sampling are summarized on the attached pages. The report text explains necessary exceptions to standard procedures.

Field Records

The chief driller prepares field test boring records or sounding records recording subsurface conditions encountered during field work. Field records contain information about the drilling or push method, samples attempted and sample recovery, presence of coarse gravel, cobbles, etc, and indications of materials encountered between sample intervals. Field records are retained at our office.

Preservation and Handling of Recovered Samples

Handling of recovered samples is in general accordance with one or more of the procedures described by ASTM D 4220, section 4, or ASTM D 5079, section 7.5.1, as described below. Carbon copies of field boring records accompanied the samples. Recovered samples not expended in laboratory tests are commonly retained in our laboratory for 60 days following completion of drilling.

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SOIL BORING AND SAMPLING PROCEDURES (continued)

METHODS FOR AUGERING OR DRILLING

The Soil Test Boring Records enclosed with this report indicate methods used to advance the borings.

Measurement of Topsoil Layers

The thickness of the organic topsoil layers, including humus and underlying stained soils, was measured by taping at shovel cuts made near each boring or sounding.

Surface Coring of Concrete Pavement for Thickness Measurement or Boring Access

Coring of concrete slabs or concrete pavement is performed in general accordance with ASTM C 42, "*Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*." Samples were obtained for measuring approximate thickness only. Moisture conditioning and end surface preparation of recovered cores described in Section 7 of ASTM C 42 was not performed.

Surface Coring of Asphalt Pavement for Thickness Measurement or Boring Access

Asphalt pavement layers are sampled using diamond coring in general accordance with ASTM D 979, "*Standard Practice for Sampling Bituminous Paving Mixtures.*" Coring is performed to allow penetration of the pavement layers by soil drilling equipment, so random sampling and averaging of data points, described in paragraph 5.2.6 of the Practice, is not performed.

Auger Borings

Auger borings are advanced mechanically by a drill rig using a flight auger or hollow stem auger in general accordance with ASTM D 1452, "*Standard Practice for Soil Investigation and Sampling by Auger Borings*". The soils encountered are identified by examining the cuttings brought to the surface. Soil consistency is qualitatively estimated by the relative difficulty of advancing the augers.

Soil Test Boring with Flight Auger

Borings were made by mechanically twisting a continuous steel flight auger into the soil. The auger consists of a flighted solid drive tube having hex couplings at each end. The drive head consists of either a steel clay split or spade bit, or a carbide finger bit with tungsten carbide teeth.

Continuous flight augering is limited to stiff cohesive soils that are able to stand unsupported for the full length of the boring. Use of split barrel samplers requires withdrawal of the drill string from the boring and insertion of a separate sampling string. Grab samples can also be recovered by "dead stick withdrawal" in which the loaded augers are withdrawn from the boring without rotation.

Soil Test Boring with Hollow-Stem Auger

The hollow stem auger consists of a hollow cutting head for cutting soil, mounted on the terminal section of the lead auger. Following auger sections consist of hollow tube with continuous helical flights on the outside to lift cuttings to the surface. Inside diameter of the hollow stem ranges from 2-1/4 inches to 6-5/8 inches and outside diameters of the auger flights range from 5 to 18 inches.

Use of hollow stem augers to obtain soil samples for engineering purposes is described by ASTM D 6151-97(2000), "*Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling*." Hollow stem augering allows drilling and casing the boring simultaneously. Sampling or penetration testing is conducted through the hollow auger column below the lead auger assembly.

Heaving, blow-in or sanding-in, sand lock or wedging of cuttings into the lead auger assembly may occur in cohesionless soils. Water or drilling fluid added to the auger column to provide hydrostatic balance and limit entry of sands, or use of special pilot bit assemblies, are noted on the field boring logs.

Soil Test Boring with Rotary Wash

A rotary drill rig has three functions: rotating the drill string, hoisting the drill string, and circulating the drilling fluid. A bit is rotated against the formation while mud is pumped down the drill pipe, through ports in the bit, and back to the ground surface through the well bore hole. Rotary drilling is sometimes called mud rotary drilling.

The drilling apparatus consists of a rotating kelly with hollow drill rod and either a rotary roller bit or drag type bit with either a side discharge or bottom discharge orifice for the drilling fluid. Drill pipes or rods are joined to a bit to form the drill string. A separate sampling string consists of either split spoon samplers or Shelby tube samplers mounted on NX drill rod. Hole diameter is typically restricted to the minimum necessary for passage of the sampling device.

A heavy drilling fluid is circulated in the boreholes to stabilize the sides and flush the cuttings. Drilling fluid may consist of either water without additives or water with heavy bentonite slurry added to raise the specific gravity of the circulating fluid. Synthetic polymer drilling fluids such as Revert also may be used. The type of drilling fluid used and the portion(s) of each boring mudded are indicated on the boring records.

A short length of drill casing is installed to stabilize the upper few feet of the boring near the ground surface. A mud pump of suitable capacity is used to push the drilling fluid through drill rod and up to the surface. Drilling fluid is recirculated through a mud tub with baffles to allow separation of the drilling cuttings from the fluid. The mud tub also serves as an initial reservoir for mixing of the drilling fluid.

Field boring records indicate size and type of drilling bit, type of drilling fluid used, and note any loss or increase in the volume of the circulating fluid during drilling. At selected intervals, circulation of the mud is turned off, the drill string withdrawn from the hole, and the sampling string inserted into the open boring to obtain samples and perform penetration testing.

Hand Auger Borings

Borings are advanced by hand augering and the soils encountered identified by cuttings brought to the surface. Representative samples of the cuttings are placed in glass jars and transported to the laboratory. Soil consistency is estimated by the relative difficulty of advancing the augers.

Backhoe Test Pits

Test pits excavated with a backhoe or excavator provide a view of a relatively large section of the strata. During excavation, the bottom of the pit is kept relatively horizontal so that each lift represents a uniform horizon. Excavated material brought up is placed in separate stacks or piles adjacent to the pit to allow segregation of the material by depth. The excavated bucket is used to clean or chip a vertical band along the side of the pit to allow inspection and identification of the soil or rock layers.

A field engineer is present to examine the soil strata exposed in each pit, estimate the relative ease of excavation, the amount of subsurface water entering the pits, and the maximum depth the pits could be excavated. However, field staff do not enter the pit to inspect the sides after the pits were extended further than five feet below the surface.

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SOIL BORING AND SAMPLING PROCEDURES (continued)

SPLIT BARREL SAMPLER WITH STANDARD PENETRATION TEST

Soil sampling and penetration testing in the soil test borings were performed in general accordance with ASTM D1586, *"Standard Test Method for Penetration Test and Split Barrel Sampling of Soils."* At regular intervals, soil samples were obtained with a standard 1.4 inch I. D., two-inch O. D., split barrel sampler.

Standard Sample Intervals

Standard sample intervals used by S&ME are as follows unless otherwise described in the report text:

Sample No.	Depth Interval (ft)	
SS-1	1-2.5	
SS-2	3.5-5	subsequent samples
SS-3	6-7.5	are taken at five foot
SS-4	8.5-10	intervals
SS-5	13.5-15	
SS-6	18.5-20	.

SPT Hammer Arrangement

S&ME uses a conventional rope and cathead arrangement with a Saf-T hammer on most of its rigs. In this arrangement the 140-lb hammer telescopes over the sampling rods and is lifted by means of hemp rope wrapped around the rotating cathead. The hammer is rhythmically lifted and dropped through a 30-inch travel along the guide by the operator.

The cathead rope is is looped around the rotating drum or cathead with the rope coming off the bottom of the cathead, making 2-1/4 total turns around the drum. The cathead rotates at 100 rpm unless noted otherwise on the field boring log. Borings performed using a donut hammer are specifically described as such in the report text.

Use of SPT Autohammer

Sampling is performed using a trip, automatic or semi-automatic hammer drop system which lifts the 140-lb hammer and allows it to drop the required 30-in distance unimpeded. This method is allowed in Section 7.4 of ASTM D 1586.

Standard penetration test N-values obtained using one of the available autohammer systems often vary widely from those obtained using conventional rope and cathead arrangements. While corrections to the resulting N-value have been developed for certain specific applications, N-values presented on S&ME graphical boring records represent field blow counts which are not modified to account for hammer energy variations.

Split Barrel Sampler

The sampler is constructed to the dimensions indicated in Fig. 2 of ASTM D 1586. The driving shoe is of hardened steel with a 35mm inside diameter. The shoe is inspected for damage at the beginning of each production day. The split barrel sample has a minimum diameter of 38 mm. ASTM D 1586 allows use of a 16-gage thick liner within the sampler, but no liner is used unless otherwise noted on the boring log. ,

Use of Retainers or Sample Catchers

Saturated, clean cohesionless sands may tend to flow out when the sampler is withdrawn from the boring. Steel or plastic sample retainers may be required to keep samples of clean granular soils in the sampler barrel. Retainers or baskets are inserted between the shoe and the sampler barrel to help retain loose or flowing materials. The retainers permit the soil to enter the sampler during driving but upon withdrawal they close and thereby retain the sample. Use of sample baskets or retainers is noted in the boring records.

Description of Soil Consistency

The sampler is first seated six inches to penetrate loose cuttings, then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler through the two final six inch increments is recorded as the penetration resistance (SPT N) value. The N-value, when properly interpreted by qualified professional staff, is an index of the soil strength and foundation support capability.

Boring records will indicate partial increments in which sampling was terminated due to excessive driving (>50 blows/6 inch) or the length in which the sampler is advanced beyond the increment by a single blow. The records will note whether the static weight of the drill rods (WOR) or the static weight of the drill rods plus the hammer (W-O-H) was required to advance the sampler beyond the sample interval.

Sample descriptions in the soil test boring logs contain a descriptor of the relative density or consistency of each soil penetrated in the boring. Soil consistency is described using SPT N-values, using the terminology in the table.

SANDS		SILTS AND CLAYS	
Penetration Resistance (bpf)	Relative Density	Penetration Resistance (bpf)	Consistency
0-4	Very Loose	0- 2	Very Soft
5-9	Loose	3 - 4	Soft
10 - 29	Medium Dense	5 - 8	Firm
		9 - 16	Stiff
30 - 50	Dense	16 - 30	Very Stiff
>50	Very Dense	31 – 50	Hard
		>50	Very Hard

Interpreted Soil Consistency Using SPT Blow Count

Correction to SPT Blow Count

Corrections to the Standard Penetration test N-value in sands have been developed to account for variations in confining stress, hole diameter, rod length and other factors. These corrections are frequently made in interpreting the N-values obtained in certain geologic environments. Under certain circumstances the corrected N-values may allow a more realistic appraisal of the relative density of sandy soils penetrated by the borings. But N-values presented on S&ME graphical boring records represent field blow counts and not modified blow counts.

Dynamic Cone Penetrometer

The dynamic cone penetrometer is a handheld penetrometer used to qualitatively estimate soil relative density or consistency in hand auger borings or test pits. At selected intervals, the penetrometer is inserted into the open boring. The conical point of the penetrometer is first seated 1-3/4 inches to penetrate any loose cuttings in the boring, then driven two additional 1-3/4 inch increments by a 15 pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration is recorded. When properly evaluated by qualified professional staff, the blow count is an index to the soil strength and ability to support foundations.

S&ME

SOIL BORING AND SAMPLING PROCEDURES (continued)

RECOVERY OF BULK AND UNDISTURBED SAMPLES

Bulk samples provide a sufficient quantity of material to allow laboratory evaluation of compaction or bearing ratio tests of laboratory-fabricated samples.

Split spoon or split barrel sampling provide samples suitable for visual examination and classification tests but not sufficiently intact for quantitative laboratory testing. To provide samples for quantitative tests, relatively undisturbed samples are obtained by use of either driven or pushed Shelby tubes or other techniques further described below.

Block samples often allow strength or compressibility tests of cohesive materials where it is desired to evaluate shear strength along predetermined failure planes or if other techniques are not feasible or do not provide sufficiently intact samples.

Bulk Samples

At selected locations and depths, representative bulk samples of the soils are obtained by randomly taking shovel loads from the cuttings or spoil brought to the surface by the hoe or by the auger scrolls used to advance soil test borings. Typically a minimum sample of 30 to 50 lbs is obtained. The bulk sample is placed in a cloth or plastic sack marked with appropriate descriptive information.

Recovered materials are typically treated as Group A samples as defined by ASTM D 4220, Section 4, except that in most cases a small quantity of soil may be placed in a sealed jar to allow a moisture content determination. Samples are protected from freezing at all times.

Stockpile Sampling

At selected locations and depths, representative bulk samples of stockpiled materials soils are obtained by randomly taking shovel loads from the surface of the pile. Typically a minimum sample of 50 lbs to 100 lbs is obtained, but a quantity sufficient to meet the requirements of section 7.2 of ASTM D 2487 is obtained if the Unified classification will be determined for the material.

The bulk sample was prepared by initially obtaining approximately three times the required quantity of material, then quartering the sample to the minimum size. The resulting sample is placed in a cloth or plastic sack marked with appropriate descriptive information.

Block Samples

Representative sections of cohesive soils are hand trimmed from large blocks of the excavated material recovered from test pits or excavations. The trimmed blocks are approximately 6 in. x 6 in. x 8 in. in length. Field trimmed block samples are treated as Group C samples as defined in ASTM 4220, section 4. Each block sample after field trimming is sealed in plastic wrap and encased by sand or other inert filler material in a suitable box or container. Samples are then immediately transported to our laboratory for further study. Unwrapped block samples are further trimmed to size suitable for shear strength or consolidation testing in the laboratory.

Shelby Tube Sampling

Undisturbed samples are obtained either in conjunction with conventional split spoon sampling and penetration tests, or in separate parallel borings advanced specifically for the purpose of obtaining samples in targeted horizons or seams. Where hollow-stem augers are used to advance the borings, open boring diameter is limited to 11.5 inches for a 3-inch diameter Shelby tube.

Undisturbed samples are obtained by pushing sections of three-inch O. D., 16 gauge, steel tubing (Shelby tube) into the soil at the desired sampling intervals. The procedures used generally follow those described in ASTM D 1587*, "Standard Practice for Thin-Walled Tube Geotechnical Sampling of Soils*." Tube lengths are standard 30-inches unless otherwise indicated. After advancing the tube, a short set period is allowed for pore pressure dissipation, then the tube slowly spun in place to shear and break off the end of the sample. The Shelby tube, together with the encased soil, is then carefully removed from the ground.

After withdrawal, the length of the recovered soil is measured and the sample preserved in accordance with the sampling plan. Recovered Shelby tube samples are typically treated as either Group B or Group C samples as defined by ASTM D 4220, Section 4, depending on the level of care to be exercised during transport. Locations and depths of undisturbed samples are recorded on each field test boring record.

UD Shelby Tube Insertion by Pushing - After cleaning out the boring, Shelby tubes are typically advanced 24 inches by pushing the tube relatively rapidly without rotating the sampling string as described in Section 7.3 of ASTM D 1587. Other push lengths, if deemed to be appropriate depending on soil conditions, are indicated on the boring records.

UD Shelby Tube Insertion by Driving - When the formation is too hard for push insertion, Shelby tubes are advanced by driving as described in Section 7.5 of ASTM D 1587. The weight and fall of the drive hammer used, the length of advance, and the penetration required are indicated on the boring records. Where drive methods of used, the sample is termed a "driven sample."

Piston Sampler

The piston sampler is a thin-wall tube with a piston, rod and a modified sampler head used for sampling soft soils where the sample recovery is difficult. The sampler is lowered to the bottom of the cleaned boring with the piston fully extended to the bottom of the tube. The piston is held fixed against the bottom of the hole and the thin walled tube is slowly advanced by hydraulic pressure or jacking.

The sampler is then carefully removed from the boring and the vacuum between the piston and the sample helps retain the sample in position. Recovered piston samples are typically treated as Group C samples as defined by ASTM D 4220, Section 4. Piston samplers are never driven. Locations and depths of undisturbed piston samples attempted are recorded on each field test boring record.

Double Tube, Pitcher Type Sampling

Samples of highly compacted, hard, stiff uncemented or slightly cemented materials are obtained using a double tube soil core barrel with liner. The double-tube core barrel is advanced by rotating the outer barrel, which cuts a circular groove and loosens the soil material to be displaced by the two barrels. Drilling fluid was forced downward through the drill stem. The inner barrel, which does not rotate, moves downward over the relatively undisturbed core of soil formed by rotation of the outer barrel. A liner is inserted into the inner barrel before the sampler was assembled.

After drilling the required length, the sampler is withdrawn and the liner removed, made airtight, and transported to the laboratory. Recovered samples are typically treated as Group B samples as defined by ASTM D 4220, Section 4. Locations and depths of undisturbed samples were recorded on each field test boring record.

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MEASUREMENT OF STATIC WATER LEVELS

Water level readings are made in the open boreholes immediately after completing drilling and withdrawal of the tools. Where feasible, measurements are repeated after an elapsed period of 24 hours to gauge the stabilized water level. Procedures for measurement of liquid levels in open boreholes are described in ASTM D 4750, "*Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well).*"

We note that ground water levels are influenced by precipitation, long term climatic variations, and nearby construction. Ground water measurements made a different times than our exploration may indicate ground water levels substantially different than indicated on the boring records in the Appendix.

Weighted Tape Method

A weighted measuring tape is slowly lowered into each borehole until the liquid surface is penetrated by the weighted end. The reading on the tape is recorded at a reference point on the surface and compared to the reading at the demarcation of the wetted and unwetted portions of the tape. The difference between the two readings is recorded as the depth of the liquid surface below the reference point. Measurements made by this method are then repeated until approximately consistent values are obtained.

Calibrated Electric Cable Method

A calibrated cable with electrical wire encased, equipped with a weighted sensing tip at one end and an electric meter at the other, is slowly lowered into each borehole until the liquid surface is penetrated by the weighted end. Contact with the water closes an electric circuit and is recorded by the meter. The depth reading on the cable is then recorded relative to a reference point on the surface. Measurements made by this method are then repeated until approximately consistent values are obtained.

Time of Boring Reading

The level of free water standing in the boring is noted immediately following completion of each boring, except where the boring is performed using rotary mud drilling and the presence of the drilling mud in the open boring precludes determining a free water level. Where the water table is believed to be shallow we may attempt to drill a shallow parallel open boring immediately adjacent to allow us to measure the free water level.

24-Hour Reading

Ground water in low permeability soils may require many hours to seep into the open borings. Where feasible, measurements are repeated after an elapsed period of at least 24 hours to gauge the stabilized water level. Notes on the boring records will indicate the actual elapsed time between completion of drilling and final recording of ground-water level. Both time of boring and 24-hour readings are indicated on the boring records where these readings are available.

Caving/Collapse of Boring

Collapse of the boring or caving of the sides and filling of the bottom of the boring may occur during the period subsequent to completion of the boring. While it is common for caving or callapse to occur within two or three feet of the static water level, accumulation of water on top of the collapsed material could result where infiltration from the surface occurs. In this case a misleading level could result. When obtaining water levels in a boring we attempt to measure the full depth of the boring to provide an indication as to whether caving or collapse may have occurred and a notation made on the boring record.

Loss/Gain of Drilling Fluid

Boring Records will indicate depths at which changes in volume of drilling fluid returning to the surface are noted. This implies that some fluid pumped down the drill pipe is entering the soil, or that fluid is entering the boring under pressure from the soil. Flow can occur through open-graded sand or gravel or open joints in rock, or could indicate open voids in the soil. Fluid loss can also occur when cuttings are not washed out and the borehole annulus becomes restricted, resulting in increased down-hole pressure.

Installation of Temporary PVC Casing (Observation Well)

Water level readings taken during boring operations do not provide information on long term fluctuations of the water table. In several of the borings, a temporary observation well was constructed by inserting PVC casing to the indicated depth. A slotted PVC well screen is attached to the bottom of the PVC pipe to allow subsurface water to enter the well. Soil is mounded around the observation wells at the ground surface to prevent surface runoff from entering the boreholes.

CPT Methods

CPT penetration pore pressures include the *in-situ equilibrium pore pressure*, controlled by the local ground water regime, and the *excess pore pressure*, generated by insertion of the probe. In clays and silts, penetration is essentially undrained and recorded pore pressures significantly exceed in-situ equilibrium pore pressures.

In sands and gravels, penetration is essentially drained and recorded pore pressures are essentially equal to the in-situ equilibrium pore pressure. The piezometric surface, defined as the point of zero equilibrium pore pressure, was obtained by plotting in-situ equilibrium pore pressure vs. depth using only pore pressure data from sand or gravel soils. Where possible, derived piezometric surface was verified by tape measurement through the sounding opening after removal of the CPT rod and before collapse of the soils.

Free Water Surface vs. Piezometric Surface

The ground-water characteristics of a soil profile consisting of alternating beds of pervious and relatively impervious soils is difficult to define by a single set of borings or wells. Borings or wells extending through relatively impervious soils into an aquifer may indicate a piezometric surface which can exist well above the top of the saturated, fully confined aquifer. In this case the measured water level in the boring or well indicates the piezometric surface – an imaginary surface that everywhere coincides with the static water level in an aquifer – not necessarily the free water surface in the surrounding soils.

Borings or wells may also reflect the presence of unconfined ground water separated from an underlying body of ground water by an unsaturated zone. A perched water table may exist over a limited area at an elevation above the normal free water elevation by an intervening impervious zone. Perched water from shallow depth entering the boring from the surface may accumulate at depth. Water entering the boring from multiple aquifers may provide a reading at some level independent of the static water level in any one layer.

SOIL BORING AND SAMPLING PROCEDURES (continued)

TERMINATION OF DRILLING AND SAMPLING

The boring records indicate the circumstances under which drilling or excavation was terminated. Borings or test pits advanced to their assigned depths and intentionally terminated are indicated as such on the boring or test pit records. Boreholes or test pits may also be prematurely terminated due to encountering dense strata or other obstructions which prevent further advance.

Refusal to Augers

The term "refusal" in the context of this report refers to the inability of the drill rig employed on the project to further advance the boring with the type of soil auger and bit in use. Practical refusal of the tools may take the form of binding or seizing of the bit, "walking off" of the drill string, or liftoff of the rig itself when the operator attempts to crowd the kelly. The term refusal is not used to describe zero penetration of the split spoon sampler in 50 blows.

In natural soils, refusal to the soil drilling methods used at a particular site may result from encountering hard cemented soil, soft weathered rock, coarse gravel, cobbles or boulders, thin rock seams, or the upper surface of sound continuous rock. In fill zones, refusal may also occur from encountering buried debris or objects within the fill mass.

The composition and density of materials below the refusal level of the borings can not be reliably estimated based on the boring data. Core drilling would be required to determine the character and continuity, strength, compressibility and bearing capacity of materials below refusal of the soil auger in natural soils. Exploration of debris laden fill would require use of machine excavated test pits at refusal locations.

Additional Probe Borings Performed at Refusal Locations

Where refusal is encountered at shallow depth (typically less than 15 feet) in a site with deep cuts anticipated, one or more additional auger borings may be performed at locations offset 10 to 20 feet from the original location. The purpose of these offset borings would be to attempt to gauge whether initial refusal occurred on a boulder or lens.

Where offset borings are performed, the strategy used to further define the profile of the obstruction(s) is discussed in the report text. Offset borings are designated with the original boring number with the suffix "A" , "B", or "C" added as appropriate.

Refusal to Augers in Fill Soils

Where fills are present, refusal to drilling may result from encountering buried debris, building materials, or objects. Where the operator judges the material to consist predominantly of rockfill or other debris, borings may also be discontinued to avoid twisting-off of the drill string. In each case, backhoe test pits would be required to expose and identify buried materials below refusal levels in filled areas.

Test Pit Refusal to Machine Excavation

Refusal to the excavator used at the test pits may have resulted from encountering hard cemented soil, soft weathered rock, coarse gravel, cobbles or boulders, thin rock seams, or the upper surface of sound continuous rock. Since a test pit represents a confined excavation, refusal to digging will vary depending on the size of the bucket. Core drilling is required to determine the character and continuity of materials below refusal of the excavator.

METHODS FOR CLOSING AND PROTECTION OF BOREHOLES

Depending on the level of protection required at the surface, different procedures for abandoning the borings may be used. State regulations may also mandate certain procedures under some circumstances. The report text will indicate which procedure was used to abandon the soil borings.

Boreholes Closed Immediately with Auger Cuttings

Boreholes in areas subject to foot traffic or farm animals are closed immediately after drilling. Boreholes are filled by slowly pouring auger cuttings into the open hole such that minimal "bridging" of the material occurs in the hole. Backfill in the upper two feet of each hole is tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceeds five feet in depth, a plastic hole plug is firmly tamped into place within the backfill at a depth of about two feet.

Boreholes Barricaded and Subsequently Filled with Cuttings

Boreholes in areas subject to foot traffic or farm animals are barricaded immediately after drilling using inverted traffic cones. After completing 24-hour water measurements, boreholes are filled by slowly pouring auger cuttings into the open hole such that minimal "bridging" of the material occurs in the hole. Backfill in the upper two feet of each hole is tamped as heavily as possible with a shovel handle or other hand held equipment, and the backfill crowned to direct rainfall away on the surface. Where boreholes exceed five feet in depth, a plastic hole plug is firmly tamped into place within the backfill at a depth of about two feet.

Borehole Closure with Grout

Boreholes are barricaded immediately after drilling using inverted traffic cones. After completing 24-hour water measurements, boreholes are filled using forced injection or tremie methods by a cement-bentonite or a neat cement grout up to the ground surface.

Closure of Test Pits and Trenches

After completion of excavation, test pits are backfilled with the spoil material; however, since the pits are narrow, deep excavations, very limited compactive effort can be applied to the backfill. Backfill is bucket-tamped during placement and surface rolled. The backfill is heaped up slightly above the level of the ground surface to reduce the possibility of future formation of a depression in the ground surface after the spoil has consolidated.

Patching of Asphalt Surfaces

Where specified in our scope fo work, penetrations of asphalt surfaces made during the drilling process are patched using compacted asphalt cold patch material. Cold patch asphalt is placed to provide a surface flush with existing pavement adjacent to the boring. Cold patch asphalt is compacted by tamping it into the boring with a shovel handle or similar hand held equipment.

Patching of Concrete Surfaces

Where specified in our scope of work, penetrations or cores through concrete surfaces in areas subject to foot traffic are patched using a high strength, quick setting concrete grout. Grout is placed to provide a surface flush with existing pavement adjacent to the boring. The borehole location is barricaded to prevent traffic in the area of the patch for a minimum of 4 hours.

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PRESERVATION AND HANDLING OF SOIL SAMPLES

PRESERVATION AND HANDLING OF SOIL SAMPLES

Procedures for preserving soil samples obtained in the field and transportation of samples to the laboratory generally follow those given in ASTM D 4220, "*Standard Practice for Preserving and Transporting Soil Samples*" for one of four groups of samples described in section 4. Sample groups are designated A through D, each group representing progressively greater effort to control the integrity and moisture content of the sample.

Soil Samples without Moisture Control – ASTM Group A

Group A samples are those samples not suspected of being contaminated and for which only a general visual description will be performed. These samples include bulk or stockpile samples transported in open containers, or jar or bag samples that are not sealed.

No attempt is made to maintain samples at the field moisture content value. Representative samples of the cuttings or split spoon samples, or representative bulk samples, are placed in suitably identified, non-sealed containers and transported to the laboratory. Sample identification numbers on the containers correspond to sample numbers recorded on field boring records or test pit records.

Soil Samples with Control of Field Moisture – ASTM Group B

Group B samples are those samples not suspected of being contaminated and for which only water content and classification, Proctor, relative density, or profile logging will be performed. Group B samples also include portions of bulk samples intended to be remolded in the laboratory for compaction, swell pressure, percent swell, consolidation, permeability, CBR, or shear testing, which are segregated from the sample to preserve natural water content.

Representative samples of the cuttings or split spoon samples, or representative bulk samples, are placed in suitably identified, sealed glass jars or plastic containers and transported to the laboratory. Sample identification numbers on the containers correspond to sample numbers recorded on field boring records or test pit records. Thin-walled tube samples are sealed at the ends with paraffin and capped with plastic end caps.

Intact Soil Samples – ASTM Group C

Group C samples are intact, naturally formed or field fabricated, samples for density determination, swell pressure, percent swell, permeability testing or shear testing with or without stress-strain plots or volume change measurement, including dynamic and cyclic testing. These samples must be obtained and handled in ways that will preserve the natural soil fabric and stratification with little disturbance.

Representative thin walled tube samples must be protected against vibration or shock, or extreme heat or cold, during transport to the laboratory. Sample identification numbers on the containers correspond to sample numbers recorded on field boring records or test pit records.

Thin-walled tube samples are sealed at the ends with paraffin and capped with plastic end caps. Samples are transported in the upright position in containers providing complete encasement in cushioning or insulation for individual samples.

Sensitive Soil Samples – ASTM Group D

Group D samples are intact, naturally formed or field fabricated, samples of high sensitivity or fragility which will be subjected to density determination, swell pressure, percent swell, permeability testing or shear testing with or without stress-strain plots or volume change measurement, including dynamic and cyclic testing.

Representative thin-walled tube samples are protected against vibration or shock, or extreme heat or cold, during transport to the laboratory in specially loaded metal or wood reusable containers. Sample identification numbers on the containers correspond to sample numbers recorded on field boring records or test pit records.

Thin-walled tube samples are sealed at the ends with paraffin and capped with plastic end caps. Samples are transported in the same position as the sampling orientation in sufficient packing material to provide complete encasement and cushioning or insulation for individual samples. Transport of the samples is supervised by a qualified person at all times.

SAMPLE IDENTIFICATION NUMBER

All samples are assigned a laboratory identification number upon arrival. In most cases the laboratory identification number corresponds to the boring and sample numbers assigned in the field and shown on field boring records. A list is prepared which matches the laboratory tests to the field or laboratory identification numbers. When requesting laboratory testing, both the field identification number and the laboratory identification number (if different) are used on the request form.

SAMPLE STORAGE

All soil samples that are Group B or higher are transported and stored to maintain moisture content as close as possible to natural conditions. Samples are not placed in direct sunlight. Undisturbed soil samples are stored in an upright position with the top side of the sample up.

As storage time increases, moisture will migrate within a tube or condense within a sample jar. Potential for disturbance and moisture migration increases with time. Excessive storage time can lead to sample disturbance that will affect strength and compressibility properties. Additionally, stress relaxation, temperature changes over time also affect sample performance. All samples are discarded after 60 days or are returned to the client. Where tests are carried out on samples more than 30 days old, a notation is made on the test report.

Long term storage may result in excessive adhesion of the soil to the Shelby tube. Resistance to extrusion may cause internal failures to occur in some soils during extrusion. Often these failures cannot be seen by the naked eye. If these samples are tested as "undisturbed" specimens, the results may be misleading. Where "old" Shelby tube samples are proposed for strength tests, S&ME may recommend x-ray radiography (ASTM D 4452) or oedometer tests assess the sample condition prior to using the strength test data.

Extrusion and Trimming of Groups B or C Samples

Undisturbed samples are stored in the vertical position in the laboratory. Samples are extruded from the thin-walled sampler, using a specially constructed extruder, in the same direction of travel as the sample entered the tube during sampling. In certain cases it may be necessary to cut the tube into short sections to facilitate removal of the soil without compressing or disturbing the sample.

Specimens are trimmed using a wire saw or steel straightedge. Where removal of pebbles or crumbling resulting from trimming causes voids on the surface of the specimens selected for quantitative laboratory testing, they are filled with remolded soil obtained from the trimmed portion of the sample.

S&ME

APPENDIX III

LABORATORY TESTING

Summary of Laboratory Results (2 pages)
Atterberg Limits Results (2 pages)
Index Properties Versus Depth (10 pages)
Hydrometer Test Reports (2)
Split Spoons: NMC%, Wash #200, Atterberg Limits Test Reports (37 pgs)
Bulk Samples: Standard Proctor, Direct Shear, Grain Size, &
Atterberg Limits Test Reports (4 pages)
UD Samples: Consolidation, Grain Size, Atterberg Limits &
CU Triaxial Test Reports (26 pages)
Corrosion Series Test Results
Laboratory Test Procedures

SUMMARY OF LABORATORY RESULTS

PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index		%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
BR-1	1.0	35	24	11		39	SC	19.1			
BR-1	5.0					14	SM	14.0			
BR-1	9.0	44	32	12		44	SM	30.4			
BR-1	19.0	34	24	10		48	SM	35.3			
BR-1	24.0	35	26	9		30	SM	39.2			
BR-2	3.0				Bulk-1A (1'-7')		SM	16.3			
BR-2	6.0	29	24	5		38	SM	15.8			
BR-2	9.0	33	22	11	Bulk (1'-15')	47	SC	(Blended)			
BR-2	11.0				Bulk-1B (7'-15')		SM	19.0			
BR-2	14.0	30	24	6		43	SM	18.5			
BR-2	19.0					7	SP-SM	27.8			
BR-2	23.5					9	SP-SM	22.3			
BR-2	25.0					15	SM	15.9			
BR-2	29.5	29	24	5		34	SM	30.1			
BR-3	1.0	35	21	14		54	CL	20.1			
BR-3	5.0	31	20	11		56	CL	25.5			
BR-3	7.0	36	22	14	UD-2 (6'-8')	79	CL	38.6			
BR-3	9.0	33	20	13		79	CL	39.6			
BR-3	9.5	31	20	11	UD-3 (8'-10')	76	CL	31.0			
BR-3	14.0					10	SP-SM	23.8			
BR-3	24.0	36	27	9		34	SM	26.3			
RW-1	1.0	35	22	13		56	CL	25.1			
RW-1	5.0	41	31	10		51	ML	29.0			
RW-1	7.0					24	SM	20.1			
RW-1	9.0	29	21	8		55	CL	30.7			
RW-1	14.0					11	SP-SM	30.2			
RW-1	20.0					18	SM	18.6			
RW-2	3.0	33	26	7		38	SM	19.3			
RW-2	7.0	33	26	7		30	SM	19.7			
RW-2	9.0	47	30	17	UD-1 (8'-10')	60	ML	29.6			
RW-2	14.0					10	SP-SM	44.3			
RW-2	19.0	52	43	9		25	SM	52.2			
RW-2	29.0					22	SM	32.5			

SUMMARY OF LABORATORY RESULTS

PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

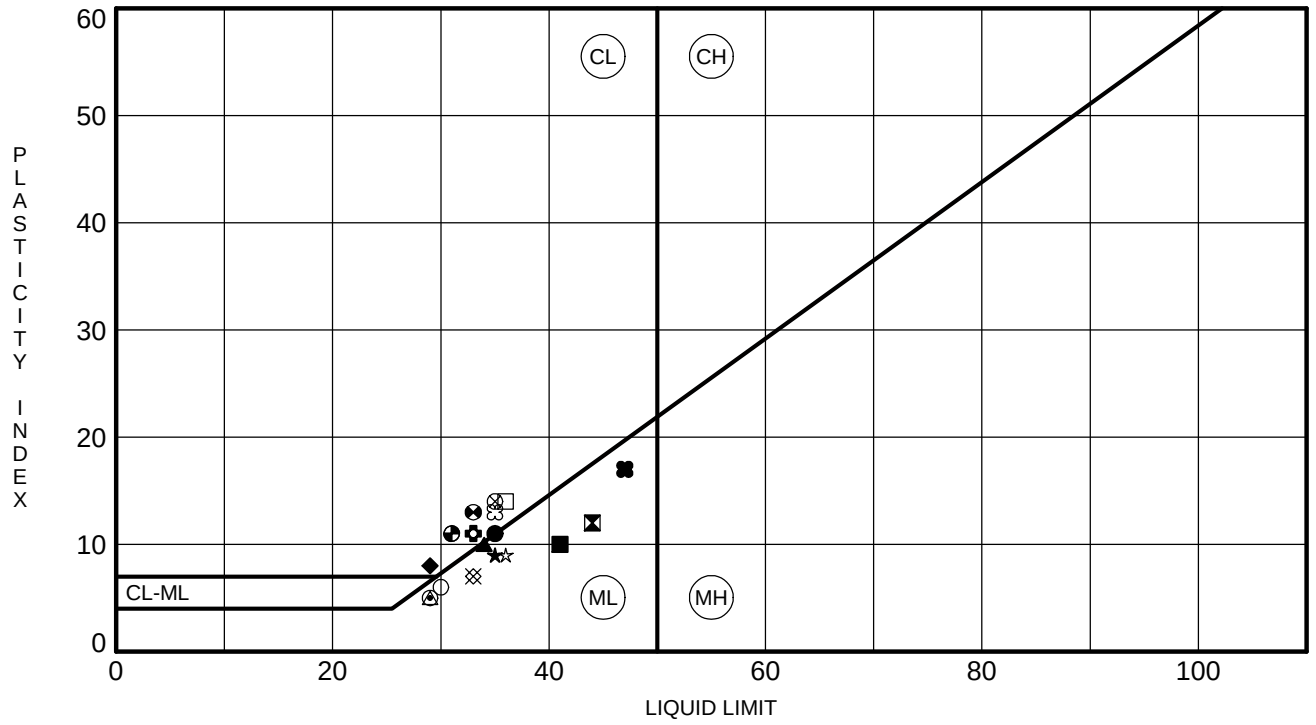
Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index		%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Satur-ation (%)	Void Ratio
R-1	1.0	45	23	22		51	CL	19.1			
R-1	3.0	54	45	9		51	MH	41.4			
R-1	7.0	43	35	8		52	ML	49.4			
R-1	14.0					22	SM	15.9			
R-2	1.0	43	31	12		47	SM	30.3			
R-2	5.0	37	22	15		59	CL	27.2			
R-2	7.0	38	24	14		71	CL	34.6			
R-2	9.0	25	18	7		36	SC-SM	27.7			
R-3	3.0	35	21	14		49	SC	18.9			
R-3	7.0	43	32	11		50	ML	23.0			
R-3	14.0					22	SM	23.7			
R-4	1.0	19	15	4		34	SC-SM	12.1			
R-4	5.0	39	31	8		43	SM	26.5			
R-4	7.0	37	30	7		32	SM	22.5			
R-5	2.0	33	25	8		41	SM	16.1			
R-5	6.0	40	27	13		46	SM	19.6			
R-5	8.0					23	SM	7.7			

ATTERBERG LIMITS' RESULTS

PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville



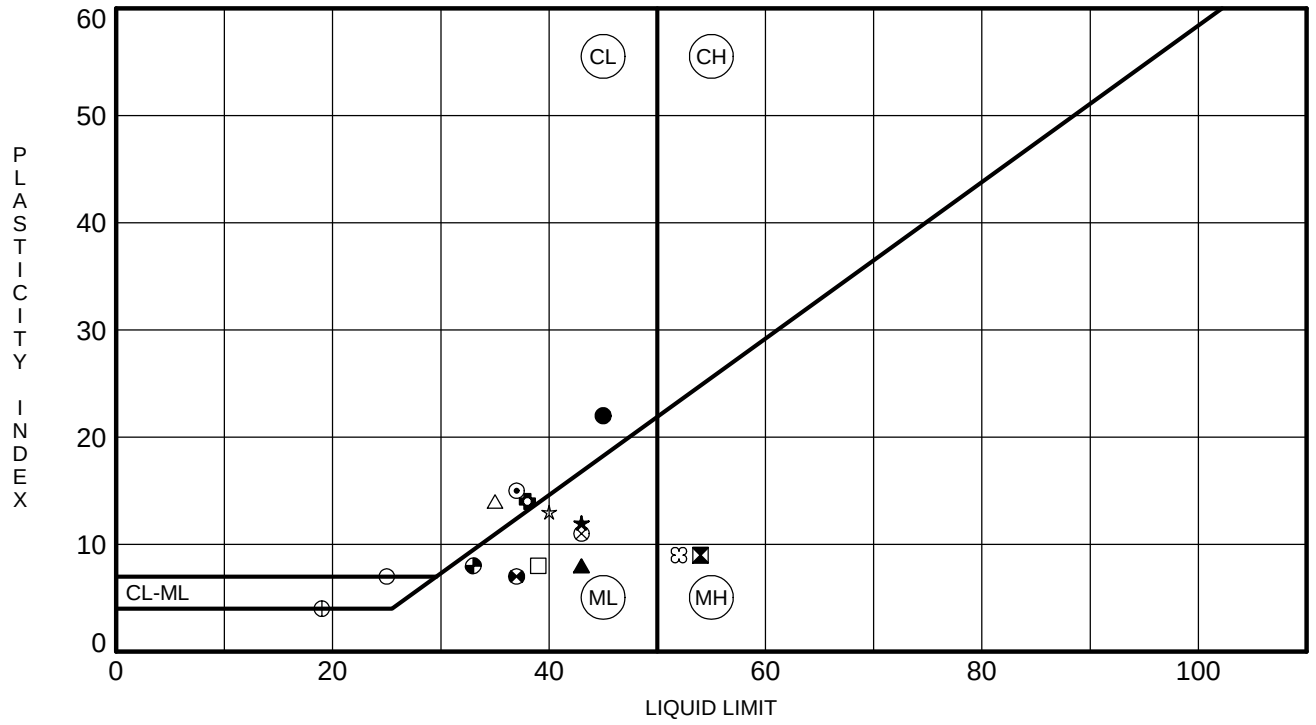
	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BR-1**	**1.0**	**35**	**24**	**11**	**39**	**CLAYEY SAND(SC)**
⧓	**BR-1**	**9.0**	**44**	**32**	**12**	**44**	**SILTY SAND(SM)**
▲	**BR-1**	**19.0**	**34**	**24**	**10**	**48**	**SILTY SAND(SM)**
★	**BR-1**	**24.0**	**35**	**26**	**9**	**30**	**SILTY SAND(SM)**
⊙	**BR-2**	**6.0**	**29**	**24**	**5**	**38**	**SILTY SAND(SM)**
✿	**BR-2**	**9.0**	**33**	**22**	**11**	**47**	**CLAYEY SAND(SC)**
○	**BR-2**	**14.0**	**30**	**24**	**6**	**43**	**SILTY SAND(SM)**
△	**BR-2**	**29.5**	**29**	**24**	**5**	**34**	**SILTY SAND(SM)**
⊗	**BR-3**	**1.0**	**35**	**21**	**14**	**54**	**SANDY LEAN CLAY(CL)**
⊕	**BR-3**	**5.0**	**31**	**20**	**11**	**56**	**SANDY LEAN CLAY(CL)**
□	**BR-3**	**7.0**	**36**	**22**	**14**	**79**	**LEAN CLAY with SAND(CL)**
⊛	**BR-3**	**9.0**	**33**	**20**	**13**	**79**	**LEAN CLAY with SAND(CL)**
◕	**BR-3**	**9.5**	**31**	**20**	**11**	**76**	**LEAN CLAY with SAND(CL)**
☆	**BR-3**	**24.0**	**36**	**27**	**9**	**34**	**SILTY SAND(SM)**
⊠	**RW-1**	**1.0**	**35**	**22**	**13**	**56**	**SANDY LEAN CLAY(CL)**
■	**RW-1**	**5.0**	**41**	**31**	**10**	**51**	**SANDY SILT(ML)**
◆	**RW-1**	**9.0**	**29**	**21**	**8**	**55**	**SANDY LEAN CLAY(CL)**
◇	**RW-2**	**3.0**	**33**	**26**	**7**	**38**	**SILTY SAND(SM)**
×	**RW-2**	**7.0**	**33**	**26**	**7**	**30**	**SILTY SAND(SM)**
✖	**RW-2**	**9.0**	**47**	**30**	**17**	**60**	**SANDY SILT(ML)**

ATTERBERG LIMITS' RESULTS

PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**R-1**	**1.0**	**45**	**23**	**22**	**51**	**SANDY LEAN CLAY(CL)**
⊠	**R-1**	**3.0**	**54**	**45**	**9**	**51**	**SANDY ELASTIC SILT(MH)**
▲	**R-1**	**7.0**	**43**	**35**	**8**	**52**	**SANDY SILT(ML)**
★	**R-2**	**1.0**	**43**	**31**	**12**	**47**	**SILTY SAND(SM)**
⊙	**R-2**	**5.0**	**37**	**22**	**15**	**59**	**SANDY LEAN CLAY(CL)**
✿	**R-2**	**7.0**	**38**	**24**	**14**	**71**	**LEAN CLAY with SAND(CL)**
○	**R-2**	**9.0**	**25**	**18**	**7**	**36**	**SILTY, CLAYEY SAND(SC-SM)**
△	**R-3**	**3.0**	**35**	**21**	**14**	**49**	**CLAYEY SAND(SC)**
⊗	**R-3**	**7.0**	**43**	**32**	**11**	**50**	**SANDY SILT(ML)**
⊕	**R-4**	**1.0**	**19**	**15**	**4**	**34**	**SILTY, CLAYEY SAND(SC-SM)**
□	**R-4**	**5.0**	**39**	**31**	**8**	**43**	**SILTY SAND(SM)**
⊠	**R-4**	**7.0**	**37**	**30**	**7**	**32**	**SILTY SAND(SM)**
◕	**R-5**	**2.0**	**33**	**25**	**8**	**41**	**SILTY SAND(SM)**
☆	**R-5**	**6.0**	**40**	**27**	**13**	**46**	**SILTY SAND(SM)**
⊠	**RW-2**	**19.0**	**52**	**43**	**9**	**25**	**SILTY SAND(SM)**

INDEX PROPERTIES VERSUS DEPTH

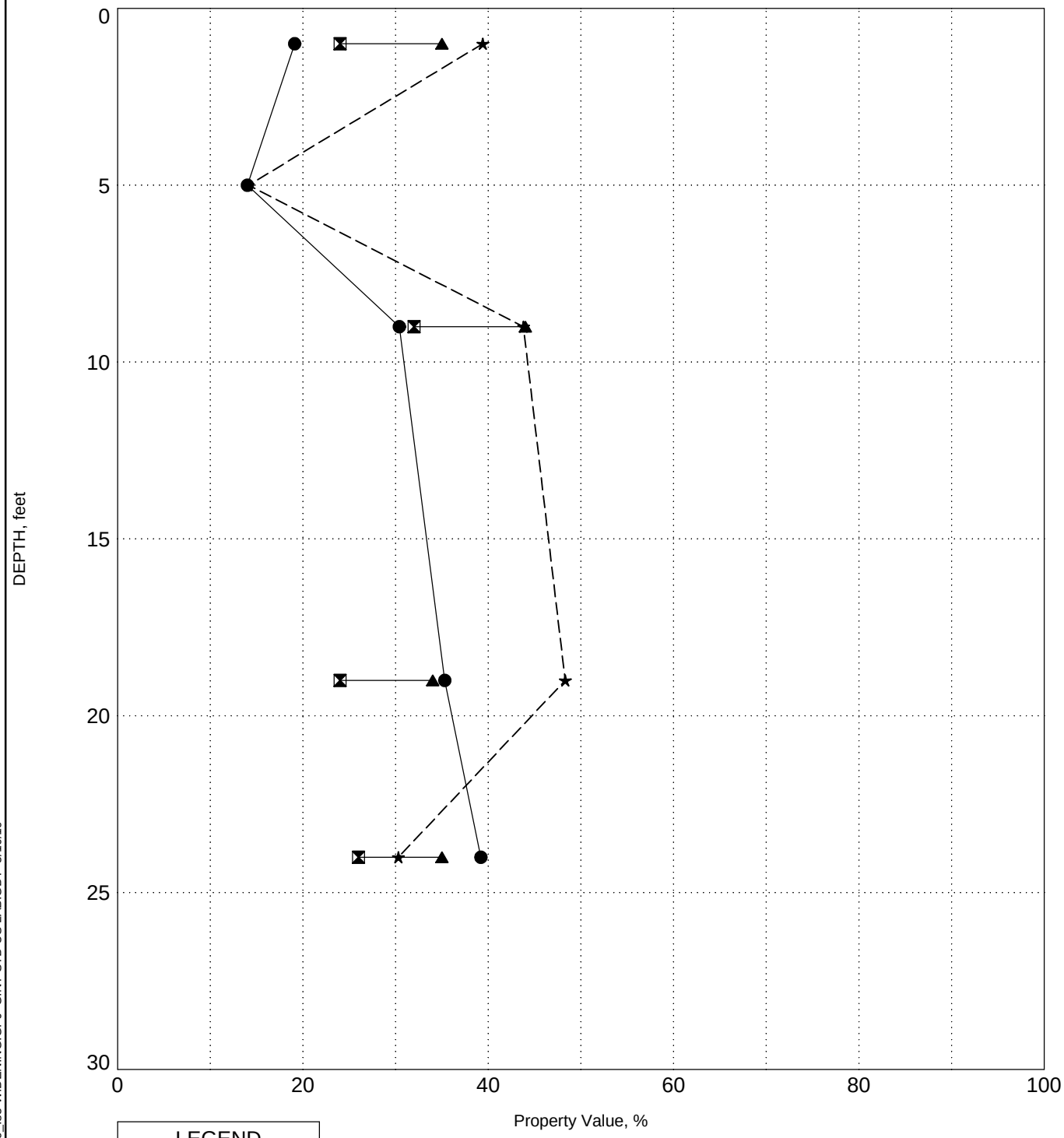
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING BR-1

SURFACE ELEVATION: 855.5



INDEX PROPERTIES VERSUS DEPTH

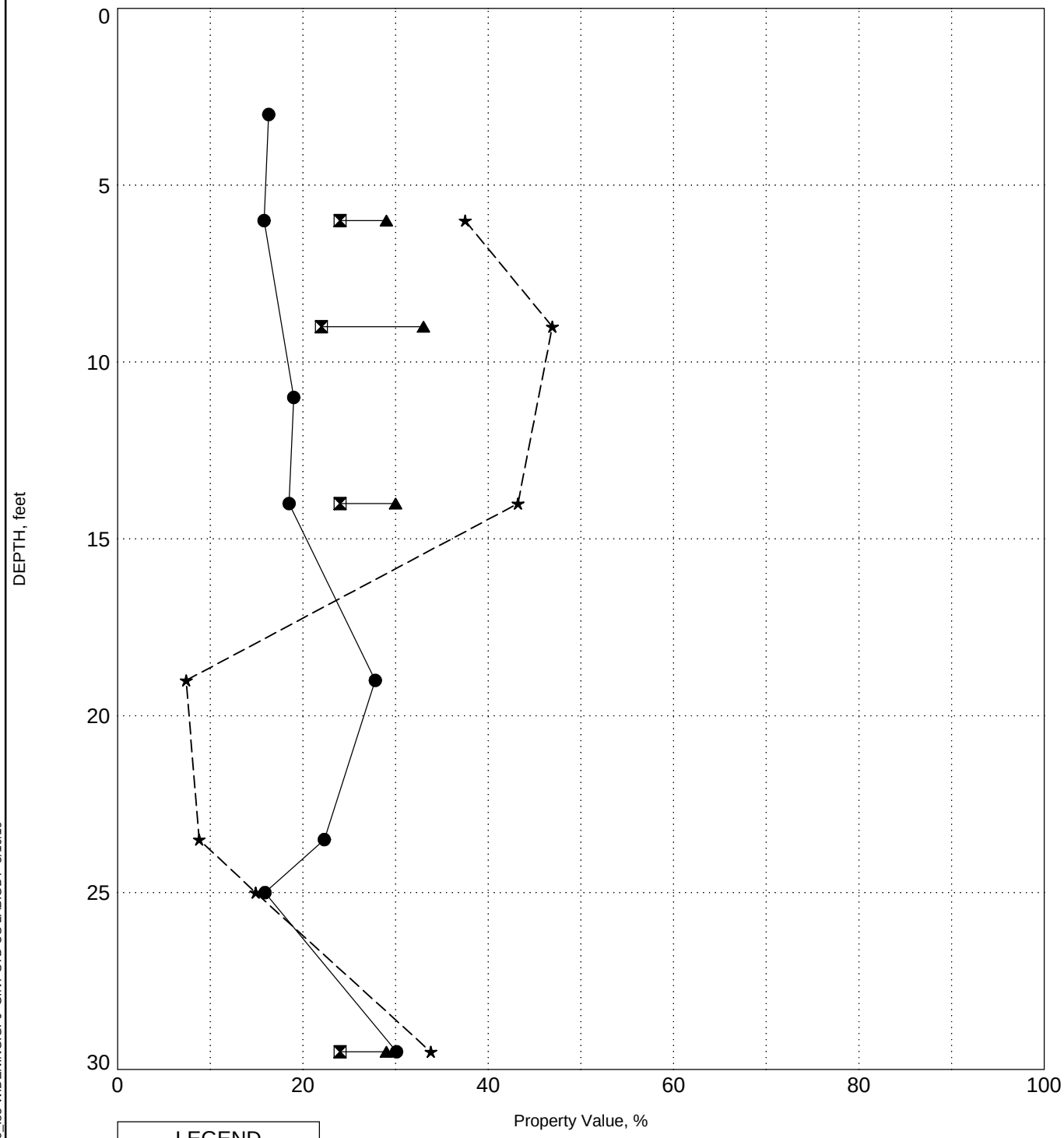
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING BR-2

SURFACE ELEVATION: 855.5



INDEX PROPERTIES VERSUS DEPTH

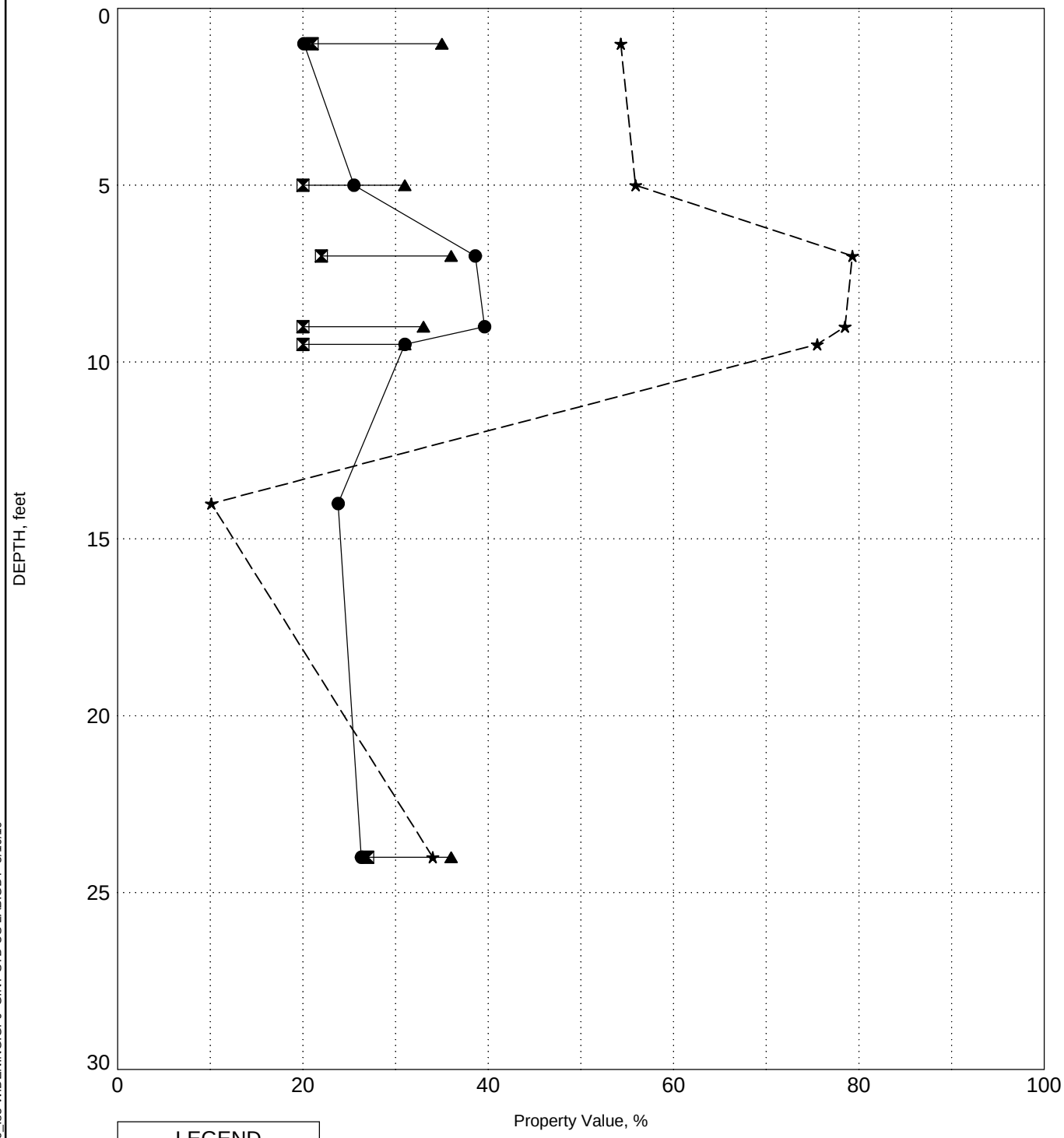
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING BR-3

SURFACE ELEVATION: 847.0



INDEX PROPERTIES VERSUS DEPTH

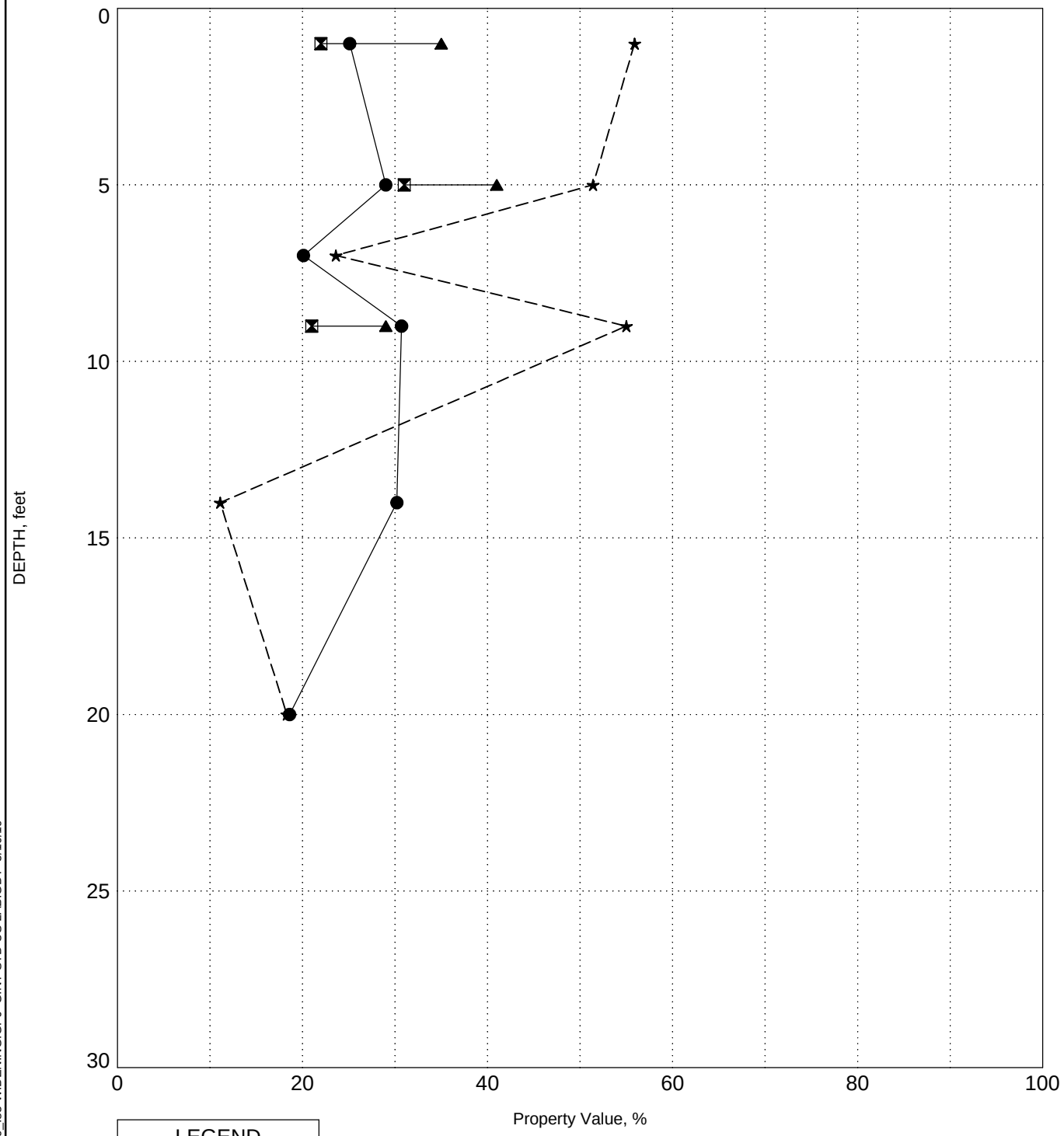
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING RW-1

SURFACE ELEVATION: 849.5



INDEX PROPERTIES VERSUS DEPTH

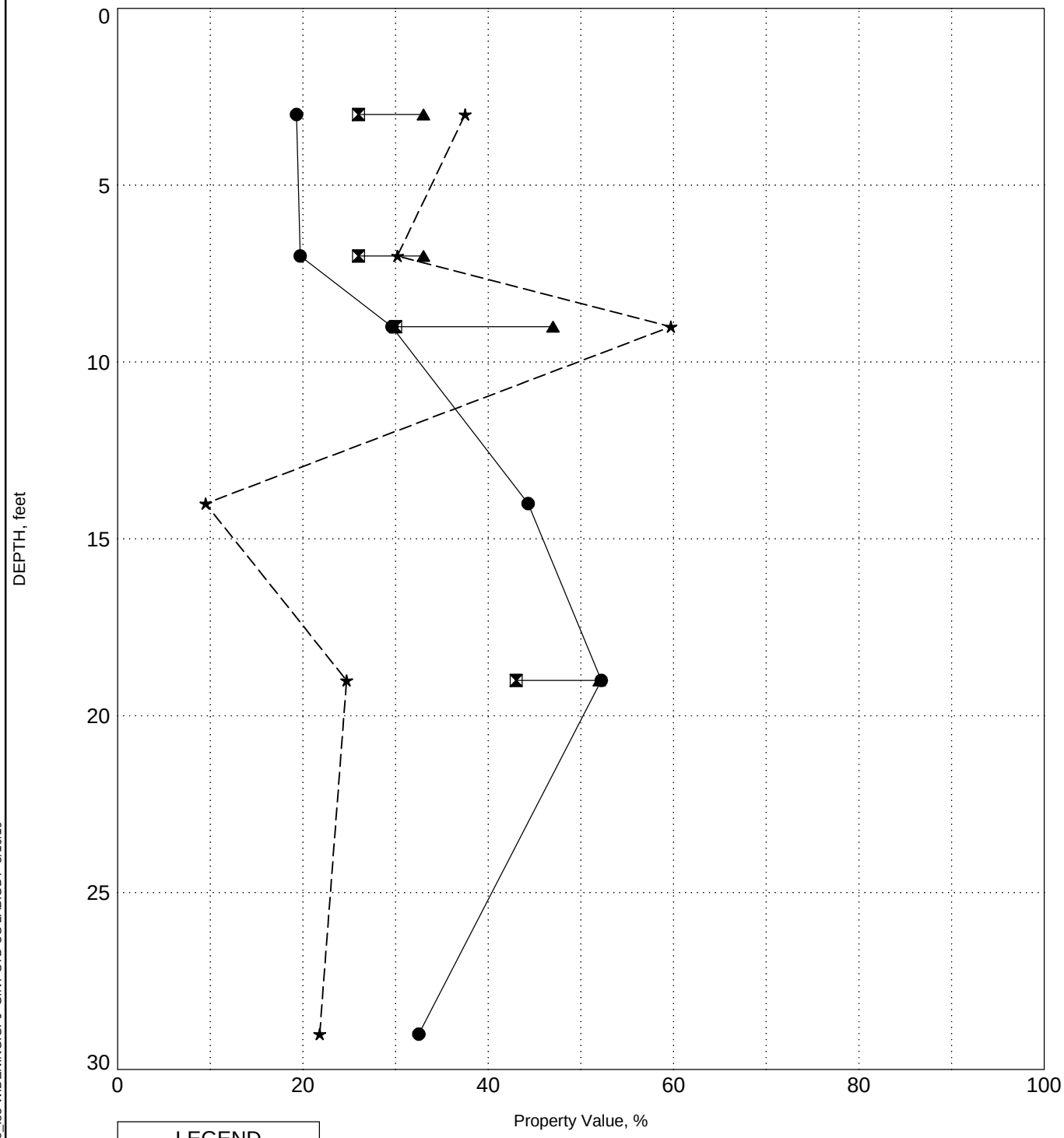
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING RW-2

SURFACE ELEVATION: 851.1



INDEX PROPERTIES VERSUS DEPTH

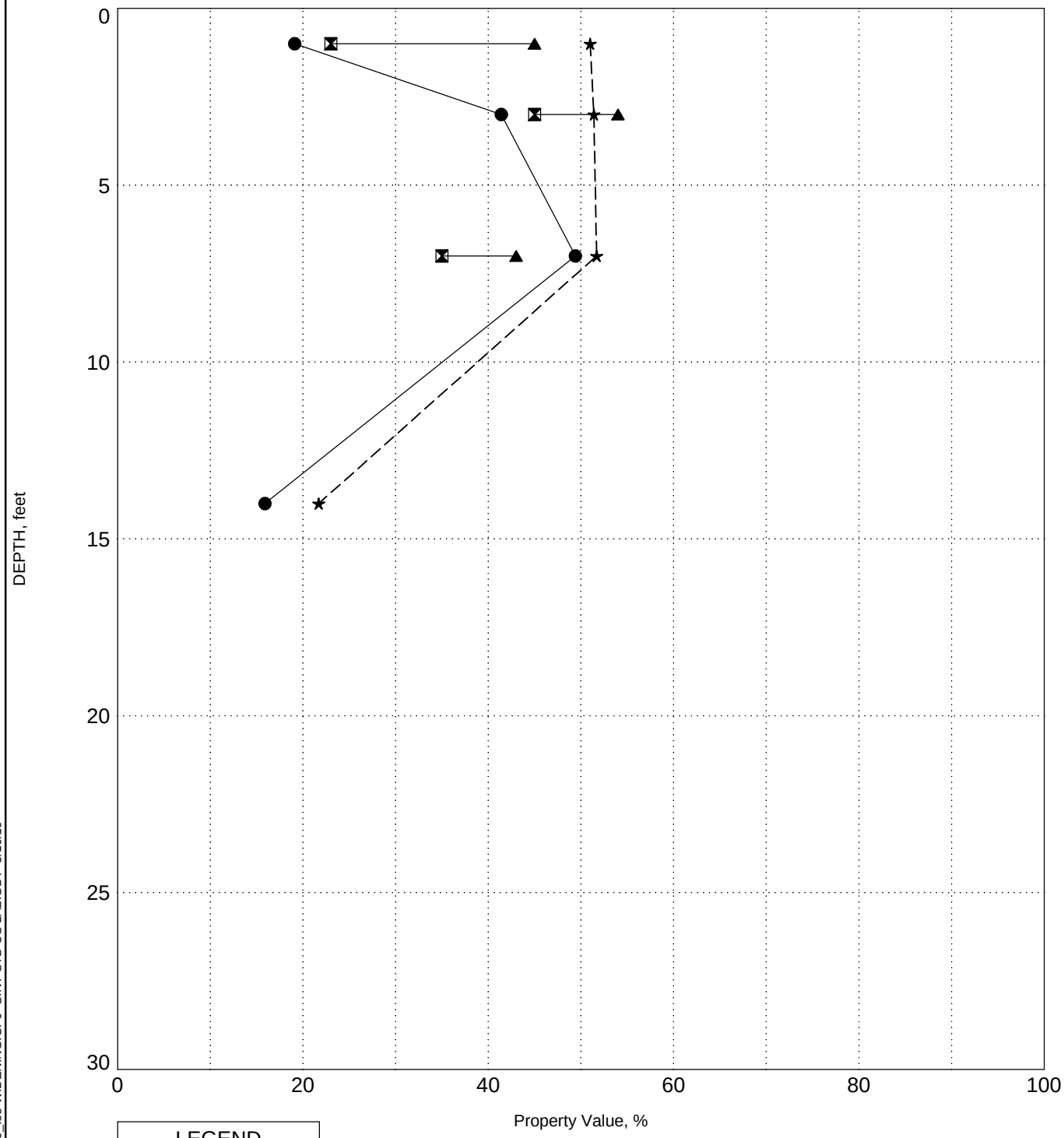
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING R-1

SURFACE ELEVATION: 860.5



INDEX PROPERTIES VERSUS DEPTH

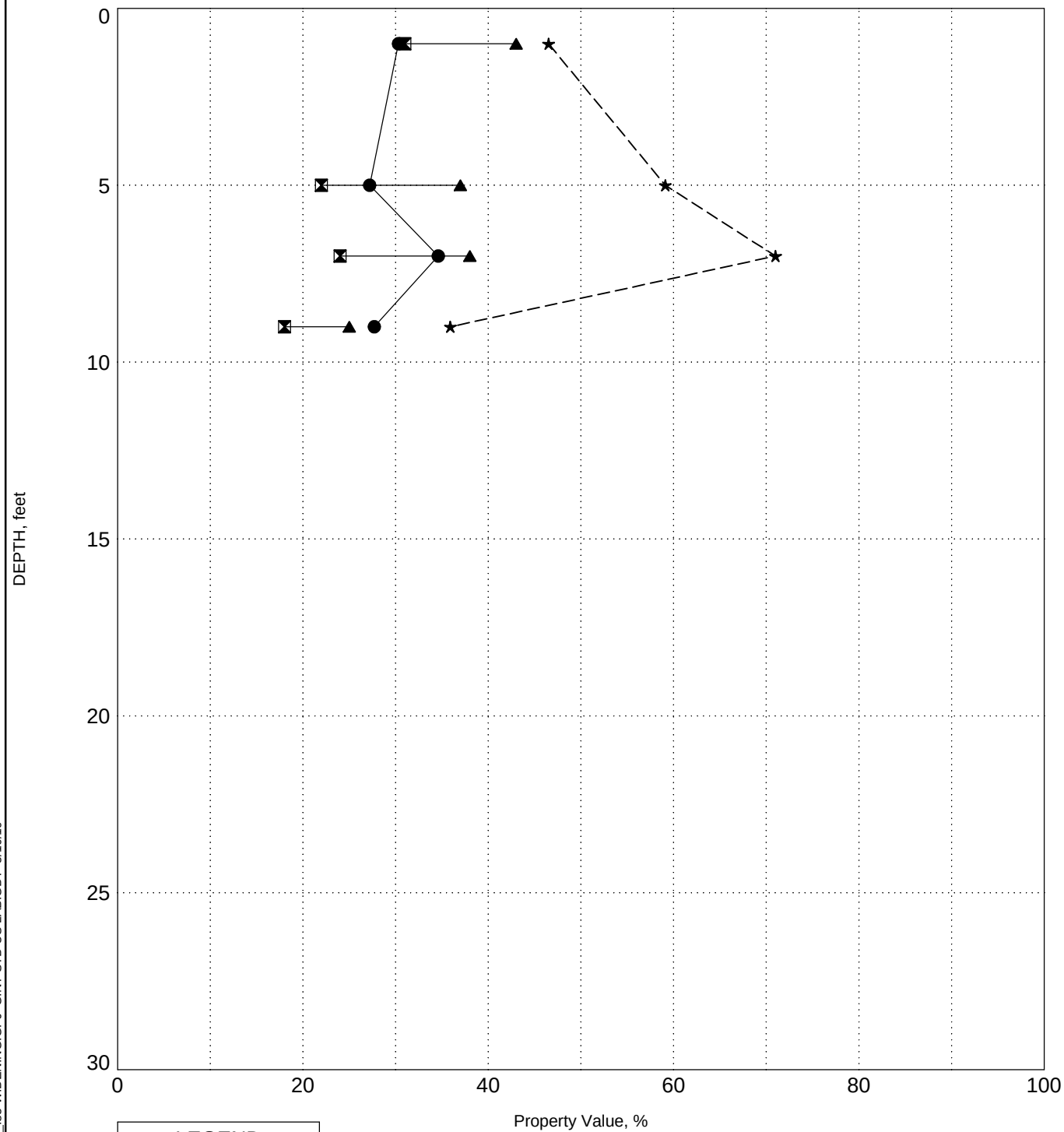
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING R-2

SURFACE ELEVATION: 849.5



LEGEND
● Water Content
⊠ Plastic Limit
▲ Liquid Limit
★ Fines

INDEX PROPERTIES VERSUS DEPTH

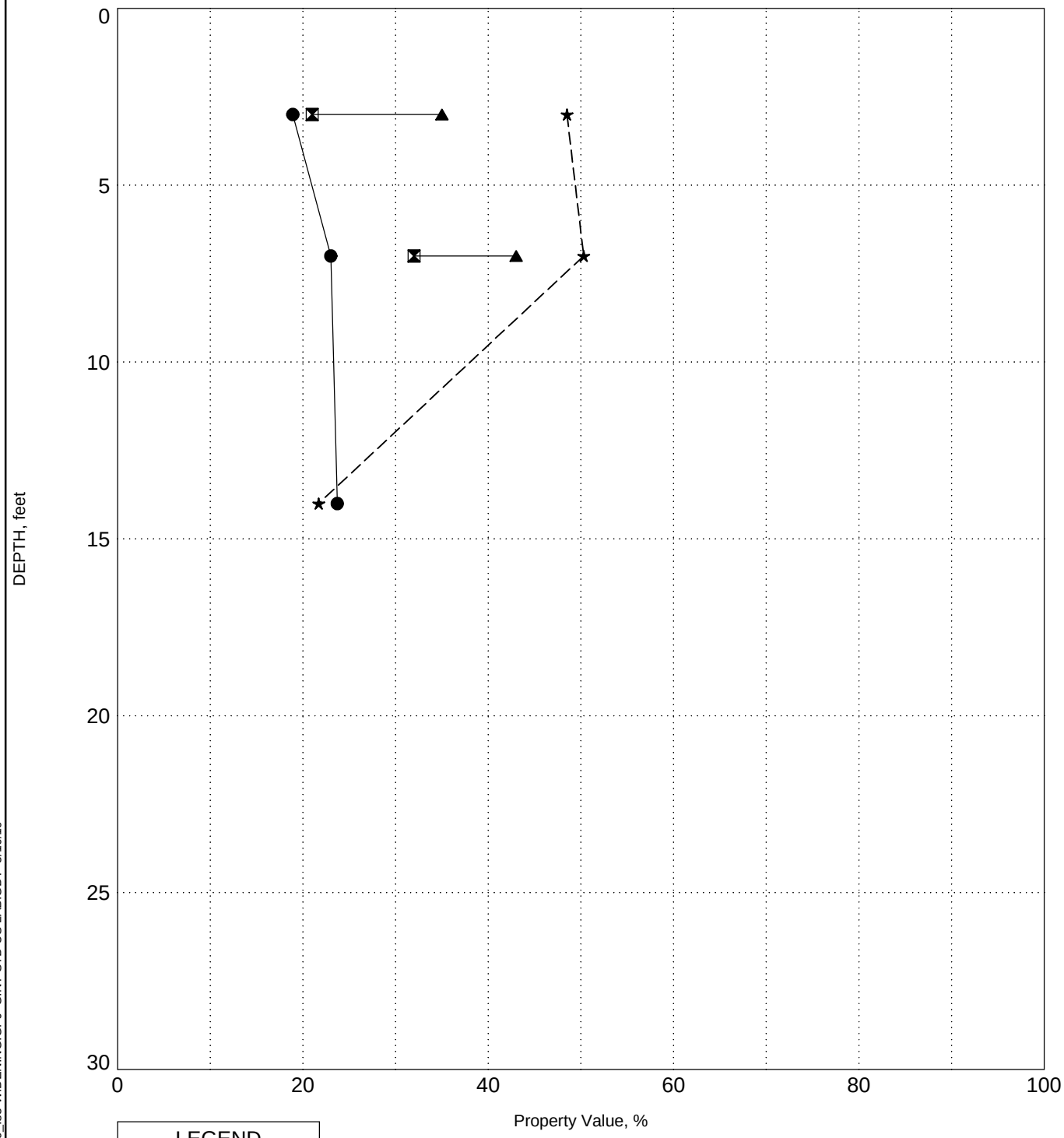
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING R-3

SURFACE ELEVATION: 850.8



INDEX PROPERTIES VERSUS DEPTH

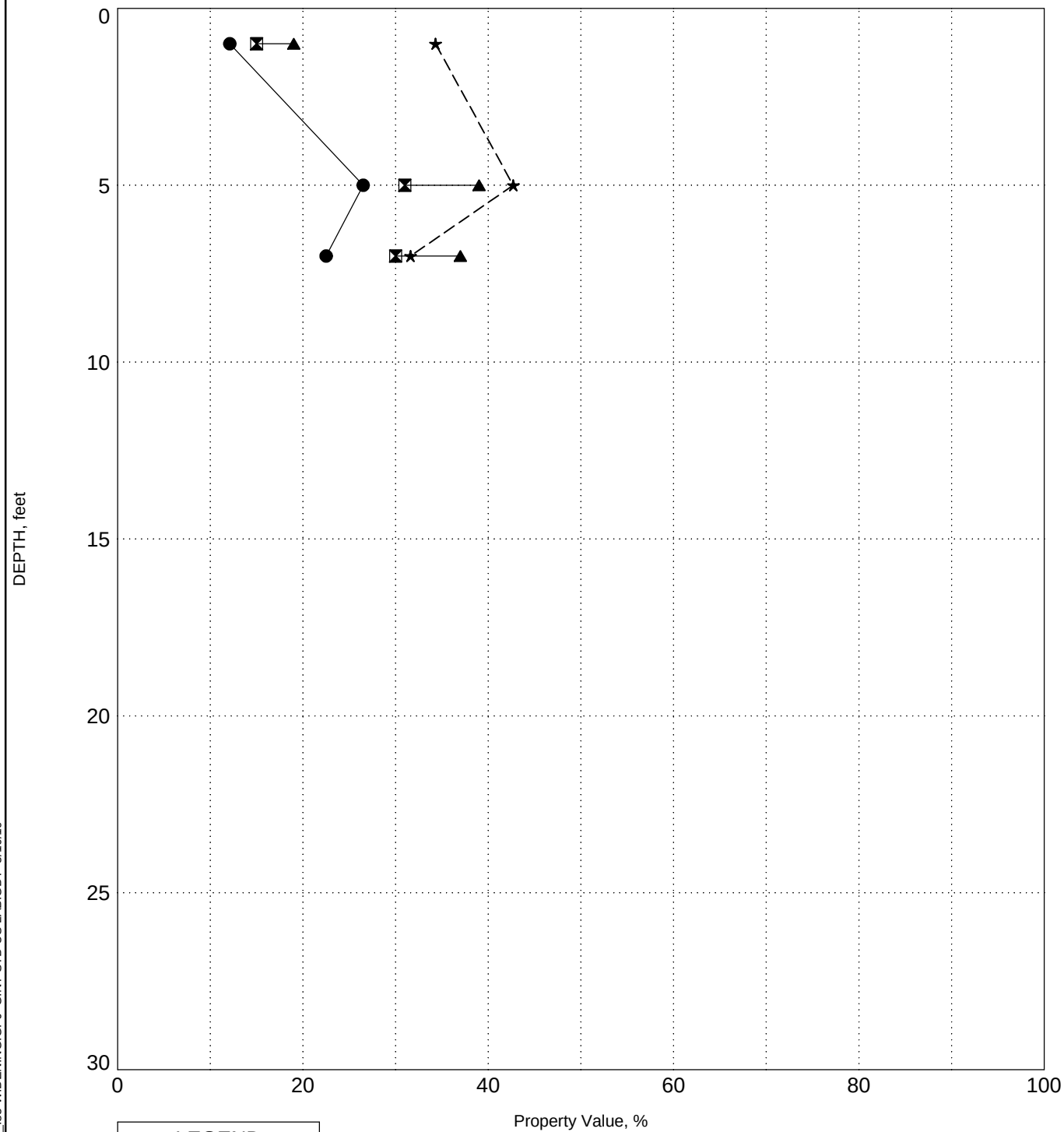
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING R-4

SURFACE ELEVATION: 870.0



INDEX PROPERTIES VERSUS DEPTH

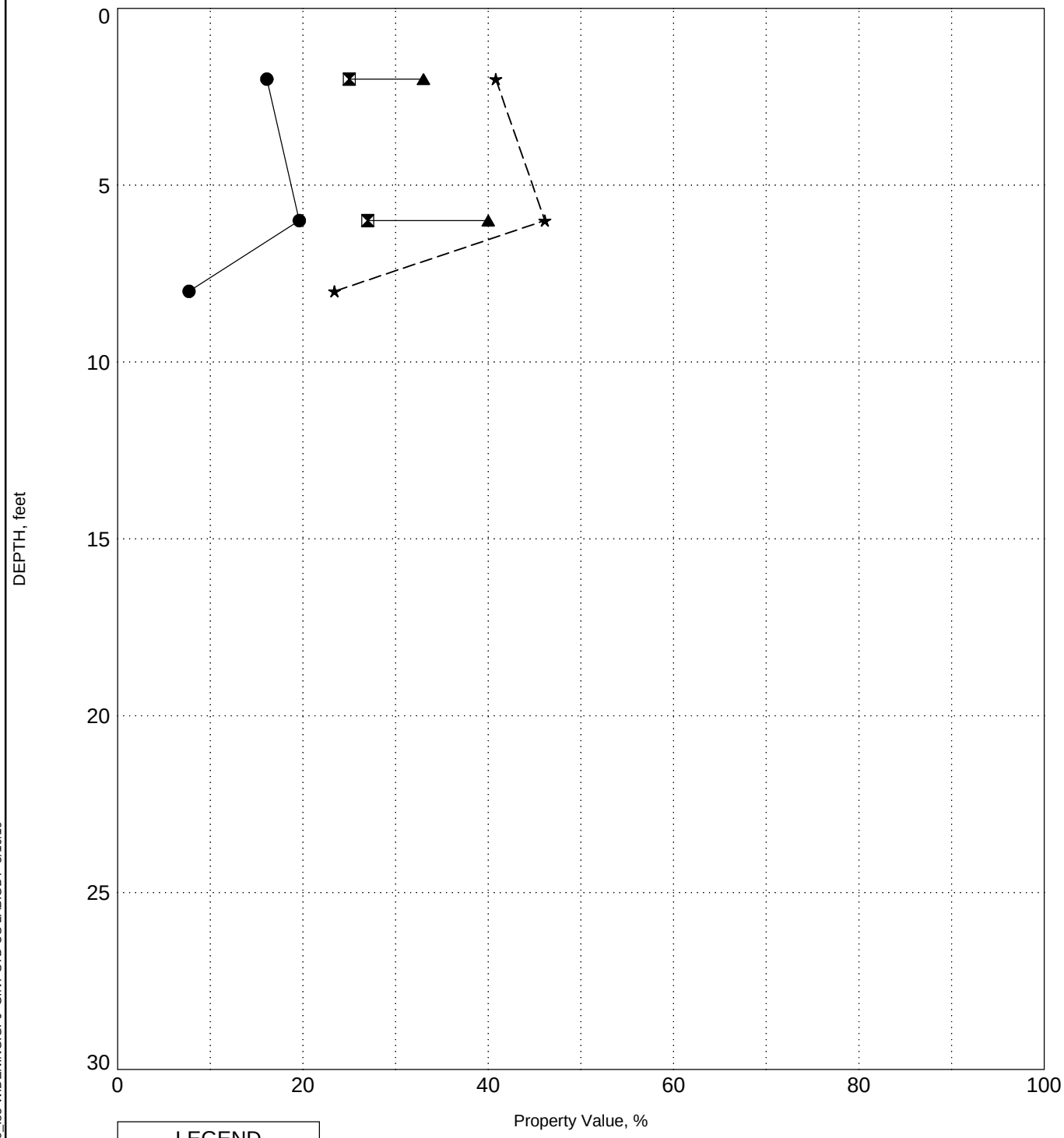
PROJECT ID (TBD)

PROJECT NAME I-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville

BORING R-5

SURFACE ELEVATION: 877.5



Form No: TR-D1140-3
Revision No. 1
Revision Date: 8/2/17

LABORATORY DETERMINATION OF WATER CONTENT & MATERIAL FINER THAN THE #200 SIEVE

AASHTO T 265 - ASTM D 1140

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

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	3/21 - 4/8/19
Client Name:	MBI		
Client Address:	Columbia, SC		
		Sample Dates:	Various
Sampling Method:	Split-spoon		

Method: **A** ☐ **B** ☑ Soaked ☑ Soak Time 2+ hrs.

Sample Identification	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	Water Wt.	Percent Moisture	% Passing #200
Boring #, Sample #, Depth	grams	grams	grams	grams	grams	%	%
BR-1, SS-1, 0-2'	0.00	164.06	137.80	83.44	26.26	**19.1%**	**39.4%**
BR-1, SS-3, 4-6'	0.00	203.45	178.44	153.28	25.01	**14.0%**	**14.1%**
BR-1, SS-5, 8-10'	0.00	168.65	129.34	72.63	39.31	**30.4%**	**43.8%**
BR-1, SS-7, 18.5-20'	0.00	258.00	190.75	98.67	67.25	**35.3%**	**48.3%**
BR-1, SS-8, 23.5-25'	0.00	251.22	180.50	125.85	70.72	**39.2%**	**30.3%**
BR-2, SS-3, 5-7'	0.00	256.77	221.80	138.52	34.97	**15.8%**	**37.5%**
BR-2, SS-6, 13-15'	0.00	218.00	183.92	-	34.08	**18.5%**	**-**
BR-2, SS-7, 18.5-20'	0.00	303.63	237.54	-	66.09	**27.8%**	**-**
BR-2, SS-8(U), 23.5-24'	0.00	303.01	247.72	-	55.29	**22.3%**	**-**
BR-2, SS-8(L), 24-25'	0.00	303.08	261.58	-	41.50	**15.9%**	**-**
BR-2, SS-9, 28.5-30'	0.00	60.44	46.44	-	14.00	**30.1%**	**-**
BR-2, Bulk-1A, 1-7'	0.00	149.35	128.37	-	20.98	**16.3%**	**-**
BR-2, Bulk-1B, 7-15'	0.00	163.56	137.44	-	26.12	**19.0%**	**-**
BR-3, SS-1, 0-2'	0.00	318.42	265.05	121.21	53.37	**20.1%**	**54.3%**
BR-3, SS-3, 4-6'	0.00	315.08	251.07	110.66	64.01	**25.5%**	**55.9%**
BR-3, SS-5, 8-10'	0.00	319.43	228.76	49.28	90.67	**39.6%**	**78.5%**
BR-3, SS-6, 13.5-15'	0.00	332.53	268.54	241.30	63.99	**23.8%**	**10.1%**
BR-3, SS-8, 23.5-25'	0.00	201.72	159.74	105.41	41.98	**26.3%**	**34.0%**

Balance ID.: *13942* *Calibration Date:* *9/11/18* *#200 Sieve:* *23239* *Calibration Date:* *2/19/19*

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

Method B uses a deflocculating agent such as Sodium Hexametaphosphate while soaking the specimen for at least 2 hours.

AASHTO T 265: Test Method for Laboratory Determination of Moisture Content of Soils

*Highlighted cells indicate *% Passing #200 Sieve* values exceeding 25%, triggering Atterberg Limits testing (as assigned).

Benjamin Kovaleski		NICET 117226	4/01/19
Technician Name		*Certification Type/No.*	*Date*
Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/01/19
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-D1140-3
Revision No. 1
Revision Date: 8/2/17

LABORATORY DETERMINATION OF WATER CONTENT & MATERIAL FINER THAN THE #200 SIEVE

AASHTO T 265 - ASTM D 1140

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

Project #:	1426-15-009 (Phase 105)	Report Date:	4/22/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	3/21 - 4/18/19
Client Name:	MBI		
Client Address:	Columbia, SC		
		Sample Dates:	4/11/19
Sampling Method:	Split-spoon		

Method: **A** ☐ **B** ☑ Soaked ☑ Soak Time 2+ hrs.

Sample Identification	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	Water Wt.	Percent Moisture	% Passing #200
Boring #, Sample #, Depth	grams	grams	grams	grams	grams	%	%
RW-1, SS-1, 0-2'	0.00	277.09	221.55	97.74	55.54	**25.1%**	**55.9%**
RW-1, SS-3, 4-6'	0.00	210.06	162.80	79.19	47.26	**29.0%**	**51.4%**
RW-1, SS-4, 6-8'	0.00	181.70	151.26	115.54	30.44	**20.1%**	**23.6%**
RW-1, SS-5, 8-10'	0.00	272.00	208.11	93.58	63.89	**30.7%**	**55.0%**
RW-1, SS-6, 13.5-15'	0.00	271.77	208.76	185.59	63.01	**30.2%**	**11.1%**
RW-1, SS-7, 18.5-20'	0.00	224.26	189.11	154.41	35.15	**18.6%**	**18.3%**
RW-2, SS-2, 2-4'	0.00	317.27	265.88	166.19	51.39	**19.3%**	**37.5%**
RW-2, SS-4, 6-8'	0.00	314.34	262.63	183.44	51.71	**19.7%**	**30.2%**
RW-2, SS-6, 13.5-15'	0.00	314.66	218.11	197.35	96.55	**44.3%**	**9.5%**
RW-2, SS-7, 18.5-20'	0.00	178.57	117.29	88.31	61.28	**52.2%**	**24.7%**
RW-2, SS-9, 28.5-30'	0.00	121.13	91.40	71.47	29.73	**32.5%**	**21.8%**

Balance ID.: *13942* *Calibration Date:* *9/11/18* *#200 Sieve:* *23239* *Calibration Date:* *2/19/19*

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

Method B uses a deflocculating agent such as Sodium Hexametaphosphate while soaking the specimen for at least 2 hours.

AASHTO T 265: Test Method for Laboratory Determination of Moisture Content of Soils

*Highlighted cells indicate *% Passing #200 Sieve* values exceeding 25%, triggering Atterberg Limits testing (as assigned).

Benjamin Kovaleski		NICET 117226	4/22/19
Technician Name		*Certification Type/No.*	*Date*
Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/22/19
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-D1140-3
Revision No. 1
Revision Date: 8/2/17

LABORATORY DETERMINATION OF WATER CONTENT & MATERIAL FINER THAN THE #200 SIEVE

AASHTO T 265 - ASTM D 1140

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

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	3/21 - 4/18/19
Client Name:	MBI		
Client Address:	Columbia, SC		
		Sample Dates:	Various
Sampling Method:	Split-spoon		

Method: **A** ☐ **B** ☑ Soaked ☑ Soak Time 2+ hrs.

Sample Identification	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	Water Wt.	Percent Moisture	% Passing #200
Boring #, Sample #, Depth	grams	grams	grams	grams	grams	%	%
R-1, SS-1, 0-2'	0.00	262.99	220.84	108.16	42.15	**19.1%**	**51.0%**
R-1, SS-2, 2-4'	0.00	262.58	185.68	90.33	76.90	**41.4%**	**51.4%**
R-1, SS-4, 6-8'	0.00	244.27	163.54	79.04	80.73	**49.4%**	**51.7%**
R-1, SS-6, 13.5-15'	0.00	273.05	235.65	184.42	37.40	**15.9%**	**21.7%**
R-2, SS-1, 0-2'	0.00	318.93	244.70	130.94	74.23	**30.3%**	**46.5%**
R-2, SS-3, 4-6'	0.00	368.78	289.81	118.41	78.97	**27.2%**	**59.1%**
R-2, SS-4, 6-8'	0.00	366.44	272.29	79.09	94.15	**34.6%**	**71.0%**
R-2, SS-5, 8-10'	0.00	385.49	301.84	193.34	83.65	**27.7%**	**35.9%**
R-3, SS-2, 2-4'	0.00	311.33	261.74	134.76	49.59	**18.9%**	**48.5%**
R-3, SS-4, 6-8'	0.00	328.83	267.30	132.79	61.53	**23.0%**	**50.3%**
R-3, SS-6, 13.5-15'	0.00	165.53	133.84	104.86	31.69	**23.7%**	**21.7%**
R-4, SS-1, 0-2'	0.00	278.18	248.14	162.97	30.04	**12.1%**	**34.3%**
R-4, SS-3, 4-6'	0.00	273.73	216.35	124.05	57.38	**26.5%**	**42.7%**
R-4, SS-4, 6-8'	0.00	278.54	227.33	155.48	51.21	**22.5%**	**31.6%**
R-5, SS-1, 1-3'	0.00	278.19	239.66	141.83	38.53	**16.1%**	**40.8%**
R-5, SS-3, 5-7'	0.00	277.45	231.98	125.12	45.47	**19.6%**	**46.1%**
R-5, SS-4, 7-9'	0.00	275.61	255.98	195.97	19.63	**7.7%**	**23.4%**

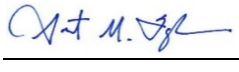
Balance ID.: *13942* *Calibration Date:* *9/11/18* *#200 Sieve:* *23239* *Calibration Date:* *2/19/19*

Notes / Deviations / References: ASTM D1140: Amount of Material in Soil Finer Than the No. 200 (75-um)) Sieve

Method B uses a deflocculating agent such as Sodium Hexametaphosphate while soaking the specimen for at least 2 hours.

AASHTO T 265: Test Method for Laboratory Determination of Moisture Content of Soils

*Highlighted cells indicate *% Passing #200 Sieve* values exceeding 25%, triggering Atterberg Limits testing (as assigned).

Benjamin Kovaleski		NICET 117226	4/01/19
Technician Name		*Certification Type/No.*	*Date*
Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/01/19
Technical Responsibility	*Signature*	*Position*	*Date*

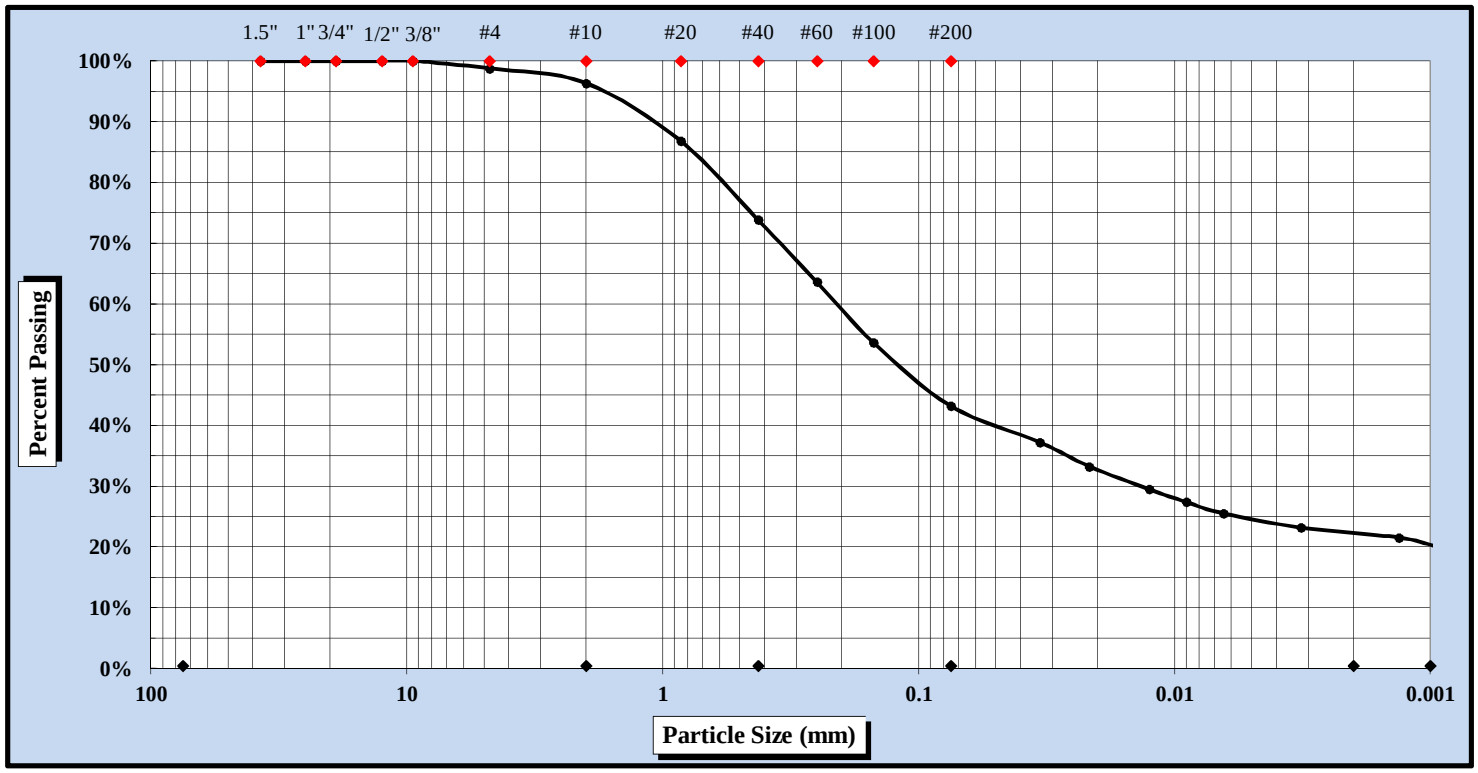
Form No. TR-126-T88-2
Revision No. 0
Revision Date: 08/17/11

Particle Size Analysis of Soils
AASHTO T 88

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

S&ME Project #:	1426-15-009 (Phase	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/05 - 4/10/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-6	Type:	Split-spoon	Depth:	13.5 - 15'
Sample Description:	Silty SAND [SM / A-4(0)]				



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Gravel	3.6%	Coarse Sand	22.5%	Silt	20.8%
Maximum Particle Size	9.50 mm	Fine Sand	30.7%	Clay	22.4%
Apparent Relative Density	2.65	Moisture Content	18.5%	Silt & Clay (% Passing #200)	43.2%
Liquid Limit	30	Plastic Limit	24	Plastic Index	6
		Moisture Content	18.5%	Group Index	0

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

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T 88: Particle Size Analysis of Soils AASHTO R 58: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes AASHTO T 100: Specific Gravity of Soils
AASHTO T 265: Laboratory Determination of Moisture Content of Soils

Technical Responsibility: Gant Taylor, P.E. *Signature* Project Mgr. / Senior Engr. *Signature*

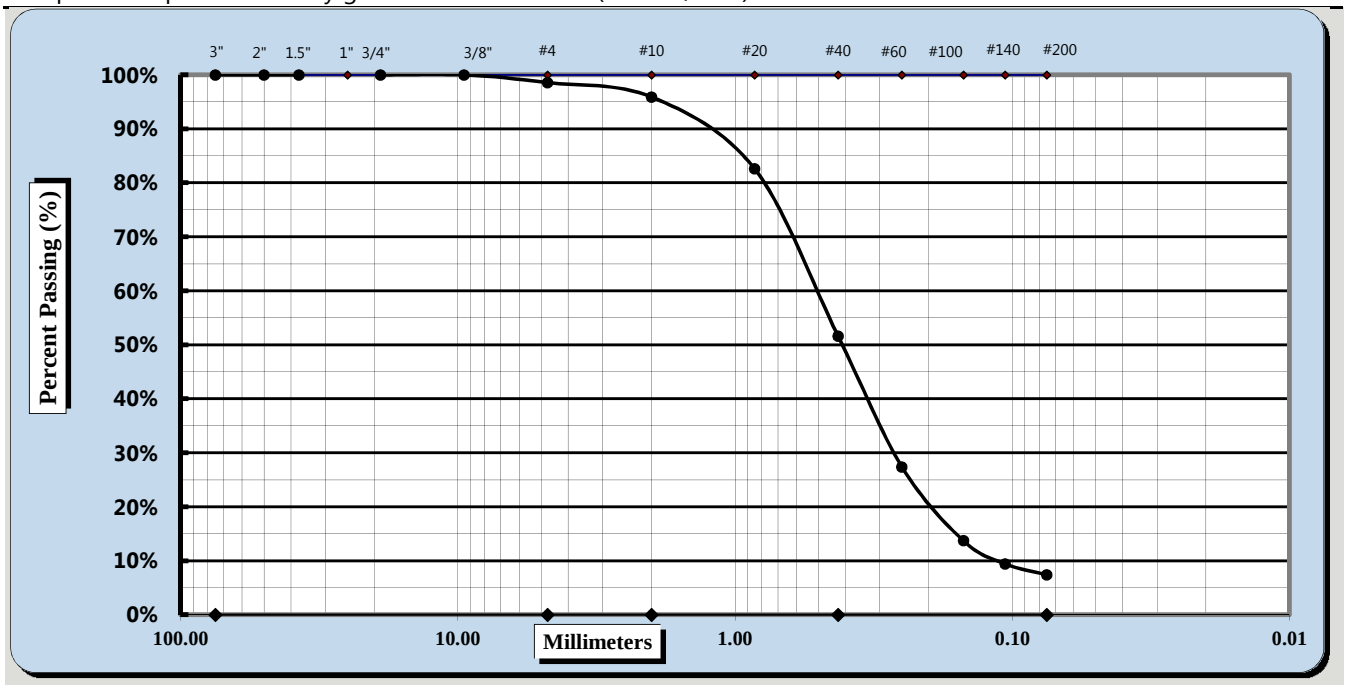
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/9/2019
Project Name:	I-85 Bridge Over Rocky Creek			Test Date:	4/04 - 4/09/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-7	Type:	Split-spoon	Depth:	18.5 - 20'
Sample Description:	Poorly graded SAND with silt (SP-SM / A-3)				



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

Method: B Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	#4	Coarse Sand	2.7%	Fine Sand	44.2%
Gravel	1.4%	Medium Sand	44.2%	Silt & Clay	7.4%
Liquid Limit	N/A	Plastic Limit	N/A	Plastic Index	N/A

Natural Moisture 27.8%

$Cc = D_{30}^2/(D_{10} \times D_{60})$ **1.122** $Cu = D_{60}/D_{10}$ **3.846**

D10 = **0.13** D30 = **0.27** D60 = **0.5** D50 = D90 =

Notes / Deviations / References:

Gant M. Taylor, P.E. — *Technical Responsibility*
Signature
Project Mgr. / Senior Engr. — *Position*
4/9/2019 — *Date*

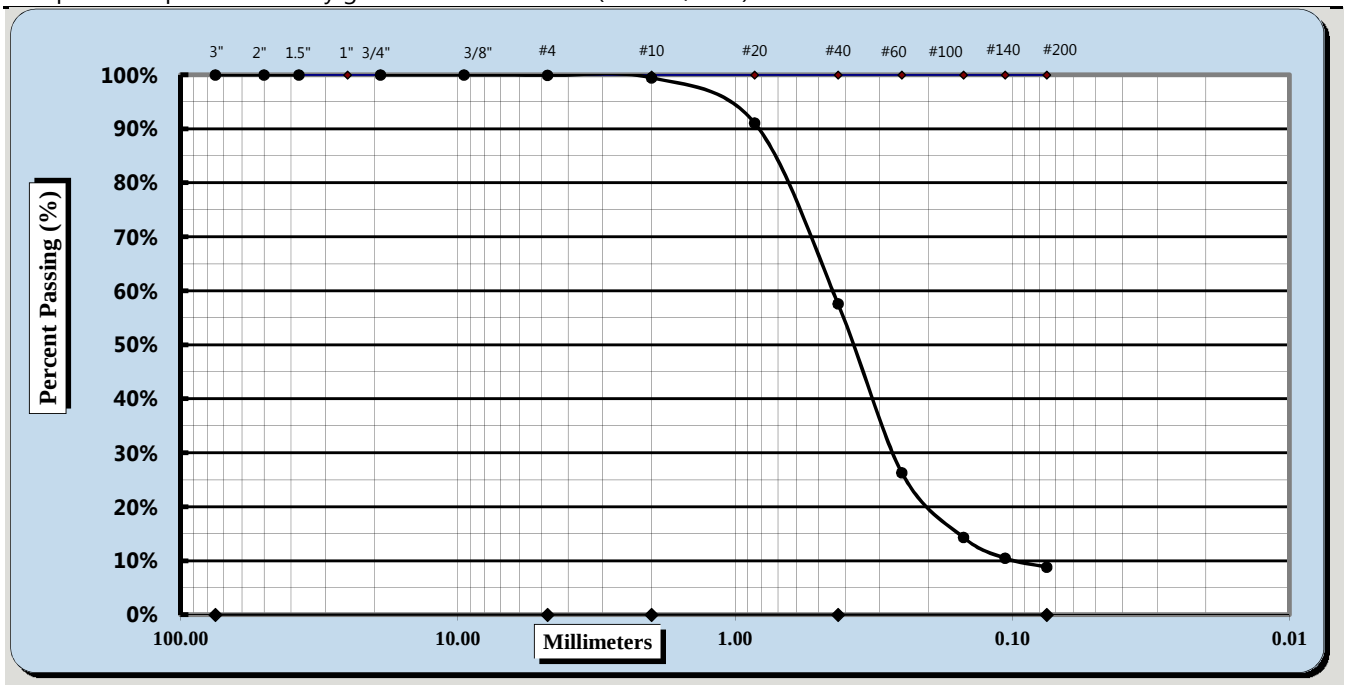
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/9/2019
Project Name:	I-85 Bridge Over Rocky Creek			Test Date:	4/04 - 4/09/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-8 (Upper)	Type:	Split-spoon	Depth:	23.5 - 24'
Sample Description:	Poorly graded SAND with silt (SP-SM / A-3)				



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

Method: B Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	#10	Coarse Sand	0.5%	Fine Sand	48.8%
Gravel	0.1%	Medium Sand	41.9%	Silt & Clay	8.8%
Liquid Limit	N/A	Plastic Limit	N/A	Plastic Index	N/A

Natural Moisture 22.3%

$Cc = D_{30}^2/(D_{10} \times D_{60})$ **1.620** $Cu = D_{60}/D_{10}$ **4.500**

D10 = **0.10** D30 = **0.27** D60 = **0.45** D50 = D90 =

Notes / Deviations / References:

Gant M. Taylor, P.E. — *Technical Responsibility*
Signature
Project Mgr. / Senior Engr. — *Position*
4/9/2019 — *Date*

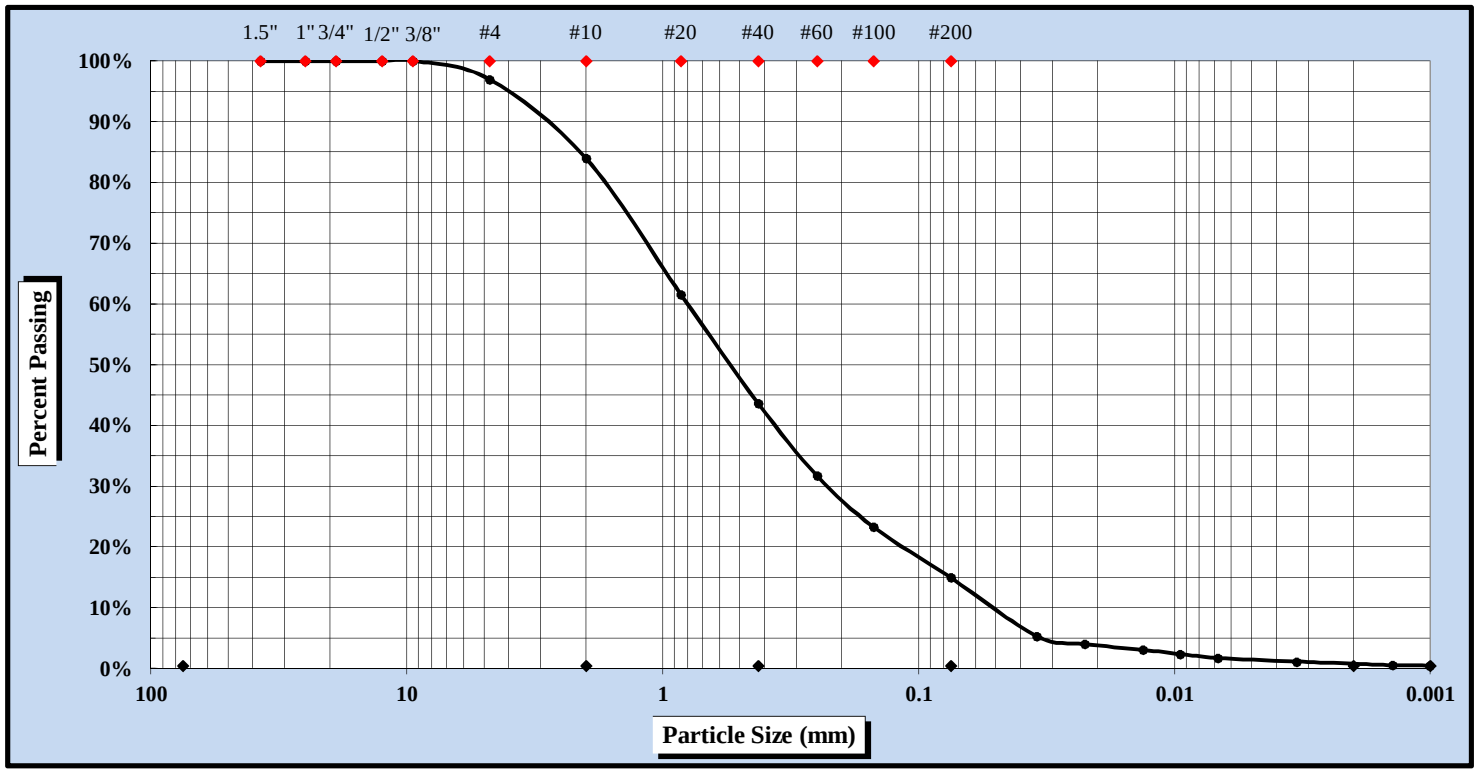
Form No. TR-126-T88-2
Revision No. 0
Revision Date: 08/17/11

Particle Size Analysis of Soils
AASHTO T 88

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

S&ME Project #:	1426-15-009 (Phase	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/09 - 4/15/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-8 (Lower)	Type:	Split-spoon	Depth:	24 - 25'
Sample Description:	Silty SAND (SM / A-1-b)				



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Gravel	16.0%	Coarse Sand	40.3%	Silt	14.1%
Maximum Particle Size	9.50 mm	Fine Sand	28.7%	Clay	0.8%
Apparent Relative Density	2.65	Moisture Content	15.9%	Silt & Clay (% Passing #200)	14.9%
Liquid Limit	N/A	Plastic Limit	N/A	Plastic Index	N/A
		Moisture Content	15.9%	Group Index	N/A

$Cc = D_{30}^2/(D_{10} \times D_{60}) =$ **1.272** $Cu = D_{60}/D_{10} =$ **15.385**

D10 = **0.052** D30 = **0.23** D60 = **0.80** D50 = D90 =

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

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T 88: Particle Size Analysis of Soils AASHTO R 58: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes AASHTO T 100: Specific Gravity of Soils
AASHTO T 265: Laboratory Determination of Moisture Content of Soils

Technical Responsibility: Gant Taylor, P.E. *Signature* Project Mgr. / Senior Engr. *Signature*

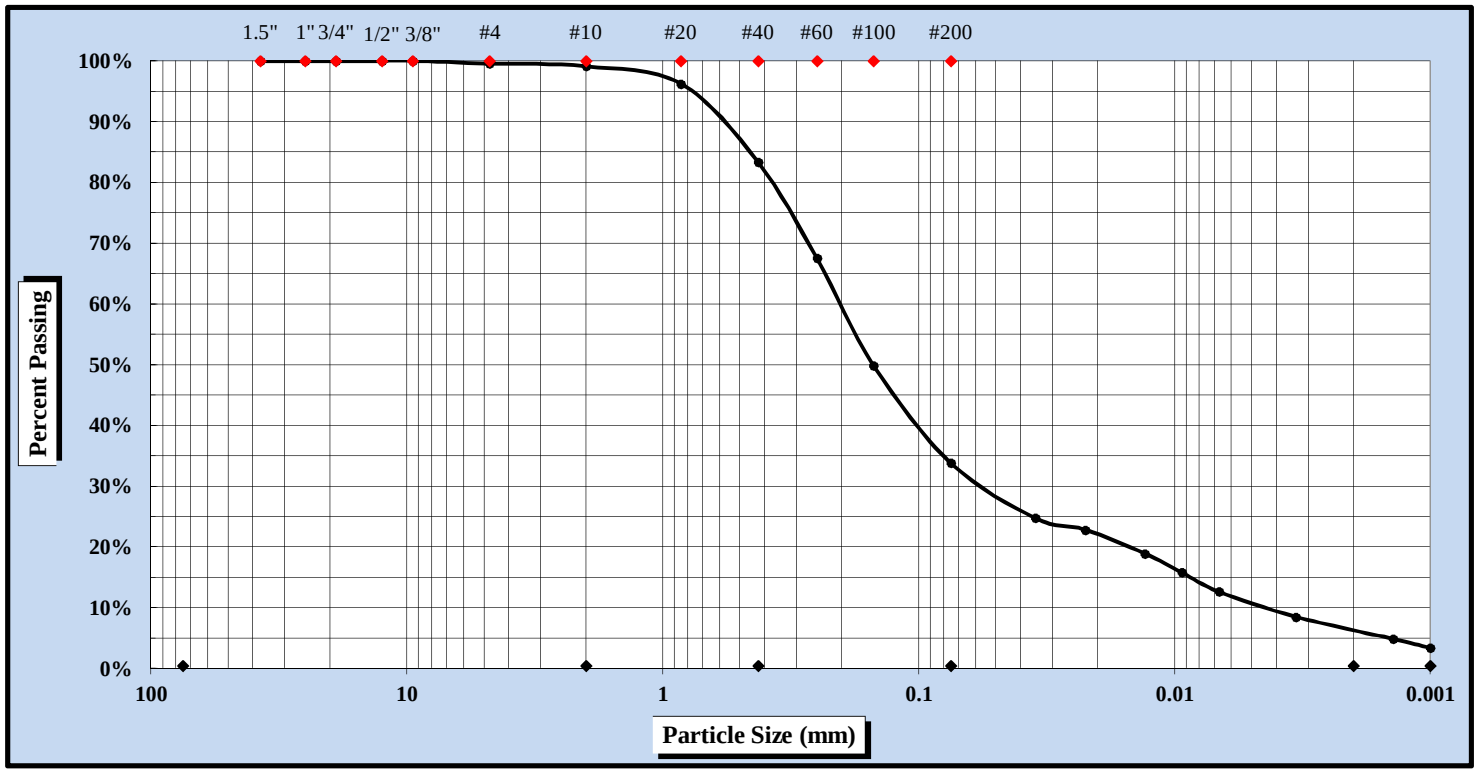
Form No. TR-126-T88-2
Revision No. 0
Revision Date: 08/17/11

Particle Size Analysis of Soils
AASHTO T 88

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

S&ME Project #:	1426-15-009 (Phase	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/05 - 4/10/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-9	Type:	Split-spoon	Depth:	28.5 - 30'
Sample Description:	Silty SAND (SM / A-2-4)				



As Defined by AASHTO		Fine Sand	< 0.425 mm and > 0.075 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.075 and > 0.002 mm
Coarse Sand	< 2.00 mm and > 0.425 mm	Clay	< 0.002 mm

Gravel	0.9%	Coarse Sand	15.7%	Silt	27.1%
Maximum Particle Size	2.00 mm	Fine Sand	49.6%	Clay	6.7%
Apparent Relative Density	2.65	Moisture Content	30.1%	Silt & Clay (% Passing #200)	33.8%
Liquid Limit	29	Plastic Limit	24	Plastic Index	5
		Moisture Content	30.1%	Group Index	N/A

$Cc = D_{30}^2/(D_{10} \times D_{60})$ = **0.361** $Cu = D_{60}/D_{10}$ = **4.444**

D10 = **0.045** D30 = **0.06** D60 = **0.20** D50 = D90 =

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

Mechanical Stirring Apparatus (A) Length of Dispersion Period: 1 min. Dispersing Agent: Sodium Hexametaphosphate: 40 g./ Liter

References: AASHTO T 88: Particle Size Analysis of Soils AASHTO R 58: Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test
AASHTO T 89: Determining the Liquid Limit of Soils AASHTO T 90: Determining the Plastic Limit & Plasticity Index of Soils
AASHTO M 145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes AASHTO T 100: Specific Gravity of Soils
AASHTO T 265: Laboratory Determination of Moisture Content of Soils

Technical Responsibility: Gant Taylor, P.E. *Signature* Project Mgr. / Senior Engr. *Signature*

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* ☒

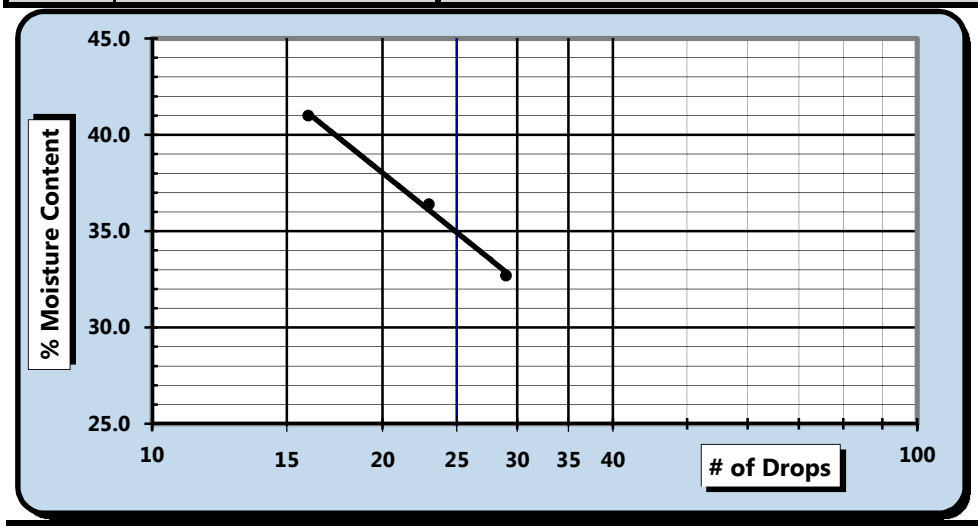
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/27/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
Sample Description:	Clayey SAND (SC / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	26.70	26.46	26.30				25.92		
B	Wet Soil Weight + A	47.48	46.37	43.90				37.35		
C	Dry Soil Weight + A	42.36	41.06	38.78				35.12		
D	Water Weight (B-C)	5.12	5.31	5.12				2.23		
E	Dry Soil Weight (C-A)	15.66	14.60	12.48				9.20		
F	% Moisture (D/E)*100	32.7%	36.4%	41.0%				24.2%		
N	# OF DROPS	29	23	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							24.2%		



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	**35**
Plastic Limit	**24**
Plastic Index	**11**
Group Symbol	**SC/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 39.4%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

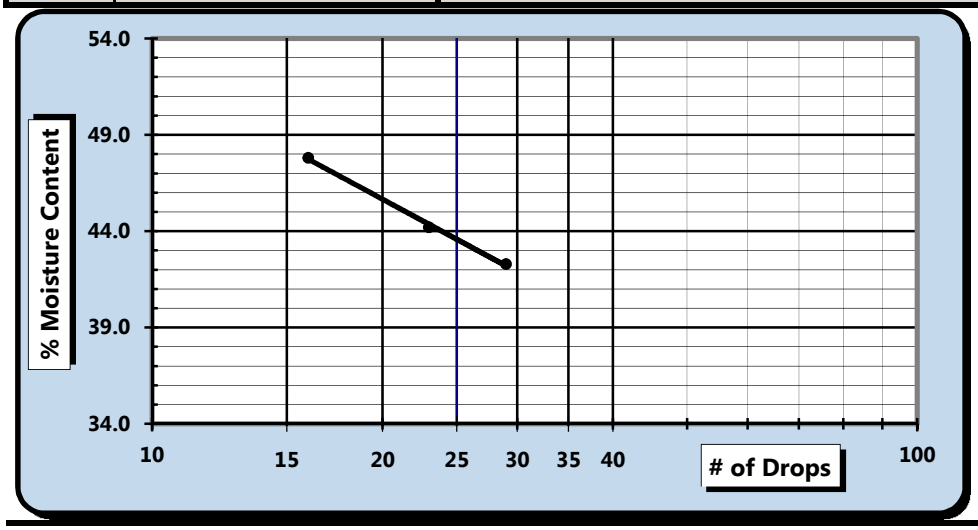
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/27/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-5	Type:	Split-spoon	Depth:	8 - 10'
Sample Description:	Silty SAND (SM / A-7-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.96	27.83	26.30				27.30		
B	Wet Soil Weight + A	45.63	44.88	41.64				37.69		
C	Dry Soil Weight + A	40.08	39.65	36.68				35.17		
D	Water Weight (B-C)	5.55	5.23	4.96				2.52		
E	Dry Soil Weight (C-A)	13.12	11.82	10.38				7.87		
F	% Moisture (D/E)*100	42.3%	44.2%	47.8%				32.0%		
N	# OF DROPS	29	23	16				*Moisture Contents determined by AASHTO T 265*		
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	**44**
Plastic Limit	**32**
Plastic Index	**12**
Group Symbol	**SM/A-7-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 43.8%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

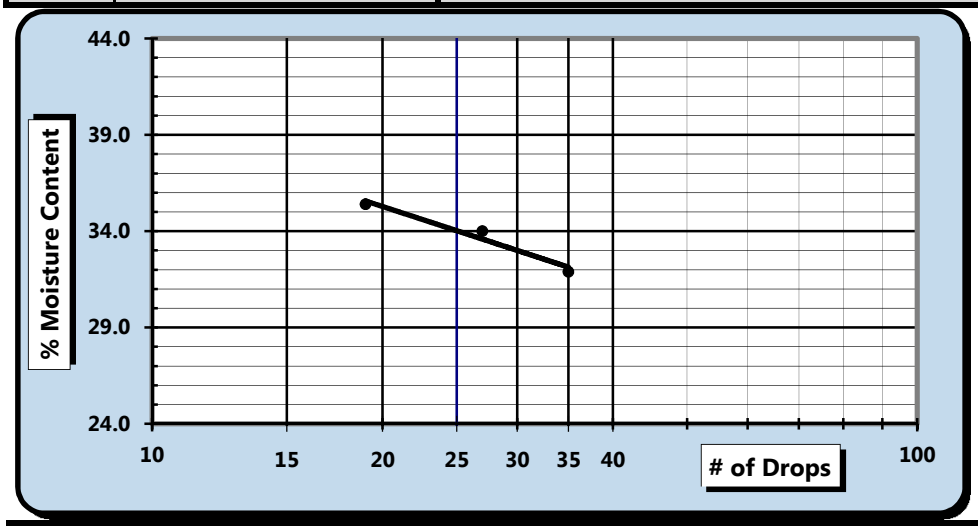
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-7	Type:	Split-spoon	Depth:	18.5 - 20'
Sample Description:	Clayey SAND (SC / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.83	26.74	26.66				26.64		
B	Wet Soil Weight + A	48.06	47.30	44.14				37.33		
C	Dry Soil Weight + A	42.92	42.08	39.57				35.29		
D	Water Weight (B-C)	5.14	5.22	4.57				2.04		
E	Dry Soil Weight (C-A)	16.09	15.34	12.91				8.65		
F	% Moisture (D/E)*100	31.9%	34.0%	35.4%				23.6%		
N	# OF DROPS	35	27	19				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							23.6%		



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	**34**
Plastic Limit	**24**
Plastic Index	**10**
Group Symbol	**SC/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 48.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

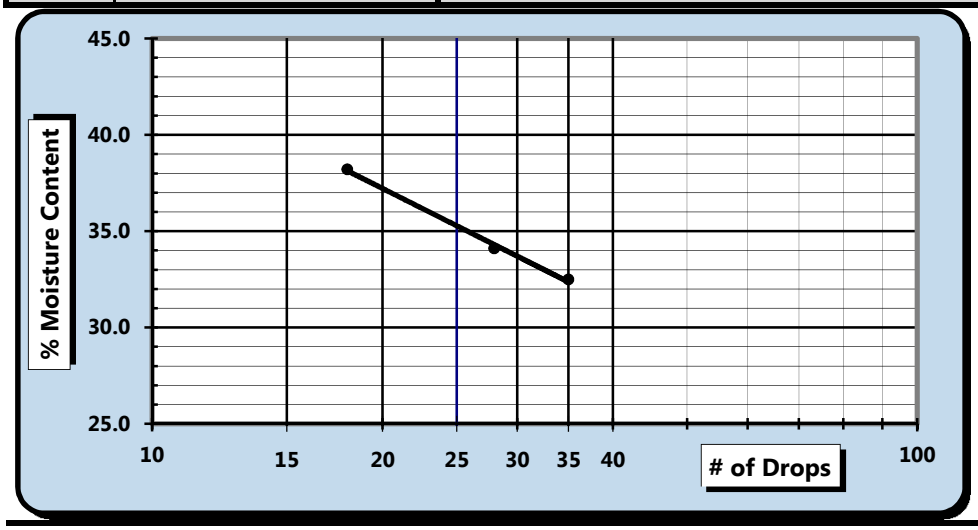
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-8	Type:	Split-spoon	Depth:	23.5 - 25'
Sample Description:	Silty SAND (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	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	13	14	15				16		
A	Tare Weight	26.78	26.64	27.58				26.58		
B	Wet Soil Weight + A	44.33	43.76	46.25				37.10		
C	Dry Soil Weight + A	40.03	39.41	41.09				34.90		
D	Water Weight (B-C)	4.30	4.35	5.16				2.20		
E	Dry Soil Weight (C-A)	13.25	12.77	13.51				8.32		
F	% Moisture (D/E)*100	32.5%	34.1%	38.2%				26.4%		
N	# OF DROPS	35	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.4%		



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 **35**
Plastic Limit **26**
Plastic Index **9**
Group Symbol **SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 30.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

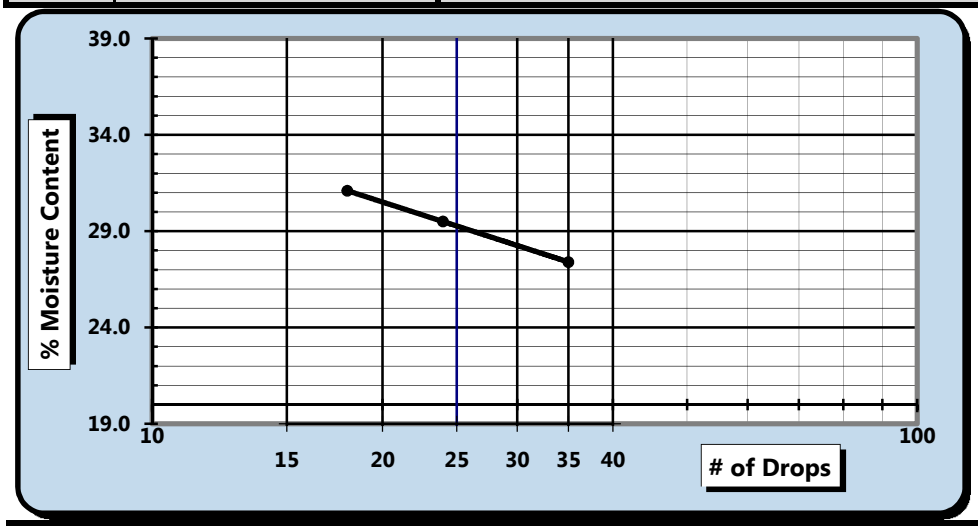
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/15/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-3	Type:	Split-spoon	Depth:	5 - 7'
Sample Description:	Silty SAND (SM / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	26	27	28				29		
A	Tare Weight	27.31	26.93	26.80				27.00		
B	Wet Soil Weight + A	42.83	47.12	44.43				39.81		
C	Dry Soil Weight + A	39.49	42.52	40.25				37.31		
D	Water Weight (B-C)	3.34	4.60	4.18				2.50		
E	Dry Soil Weight (C-A)	12.18	15.59	13.45				10.31		
F	% Moisture (D/E)*100	27.4%	29.5%	31.1%				24.2%		
N	# OF DROPS	35	24	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							24.2%		



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	**29**
Plastic Limit	**24**
Plastic Index	**5**
Group Symbol	**SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 37.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/16/19	Gant Taylor, P.E.	4/16/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

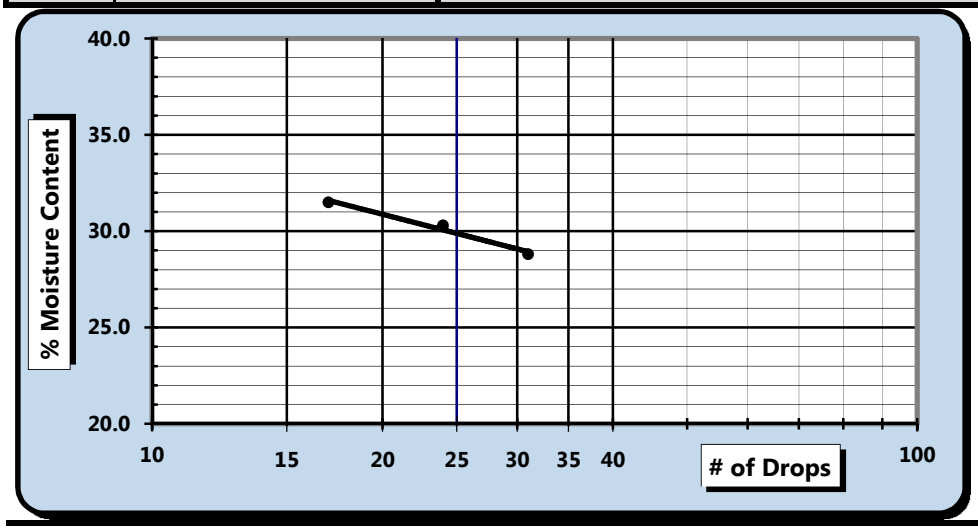
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/15/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-6	Type:	Split-spoon	Depth:	13.5 - 15'
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	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	26.69	26.46	26.31				25.92		
B	Wet Soil Weight + A	46.87	44.58	46.81				39.39		
C	Dry Soil Weight + A	42.36	40.37	41.90				36.83		
D	Water Weight (B-C)	4.51	4.21	4.91				2.56		
E	Dry Soil Weight (C-A)	15.67	13.91	15.59				10.91		
F	% Moisture (D/E)*100	28.8%	30.3%	31.5%				23.5%		
N	# OF DROPS	31	24	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							23.5%		



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	**30**
Plastic Limit	**24**
Plastic Index	**6**
Group Symbol	**SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 43.2%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/16/19	Gant Taylor, P.E.	4/16/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

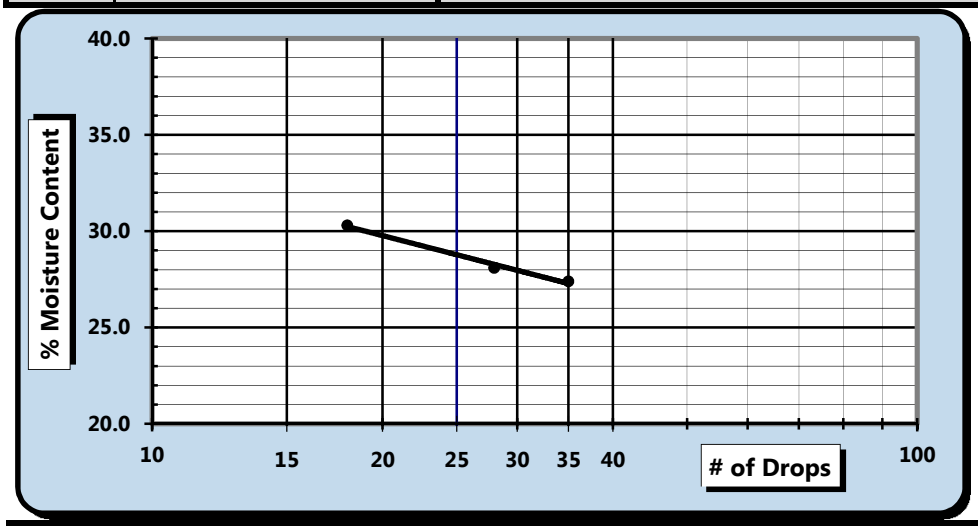
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/15/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	SS-9	Type:	Split-spoon	Depth:	28.5 - 30'
Sample Description:	Silty SAND (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	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.85	26.75	26.67				26.65		
B	Wet Soil Weight + A	40.66	44.13	44.68				39.25		
C	Dry Soil Weight + A	37.69	40.32	40.49				36.81		
D	Water Weight (B-C)	2.97	3.81	4.19				2.44		
E	Dry Soil Weight (C-A)	10.84	13.57	13.82				10.16		
F	% Moisture (D/E)*100	27.4%	28.1%	30.3%				24.0%		
N	# OF DROPS	35	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							24.0%		



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	**29**
Plastic Limit	**24**
Plastic Index	**5**
Group Symbol	**SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 33.8%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/16/19	Gant Taylor, P.E.	4/16/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

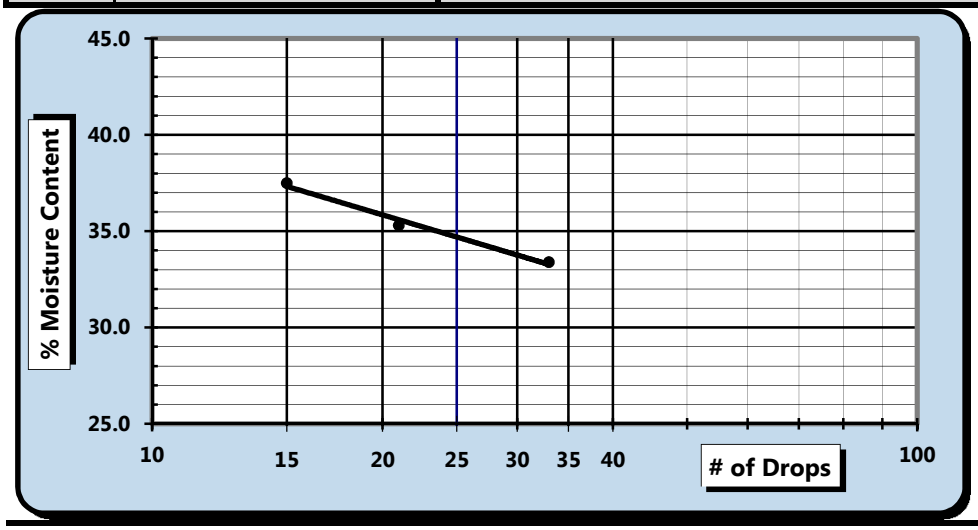
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
Sample Description:	Sandy LEAN CLAY (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	17	18	19				20		
A	Tare Weight	26.63	26.78	26.66				26.82		
B	Wet Soil Weight + A	42.26	44.48	44.13				37.53		
C	Dry Soil Weight + A	38.35	39.86	39.37				35.66		
D	Water Weight (B-C)	3.91	4.62	4.76				1.87		
E	Dry Soil Weight (C-A)	11.72	13.08	12.71				8.84		
F	% Moisture (D/E)*100	33.4%	35.3%	37.5%				21.2%		
N	# OF DROPS	33	21	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							21.2%		



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	**35**
Plastic Limit	**21**
Plastic Index	**14**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 54.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

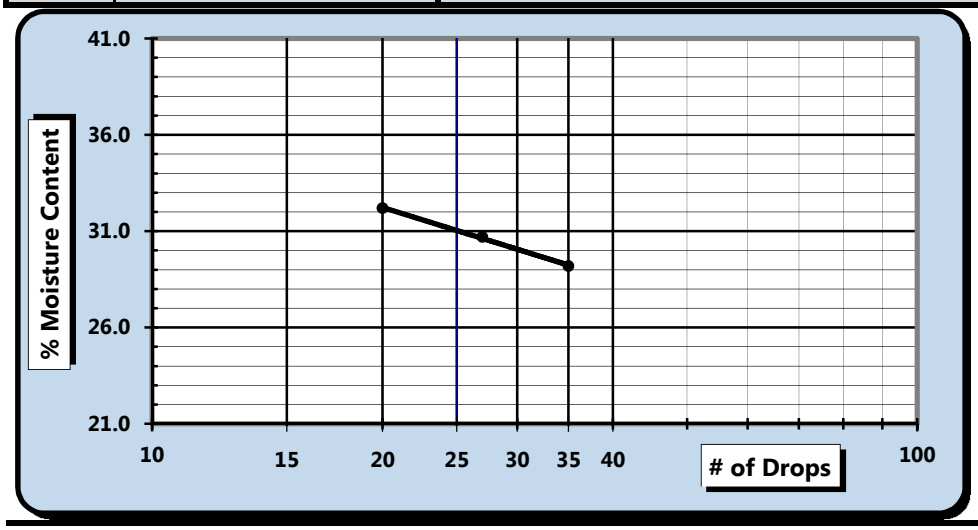
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-3	Type:	Split-spoon	Depth:	4 - 6'
Sample Description:	Sandy LEAN CLAY (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24		
A	Tare Weight	28.07	25.66	27.23				25.98		
B	Wet Soil Weight + A	45.14	43.35	46.99				37.88		
C	Dry Soil Weight + A	41.28	39.19	42.18				35.90		
D	Water Weight (B-C)	3.86	4.16	4.81				1.98		
E	Dry Soil Weight (C-A)	13.21	13.53	14.95				9.92		
F	% Moisture (D/E)*100	29.2%	30.7%	32.2%				20.0%		
N	# OF DROPS	35	27	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							20.0%		



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	**31**
Plastic Limit	**20**
Plastic Index	**11**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 55.9%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

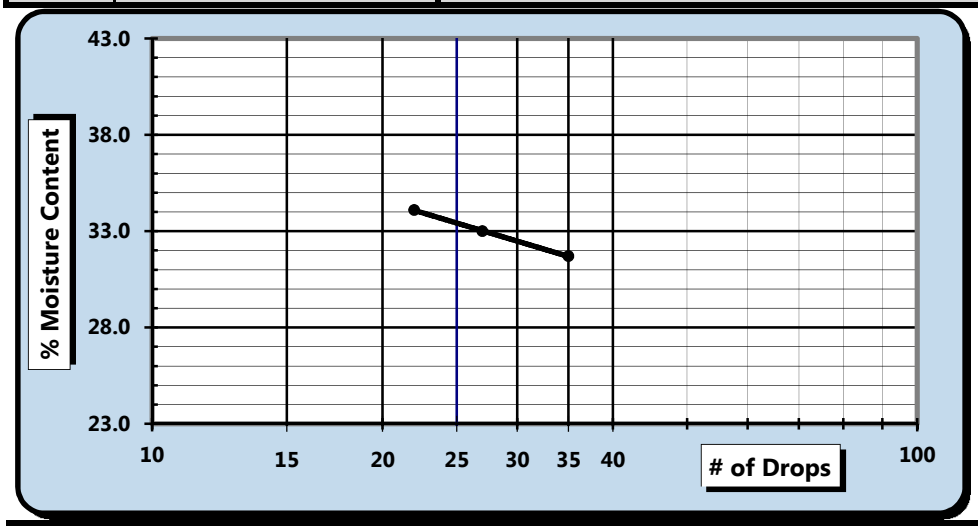
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-5	Type:	Split-spoon	Depth:	8 - 10'
Sample Description:	LEAN CLAY with Sand (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	27	25	26				28		
A	Tare Weight	26.92	26.78	27.33				26.80		
B	Wet Soil Weight + A	43.64	42.02	45.35				38.38		
C	Dry Soil Weight + A	39.62	38.24	40.77				36.43		
D	Water Weight (B-C)	4.02	3.78	4.58				1.95		
E	Dry Soil Weight (C-A)	12.70	11.46	13.44				9.63		
F	% Moisture (D/E)*100	31.7%	33.0%	34.1%				20.2%		
N	# OF DROPS	35	27	22				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							20.2%		



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	**33**
Plastic Limit	**20**
Plastic Index	**13**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 78.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

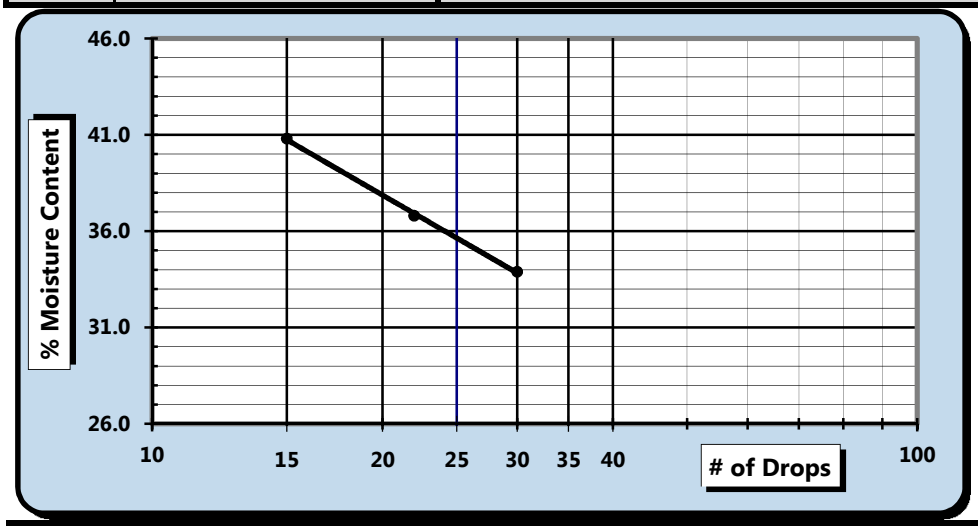
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-8	Type:	Split-spoon	Depth:	23.5 - 25'
Sample Description:	Silty SAND (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	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	29	30	31				32		
A	Tare Weight	26.98	27.36	28.60				27.60		
B	Wet Soil Weight + A	46.48	45.10	46.31				38.38		
C	Dry Soil Weight + A	41.54	40.33	41.18				36.11		
D	Water Weight (B-C)	4.94	4.77	5.13				2.27		
E	Dry Soil Weight (C-A)	14.56	12.97	12.58				8.51		
F	% Moisture (D/E)*100	33.9%	36.8%	40.8%				26.7%		
N	# OF DROPS	30	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.7%		



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	**36**
Plastic Limit	**27**
Plastic Index	**9**
Group Symbol	**SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 34.0%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

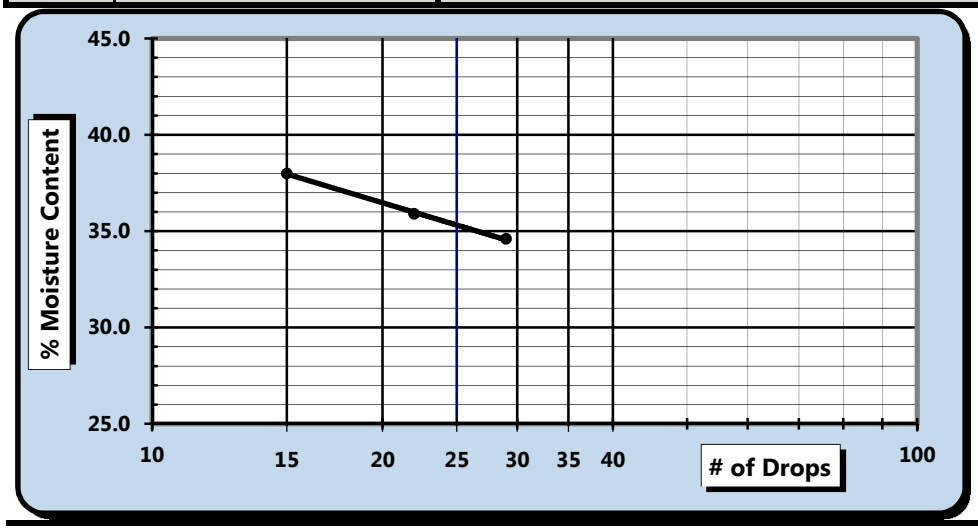
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/23/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/22/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-1	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
Sample Description:	Sandy LEAN CLAY (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	26.70	26.47	26.31				25.92		
B	Wet Soil Weight + A	45.60	42.26	43.57				39.34		
C	Dry Soil Weight + A	40.74	38.09	38.82				36.88		
D	Water Weight (B-C)	4.86	4.17	4.75				2.46		
E	Dry Soil Weight (C-A)	14.04	11.62	12.51				10.96		
F	% Moisture (D/E)*100	34.6%	35.9%	38.0%				22.4%		
N	# OF DROPS	29	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							22.4%		



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	**35**
Plastic Limit	**22**
Plastic Index	**13**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 55.9%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/23/19	Gant Taylor, P.E.	4/23/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

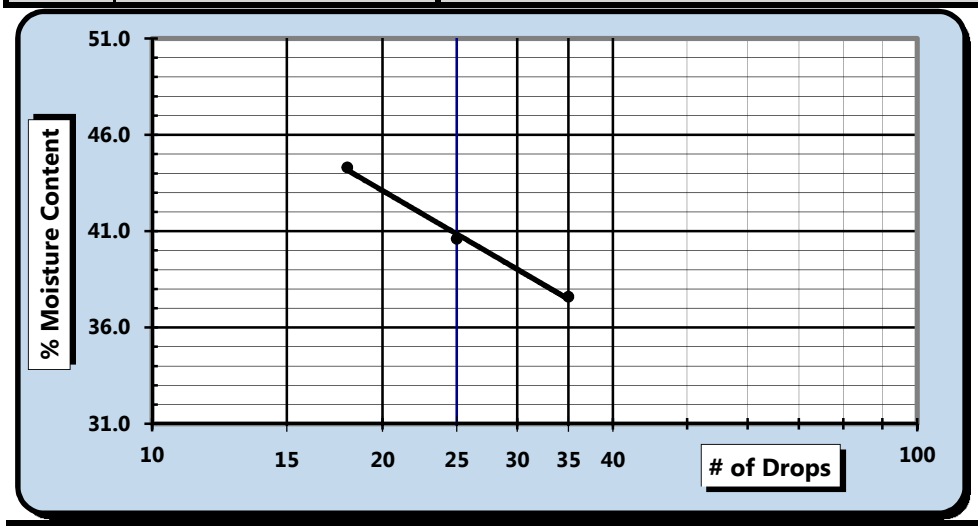
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/23/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/22/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-1	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-3	Type:	Split-spoon	Depth:	4 - 6'
Sample Description:	Sandy SILT (ML / A-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.98	27.80	26.29				27.29		
B	Wet Soil Weight + A	43.37	46.18	44.00				39.88		
C	Dry Soil Weight + A	38.89	40.87	38.56				36.91		
D	Water Weight (B-C)	4.48	5.31	5.44				2.97		
E	Dry Soil Weight (C-A)	11.91	13.07	12.27				9.62		
F	% Moisture (D/E)*100	37.6%	40.6%	44.3%				30.9%		
N	# OF DROPS	35	25	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							30.9%		



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	**41**
Plastic Limit	**31**
Plastic Index	**10**
Group Symbol	**ML/A-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 51.4%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/23/19	Gant Taylor, P.E.	4/23/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

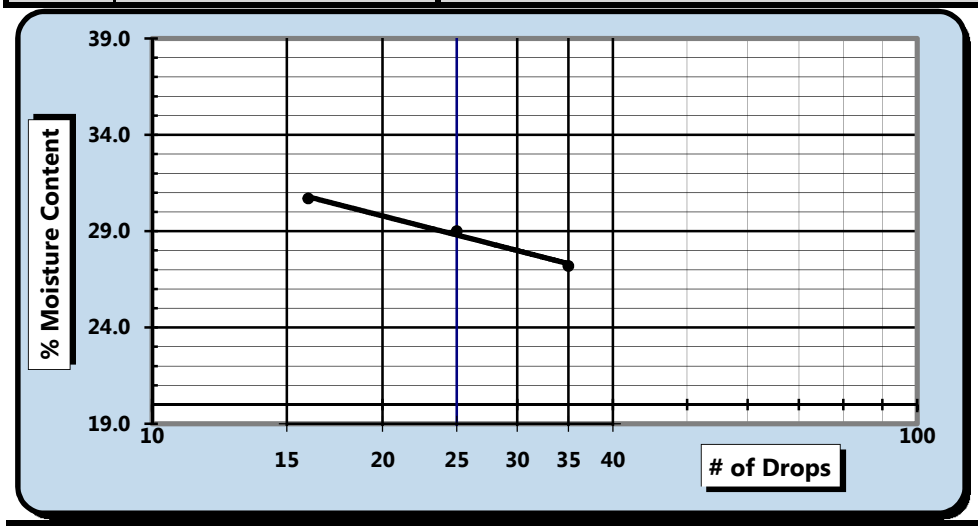
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/23/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/22/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-1	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-5	Type:	Split-spoon	Depth:	8 - 10'
Sample Description:	Sandy LEAN CLAY (CL / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.83	26.75	26.67				26.65		
B	Wet Soil Weight + A	48.46	45.19	46.01				40.65		
C	Dry Soil Weight + A	43.84	41.04	41.47				38.21		
D	Water Weight (B-C)	4.62	4.15	4.54				2.44		
E	Dry Soil Weight (C-A)	17.01	14.29	14.80				11.56		
F	% Moisture (D/E)*100	27.2%	29.0%	30.7%				21.1%		
N	# OF DROPS	35	25	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							21.1%		



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 **29**
Plastic Limit **21**
Plastic Index **8**
Group Symbol **CL/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 55.0%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/23/19	Gant Taylor, P.E.	4/23/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

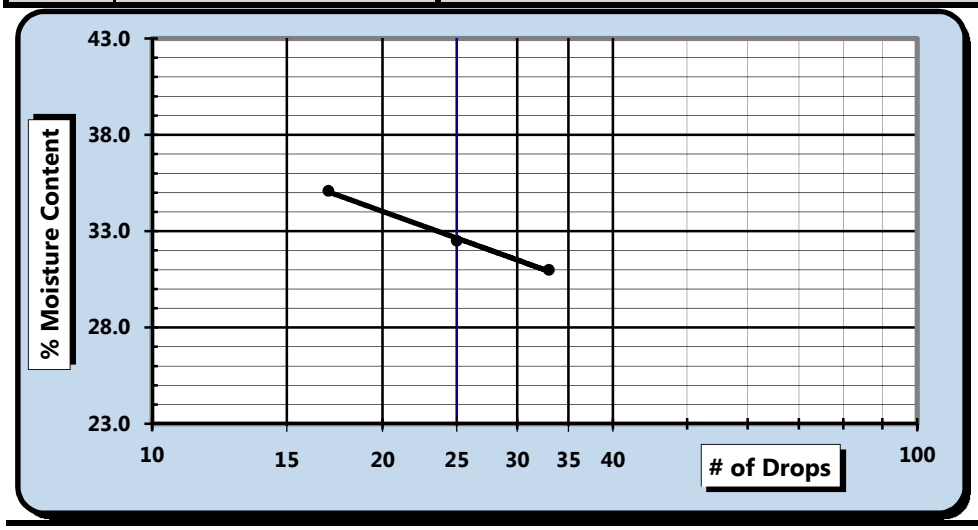
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-2	Type:	Split-spoon	Depth:	2 - 4'
Sample Description:	Silty SAND (SM / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	33	34	35				36		
A	Tare Weight	26.68	28.26	26.96				25.64		
B	Wet Soil Weight + A	45.61	48.69	45.12				37.71		
C	Dry Soil Weight + A	41.13	43.68	40.40				35.24		
D	Water Weight (B-C)	4.48	5.01	4.72				2.47		
E	Dry Soil Weight (C-A)	14.45	15.42	13.44				9.60		
F	% Moisture (D/E)*100	31.0%	32.5%	35.1%				25.7%		
N	# OF DROPS	33	25	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							25.7%		



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 **33**
Plastic Limit **26**
Plastic Index **7**
Group Symbol **SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 37.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

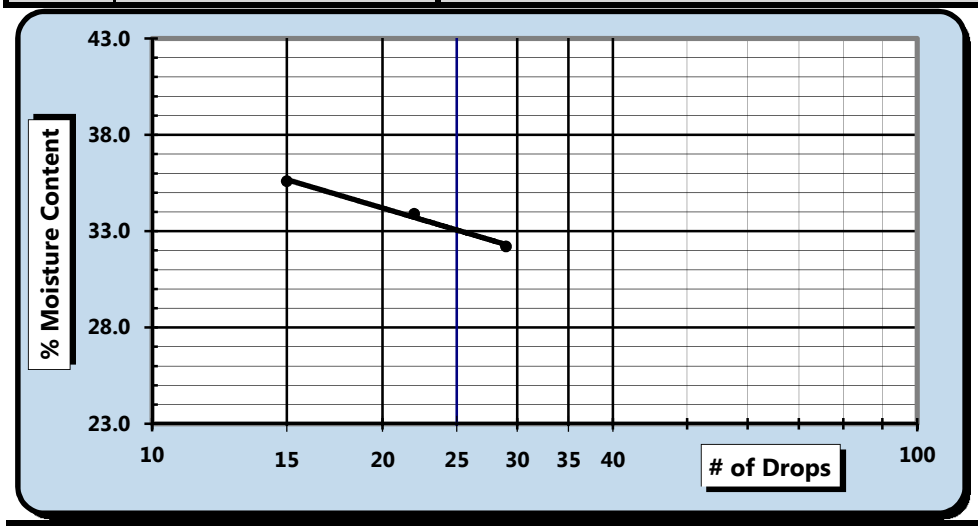
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/28/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-4	Type:	Split-spoon	Depth:	6 - 8'
Sample Description:	Silty SAND (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	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	37	28	39				40		
A	Tare Weight	26.19	26.29	25.88				26.27		
B	Wet Soil Weight + A	44.70	46.69	46.75				38.90		
C	Dry Soil Weight + A	40.19	41.53	41.27				36.26		
D	Water Weight (B-C)	4.51	5.16	5.48				2.64		
E	Dry Soil Weight (C-A)	14.00	15.24	15.39				9.99		
F	% Moisture (D/E)*100	32.2%	33.9%	35.6%				26.4%		
N	# OF DROPS	29	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.4%		



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 **33**
Plastic Limit **26**
Plastic Index **7**
Group Symbol **SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 30.2%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

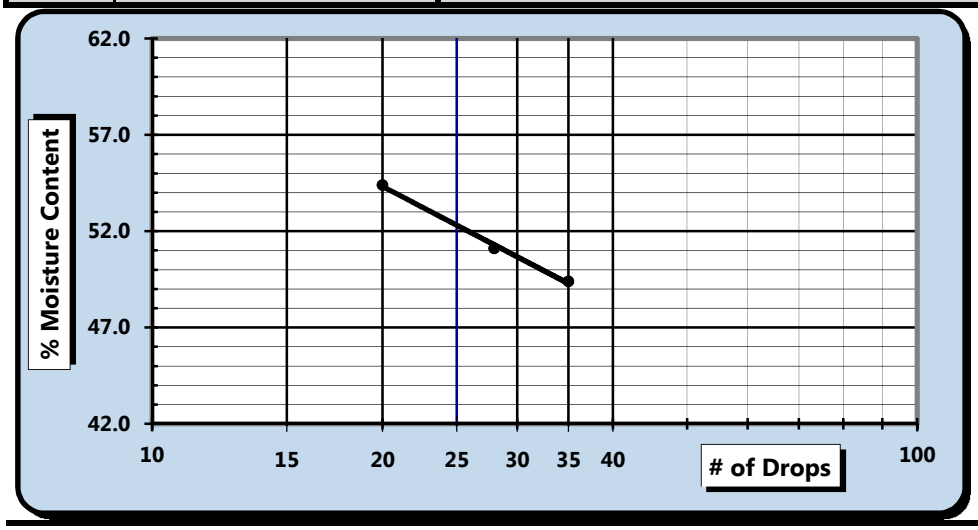
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/29/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-7	Type:	Split-spoon	Depth:	18.5 - 20'
Sample Description:	Silty SAND (SM / A-2-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	7	8	9				10		
A	Tare Weight	26.29	27.31	26.84				26.75		
B	Wet Soil Weight + A	38.32	40.32	41.72				36.82		
C	Dry Soil Weight + A	34.34	35.92	36.48				33.79		
D	Water Weight (B-C)	3.98	4.40	5.24				3.03		
E	Dry Soil Weight (C-A)	8.05	8.61	9.64				7.04		
F	% Moisture (D/E)*100	49.4%	51.1%	54.4%				43.0%		
N	# OF DROPS	35	28	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							43.0%		



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 **52**
Plastic Limit **43**
Plastic Index **9**
Group Symbol **SM/A-2-5**
Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 24.7%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

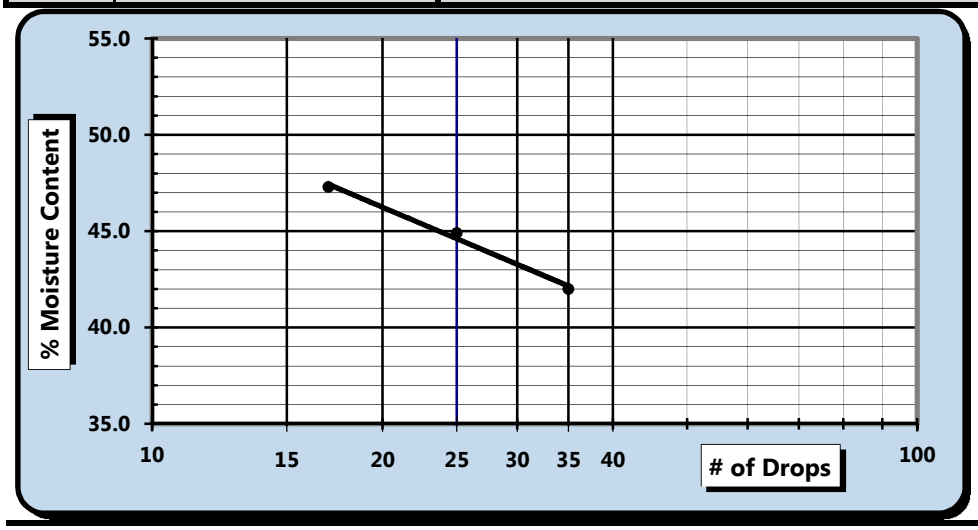
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/29/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
Sample Description:	Sandy LEAN CLAY (CL / A-7-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14		
A	Tare Weight	26.66	26.64	26.77				26.65		
B	Wet Soil Weight + A	44.16	42.48	44.11				37.54		
C	Dry Soil Weight + A	38.98	37.57	38.54				35.54		
D	Water Weight (B-C)	5.18	4.91	5.57				2.00		
E	Dry Soil Weight (C-A)	12.32	10.93	11.77				8.89		
F	% Moisture (D/E)*100	42.0%	44.9%	47.3%				22.5%		
N	# OF DROPS	35	25	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							22.5%		



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	**45**
Plastic Limit	**23**
Plastic Index	**22**
Group Symbol	**CL/A-7-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 51.0%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

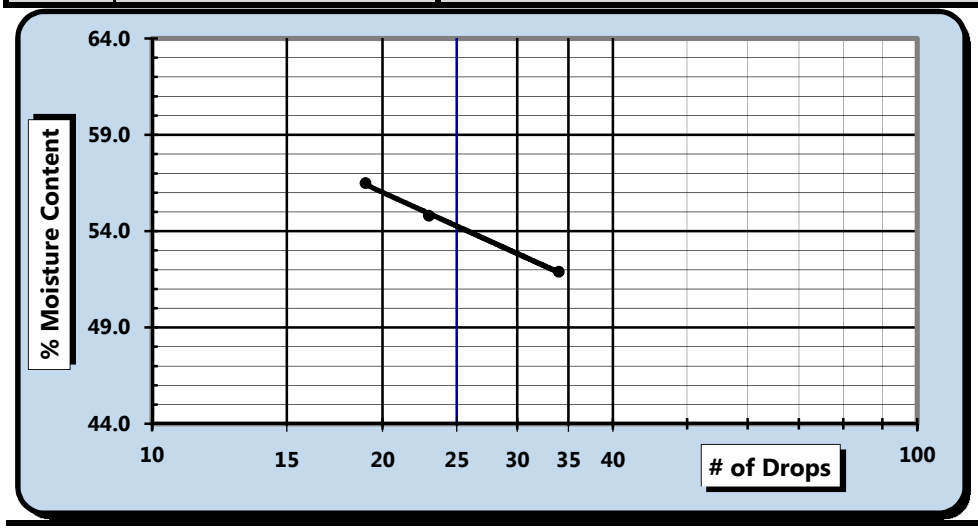
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/29/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-2	Type:	Split-spoon	Depth:	2 - 4'
Sample Description:	Sandy ELASTIC SILT (MH / A-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	15	16	17				18		
A	Tare Weight	27.58	26.57	26.64				26.77		
B	Wet Soil Weight + A	44.49	43.67	43.78				36.91		
C	Dry Soil Weight + A	38.71	37.62	37.59				33.77		
D	Water Weight (B-C)	5.78	6.05	6.19				3.14		
E	Dry Soil Weight (C-A)	11.13	11.05	10.95				7.00		
F	% Moisture (D/E)*100	51.9%	54.8%	56.5%				44.9%		
N	# OF DROPS	34	23	19				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							44.9%		



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	**54**
Plastic Limit	**45**
Plastic Index	**9**
Group Symbol	**MH/A-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 51.4%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

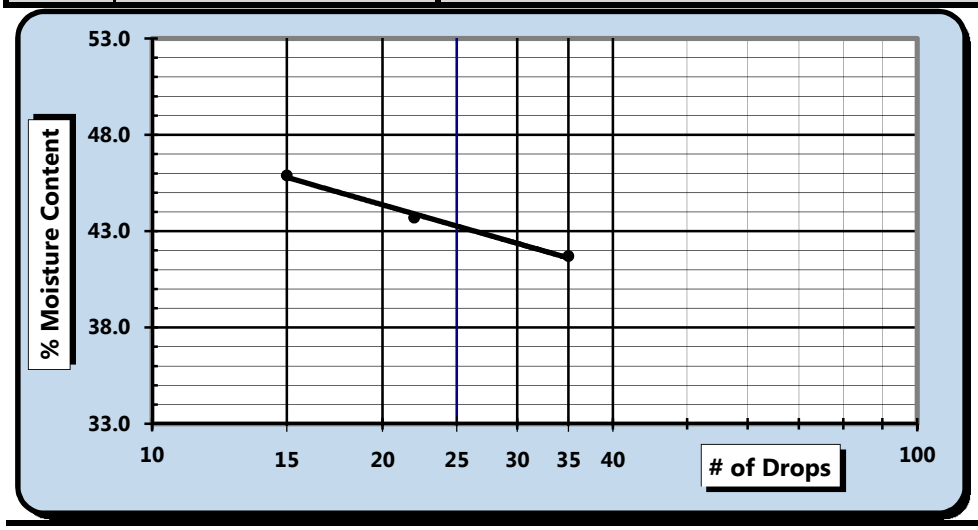
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/29/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-1	Log #:	25g	Sample Date:	Various
Sample #:	SS-4	Type:	Split-spoon	Depth:	6 - 8'
Sample Description:	Sandy SILT (ML / A-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	19	20	21				22		
A	Tare Weight	26.68	26.82	28.07				25.67		
B	Wet Soil Weight + A	42.44	46.78	45.53				36.16		
C	Dry Soil Weight + A	37.80	40.71	40.04				33.45		
D	Water Weight (B-C)	4.64	6.07	5.49				2.71		
E	Dry Soil Weight (C-A)	11.12	13.89	11.97				7.78		
F	% Moisture (D/E)*100	41.7%	43.7%	45.9%				34.8%		
N	# OF DROPS	35	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							34.8%		



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	**43**
Plastic Limit	**35**
Plastic Index	**8**
Group Symbol	**ML/A-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 51.7%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

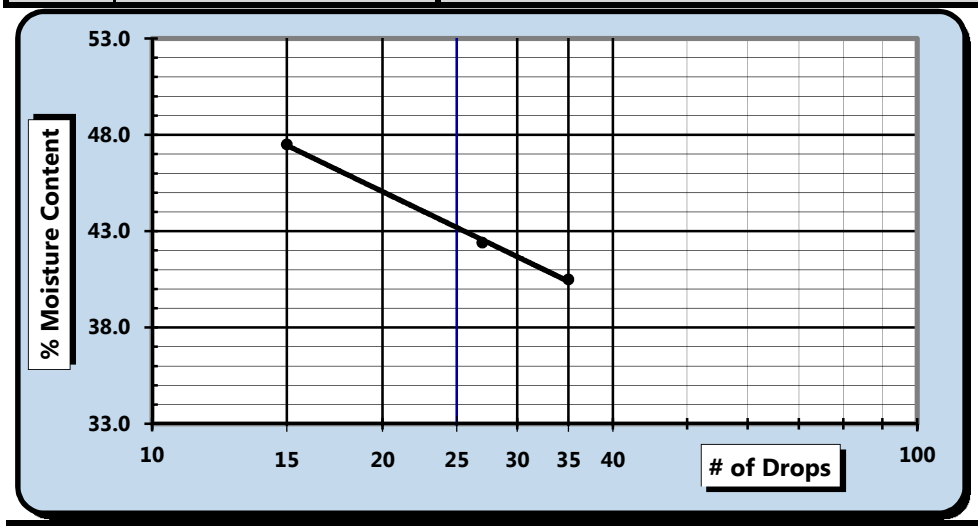
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/01/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	3/29/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
Sample Description:	Silty SAND (SM / A-7-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23214	11/11/2018
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	23	24	25				26		
A	Tare Weight	27.25	25.99	26.79				27.33		
B	Wet Soil Weight + A	47.41	45.58	44.28				39.71		
C	Dry Soil Weight + A	41.60	39.75	38.65				36.75		
D	Water Weight (B-C)	5.81	5.83	5.63				2.96		
E	Dry Soil Weight (C-A)	14.35	13.76	11.86				9.42		
F	% Moisture (D/E)*100	40.5%	42.4%	47.5%				31.4%		
N	# OF DROPS	35	27	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							31.4%		



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	**43**
Plastic Limit	**31**
Plastic Index	**12**
Group Symbol	**SM/A-7-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 46.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/01/19	Gant Taylor, P.E.	4/01/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

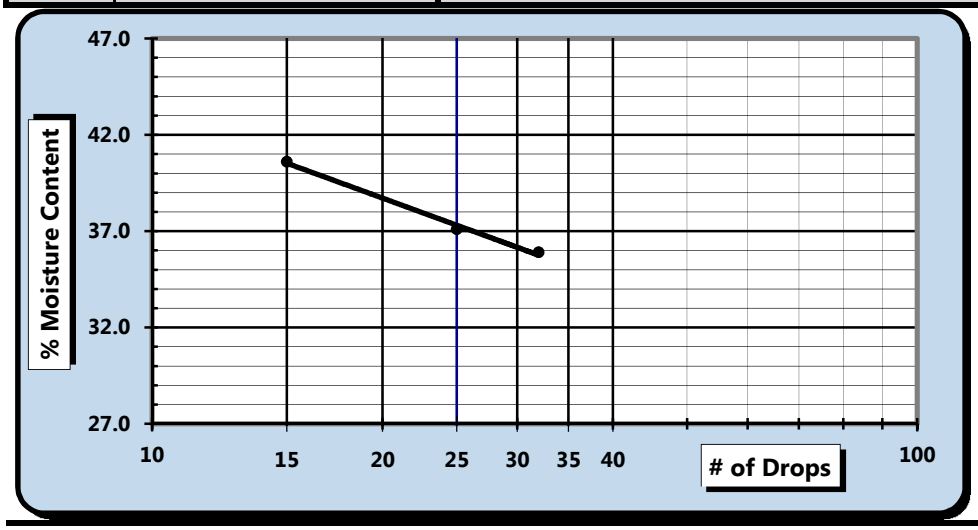
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/03/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/02/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-3	Type:	Split-spoon	Depth:	4 - 6'
Sample Description:	Sandy LEAN CLAY (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.95	27.82	26.79				27.30		
B	Wet Soil Weight + A	42.44	44.96	45.38				37.51		
C	Dry Soil Weight + A	38.35	40.32	40.01				35.64		
D	Water Weight (B-C)	4.09	4.64	5.37				1.87		
E	Dry Soil Weight (C-A)	11.40	12.50	13.22				8.34		
F	% Moisture (D/E)*100	35.9%	37.1%	40.6%				22.4%		
N	# OF DROPS	32	25	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							22.4%		



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	**37**
Plastic Limit	**22**
Plastic Index	**15**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 59.1%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/03/19	Gant Taylor, P.E.	4/03/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

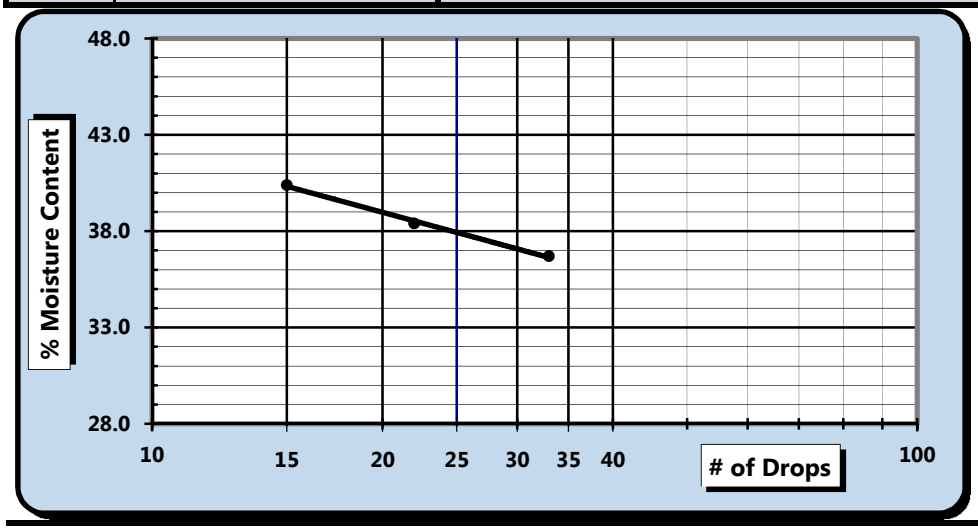
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/03/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/02/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-4	Type:	Split-spoon	Depth:	6 - 8'
Sample Description:	LEAN CLAY with Sand (CL / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.84	26.74	26.66				26.65		
B	Wet Soil Weight + A	43.26	43.50	43.66				38.81		
C	Dry Soil Weight + A	38.85	38.85	38.77				36.50		
D	Water Weight (B-C)	4.41	4.65	4.89				2.31		
E	Dry Soil Weight (C-A)	12.01	12.11	12.11				9.85		
F	% Moisture (D/E)*100	36.7%	38.4%	40.4%				23.5%		
N	# OF DROPS	33	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							23.5%		



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	**38**
Plastic Limit	**24**
Plastic Index	**14**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 71.0%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/03/19	Gant Taylor, P.E.	4/03/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

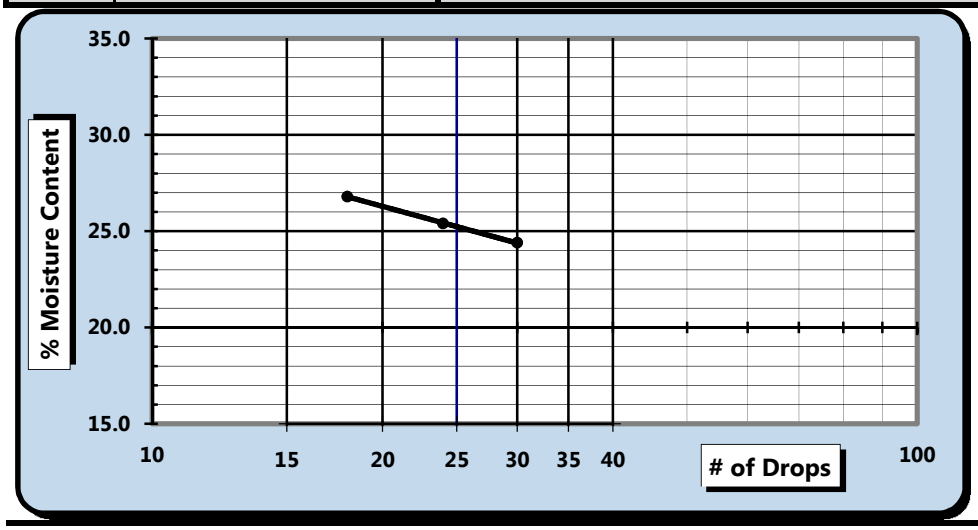
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/03/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/02/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-2	Log #:	25g	Sample Date:	Various
Sample #:	SS-5	Type:	Split-spoon	Depth:	8 - 10'
Sample Description:	Silty, Clayey SAND (SC-SM / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	13	14	15				16		
A	Tare Weight	26.77	26.65	27.59				26.58		
B	Wet Soil Weight + A	46.61	48.29	41.51				37.84		
C	Dry Soil Weight + A	42.72	43.91	38.57				36.13		
D	Water Weight (B-C)	3.89	4.38	2.94				1.71		
E	Dry Soil Weight (C-A)	15.95	17.26	10.98				9.55		
F	% Moisture (D/E)*100	24.4%	25.4%	26.8%				17.9%		
N	# OF DROPS	30	24	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							17.9%		



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	**25**
Plastic Limit	**18**
Plastic Index	**7**
Group Symbol	**SC-SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 35.9%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/03/19	Gant Taylor, P.E.	4/03/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

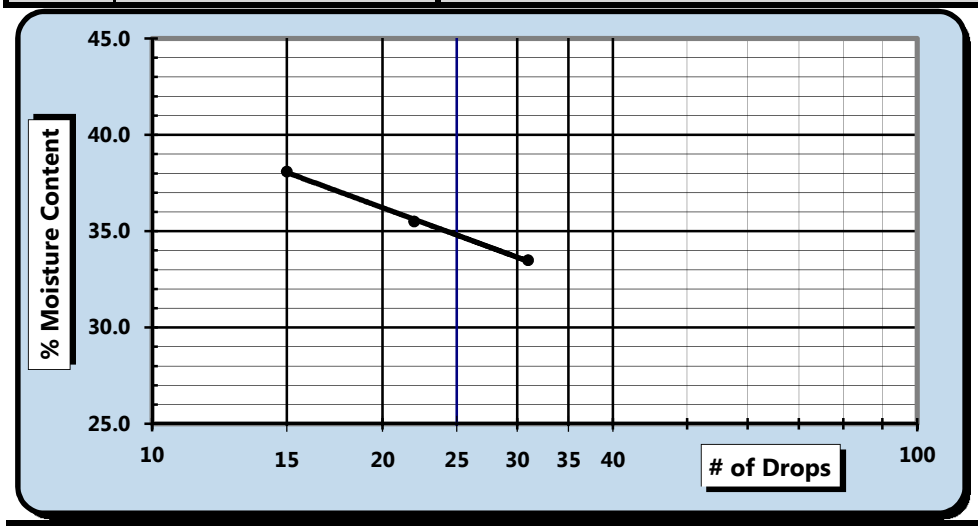
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/03/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/02/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-2	Type:	Split-spoon	Depth:	2 - 4'
Sample Description:	Clayey SAND (SC / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	17	18	19				20		
A	Tare Weight	26.65	26.79	26.68				26.82		
B	Wet Soil Weight + A	44.11	42.63	43.56				39.22		
C	Dry Soil Weight + A	39.73	38.48	38.90				37.04		
D	Water Weight (B-C)	4.38	4.15	4.66				2.18		
E	Dry Soil Weight (C-A)	13.08	11.69	12.22				10.22		
F	% Moisture (D/E)*100	33.5%	35.5%	38.1%				21.3%		
N	# OF DROPS	31	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							21.3%		



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	**35**
Plastic Limit	**21**
Plastic Index	**14**
Group Symbol	**SC/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 48.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/03/19	Gant Taylor, P.E.	4/03/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

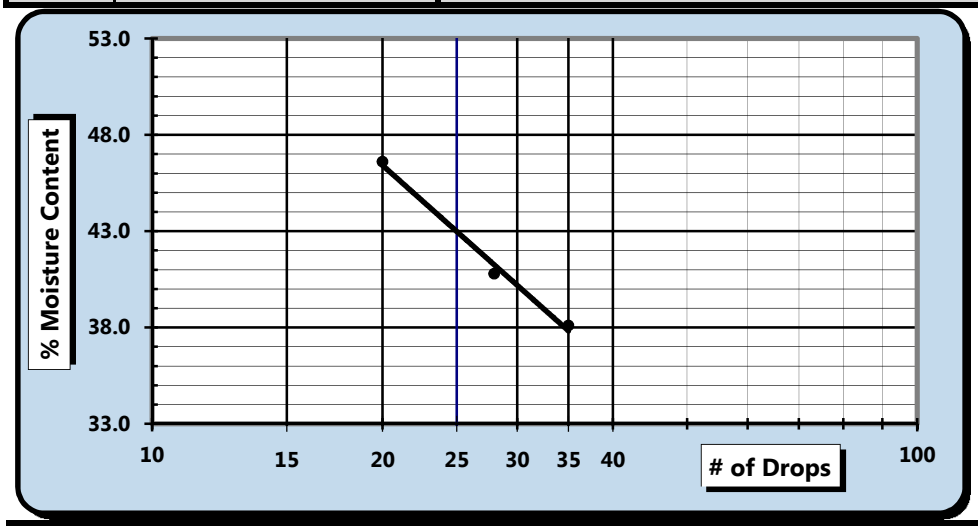
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/03/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/02/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-3	Log #:	25g	Sample Date:	Various
Sample #:	SS-4	Type:	Split-spoon	Depth:	6 - 8'
Sample Description:	Sandy SILT (ML / A-7-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24		
A	Tare Weight	28.09	25.67	27.24				25.98		
B	Wet Soil Weight + A	46.95	44.55	44.27				38.23		
C	Dry Soil Weight + A	41.75	39.08	38.86				35.29		
D	Water Weight (B-C)	5.20	5.47	5.41				2.94		
E	Dry Soil Weight (C-A)	13.66	13.41	11.62				9.31		
F	% Moisture (D/E)*100	38.1%	40.8%	46.6%				31.6%		
N	# OF DROPS	35	28	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							31.6%		



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	**43**
Plastic Limit	**32**
Plastic Index	**11**
Group Symbol	**ML/A-7-5**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 50.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/03/19	Gant Taylor, P.E.	4/03/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

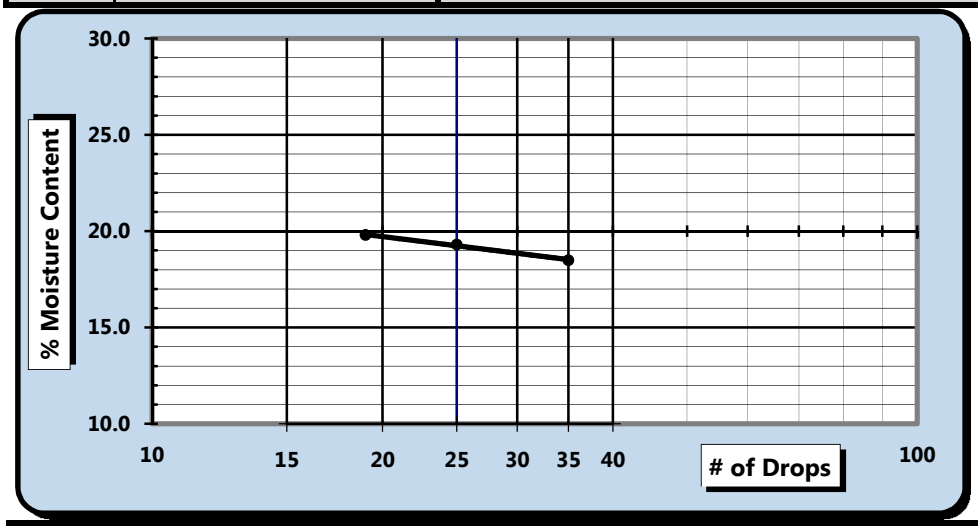
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/24/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/23/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-4	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-1	Type:	Split-spoon	Depth:	0 - 2'
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	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	26.70	26.47	26.31				25.91		
B	Wet Soil Weight + A	48.77	47.36	45.39				39.65		
C	Dry Soil Weight + A	45.32	43.98	42.24				37.86		
D	Water Weight (B-C)	3.45	3.38	3.15				1.79		
E	Dry Soil Weight (C-A)	18.62	17.51	15.93				11.95		
F	% Moisture (D/E)*100	18.5%	19.3%	19.8%				15.0%		
N	# OF DROPS	35	25	19				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							15.0%		



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	**19**
Plastic Limit	**15**
Plastic Index	**4**
Group Symbol	**SC-SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 34.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/24/19	Gant Taylor, P.E.	4/24/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

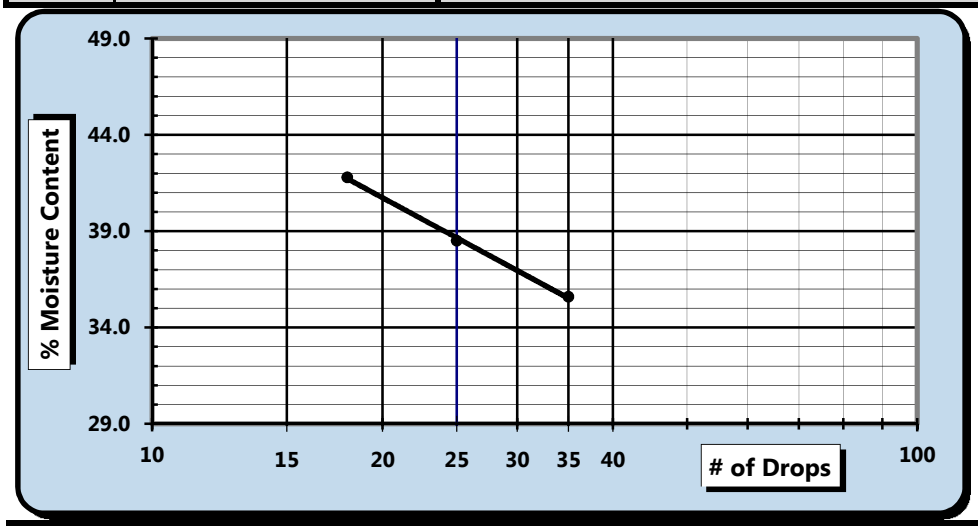
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/24/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/23/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-4	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-3	Type:	Split-spoon	Depth:	4 - 6'
Sample Description:	Silty SAND (SM / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.96	27.79	26.29				27.29		
B	Wet Soil Weight + A	44.90	44.38	44.26				41.59		
C	Dry Soil Weight + A	40.19	39.77	38.96				38.22		
D	Water Weight (B-C)	4.71	4.61	5.30				3.37		
E	Dry Soil Weight (C-A)	13.23	11.98	12.67				10.93		
F	% Moisture (D/E)*100	35.6%	38.5%	41.8%				30.8%		
N	# OF DROPS	35	25	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							30.8%		



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	**39**
Plastic Limit	**31**
Plastic Index	**8**
Group Symbol	**SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 42.7%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/24/19	Gant Taylor, P.E.	4/24/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

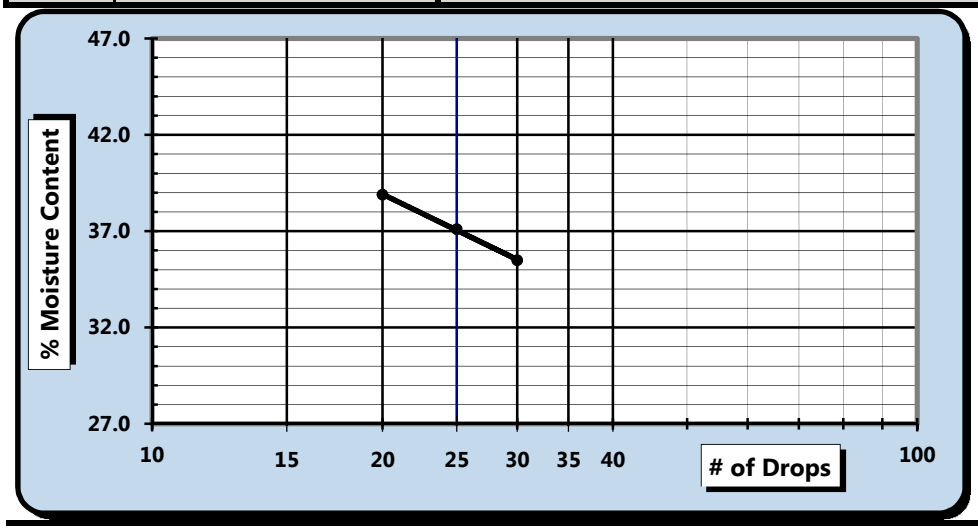
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/24/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/23/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-4	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-4	Type:	Split-spoon	Depth:	6 - 8'
Sample Description:	Silty SAND (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	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.83	26.75	26.67				26.65		
B	Wet Soil Weight + A	43.05	42.46	45.21				36.80		
C	Dry Soil Weight + A	38.80	38.21	40.02				34.44		
D	Water Weight (B-C)	4.25	4.25	5.19				2.36		
E	Dry Soil Weight (C-A)	11.97	11.46	13.35				7.79		
F	% Moisture (D/E)*100	35.5%	37.1%	38.9%				30.3%		
N	# OF DROPS	30	25	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							30.3%		



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	**37**
Plastic Limit	**30**
Plastic Index	**7**
Group Symbol	**SM/A-2-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 31.6%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/24/19	Gant Taylor, P.E.	4/24/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

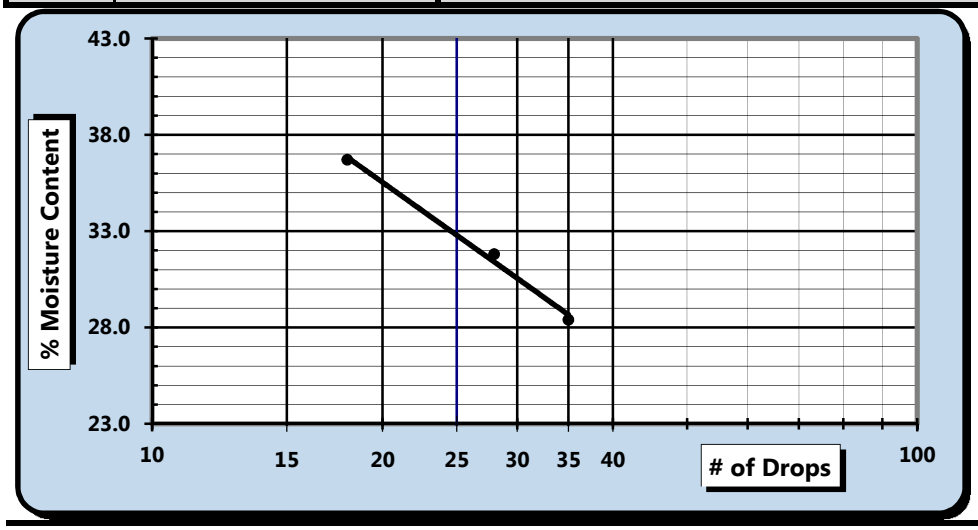
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/24/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/23/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-5	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-1	Type:	Split-spoon	Depth:	1 - 3'
Sample Description:	Silty SAND (SM / A-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	13	14	15				16		
A	Tare Weight	26.78	26.65	27.61				26.58		
B	Wet Soil Weight + A	43.77	46.47	47.42				36.84		
C	Dry Soil Weight + A	40.01	41.69	42.10				34.78		
D	Water Weight (B-C)	3.76	4.78	5.32				2.06		
E	Dry Soil Weight (C-A)	13.23	15.04	14.49				8.20		
F	% Moisture (D/E)*100	28.4%	31.8%	36.7%				25.1%		
N	# OF DROPS	35	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							25.1%		



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	**33**
Plastic Limit	**25**
Plastic Index	**8**
Group Symbol	**SM/A-4**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 40.8%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/24/19	Gant Taylor, P.E.	4/24/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

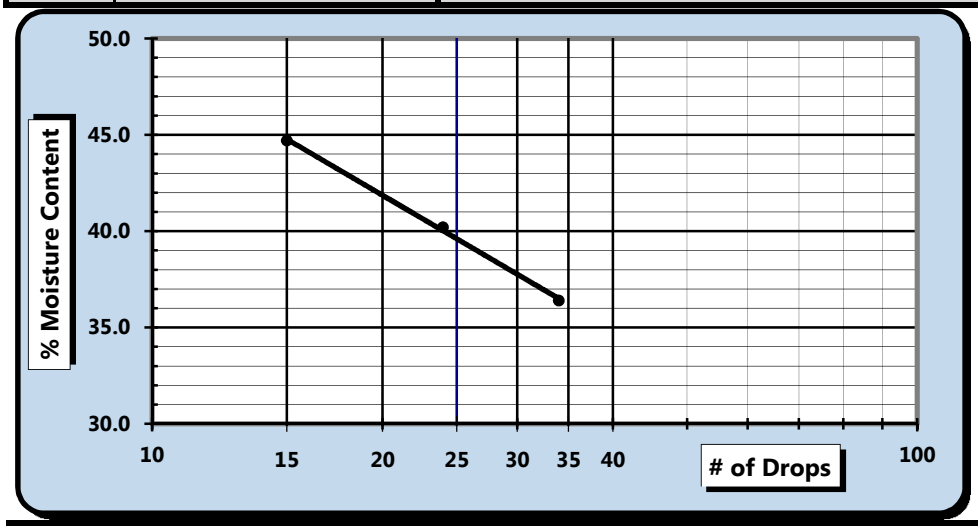
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/24/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/23/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	R-5	Log #:	40g	Sample Date:	4/11/19
Sample #:	SS-3	Type:	Split-spoon	Depth:	5 - 7'
Sample Description:	Silty SAND (SM / A-6)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	17	18	19				20		
A	Tare Weight	26.63	26.79	26.68				26.81		
B	Wet Soil Weight + A	43.14	42.28	41.77				38.56		
C	Dry Soil Weight + A	38.73	37.84	37.11				36.07		
D	Water Weight (B-C)	4.41	4.44	4.66				2.49		
E	Dry Soil Weight (C-A)	12.10	11.05	10.43				9.26		
F	% Moisture (D/E)*100	36.4%	40.2%	44.7%				26.9%		
N	# OF DROPS	34	24	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.9%		



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	**40**
Plastic Limit	**27**
Plastic Index	**13**
Group Symbol	**SM/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 46.1%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/24/19	Gant Taylor, P.E.	4/24/19
Technician Name	*Date*	*Technical Responsibility*	*Date*

Form No. TR-D698-2
Revision No. : 1
Revision Date: 07/25/17

MOISTURE - DENSITY REPORT

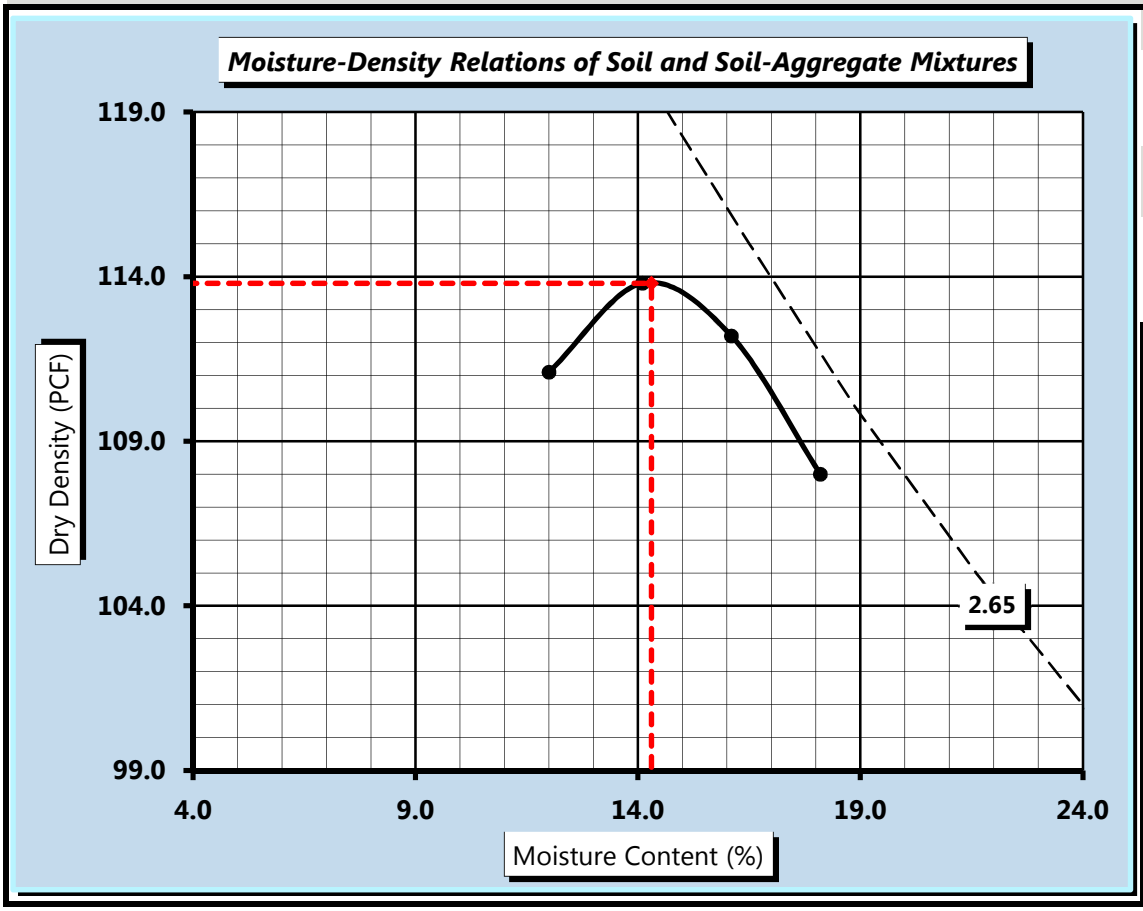
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

S&ME Project #:	1426-15-009 (Phase 105)	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/04/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	Bulk-1 (Composite)	Type:	Bulk	Depth:	1 - 15'
Sample Description:	Clayey SAND [SC / A-6(2)]				

Maximum Dry Density **113.8** PCF. Optimum Moisture Content **14.3%**

AASHTO T 99 - - Method A



Soil Properties	
Natural Moisture Content	*
Specific Gravity of Soil	2.650
Liquid Limit	33
Plastic Limit	22
Plastic Index	11

% Passing	
3/4"	100.0%
3/8"	100.0%
#4	99.3%
#10	96.0%
#40	75.4%
#60	66.8%
#100	58.6%
#200	46.9%

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: ***See Moisture Content Test Report**

AASHTO T 265: Laboratory Determination of Moisture Content of Soils

AASHTO T 99: Moisture-Density Relations of Soil Using a 5.5 Lb. Rammer and a 12" Drop

Gant Taylor, P.E.		Project Mgr. / Senior Engr.	4/16/19
Technical Responsibility	*Signature*	*Position*	*Date*

S&ME, Inc.

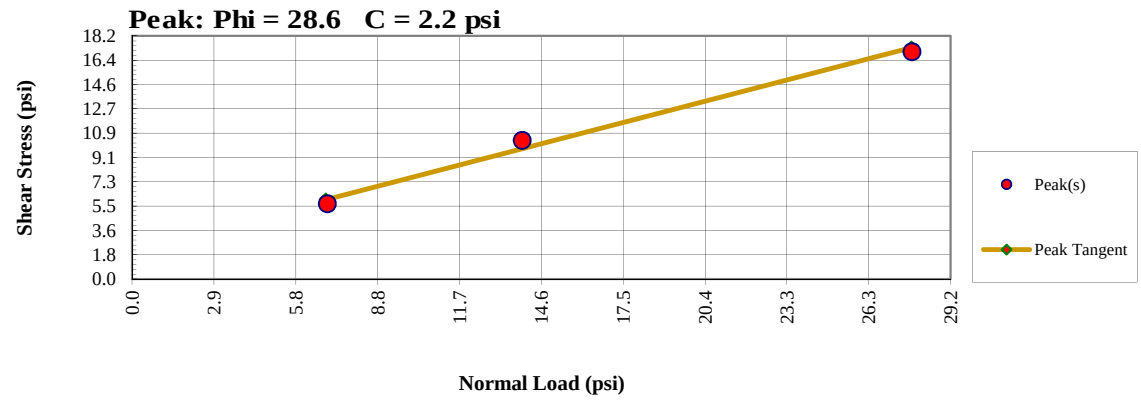
Direct Shear Test (AASHTO T 236)

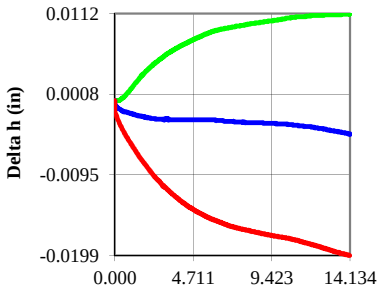
Date: 4/12/19

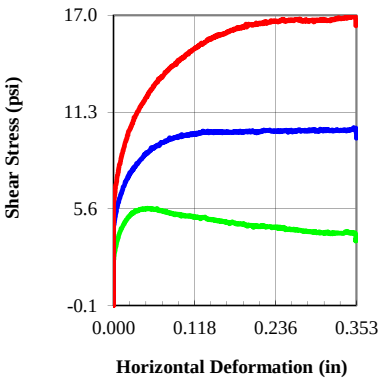
Checked By: Brian Vaughan, P.E.

Date 4/11/19

Tested By: Matt Jacobs







Initial	Specimen A	B	C	
Moisture (%)	16.31	16.28	16.25	
Density (pcf)	108.15	108.16	108.19	
Void Ratio	0.530	0.530	0.529	
Saturation (%)	81.60	81.46	81.39	
Diameter (in)	2.500	2.500	2.500	
Height (in)	1.000	1.000	1.000	

Final	A	B	C	
Moisture (%)	20.63	20.45	19.32	
Density (pcf)	111.17	110.37	110.44	
Void Ratio	0.488	0.499	0.498	
Saturation (%)	100.00	100.00	100.00	
Diameter (in)	2.500	2.500	2.500	
Height (in)	0.988	0.982	0.977	
Normal Stress (psi)	6.9	13.9	27.8	
Peak Stress (psi)	5.7	10.4	17.0	
Strain (%)	14.099	14.134	14.111	
Rate (in/min)	0.00857	0.00885	0.00919	

Project Date	
Date	4/11/19

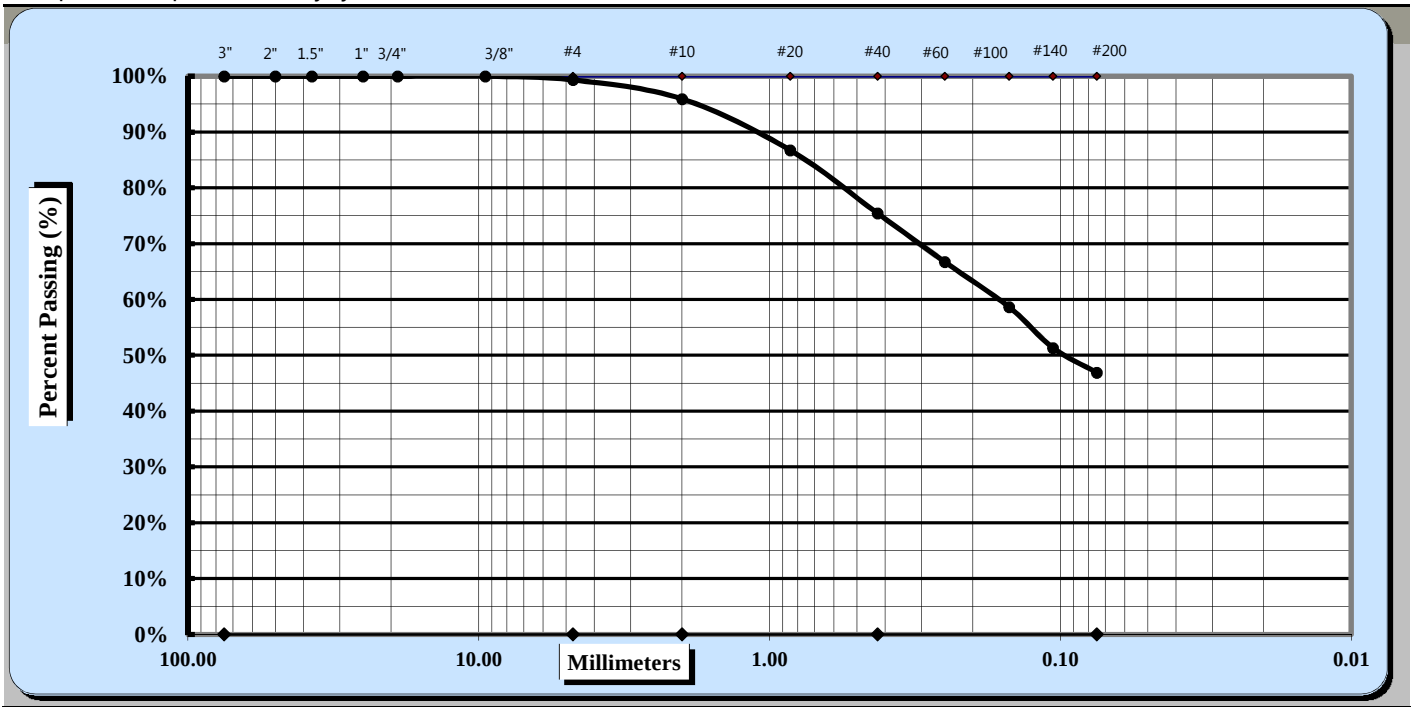
Project:	I-85 Bridge Over Rocky Creek
Location:	BR-2 (Bulk-1) Composite
Project Number:	1426-15-009 (Phase 105)
Boring Number	BR-2
Sample Number:	54
Depth:	1 - 15'
Sample Type:	Remolded
Description:	Clayey SAND [SC / A-6(2)]
Test Type:	Direct Shear
Remarks:	Proctor value = 113.8 @ 14.3%, Remolded to 95% @ +2%, 46.9% passing #200, LL = 33, PI = 11

SIEVE ANALYSIS OF SOIL

ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek			Test Date(s):	4/04 - 4/09/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	BR-2	Sample #:	32g	Sample Date:	3/25/2019
Location:	Bulk-1 (Composite)	Type:	Bulk	Depth:	1 - 15'
Sample Description:	Clayey SAND [SC / A-6(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

Method: A Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	#4	Coarse Sand	3.4%	Fine Sand	28.5%
Gravel	0.7%	Medium Sand	20.5%	Silt & Clay	46.9%
Liquid Limit	33	Plastic Limit	22	Plastic Index	11

Notes / Deviations / References:

Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/16/2019
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* ☒

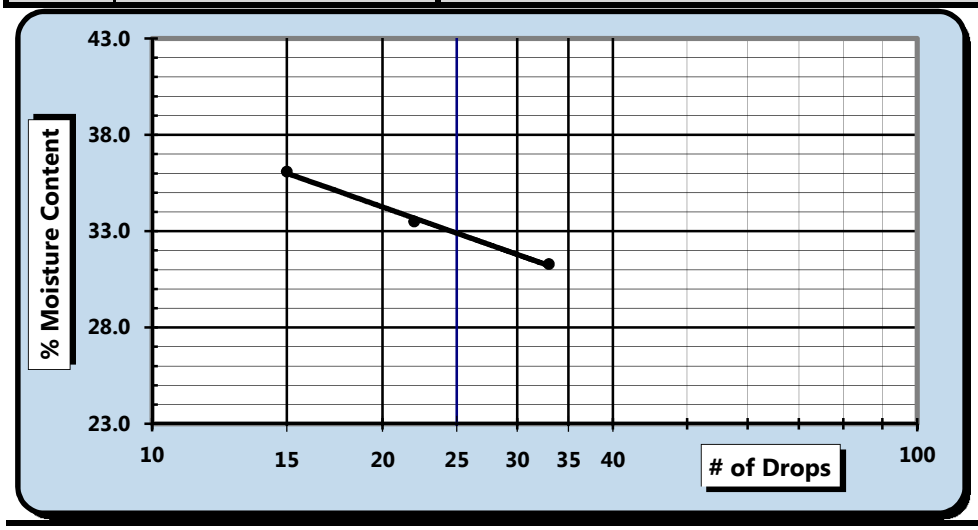
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/16/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/15/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/19
Sample #:	Bulk-1 (Composite)	Type:	Bulk	Depth:	1 - 15'
Sample Description:	Clayey SAND [SC / A-6(2)]				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.97	27.81	26.29				27.29		
B	Wet Soil Weight + A	41.93	46.28	44.50				38.26		
C	Dry Soil Weight + A	38.36	41.65	39.67				36.25		
D	Water Weight (B-C)	3.57	4.63	4.83				2.01		
E	Dry Soil Weight (C-A)	11.39	13.84	13.38				8.96		
F	% Moisture (D/E)*100	31.3%	33.5%	36.1%				22.4%		
N	# OF DROPS	33	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							22.4%		



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	**33**
Plastic Limit	**22**
Plastic Index	**11**
Group Symbol	**SC/A-6**

Multipoint Method ☑
One-point Method ☐

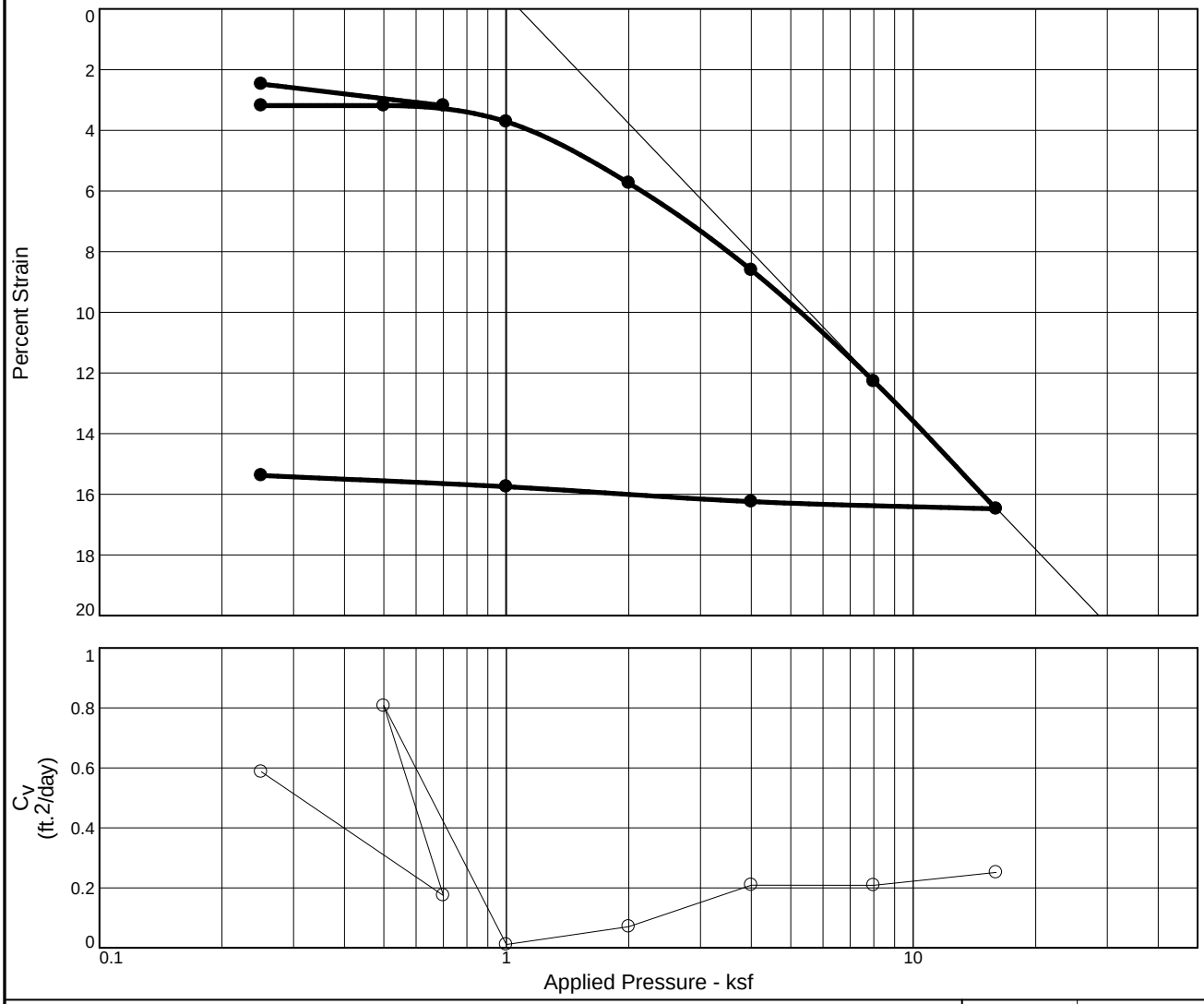
Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 46.9%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/16/19	Gant Taylor, P.E.	4/16/19
Technician Name	*Date*	*Technical Responsibility*	*Date*

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
LEAN CLAY with SAND [CL / A-6(10)]	CL	A-6(10)

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
36	14	2.689	0.7	79.1	92.1	38.6 %	29.8 %	92.5 %	100.0 %	1.122	0.796	2.3	0.30

Preparation Process: ASTM D2435 - Sec. 9

Condition of Test: Unsaturated

D2435 Method	C_r
B	0.07

Project No. 1426-15-009 **Client:** MBI

Project: I-85 Bridge Over Rocky Creek

Location: Soil Test Borings **Depth:** 6 - 8' **Sample Number:** BR-3

S&ME, Inc.

Greenville, SC

Remarks:

Checked By: Gant M. Taylor, P.E.

Title: Project Mgr. / Senior Engr.

Figure 1

Tested By: Benjamin Kovaleski

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 #:	1426-15-009 (Phase 105)	Report Date:	4/29/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/19 - 4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		
Boring #:	BR-3 Log #: 39g	Sample Date:	3/11/19
Location:	UD-2 Type: Undisturbed	Depth:	6 - 8'
Sample Description:	LEAN CLAY with Sand [CL / A-6(10)]		
Material Excluded:	0%	% Passing #4 Sieve:	100%

Balance ID.	*0.01 gram*	*ID#:*	*13942*	*Cal. Date:*	*9/11/18*	*Cal. Due:*	*9/11/19*
Pycnometer ID No.	*23161*	*Cal. Date:*	*2/10/19*	*Balance Verification*		Check Mass:	500 gram

Pycnometer Volume (V_p)	249.81	ml.	Mass Determination: 500.00 grams
Pycnometer Mass (PM)	110.89	grams	*If [PM-M_p] is greater than .06 grams,*
Ave. Pycnometer Mass (M_p)	110.89	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* = **383.98** *grams*

Mass of Dry Soil (grams)		Tare #	BB-10
A	Tare Weight		206.68
C	Dry Wt. + Tare Wt.		244.66
M_s	Dry Weight	**C-A**	**37.98**

T_t =	Test Temperature T_t		**22.5** °C
K =	Temperature Coefficient at T_t		**0.99945**
K =	Temperature Coefficient at 23°C		**0.99933**
$p_{w;t}$ =	Density of Water at T_t		**0.99766** g./ml.

$M_{pw;t}$ =	Mass of the Pycnometer and water at T_t	$M_{pw;t} = M_p + (V_p \times p_{w;t})$	**360.12** grams
G_t =	Specific Gravity of Soil Solids at the T_t	$G_t = M_s / (M_{pw;t} - (M_{psw;t} - M_s))$	**2.690**
G =	Specific Gravity of Soil Solids at the 20°C	$G = K \times G_t$	**2.689**

Soils containing plus #4 material tested per ***ASTM C 127***

R = *% of Soil retained on the #4 sieve* **0.0%**
P = *% of Soil passing the #4 sieve* **100.0%**

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}** = $\dfrac{1}{\dfrac{R}{100 \times G_{+4}} + \dfrac{P}{100 \times G}}$ = **2.689**

Notes / Deviations / References: ASTM D854: Specific Gravity of Soil Solids by Water Pycnometer

Benjamin Kovaleski		Project Mgr. / Senior Engr.	4/29/19
Technician Name	*Technical Responsibility*	*Position*	Date

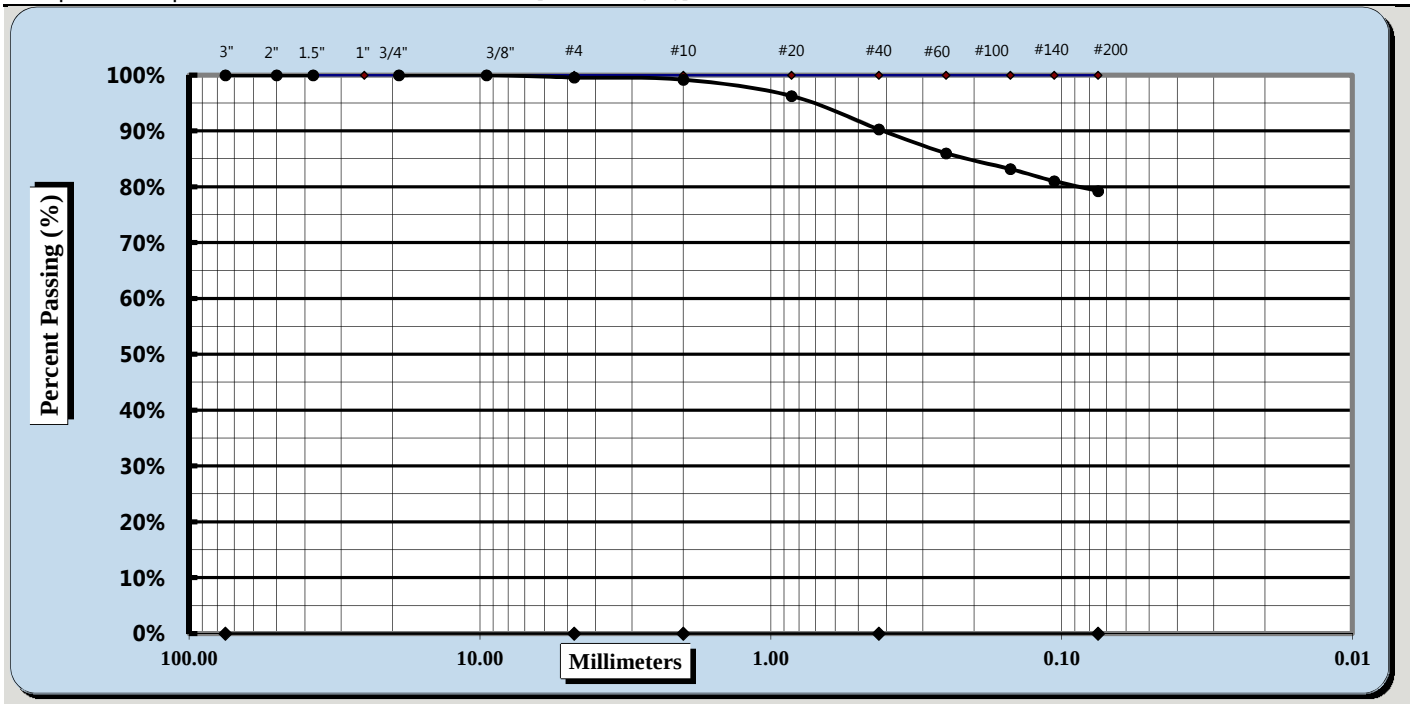
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/29/2019
Project Name:	I-85 Bridge Over Rocky Creek			Test Date:	4/19 - 4/25/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	BR-3	Log #:	39g	Sample Date:	3/11/19
Sample #:	UD-2	Type:	Undisturbed	Depth:	6 - 8'
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
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

Method: B Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	2.00 mm	Coarse Sand	0.4%	Fine Sand	11.0%
Gravel	0.4%	Medium Sand	8.9%	Silt & Clay	79.3%
Liquid Limit	36	Plastic Limit	22	Plastic Index	14
		Natural Moisture	*		

Notes / Deviations / References: ***See One-Dimensional Consolidation Test Report**

Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/29/2019
Technical Responsibility	*Signature*	*Position*	*Date*

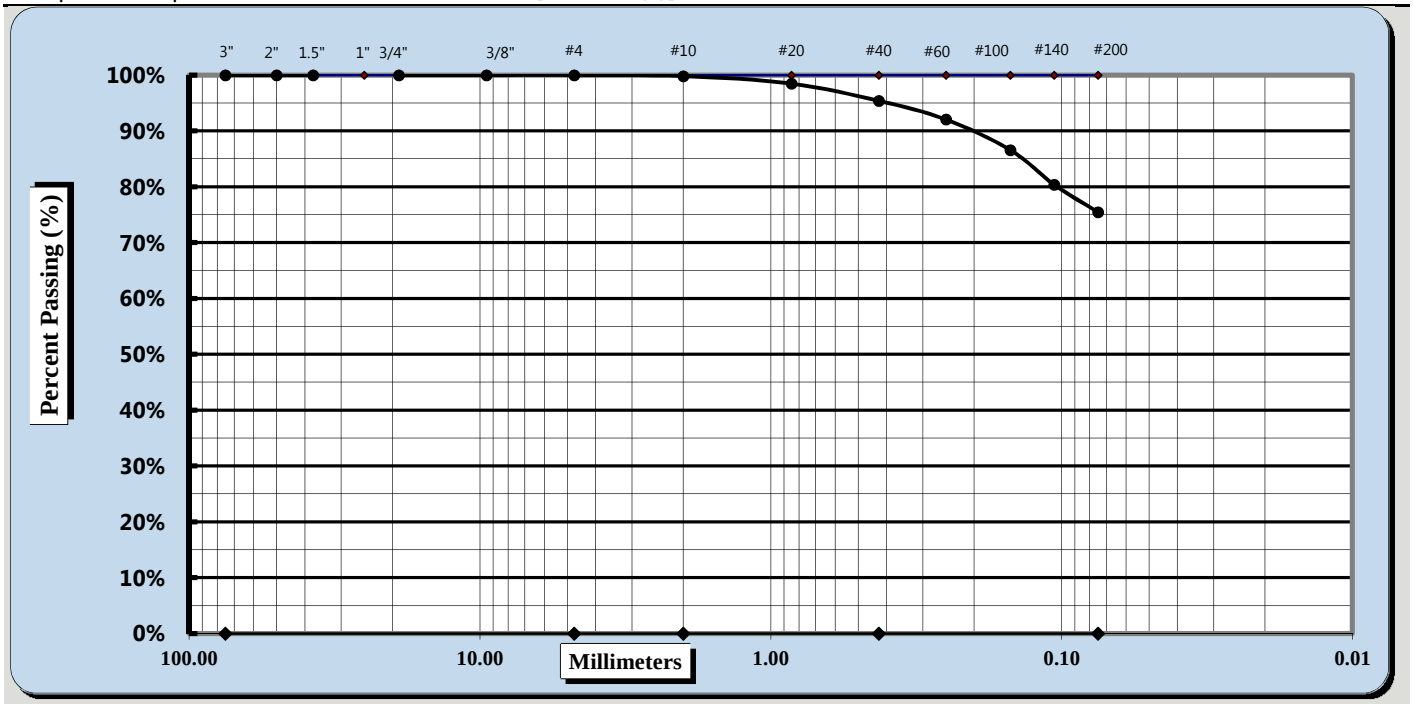
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/29/2019
Project Name:	I-85 Bridge Over Rocky Creek			Test Date:	4/19 - 4/25/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	BR-3	Log #:	39g	Sample Date:	3/11/19
Sample #:	UD-3	Type:	Undisturbed	Depth:	8 - 10'
Sample Description:	LEAN CLAY with Sand [CL / A-6(7)]				



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

Method: B Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	2.00 mm	Coarse Sand	0.2%	Fine Sand	19.9%
Gravel	0.0%	Medium Sand	4.4%	Silt & Clay	75.5%
Liquid Limit	31	Plastic Limit	20	Plastic Index	11

Natural Moisture *

Notes / Deviations / References: ***See Consolidated Undrained Triaxial Test Report**

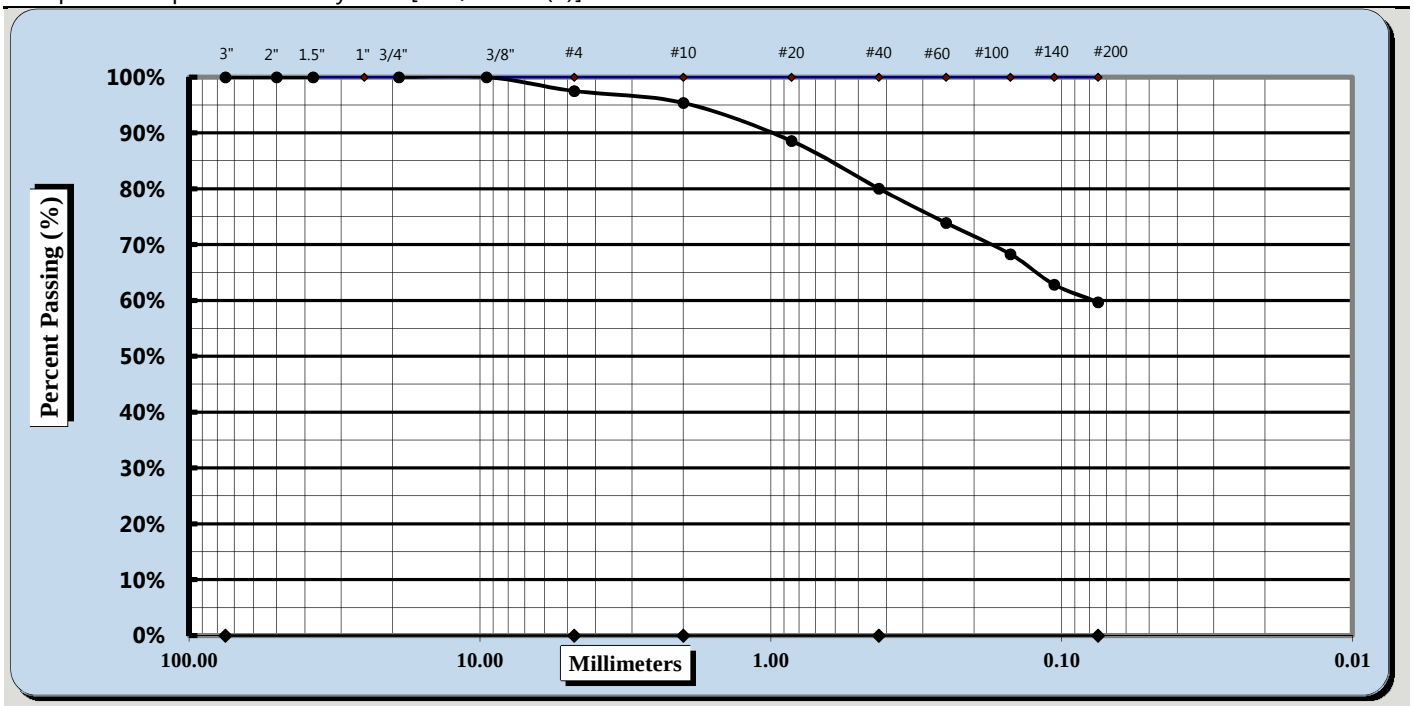
Gant M. Taylor, P.E.		Project Mgr. / Senior Engr.	4/29/2019
Technical Responsibility	*Signature*	*Position*	*Date*

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1426-15-009 (Phase 105)			Report Date:	4/30/2019
Project Name:	I-85 Bridge Over Rocky Creek			Test Date:	4/26 - 4/29/19
Client Name:	MBI				
Client Address:	Columbia, SC				
Boring #:	RW-2	Log #:	39g	Sample Date:	3/13/19
Sample #:	UD-1	Type:	Undisturbed	Depth:	8 - 10'
Sample Description:	Sandy SILT [ML / A-7-5(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

Method: B Procedure for obtaining Specimen: Moist Dispersion Process: Dispersant

Maximum Particle Size	9.50 mm	Coarse Sand	2.1%	Fine Sand	20.3%
Gravel	2.5%	Medium Sand	15.4%	Silt & Clay	59.7%
Liquid Limit	47	Plastic Limit	30	Plastic Index	17

Natural Moisture *

Notes / Deviations / References: ***See Conolidated Undrained Triaxial Test Report**

Gant M. Taylor, P.E. — *Technical Responsibility*
Signature
Project Mgr. / Senior Engr. — *Position*
4/30/2019 — *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* ☒

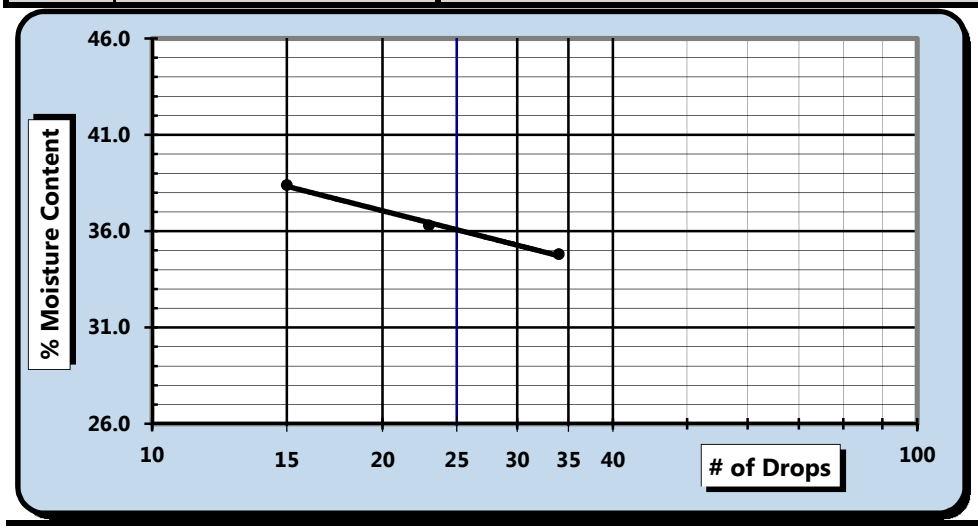
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/29/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	39g	Sample Date:	3/11/19
Sample #:	UD-2	Type:	Undisturbed	Depth:	6 - 8'
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	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	5	6	7				8		
A	Tare Weight	26.96	27.81	26.29				27.29		
B	Wet Soil Weight + A	41.56	44.57	43.01				40.22		
C	Dry Soil Weight + A	37.79	40.11	38.37				37.88		
D	Water Weight (B-C)	3.77	4.46	4.64				2.34		
E	Dry Soil Weight (C-A)	10.83	12.30	12.08				10.59		
F	% Moisture (D/E)*100	34.8%	36.3%	38.4%				22.1%		
N	# OF DROPS	34	23	15				*Moisture Contents determined by AASHTO T 265*		
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	**36**
Plastic Limit	**22**
Plastic Index	**14**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 79.3%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/29/19	Gant Taylor, P.E.	4/29/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

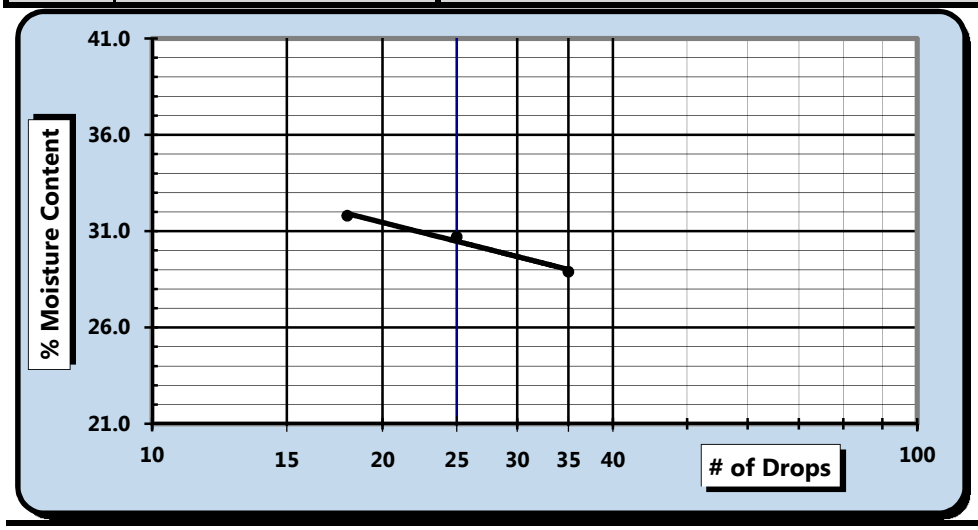
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/29/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	BR-3	Log #:	39g	Sample Date:	3/11/19
Sample #:	UD-3	Type:	Undisturbed	Depth:	8 - 10'
Sample Description:	LEAN CLAY with Sand [CL / A-6(7)]				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	26.69	26.47	26.31				25.93		
B	Wet Soil Weight + A	45.98	43.43	43.45				37.15		
C	Dry Soil Weight + A	41.65	39.45	39.31				35.31		
D	Water Weight (B-C)	4.33	3.98	4.14				1.84		
E	Dry Soil Weight (C-A)	14.96	12.98	13.00				9.38		
F	% Moisture (D/E)*100	28.9%	30.7%	31.8%				19.6%		
N	# OF DROPS	35	25	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							19.6%		



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	**31**
Plastic Limit	**20**
Plastic Index	**11**
Group Symbol	**CL/A-6**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 75.5%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/29/19	Gant Taylor, P.E.	4/29/19
Technician Name	*Date*	*Technical Responsibility*	*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* ☒

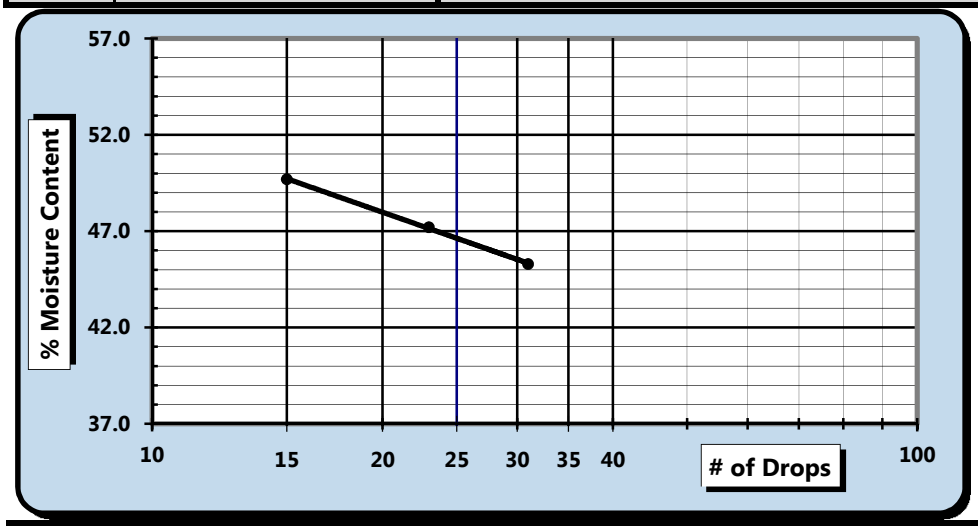
S&ME, Inc. - Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1426-15-009 (Phase 105)	Report Date:	4/30/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date:	4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-2	Log #:	39g	Sample Date:	3/13/19
Sample #:	UD-1	Type:	Undisturbed	Depth:	8 - 10'
Sample Description:	Sandy SILT [ML / A-7-5(9)]				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/11/2018	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/8/2018			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	9	10	11				12		
A	Tare Weight	26.84	26.74	26.68				26.65		
B	Wet Soil Weight + A	41.83	44.57	43.91				37.97		
C	Dry Soil Weight + A	37.16	38.85	38.19				35.34		
D	Water Weight (B-C)	4.67	5.72	5.72				2.63		
E	Dry Soil Weight (C-A)	10.32	12.11	11.51				8.69		
F	% Moisture (D/E)*100	45.3%	47.2%	49.7%				30.3%		
N	# OF DROPS	31	23	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							30.3%		



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	**47**
Plastic Limit	**30**
Plastic Index	**17**
Group Symbol	**ML/A-7-5**

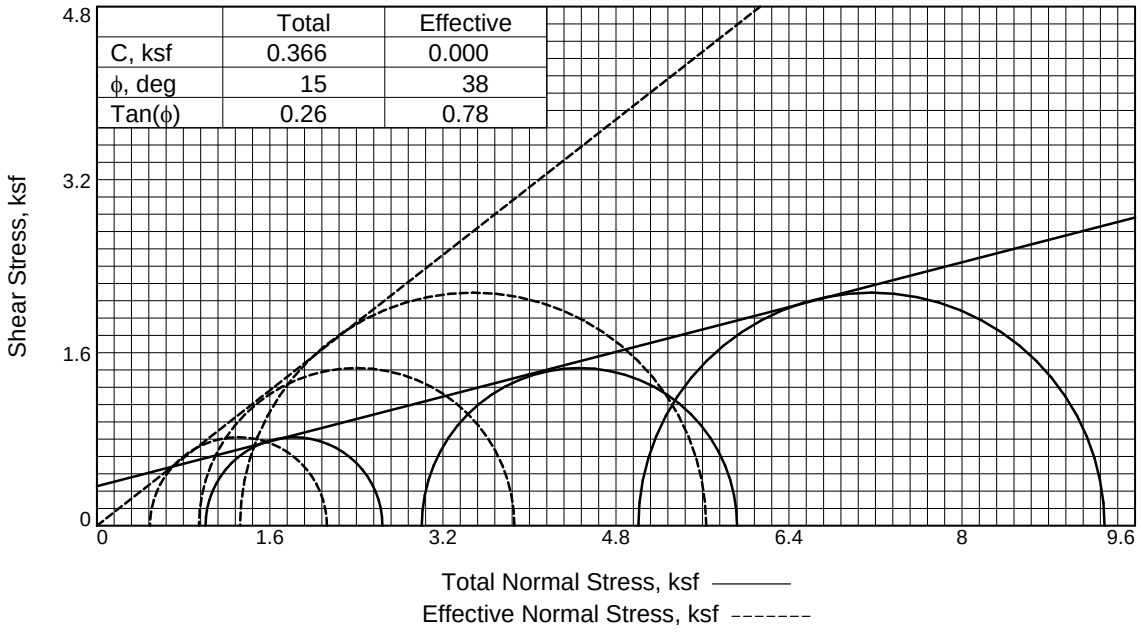
Multipoint Method ☑
One-point Method ☐

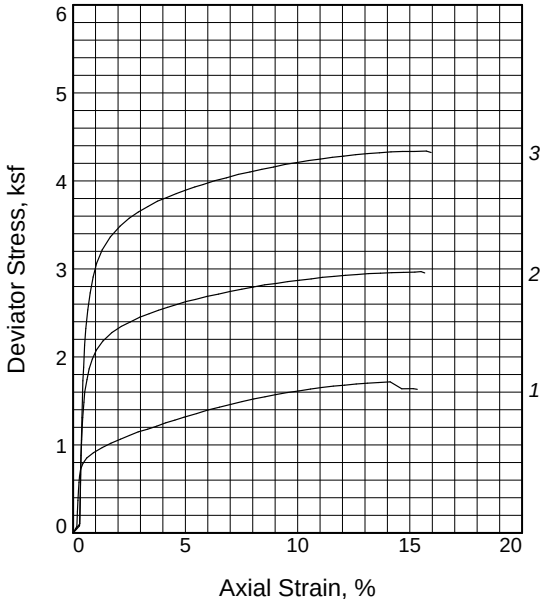
Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ % Passing the #200 Sieve: 59.7%

Notes / Deviations / References:

AASHTO T 90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T 89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	4/30/19	Gant Taylor, P.E.	4/30/19
Technician Name	*Date*	*Technical Responsibility*	*Date*





Specimen No.		1	2	3
Initial	Water Content, %	31.7	34.9	38.1
	Dry Density, pcf	88.0	85.1	78.7
	Saturation, %	94.9	97.6	91.2
	Void Ratio	0.8883	0.9522	1.1102
	Diameter, in.	2.854	2.836	2.828
	Height, in.	5.625	5.592	5.696
At Test	Water Content, %	31.1	30.3	31.7
	Dry Density, pcf	90.9	91.9	90.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.8277	0.8067	0.8428
	Diameter, in.	2.822	2.762	2.696
	Height, in.	5.569	5.457	5.472
Strain rate, %/min.		0.22	0.22	0.22
Eff. Cell Pressure, ksf		1.005	3.004	5.007
Fail. Stress, ksf		1.636	2.916	4.311
Total Pore Pr., ksf		6.274	7.820	9.443
Strain, %		10.6	11.6	13.1
Ult. Stress, ksf		1.640	2.970	4.340
Total Pore Pr., ksf		6.206	7.785	9.409
Strain, %		15.1	15.5	15.7
$\bar{\sigma}_1$ Failure, ksf		2.127	3.860	5.635
$\bar{\sigma}_3$ Failure, ksf		0.491	0.944	1.324

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: LEAN CLAY with Sand [CL / A-6(7)]
LL= 31 **PL=** 20 **PI=** 11
Specific Gravity= 2.661
Remarks: The specimens failed with bulging.
Failure selected at peak obliquity.
Percent passing the #200 sieve: 75.5%

Figure 1

Client: MBI

Project: I-85 Bridge Over Rocky Creek

Location: Soil Test Borings

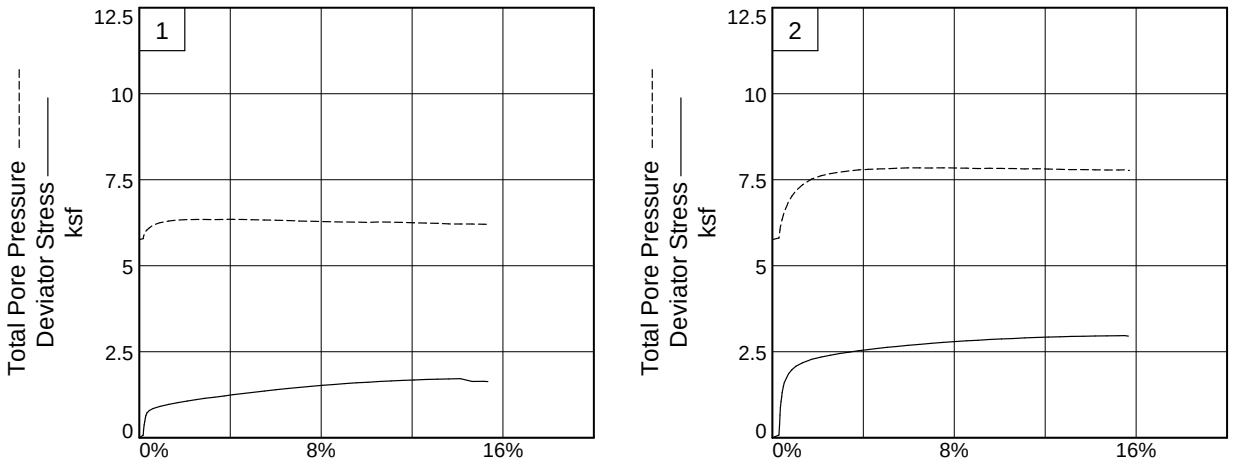
Sample Number: BR-3 **Depth:** 8 - 10'

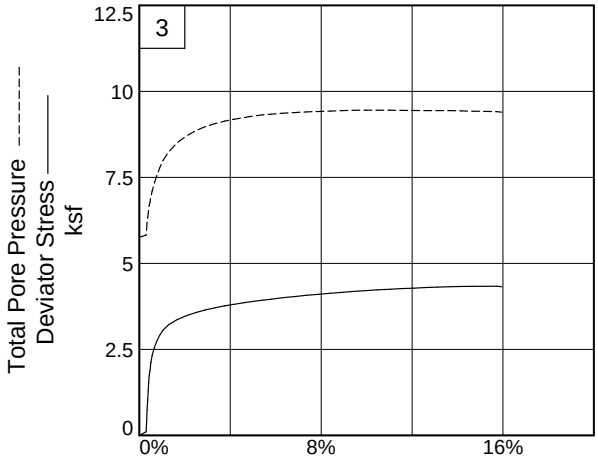
Proj. No.: 1426-15-009 (Phase 105) **Date Sampled:** 3/11/19

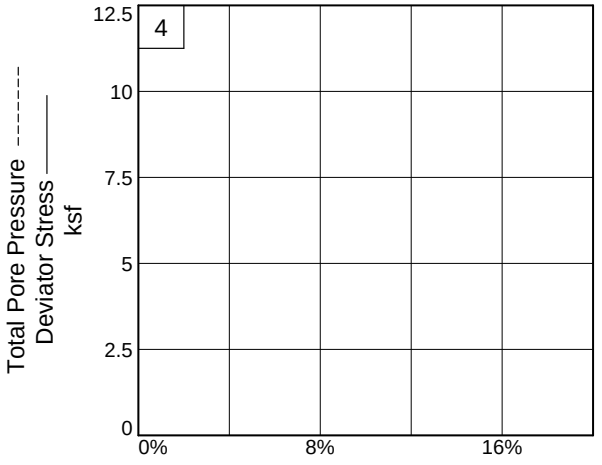
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

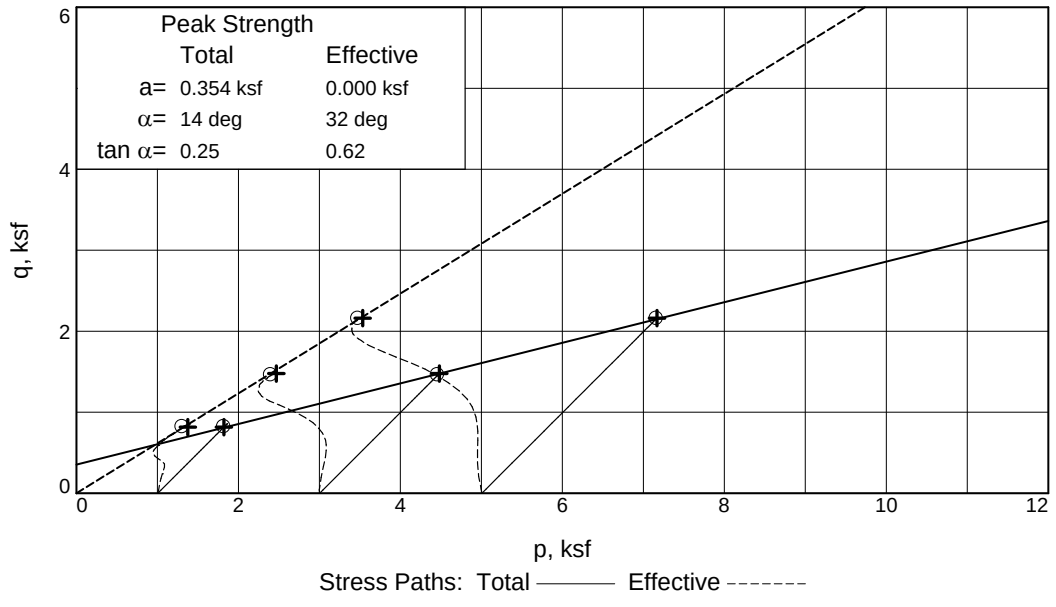
Tested By: Benjamin Kovaleski **Checked By:** Gant M. Taylor, P.E.

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: MBI
Project: I-85 Bridge Over Rocky Creek
Location: Soil Test Borings **Depth:** 8 - 10' **Sample Number:** BR-3
Project No.: 1426-15-009 (Phase 105) **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski **Checked By:** Gant M. Taylor, P.E.

TRIAXIAL COMPRESSION TEST

CU with Pore Pressures

4/29/2019
12:56 PM

Date: 3/11/19
Client: MBI
Project: I-85 Bridge Over Rocky Creek
Project No.: 1426-15-009 (Phase 105)
Location: Soil Test Borings
Depth: 8 - 10' **Sample Number:** BR-3
Description: LEAN CLAY with Sand [CL / A-6(7)]
Remarks: The specimens failed with bulging. Failure selected at peak obliquity.
Percent passing the #200 sieve: 75.5%
Type of Sample: Undisturbed
Specific Gravity=2.661 **LL=**31 **PL=**20 **PI=**11
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	49.470			1069.230
Moisture content: Dry soil+tare, gms.	37.570			815.600
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	31.7	32.5	31.1	31.1
Moist specimen weight, gms.	1094.21			
Diameter, in.	2.854	2.843	2.822	
Area, in.²	6.397	6.347	6.254	
Height, in.	5.625	5.603	5.569	
Net decrease in height, in.		0.022	0.034	
Net decrease in water volume, cc.			12.000	
Wet density, pcf	115.8	118.0	119.2	
Dry density, pcf	88.0	89.0	90.9	
Void ratio	0.8883	0.8661	0.8277	
Saturation, %	94.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 46.980 psi (6.765 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 1.005 ksf
Strain rate, %/min. = 0.22
Fail. Stress = 1.636 ksf **at reading no.** 31
Ult. Stress = 1.640 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	1.005	1.005	1.00	40.000	1.005	0.000
1	0.0094	3.275	3.3	0.2	0.075	0.977	1.052	1.08	40.196	1.015	0.038
2	0.0106	10.413	10.4	0.2	0.239	0.908	1.147	1.26	40.674	1.028	0.120
3	0.0118	16.021	16.0	0.2	0.368	0.860	1.228	1.43	41.010	1.044	0.184
4	0.0133	20.869	20.9	0.2	0.479	0.821	1.301	1.58	41.276	1.061	0.240
5	0.0147	24.954	25.0	0.3	0.573	0.789	1.362	1.73	41.499	1.076	0.287
6	0.0159	28.074	28.1	0.3	0.645	0.764	1.409	1.84	41.674	1.086	0.322
7	0.0186	31.542	31.5	0.3	0.724	0.725	1.449	2.00	41.944	1.087	0.362
8	0.0245	34.526	34.5	0.4	0.791	0.662	1.454	2.19	42.380	1.058	0.396
9	0.0338	37.205	37.2	0.6	0.851	0.584	1.435	2.46	42.926	1.009	0.426
10	0.0506	40.025	40.0	0.9	0.913	0.513	1.426	2.78	43.417	0.970	0.457
11	0.0720	42.707	42.7	1.3	0.971	0.466	1.437	3.08	43.744	0.951	0.485
12	0.0939	45.087	45.1	1.7	1.021	0.436	1.456	3.34	43.955	0.946	0.510
13	0.1173	47.294	47.3	2.1	1.066	0.424	1.490	3.51	44.035	0.957	0.533
14	0.1395	49.380	49.4	2.5	1.108	0.420	1.529	3.64	44.061	0.975	0.554
15	0.1615	51.362	51.4	2.9	1.148	0.420	1.569	3.73	44.062	0.994	0.574
16	0.1851	52.994	53.0	3.3	1.180	0.424	1.604	3.78	44.036	1.014	0.590
17	0.2076	54.800	54.8	3.7	1.215	0.418	1.632	3.91	44.080	1.025	0.607
18	0.2298	56.721	56.7	4.1	1.252	0.418	1.670	4.00	44.079	1.044	0.626
19	0.2524	58.361	58.4	4.5	1.283	0.421	1.703	4.05	44.059	1.062	0.641
20	0.2751	60.100	60.1	4.9	1.315	0.428	1.743	4.07	44.008	1.086	0.658
21	0.3062	62.376	62.4	5.5	1.357	0.435	1.792	4.12	43.961	1.113	0.679
22	0.3343	64.554	64.6	6.0	1.397	0.441	1.838	4.17	43.915	1.140	0.699
23	0.3627	66.416	66.4	6.5	1.430	0.452	1.882	4.16	43.838	1.167	0.715
24	0.3909	68.248	68.2	7.0	1.461	0.465	1.926	4.14	43.751	1.196	0.731
25	0.4192	70.102	70.1	7.5	1.493	0.472	1.964	4.16	43.703	1.218	0.746
26	0.4482	71.919	71.9	8.0	1.523	0.481	2.004	4.16	43.638	1.243	0.761
27	0.4760	73.470	73.5	8.5	1.547	0.489	2.036	4.17	43.587	1.262	0.773
28	0.5037	75.146	75.1	9.0	1.574	0.495	2.069	4.18	43.540	1.282	0.787
29	0.5315	76.660	76.7	9.5	1.597	0.496	2.092	4.22	43.537	1.294	0.798
30	0.5604	77.958	78.0	10.1	1.614	0.505	2.119	4.20	43.473	1.312	0.807
31	0.5887	79.439	79.4	10.6	1.636	0.491	2.127	4.33	43.568	1.309	0.818
32	0.6171	80.797	80.8	11.1	1.654	0.499	2.153	4.32	43.517	1.326	0.827
33	0.6453	81.940	81.9	11.6	1.668	0.507	2.175	4.29	43.462	1.341	0.834
34	0.6734	82.995	83.0	12.1	1.680	0.516	2.196	4.26	43.397	1.356	0.840
35	0.7022	84.167	84.2	12.6	1.694	0.524	2.218	4.23	43.339	1.371	0.847
36	0.7301	85.084	85.1	13.1	1.702	0.532	2.234	4.20	43.283	1.383	0.851
37	0.7581	85.986	86.0	13.6	1.710	0.550	2.260	4.11	43.163	1.405	0.855
38	0.7866	86.838	86.8	14.1	1.717	0.551	2.268	4.12	43.156	1.409	0.858
39	0.8153	87.791	87.8	14.6	1.638	0.553	2.192	3.96	43.137	1.373	0.819
40	0.8437	88.559	88.6	15.1	1.640	0.559	2.199	3.93	43.100	1.379	0.820
41	0.8539	88.377	88.4	15.3	1.632	0.560	2.191	3.91	43.093	1.376	0.816

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	63.760			1008.690
Moisture content: Dry soil+tare, gms.	47.260			773.970
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	34.9	34.9	30.3	30.3
Moist specimen weight, gms.	1064.50			
Diameter, in.	2.836	2.824	2.762	
Area, in.²	6.317	6.265	5.991	
Height, in.	5.592	5.569	5.457	
Net decrease in height, in.		0.023	0.112	
Net decrease in water volume, cc.			36.000	
Wet density, pcf	114.8	116.2	119.8	
Dry density, pcf	85.1	86.2	91.9	
Void ratio	0.9522	0.9281	0.8067	
Saturation, %	97.6	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 60.860 psi (8.764 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 3.004 ksf
Strain rate, %/min. = 0.22
Fail. Stress = 2.916 ksf **at reading no.** 36
Ult. Stress = 2.970 ksf **at reading no.** 44

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	3.004	3.004	1.00	40.000	3.004	0.000
1	0.0157	3.345	3.3	0.3	0.080	2.959	3.039	1.03	40.311	2.999	0.040
2	0.0171	16.224	16.2	0.3	0.389	2.827	3.216	1.14	41.227	3.021	0.194
3	0.0181	27.607	27.6	0.3	0.661	2.719	3.380	1.24	41.978	3.050	0.331
4	0.0192	36.828	36.8	0.4	0.882	2.633	3.515	1.34	42.577	3.074	0.441
5	0.0208	44.254	44.3	0.4	1.060	2.554	3.614	1.41	43.121	3.084	0.530
6	0.0222	50.104	50.1	0.4	1.199	2.484	3.684	1.48	43.609	3.084	0.600
7	0.0232	54.853	54.9	0.4	1.313	2.418	3.731	1.54	44.065	3.075	0.656
8	0.0262	62.076	62.1	0.5	1.485	2.296	3.781	1.65	44.915	3.039	0.742
9	0.0283	66.979	67.0	0.5	1.602	2.192	3.793	1.73	45.641	2.992	0.801
10	0.0337	72.958	73.0	0.6	1.743	2.048	3.791	1.85	46.638	2.919	0.871
11	0.0389	78.135	78.1	0.7	1.865	1.894	3.759	1.98	47.708	2.826	0.932
12	0.0466	82.915	82.9	0.9	1.976	1.741	3.717	2.14	48.770	2.729	0.988
13	0.0564	87.336	87.3	1.0	2.078	1.581	3.659	2.31	49.881	2.620	1.039
14	0.0722	91.941	91.9	1.3	2.181	1.411	3.592	2.55	51.059	2.502	1.090
15	0.0942	96.448	96.4	1.7	2.278	1.243	3.522	2.83	52.225	2.383	1.139
16	0.1169	99.787	99.8	2.1	2.347	1.149	3.496	3.04	52.883	2.322	1.174
17	0.1394	102.422	102.4	2.6	2.399	1.086	3.485	3.21	53.319	2.285	1.200
18	0.1620	105.113	105.1	3.0	2.452	1.042	3.493	3.35	53.627	2.267	1.226
19	0.1848	107.274	107.3	3.4	2.491	1.006	3.497	3.48	53.876	2.251	1.246
20	0.2075	109.433	109.4	3.8	2.530	0.978	3.509	3.59	54.066	2.244	1.265
21	0.2296	111.337	111.3	4.2	2.564	0.963	3.527	3.66	54.173	2.245	1.282
22	0.2527	113.325	113.3	4.6	2.598	0.952	3.550	3.73	54.251	2.251	1.299

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	0.2753	115.241	115.2	5.0	2.630	0.945	3.576	3.78	54.296	2.260	1.315
24	0.2973	116.751	116.8	5.4	2.653	0.931	3.584	3.85	54.398	2.257	1.327
25	0.3255	118.921	118.9	6.0	2.688	0.920	3.608	3.92	54.472	2.264	1.344
26	0.3535	120.722	120.7	6.5	2.714	0.920	3.633	3.95	54.474	2.276	1.357
27	0.3816	122.750	122.7	7.0	2.744	0.923	3.667	3.97	54.452	2.295	1.372
28	0.4099	124.614	124.6	7.5	2.770	0.918	3.689	4.02	54.484	2.303	1.385
29	0.4376	126.383	126.4	8.0	2.794	0.923	3.718	4.03	54.449	2.320	1.397
30	0.4659	128.276	128.3	8.5	2.820	0.928	3.748	4.04	54.417	2.338	1.410
31	0.4938	129.718	129.7	9.0	2.836	0.938	3.774	4.02	54.347	2.356	1.418
32	0.5218	131.425	131.4	9.6	2.857	0.931	3.788	4.07	54.392	2.360	1.429
33	0.5498	132.876	132.9	10.1	2.872	0.936	3.808	4.07	54.362	2.372	1.436
34	0.5785	134.318	134.3	10.6	2.886	0.939	3.826	4.07	54.338	2.382	1.443
35	0.6061	135.919	135.9	11.1	2.904	0.948	3.853	4.06	54.274	2.400	1.452
36	0.6339	137.254	137.3	11.6	2.916	0.944	3.860	4.09	54.302	2.402	1.458
37	0.6621	138.611	138.6	12.1	2.928	0.953	3.881	4.07	54.241	2.417	1.464
38	0.6904	139.851	139.9	12.7	2.936	0.962	3.898	4.05	54.179	2.430	1.468
39	0.7186	141.177	141.2	13.2	2.947	0.971	3.917	4.04	54.119	2.444	1.473
40	0.7471	142.268	142.3	13.7	2.952	0.968	3.920	4.05	54.135	2.444	1.476
41	0.7749	143.397	143.4	14.2	2.957	0.975	3.933	4.03	54.088	2.454	1.479
42	0.8030	144.453	144.5	14.7	2.961	0.981	3.942	4.02	54.048	2.462	1.481
43	0.8307	145.469	145.5	15.2	2.964	0.981	3.945	4.02	54.050	2.463	1.482
44	0.8457	146.241	146.2	15.5	2.970	0.978	3.949	4.04	54.066	2.464	1.485
45	0.8547	145.741	145.7	15.7	2.955	0.991	3.946	3.98	53.978	2.468	1.477

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	62.640			921.090
Moisture content: Dry soil+tare, gms.	45.370			699.460
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	38.1	40.8	31.7	31.7
Moist specimen weight, gms.	1020.74			
Diameter, in.	2.828	2.817	2.696	
Area, in.²	6.281	6.233	5.710	
Height, in.	5.696	5.674	5.472	
Net decrease in height, in.		0.022	0.202	
Net decrease in water volume, cc.			67.500	
Wet density, pcf	108.7	112.2	118.7	
Dry density, pcf	78.7	79.6	90.1	
Void ratio	1.1102	1.0858	0.8428	
Saturation, %	91.2	100.0	100.0	

Test Readings for Specimen No. 3

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 74.770 psi (10.767 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 5.007 ksf
Strain rate, %/min. = 0.22
Fail. Stress = 4.311 ksf **at reading no.** 40
Ult. Stress = 4.340 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	5.007	5.007	1.00	40.000	5.007	0.000
1	0.0163	4.153	4.2	0.3	0.104	4.946	5.050	1.02	40.426	4.998	0.052
2	0.0176	16.665	16.7	0.3	0.419	4.757	5.176	1.09	41.735	4.966	0.209
3	0.0185	29.514	29.5	0.3	0.742	4.581	5.323	1.16	42.956	4.952	0.371
4	0.0202	41.666	41.7	0.4	1.047	4.430	5.477	1.24	44.009	4.953	0.523
5	0.0215	52.119	52.1	0.4	1.309	4.301	5.610	1.30	44.902	4.956	0.655
6	0.0226	61.101	61.1	0.4	1.535	4.188	5.722	1.37	45.688	4.955	0.767
7	0.0238	68.892	68.9	0.4	1.730	4.082	5.811	1.42	46.426	4.946	0.865
8	0.0257	75.035	75.0	0.5	1.883	3.991	5.875	1.47	47.051	4.933	0.942
9	0.0280	85.051	85.1	0.5	2.134	3.820	5.954	1.56	48.242	4.887	1.067
10	0.0309	92.618	92.6	0.6	2.323	3.664	5.987	1.63	49.325	4.825	1.161
11	0.0357	101.171	101.2	0.7	2.535	3.455	5.990	1.73	50.778	4.722	1.267
12	0.0418	109.000	109.0	0.8	2.728	3.228	5.956	1.85	52.352	4.592	1.364
13	0.0488	116.331	116.3	0.9	2.908	2.994	5.902	1.97	53.975	4.448	1.454
14	0.0573	122.752	122.8	1.0	3.063	2.774	5.837	2.10	55.510	4.305	1.532
15	0.0708	129.207	129.2	1.3	3.216	2.524	5.740	2.27	57.241	4.132	1.608
16	0.0907	135.629	135.6	1.7	3.364	2.261	5.625	2.49	59.067	3.943	1.682
17	0.1143	141.188	141.2	2.1	3.486	2.053	5.539	2.70	60.512	3.796	1.743
18	0.1367	145.426	145.4	2.5	3.576	1.904	5.480	2.88	61.548	3.692	1.788
19	0.1588	148.960	149.0	2.9	3.648	1.791	5.438	3.04	62.336	3.614	1.824
20	0.1824	152.161	152.2	3.3	3.710	1.703	5.413	3.18	62.943	3.558	1.855
21	0.2055	155.300	155.3	3.8	3.770	1.633	5.403	3.31	63.428	3.518	1.885
22	0.2280	157.705	157.7	4.2	3.812	1.577	5.389	3.42	63.818	3.483	1.906

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	0.2516	160.265	160.3	4.6	3.856	1.528	5.384	3.52	64.160	3.456	1.928
24	0.2742	162.624	162.6	5.0	3.896	1.485	5.380	3.62	64.460	3.433	1.948
25	0.2968	164.826	164.8	5.4	3.931	1.450	5.382	3.71	64.698	3.416	1.966
26	0.3169	166.619	166.6	5.8	3.959	1.429	5.387	3.77	64.849	3.408	1.979
27	0.3455	169.460	169.5	6.3	4.004	1.401	5.405	3.86	65.041	3.403	2.002
28	0.3734	171.729	171.7	6.8	4.035	1.382	5.417	3.92	65.175	3.399	2.018
29	0.4024	174.365	174.4	7.4	4.074	1.364	5.438	3.99	65.298	3.401	2.037
30	0.4308	176.536	176.5	7.9	4.102	1.351	5.453	4.04	65.388	3.402	2.051
31	0.4599	178.868	178.9	8.4	4.132	1.340	5.472	4.08	65.463	3.406	2.066
32	0.4884	181.023	181.0	8.9	4.158	1.326	5.484	4.14	65.562	3.405	2.079
33	0.5169	183.382	183.4	9.4	4.188	1.316	5.504	4.18	65.629	3.410	2.094
34	0.5460	185.442	185.4	10.0	4.210	1.313	5.523	4.21	65.650	3.418	2.105
35	0.5745	187.524	187.5	10.5	4.233	1.314	5.547	4.22	65.643	3.431	2.116
36	0.6030	189.330	189.3	11.0	4.249	1.315	5.563	4.23	65.641	3.439	2.124
37	0.6314	191.319	191.3	11.5	4.268	1.317	5.585	4.24	65.622	3.451	2.134
38	0.6599	193.058	193.1	12.1	4.282	1.323	5.604	4.24	65.584	3.464	2.141
39	0.6889	195.003	195.0	12.6	4.299	1.327	5.625	4.24	65.557	3.476	2.149
40	0.7177	196.733	196.7	13.1	4.311	1.324	5.635	4.26	65.576	3.479	2.155
41	0.7466	198.382	198.4	13.6	4.320	1.326	5.646	4.26	65.564	3.486	2.160
42	0.7748	200.024	200.0	14.2	4.330	1.334	5.664	4.25	65.506	3.499	2.165
43	0.8033	201.475	201.5	14.7	4.335	1.343	5.678	4.23	65.443	3.511	2.168
44	0.8322	202.710	202.7	15.2	4.335	1.349	5.683	4.21	65.405	3.516	2.167
45	0.8611	204.209	204.2	15.7	4.340	1.358	5.698	4.20	65.339	3.528	2.170
46	0.8725	203.942	203.9	15.9	4.323	1.373	5.696	4.15	65.235	3.535	2.162

Project Name: I-85 Bridge Over Rocky Creek

Project #: 1426-15-009 (Phase 105)

Boring #: BR-3

Depth: 8′ - 10′ (UD-3)

Sample Date: 3/11/2019

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)

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 #:	1426-15-009 (Phase 105)	Report Date:	4/29/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/19 - 4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		
Boring #:	BR-3 Log #: 39g	Sample Date:	3/11/19
Location:	UD-3 Type: Undisturbed	Depth:	8 - 10'
Sample Description:	LEAN CLAY with Sand [CL / A-6(7)]		
Material Excluded:	0%	% Passing #4 Sieve:	100%

Balance ID.	*0.01 gram*	*ID#:*	*13942*	*Cal. Date:*	*9/11/18*	*Cal. Due:*	*9/11/19*
Pycnometer ID No.	*23162*	*Cal. Date:*	*2/10/19*	*Balance Verification*		Check Mass:	500 gram

Pycnometer Volume (V_p)	249.82	ml.	Mass Determination: 500.00 grams
Pycnometer Mass (PM)	115.02	grams	*If [PM-M_p] is greater than .06 grams,*
Ave. Pycnometer Mass (M_p)	115.02	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* = **388.18** *grams*

Mass of Dry Soil (grams)		Tare #	BB-8
A	Tare Weight		204.23
C	Dry Wt. + Tare Wt.		242.53
M_s	Dry Weight	**C-A**	**38.30**

T_t =	Test Temperature T_t		**22.3** °C
K =	Temperature Coefficient at T_t		**0.99950**
K =	Temperature Coefficient at 23°C		**0.99933**
$\rho_{w;t}$ =	Density of Water at T_t		**0.99770** g./ml.

$M_{pw;t}$ =	Mass of the Pycnometer and water at T_t	$M_{pw;t} = M_p + (V_p \times \rho_{w;t})$	**364.27** grams
G_t =	Specific Gravity of Soil Solids at the T_t	$G_t = M_s / (M_{pw;t} - (M_{psw;t} - M_s))$	**2.662**
G =	Specific Gravity of Soil Solids at the 20°C	$G = K \times G_t$	**2.661**

Soils containing plus #4 material tested per ***ASTM C 127***

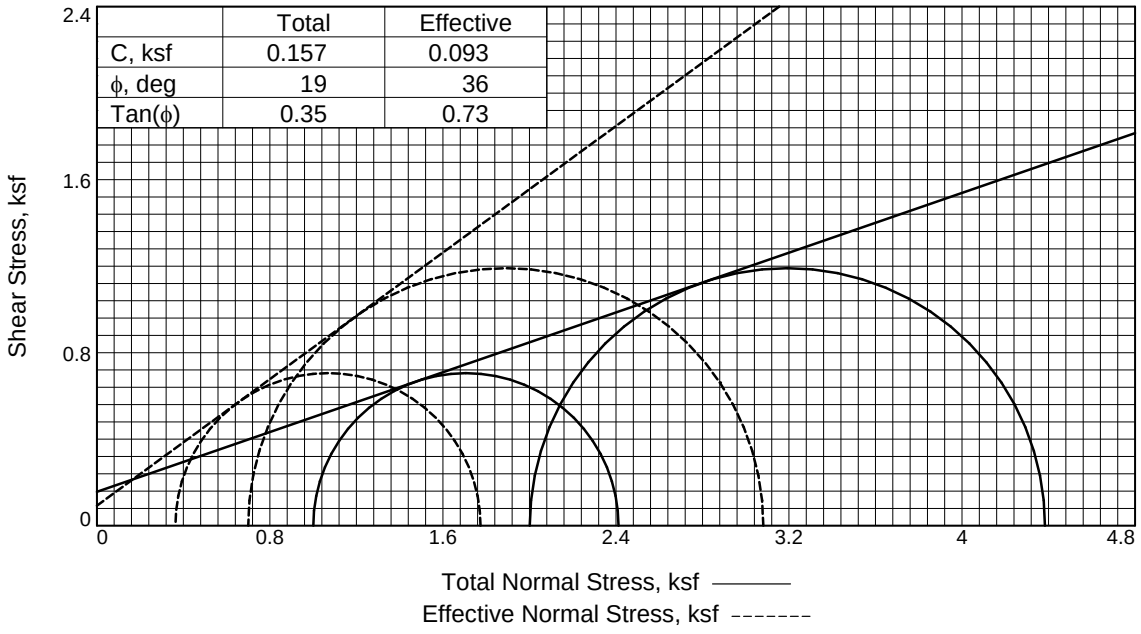
R = *% of Soil retained on the #4 sieve* **0.0%**
P = *% of Soil passing the #4 sieve* **100.0%**

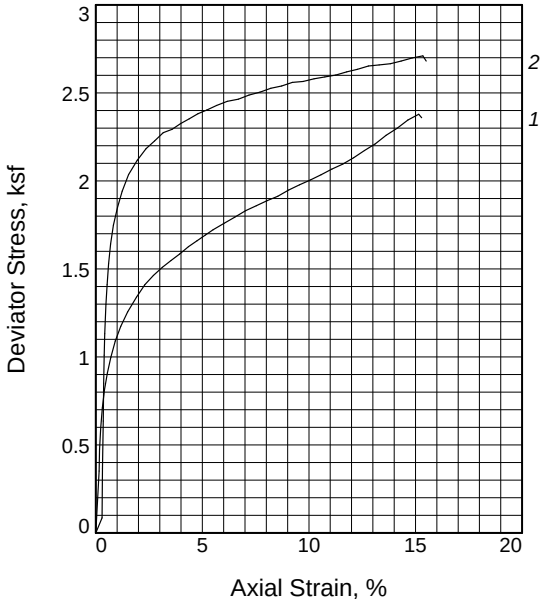
G_{+4} Apparent Specific Gravity of plus #4 material at the 23°C per ASTM C127
Apparent Specific Gravity of plus #4 material corrected to 20°C

G_{total} *Total Sample Specific Gravity* **G_{total}** = $\dfrac{1}{\dfrac{R}{100 \times G_{+4}} + \dfrac{P}{100 \times G}}$ = **2.661**

Notes / Deviations / References: ASTM D854: Specific Gravity of Soil Solids by Water Pycnometer

Benjamin Kovaleski		Project Mgr. / Senior Engr.	4/29/19
Technician Name	*Technical Responsibility*	*Position*	Date





Specimen No.		1	2
Initial	Water Content, %	24.5	32.9
	Dry Density, pcf	94.7	87.4
	Saturation, %	83.3	94.3
	Void Ratio	0.8060	0.9553
	Diameter, in.	2.844	2.858
	Height, in.	5.766	5.714
At Test	Water Content, %	27.9	31.2
	Dry Density, pcf	97.0	92.2
	Saturation, %	100.0	100.0
	Void Ratio	0.7636	0.8539
	Diameter, in.	2.820	2.800
	Height, in.	5.727	5.644
Strain rate, %/min.		0.40	0.40
Eff. Cell Pressure, ksf		1.001	2.002
Fail. Stress, ksf		1.411	2.382
Total Pore Pr., ksf		7.838	8.502
Strain, %		2.3	4.8
Ult. Stress, ksf		2.379	2.710
Total Pore Pr., ksf		7.653	8.361
Strain, %		15.1	15.3
$\bar{\sigma}_1$ Failure, ksf		1.774	3.081
$\bar{\sigma}_3$ Failure, ksf		0.363	0.700

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Sandy SILT [(ML / A-7-5(9)]

LL= 47 **PL=** 30 **PI=** 17
Specific Gravity= 2.739
Remarks: Specimens failed with bulging and shearing. Failure selected at peak pore pressure, Specimen #1 and peak obliquity, Specimen #2.

Figure 1

Client: MBI

Project: I-85 Bridge Over Rocky Creek

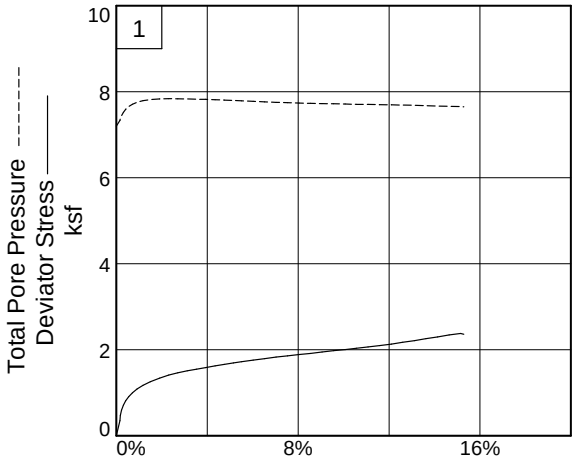
Location: Soil Test Borings

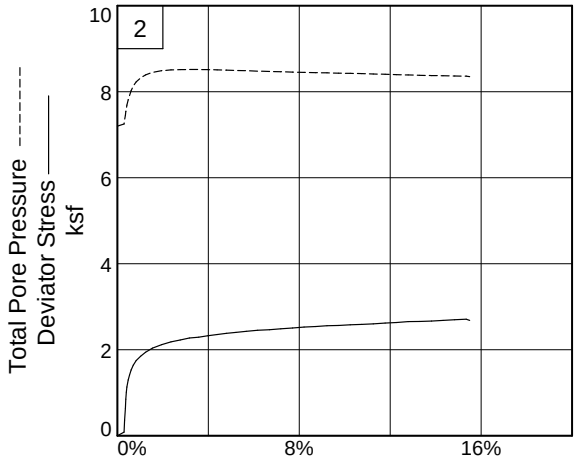
Sample Number: RW-2 **Depth:** 8 - 10'

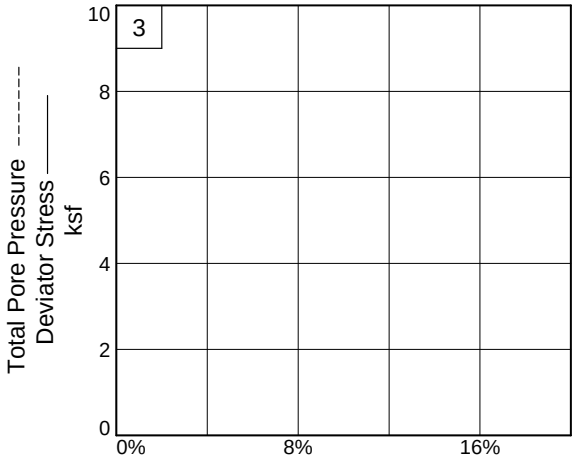
Proj. No.: 1426-15-009 (Phase 105) **Date Sampled:** 3/13/19

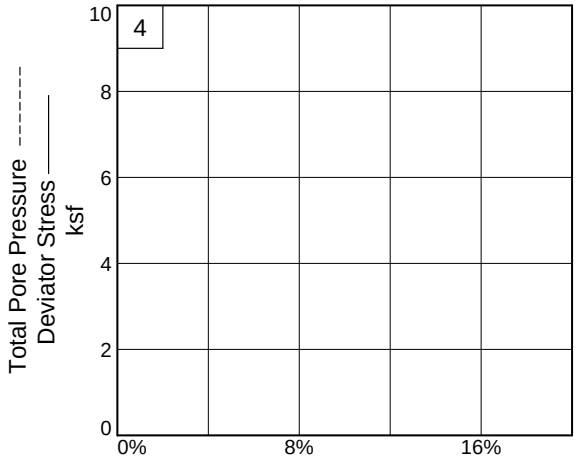
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

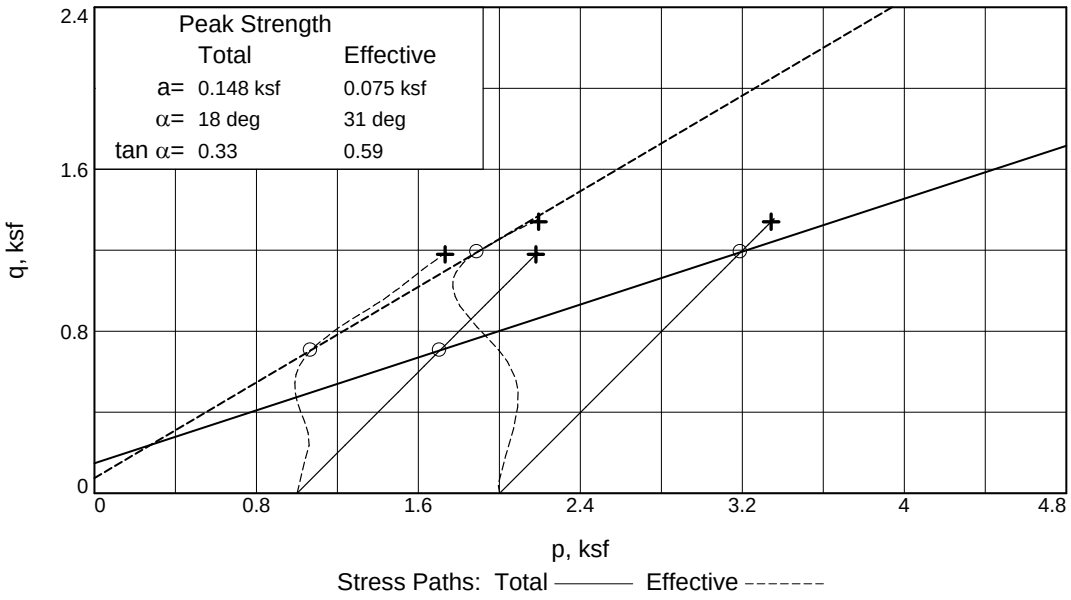
Tested By: Benjamin Kovaleski **Checked By:** Gant M. Taylor, P.E.











Client: MBI
Project: I-85 Bridge Over Rocky Creek
Location: Soil Test Borings **Depth:** 8 - 10' **Sample Number:** RW-2
Project No.: 1426-15-009 (Phase 105) **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski **Checked By:** Gant M. Taylor, P.E.

TRIAXIAL COMPRESSION TEST

4/30/2019

CU with Pore Pressures

4:29 PM

Date: 3/13/19
Client: MBI
Project: I-85 Bridge Over Rocky Creek
Project No.: 1426-15-009 (Phase 105)
Location: Soil Test Borings
Depth: 8 - 10' **Sample Number:** RW-2
Description: Sandy SILT [(ML / A-7-5(9)]
Remarks: Specimens failed with bulging and shearing. Failure selected at peak pore pressure, Specimen #1 and peak obliquity, Specimen #2.
Type of Sample: Undisturbed
Specific Gravity=2.739 **LL=**47 **PL=**30 **PI=**17
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	45.560			1146.420
Moisture content: Dry soil+tare, gms.	36.590			896.460
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	24.5	28.6	27.9	27.9
Moist specimen weight, gms.	1133.51			
Diameter, in.	2.844	2.833	2.820	
Area, in.²	6.353	6.302	6.246	
Height, in.	5.766	5.743	5.727	
Net decrease in height, in.		0.023	0.016	
Net decrease in water volume, cc.			6.900	
Wet density, pcf	117.9	123.3	124.0	
Dry density, pcf	94.7	95.8	97.0	
Void ratio	0.8060	0.7844	0.7636	
Saturation, %	83.3	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 56.950 psi (8.201 ksf)
Consolidation back pressure = 50.000 psi (7.200 ksf)
Consolidation effective confining stress = 1.001 ksf
Strain rate, %/min. = 0.40
Fail. Stress = 1.411 ksf **at reading no.** 12
Ult. Stress = 2.379 ksf **at reading no.** 39

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	1.001	1.001	1.00	50.000	1.001	0.000
1	0.0090	15.267	15.3	0.2	0.351	0.867	1.219	1.41	50.927	1.043	0.176
2	0.0101	20.553	20.6	0.2	0.473	0.824	1.297	1.57	51.227	1.061	0.237
3	0.0132	25.987	26.0	0.2	0.598	0.756	1.354	1.79	51.697	1.055	0.299
4	0.0177	30.894	30.9	0.3	0.710	0.682	1.392	2.04	52.213	1.037	0.355
5	0.0234	35.418	35.4	0.4	0.813	0.610	1.423	2.33	52.714	1.017	0.407
6	0.0312	39.654	39.7	0.5	0.909	0.546	1.455	2.67	53.158	1.001	0.455
7	0.0407	43.617	43.6	0.7	0.998	0.493	1.491	3.03	53.528	0.992	0.499
8	0.0524	47.724	47.7	0.9	1.090	0.445	1.535	3.45	53.860	0.990	0.545
9	0.0671	51.510	51.5	1.2	1.174	0.409	1.583	3.87	54.110	0.996	0.587
10	0.0857	55.318	55.3	1.5	1.256	0.384	1.640	4.28	54.287	1.012	0.628
11	0.1093	59.241	59.2	1.9	1.340	0.369	1.708	4.63	54.390	1.039	0.670
12	0.1320	62.639	62.6	2.3	1.411	0.363	1.774	4.89	54.430	1.068	0.705
13	0.1548	65.231	65.2	2.7	1.463	0.365	1.828	5.01	54.419	1.096	0.732
14	0.1789	67.579	67.6	3.1	1.509	0.369	1.878	5.09	54.388	1.124	0.755
15	0.2022	69.585	69.6	3.5	1.548	0.376	1.924	5.12	54.339	1.150	0.774
16	0.2253	71.562	71.6	3.9	1.585	0.379	1.964	5.19	54.321	1.171	0.792
17	0.2488	73.751	73.8	4.3	1.627	0.386	2.013	5.21	54.266	1.200	0.813
18	0.2719	75.572	75.6	4.7	1.660	0.395	2.055	5.20	54.204	1.225	0.830
19	0.2950	77.449	77.4	5.2	1.694	0.405	2.098	5.19	54.140	1.251	0.847
20	0.3151	79.070	79.1	5.5	1.723	0.413	2.135	5.18	54.085	1.274	0.861
21	0.3446	81.205	81.2	6.0	1.760	0.424	2.184	5.15	54.004	1.304	0.880
22	0.3735	83.231	83.2	6.5	1.794	0.435	2.229	5.12	53.928	1.332	0.897
23	0.4027	85.441	85.4	7.0	1.831	0.448	2.280	5.09	53.837	1.364	0.916
24	0.4313	87.219	87.2	7.5	1.859	0.454	2.313	5.10	53.798	1.384	0.930
25	0.4604	89.033	89.0	8.0	1.888	0.463	2.351	5.07	53.732	1.407	0.944
26	0.4889	90.729	90.7	8.5	1.913	0.471	2.385	5.06	53.676	1.428	0.957
27	0.5182	92.934	92.9	9.0	1.949	0.477	2.426	5.09	53.639	1.451	0.974
28	0.5473	94.869	94.9	9.6	1.978	0.482	2.460	5.11	53.605	1.471	0.989
29	0.5764	96.708	96.7	10.1	2.005	0.487	2.492	5.12	53.567	1.490	1.003
30	0.6052	98.687	98.7	10.6	2.035	0.495	2.530	5.11	53.514	1.512	1.017
31	0.6343	100.838	100.8	11.1	2.067	0.496	2.564	5.16	53.503	1.530	1.034
32	0.6633	102.802	102.8	11.6	2.096	0.501	2.597	5.18	53.470	1.549	1.048
33	0.6930	105.186	105.2	12.1	2.132	0.506	2.638	5.21	53.434	1.572	1.066
34	0.7218	107.851	107.9	12.6	2.173	0.512	2.685	5.25	53.396	1.598	1.087
35	0.7510	110.365	110.4	13.1	2.211	0.517	2.728	5.28	53.361	1.622	1.105
36	0.7800	113.432	113.4	13.6	2.259	0.524	2.783	5.31	53.309	1.654	1.130
37	0.8095	116.159	116.2	14.1	2.300	0.534	2.834	5.30	53.238	1.684	1.150
38	0.8386	119.210	119.2	14.6	2.346	0.540	2.886	5.34	53.198	1.713	1.173
39	0.8676	121.587	121.6	15.1	2.379	0.548	2.926	5.34	53.147	1.737	1.189
40	0.8755	120.801	120.8	15.3	2.359	0.552	2.912	5.27	53.114	1.732	1.180

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	49.680			1104.230
Moisture content: Dry soil+tare, gms.	37.380			841.730
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	32.9	34.0	31.2	31.2
Moist specimen weight, gms.	1118.33			
Diameter, in.	2.858	2.846	2.800	
Area, in.²	6.415	6.363	6.158	
Height, in.	5.714	5.691	5.644	
Net decrease in height, in.		0.023	0.047	
Net decrease in water volume, cc.			23.900	
Wet density, pcf	116.2	118.6	121.0	
Dry density, pcf	87.4	88.5	92.2	
Void ratio	0.9553	0.9317	0.8539	
Saturation, %	94.3	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = .167543 kN/cm²
Membrane thickness = .03048 cm
Consolidation cell pressure = 63.900 psi (9.202 ksf)
Consolidation back pressure = 50.000 psi (7.200 ksf)
Consolidation effective confining stress = 2.002 ksf
Strain rate, %/min. = 0.40
Fail. Stress = 2.382 ksf **at reading no.** 22
Ult. Stress = 2.710 ksf **at reading no.** 43

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	2.002	2.002	1.00	50.000	2.002	0.000
1	0.0165	3.678	3.7	0.3	0.086	1.951	2.037	1.04	50.350	1.994	0.043
2	0.0178	15.671	15.7	0.3	0.365	1.848	2.213	1.20	51.066	2.031	0.183
3	0.0198	27.284	27.3	0.4	0.636	1.752	2.388	1.36	51.734	2.070	0.318
4	0.0208	36.518	36.5	0.4	0.851	1.665	2.516	1.51	52.338	2.090	0.425
5	0.0222	43.376	43.4	0.4	1.010	1.587	2.598	1.64	52.878	2.092	0.505
6	0.0235	48.611	48.6	0.4	1.132	1.514	2.646	1.75	53.385	2.080	0.566
7	0.0267	55.792	55.8	0.5	1.298	1.391	2.689	1.93	54.240	2.040	0.649
8	0.0299	60.649	60.6	0.5	1.411	1.293	2.703	2.09	54.922	1.998	0.705
9	0.0339	65.820	65.8	0.6	1.530	1.179	2.708	2.30	55.716	1.944	0.765
10	0.0393	70.700	70.7	0.7	1.642	1.069	2.711	2.54	56.477	1.890	0.821
11	0.0468	75.409	75.4	0.8	1.749	0.972	2.720	2.80	57.153	1.846	0.874
12	0.0576	79.939	79.9	1.0	1.850	0.879	2.730	3.10	57.792	1.805	0.925
13	0.0698	84.090	84.1	1.2	1.942	0.811	2.753	3.39	58.266	1.782	0.971
14	0.0870	88.449	88.4	1.5	2.036	0.752	2.788	3.71	58.679	1.770	1.018
15	0.1097	92.360	92.4	1.9	2.118	0.712	2.830	3.97	58.954	1.771	1.059
16	0.1330	95.634	95.6	2.4	2.184	0.694	2.878	4.14	59.077	1.786	1.092
17	0.1559	97.947	97.9	2.8	2.227	0.689	2.916	4.23	59.118	1.802	1.114
18	0.1787	100.436	100.4	3.2	2.274	0.684	2.958	4.33	59.151	1.821	1.137
19	0.2020	101.715	101.7	3.6	2.293	0.685	2.978	4.35	59.147	1.831	1.147
20	0.2247	103.586	103.6	4.0	2.326	0.689	3.014	4.38	59.118	1.852	1.163
21	0.2475	105.254	105.3	4.4	2.353	0.693	3.047	4.39	59.085	1.870	1.177
22	0.2706	106.974	107.0	4.8	2.382	0.700	3.081	4.40	59.041	1.890	1.191

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	0.2943	108.404	108.4	5.2	2.403	0.706	3.109	4.40	58.995	1.908	1.201
24	0.3198	110.111	110.1	5.7	2.429	0.714	3.143	4.40	58.942	1.928	1.214
25	0.3481	111.771	111.8	6.2	2.452	0.723	3.176	4.39	58.878	1.949	1.226
26	0.3773	112.934	112.9	6.7	2.464	0.730	3.194	4.38	58.830	1.962	1.232
27	0.4058	114.629	114.6	7.2	2.488	0.737	3.225	4.37	58.781	1.981	1.244
28	0.4351	116.068	116.1	7.7	2.505	0.745	3.250	4.36	58.725	1.998	1.252
29	0.4635	117.726	117.7	8.2	2.527	0.752	3.279	4.36	58.678	2.015	1.263
30	0.4921	118.964	119.0	8.7	2.539	0.757	3.297	4.35	58.640	2.027	1.270
31	0.5203	120.583	120.6	9.2	2.560	0.763	3.323	4.35	58.601	2.043	1.280
32	0.5491	121.535	121.5	9.7	2.566	0.771	3.336	4.33	58.548	2.053	1.283
33	0.5779	122.923	122.9	10.2	2.580	0.775	3.355	4.33	58.519	2.065	1.290
34	0.6065	124.156	124.2	10.7	2.591	0.780	3.371	4.32	58.483	2.076	1.296
35	0.6354	125.383	125.4	11.3	2.602	0.789	3.391	4.30	58.421	2.090	1.301
36	0.6646	126.970	127.0	11.8	2.619	0.796	3.416	4.29	58.369	2.106	1.310
37	0.6927	128.406	128.4	12.3	2.634	0.804	3.438	4.28	58.315	2.121	1.317
38	0.7222	130.119	130.1	12.8	2.653	0.812	3.466	4.27	58.259	2.139	1.327
39	0.7502	131.157	131.2	13.3	2.659	0.819	3.479	4.25	58.210	2.149	1.330
40	0.7800	132.281	132.3	13.8	2.666	0.826	3.492	4.23	58.162	2.159	1.333
41	0.8085	133.839	133.8	14.3	2.681	0.830	3.511	4.23	58.138	2.170	1.341
42	0.8375	135.494	135.5	14.8	2.698	0.836	3.534	4.23	58.094	2.185	1.349
43	0.8661	136.917	136.9	15.3	2.710	0.841	3.551	4.22	58.063	2.196	1.355
44	0.8747	135.693	135.7	15.5	2.681	0.853	3.534	4.14	57.977	2.194	1.341

Project Name: I-85 Bridge Over Rocky Creek

Project #: 1426-15-009 (Phase 105)

Boring #: RW-2

Depth: 8′ - 10′ (UD-1)

Sample Date: 3/13/2019

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)

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 #:	1426-15-009 (Phase 105)	Report Date:	4/30/19
Project Name:	I-85 Bridge Over Rocky Creek	Test Date(s):	4/19 - 4/26/19
Client Name:	MBI		
Client Address:	Columbia, SC		

Boring #:	RW-2	Log #:	39g	Sample Date:	3/13/19
Location:	UD-1	Type:	Undisturbed	Depth:	8 - 10'
Sample Description:	Sandy SILT [ML / A-7-5(9)]				
Material Excluded:	2.5%			% Passing #4 Sieve:	97.5%

Balance ID.	*0.01 gram*	*ID#:*	*13942*	*Cal. Date:*	*9/11/18*	*Cal. Due:*	*9/11/19*
Pycnometer ID No.	*23169*	*Cal. Date:*	*3/10/19*	*Balance Verification*		Check Mass:	500 gram

Pycnometer Volume (V_p)	249.73	ml.	Mass Determination: 500.00 grams
Pycnometer Mass (PM)	104.27	grams	*If [PM-M_p] is greater than .06 grams,*
Ave. Pycnometer Mass (M_p)	104.27	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* = **378.23** *grams*

Mass of Dry Soil (grams)		Tare #	BB-2
A	Tare Weight		227.23
C	Dry Wt. + Tare Wt.		266.27
M_s	Dry Weight	**C-A**	**39.04**

T_t =	Test Temperature T_t		**22.0** °C
K =	Temperature Coefficient at T_t		**0.99957**
K =	Temperature Coefficient at 23°C		**0.99933**
$p_{w;t}$ =	Density of Water at T_t		**0.99777** g./ml.

$M_{pw;t}$ =	Mass of the Pycnometer and water at T_t	$M_{pw;t} = M_p + (V_p \times p_{w;t})$	**353.44** grams
G_t =	Specific Gravity of Soil Solids at the T_t	$G_t = M_s / (M_{pw;t} - (M_{psw;t} - M_s))$	**2.740**
G =	Specific Gravity of Soil Solids at the 20°C	$G = K \times G_t$	**2.739**

Soils containing plus #4 material tested per ***ASTM C 127***

R = *% of Soil retained on the #4 sieve* **2.5%**
P = *% of Soil passing the #4 sieve* **97.5%**

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}** = $\dfrac{1}{\dfrac{R}{100 \times G_{+4}} + \dfrac{P}{100 \times G}}$ = **2.739**

Notes / Deviations / References: ASTM D854: Specific Gravity of Soil Solids by Water Pycnometer

Benjamin Kovaleski		Project Mgr. / Senior Engr.	4/30/19
Technician Name	*Technical Responsibility*	*Position*	Date

pH / Resistivity / Chloride / Sulfate

AASHTO T 289 / AASHTO T 288 / EPA SW9056A

Project #: 1426-15-009 (Phase 105)

Project Name: I-85 Bridge Over Rocky Creek

Report Date: 4/8/2019

BORING NUMBER	DEPTH	pH	RESISTIVITY (Ω-cm)	CHLORIDE CONTENT (mg / Kg)	SULFATE CONTENT (mg / Kg)
BR-1	6' - 25' *	6.4	7,000	55	37
BR-3	6 - 15' ^	5.7	12,500	19	33

* BR-1 Composite Sample blended from 5 samples:
SS-4, SS-5, SS-6, SS-7, and SS-8

^ BR-3 Composite Sample blended from 3 samples:
SS-4, SS-5, and SS-6

Matt Jacobs	NICET Lab Level III / 118202	4/8/2019
Technician Name	*Certification Type / No.*	*Date*
Brian Vaughan, P.E.	Group Leader	Brian Vaughan
Technical Responsibility	*Position*	*Signature*

LABORATORY PROCEDURES

Moisture Content: The moisture content of 17 split-spoon samples was determined. The moisture content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test was conducted in accordance with ASTM Designation D 2216. The test results are presented on the attached Summary of Laboratory Data Sheet.

Soil Plasticity Tests (Atterberg Limits Test): Representative samples were selected for Atterberg Limits testing to determine the soil's plasticity characteristics. The Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous fluid and is determined in accordance with ASTM D 423. The Plastic Limit is the moisture content at which the soil begins to lose its plasticity and is determined in accordance with ASTM D 424. The data obtained is presented on the attached Summary of Laboratory Test Data Sheet.

Grain Size Test: Grain size tests were performed to determine the particle size and distribution of the samples tested. The grain size distribution of soils coarser than a No. 200 sieve was determined by passing the samples through a set of nested sieves. The soil particles passing the No. 200 sieve were suspended in solution and the grain size distribution determined from the rate of settlement. The results are presented on the attached Particle Size Distribution Sheets.

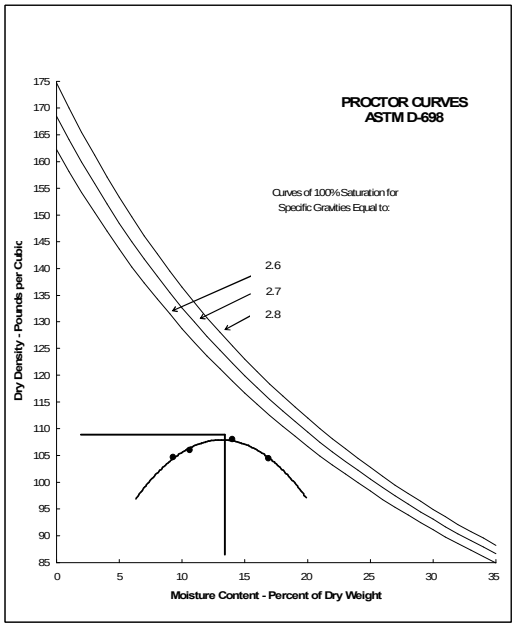
LABORATORY COMPACTION TESTING OF SOIL

LABORATORY COMPACTION TESTING

Soil placed as engineering fill is compacted to a dense state to obtain satisfactory engineering properties. Laboratory compaction tests provide the basis for determining the percent compaction and water content needed to achieve the required engineering properties, and for controlling construction to assure the required compaction and water contents are achieved.

Two alternate procedures are used for determining a moisture-density relationship for soils and granular materials. The determination of which procedure is more appropriate for the specific soils on a site is made by the geotechnical engineer after examination of the recovered bulk samples and considering local practice.

Each approach involves compaction of loose soils into a standard size mold using a specified compactive effort, then weighing back the unit weight of the soil and recording the moisture content.



Typical moisture- density curve indicates maximum dry density and optimum moisture content. Also shown are zero air voids curves for assumed specific gravity values.

Soil is compacted in the mold in three layers of approximately equal thickness, each compacted with either 25 or 56 blows of the rammer. Separate soils are used for each sample point, adjusting the moisture content of the soil as described in Section 10.2 (Moist Preparation Method). The procedure is repeated for a sufficient number of water content values to allow the dry density vs. water content values to be plotted and the *maximum dry density* and *optimum moisture content* to be determined from the resulting curvilinear relationship.

Compaction Tests of Soils Using Standard Effort

Test procedures generally follow those described by ASTM D 698, "*Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 lbf/ft^3).*"

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 5.5 lbf rammer dropped from a height of 12 inches, producing a compactive effort of 12,400 lbf/ft^3. ASTM D 698 provides three alternative procedures depending on material gradation:

Method A
- All material passes No. 4 sieve size
- 4 inch diameter mold
- Shall be used if 20 percent or less by weight is retained on No. 4 sieve

Soil in 3 layers with 25 blows per layer Method B
- All material passes 3/8 inch sieve
- 4 inch diameter mold
- Shall be used if 20 percent by weight is retained on the No. 4 sieve and 20 percent or less by weight is retained on the 3/8 Inch sieve.
- Soil in 3 layers with 25 blows per layer

Method C
- All material passes ¾ inch sieve
- 6-inch diameter mold
- Shall be used if more than 20 percent by weight is retained on the 3/8 inch sieve and less than 30 percent is retained on the ¾ inch sieve.
- Soil in 3 layers with 56 blows per layer

Compaction Tests of Soils Using Modified Effort

The compactive effort will be greater when using a heavier roller on the site. To attempt to reproduce the effort applied by heavy rollers, a modified procedure applies a greater compactive effort in the laboratory. Test procedures generally follow those described by ASTM D 1557, "*Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 lbf/ft^3).*"

The relationship between water content and the dry unit weight is determined for soils compacted in either 4 or 6 inch diameter molds with a 10 lbf rammer dropped from a height of 18 inches, producing a compactive effort of 56,000 lbf/ft^3. ASTM D 1557 provides three alternative procedures depending on material gradation:

Method A
- All material passes No. 4 sieve size
- 4 inch diameter mold
- Shall be used if 20 percent or less by weight is retained on No. 4 sieve
- Soil in 5 layers with 25 blows per layer

Method B
- All material passes 3/8 inch sieve
- 4 inch diameter mold
- Shall be used if 20 percent by weight is retained on the No. 4 sieve and 20 percent or less by weight is retained on the 3/8 Inch sieve.
- Soil in 5 layers with 25 blows per layer

Method C
- All material passes ¾ inch sieve
- 6-inch diameter mold
- Shall be used if more than 20 percent by weight is retained on the 3/8 inch sieve and less than 30 percent is retained on the ¾inch sieve.
- Soil in 5 layers with 56 blows per layer

Correction for Oversize Material

Compaction testing performed using either ASTM D698 or D1557 place limits on the maximum particle size that can be used in the tests. Oversize materials are sieved out of the samples prior to performing moisture-density tests.

Where samples contain greater than 5 percent by weight exceeding the maximum size fraction, unit weight and moisture contents of all data points obtained in Proctor tests using either Standard or Modified effort must be corrected using the procedures outlined in ASTM D 4718, *"Standard Practice for Correction of Unit Weight and Water Content for Soils Containing Oversize Particles."* Where this correction is made test data and report text so states.

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ELECTRO-CHEMICAL CLASSIFICATION TESTS

ELECTRO-CHEMICAL CLASSIFICATION TESTS

Electro chemical classification tests provide the engineer or geologist with quantitative information related to the aggressiveness of the soil conditions and the potential for deterioration of a foundation material. Electro chemical tests include (1) pH; (2) resistivity; (3) sulfate ion content; and (4) chloride ion content.

Soil pH Testing

Soil pH measures the activity of hydrogen ions in a water solution. The pH scale ranges from 0 (very acidic) to 14 (very alkaline or basic). Test methods follow those given by AASHTO T-289-91(2004), *"Determining pH for Soil for Use in Corrosion Testing."*

Moist samples are sieved and pulverized as described in Section 6.2. A 30mg sample is then suspended in distilled water for one hour. A pH meter is first standardized against a buffer solution of known pH, then the probe immersed in the suspended solution and the pH reading recorded. If the pH of the soil is below 4.5 the soil is reported as aggressive.

Field Resistivity Testing

Apparent resistivity of the soil is measured at selected locations by measuring the voltage potential between four equally spaced, in-line direct current electrodes in the Wenner Electrode Arrangement as described in ASTM D 6431, *"Standard Guide for Using the Direct Current Resistivity Method for Subsurface Investigation."* Using the measured voltages, resistivity is estimated using the approach described in "*A Method of Measuring Earth Resistivity*", U. S. Bureau of Standards Bulletin No. 258, by Dr. F. Wenner, in which the average resistivity of the soil to a depth of "A" is given by:

r = 191.5 x AE/I, where:

r = Average resistivity of soil, ohm-cm
A = Distance between electrodes, cm
E = Measured Voltage, Volts
I = Current, Amperes

Measurements employ a set of four electrodes in a linear array. Measurements at a single location are typically made in two orientations at right angles to one another. The location and orientation of each traverse is indicated in the report or on the boring location plan in the Appendix.

Successive measurements are made by varying the electrode spacing at horizontal intervals of 5, 10, 15, and 20 feet unless otherwise indicated in the report. The depth of measurement is considered roughly equivalent to the electrode spacing

Laboratory Minimum Soil Resistivity

This method is used to determine the soil corrosivity and identify conditions under which corrosion of metals in the soil may be reduced. Test methods follow those described in AASHTO T-288-91(2004), "*Determining Minimum Laboratory Soil Resistivity.*"

Tests are performed on about 1500 grams of air dried material obtained by splitting or quartering recovered samples. Testing is performed on material passing the No. 10 sieve size. Prepared samples are placed in a standard soil box and finger compacted. Resistance of the sample between the electrodes is measured with either an alternating current resistivity meter or a 12-V direct current resistivity meter.

After each test, the sample is removed from the box and moisture content adjusted by addition of distilled water to the soil. The sample is replaced in the box with finger compaction and the test repeated. Testing is preformed on successively higher moisture contents until a minimum resistivity value is recorded, which is reported as the resistivity. The minimum soil resistivity can occur at any soil moisture content.

Soil Corrosivity Versus Resistivity

Soil Corrosivity	Soil Resistivity (ohm-cm)
Very corrosive	0 to 2,000
Corrosive	2,000 to 5,000
Moderately corrosive	5,000 to 10,000
Mildly corrosive	10,000 to 25,000
Relatively less corrosive	25,000 to 50,000
Progressively non-corrosive	50,000 to 100,000

Laboratory Sulfate Ion Content Test

External sulfate can occur when concrete is in contact with sulfate containing water e.g. seawater, swamp water, ground water or sewage water. The often massive formation of gypsum and ettringite formed during the external sulfate attack may cause concrete to crack and scale.

Water soluble sulfate ion content is determined using either Method A or B as described by AASHTO T-290-95(2003), *"Determining Water-Soluble Sulfate Ion Content in Soil*." Soil specimens were first prepared by splitting and quartering representative portions from recovered samples as described in Section 7.2.

Method A, the Gravimetric Method, determines sulfate content by precipitation of barium sulfate from a heated solution of the soil and chemical reagents. Method B, the Turbidimetric Method, relies on a photoelectric colorimeter to determine the turbidity of a barium sulfate suspension after chemical reagents are added. Laboratory test data sheets will indicate the method used.

Laboratory Chloride Ion Content Test

Water soluble chloride ion content is determined using either Method A or B as described by AASHTO T-291-94(2004), *"Determining Water-Soluble chloride Ion Content in Soil*." Soil specimens were first prepared by splitting and quartering representative portions from recovered samples as described in Section 7.2.

Method A, the Mohr Titration Method, determines chloride ion content using silver nitrate in a suspended solution of the soil and distilled water. A reaction between a potassium chromate indicator solution and the silver nitrate produces a red-silver chromate precipitate.

Method B utilizes a pH/mV meter with chloride ion selective electrodes. When inserted into the suspension the meter records the activity of the chloride ions. These readings are compared to a set of calibration curves to determine the ion content in mg/kg.

Interpretation of Soil Corrosive Potential

Tests to characterize the aggressiveness of a soil environment are important for design applications that include metallic elements, especially for ground anchors comprised of high strength steel and for metallic reinforcements in mechanically stabilized earth walls.

If results from these tests indicate chloride ion content greater than 100 ppm or sulfate ion content greater than 200 ppm, then the soil should be considered as **aggressive**. If the pH of the soil is below 4.5 or the resistivity is less than 1000 ohms/cm, the soil is reported as **aggressive**.

S&ME

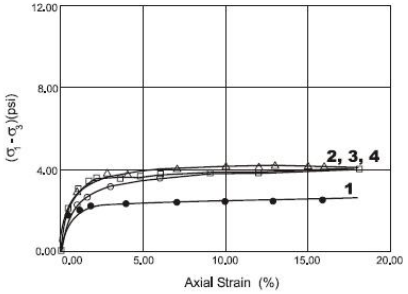
LABORATORY SHEAR STRENGTH TESTING

UU or "Q" Triaxial Shear Tests of Undisturbed Samples

Undrained strength tests performed using the UU or "Q" test method are described by ASTM D 2850, "*Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils."* This test is typically limited to cohesive soils having a permeability slower than 10^{-3} cm/sec, preserved as Group C samples as defined in ASTM D 4220.

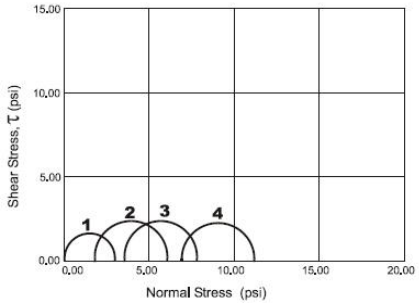
The UU test employs rapid application of both confining and axial stresses without permitting drainage of pore water. This condition simulates rapid loading of the soil during construction before sufficient time is allowed for the soil to consolidate. UU tests are performed on samples at their "as-received" moisture content, so that results may be applied to "construction conditions" in embankment stability analyses.

The extruded sample was encased in a rubber membrane and sealed to the specimen base and cap with rubber O-rings to prevent drainage of the specimen. In most cases UD samples are tested without trimming except for cutting the end surfaces plane and perpendicular to the longitudinal axis of the specimen.



The UU test is performed with the drain valve of the triaxial cell closed during all phases of the test and before the sample has a chance to consolidate (S<100 percent). The chamber is pressurized to the desired confining pressure and the sample allowed to stabilize at least 10 minutes before application of axial load. The sample is loaded axially by compressing the top platen into the sample at a constant rate of approximately one percent strain per minute.

Deformation of the sample and the applied stress is recorded electronically using LVDT strain gages. Failure of the specimens during the tests is defined as the maximum principal stress difference (deviator stress) attained at any point during the test, or as the deviator stress at 15 percent strain, whichever occurs first. Test output is attached in the Appendix and includes a plot of deviator stress vs. applied strain for various load increments, and Mohr Circle plots at various increments of confining stress.



CU or "R" Triaxial Shear Tests of Undisturbed Samples

Shear tests performed using the CU or "R" test method are described by ASTM D 4767, *"Standard Test Method for Consolidated-Undrained Triaxial Compression Test for Cohesive Soils*." This test is typically applicable to Group C samples as defined in ASTM D 4220.

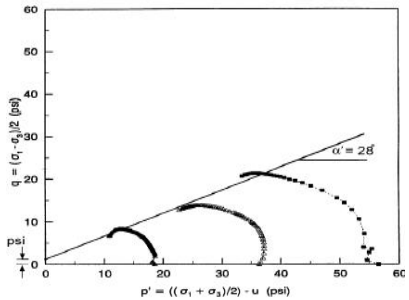
Samples tested using the R test method are isotropically consolidated and sheared in compression without drainage at a constant rate of axial deformation. The measured shear strength can be applied to field conditions where soils that have been fully consolidated under one set of stresses are subjected to a change in stress without time for further consolidation to take place.

Measured pore pressures induced by the change in stress can be used to compute effective stress shear strength, which may be applied to field conditions in which full drainage can occur or to conditions in which pore pressures induced by loading can be estimated.

R test samples are prepared as generally described in Section 6 of ASTM D 4767. Each extruded sample is encased in a rubber membrane and sealed with rubber O-rings to prevent drainage of the specimen. UD samples are typically tested without trimming except for cutting end surfaces plane and perpendicular to the long axis of the specimen. Samples are saturated by back pressuring the pore water to drive the air in the void spaces into solution, after the system was saturated by applying a vacuum to the specimen and dry drainage system as described in section 8.2.

With the drainage valves of the triaxial cell closed, the cell pressure is increased with back pressure constant to confine the specimen. After attaining the desired confining pressure, the drainage ports are opened and the sample fully consolidated to equilibrium before applying axial load.

p-q plot of test results



The fully consolidated sample is loaded axially by compressing the top platen at a constant rate of one percent strain per minute, with drainage ports again closed. Sample deformation and applied stress is recorded electronically using LVDT strain gages and induced pore pressures measured using a stiff electronic pressure transducer.

Failure of the specimens during the tests is defined as the point of maximum effective stress obliquity, the maximum stress difference (deviator stress) attained at any point during the test, or as the deviator stress at 15 percent strain, whichever occurs first. Test output is attached in the Appendix and includes a plot of deviator stress vs. applied strain for various load increments, induced pore pressure vs. applied strain, p'-q' diagram, and Mohr Circle plots at various increments of confining stress.

Triaxial Shear Tests of Remolded Samples

Specimens are prepared in a standard mold by compacting them at predetermined moisture contents to the dry density values prescribed by the geotechnical engineer. Compacted samples are then removed from the mold and the ends of each specimen carved by hand and trimmed as necessary to provide a surface perpendicular to the long axis.

S&ME

APPENDIX IV

ROCK CORE DATA

Rock Core Photographs
Unconfined Compressive Strength Test Data

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Rock Core Photographs
Core Location: Boring BR-1
I-85 Bridge Over Rocky Creek
Greenville County, South Carolina
SCDOT Project ID P038111 (S&ME Project No. 1426-15-009)
Depth Cored: 28.1 to 50.6 ft

Box 1 of 2 Top

Box 2 of 2 Top

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Rock Core Photographs
Core Location: Boring BR-2
I-85 Bridge Over Rocky Creek
Greenville County, South Carolina
SCDOT Project ID P038111 (S&ME Project No. 1426-15-009)
Depth Cored: 37.3 to 61.5 ft

Box 1 of 2

Box 2 of 2

48 Brookfield Oaks Drive, Suite F
Greenville, South Carolina 29607

Rock Core Photographs
Core Location: Boring BR-3
I-85 Bridge Over Rocky Creek
Greenville County, South Carolina
SCDOT Project ID P038111 (S&ME Project No. 1426-15-009)
Depth Cored: 31.5 to 50.8 ft

Box 1 of 2 Top

Box 2 of 2 Top

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

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

Project Name: I-85 Bridge Over Rocky Creek
Project Number: 1426-15-009, Phase 105

Report Date: April 8, 2019
Reviewed By: Jason B. Burgess

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
BR-1	NQ-1	29.6 - 30.6	4.47	1.99	A	3.11	166.0	75	76,507	24,600	0.2
BR-1	NQ-2	33.9 - 34.6	4.45	1.99	A	3.11	164.7	73	88,076	28,320	0.1
BR-1	NQ-3	39.8 - 40.6	4.46	1.98	A	3.08	163.7	70	50,960	16,545	0.1
BR-1	NQ-4	42.9 - 43.5	3.93	1.98	D	3.08	170.4	82	20,837	6,765	0.2

NOTES: Effective (as received) unit weight as determined by RTH 109-93.
Loading rates were selected to target reaching failure between 2 and 15 minutes.
Test results for specimens not meeting the requirements of ASTM D4543-08$^{\epsilon 1}$ may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08$^{\epsilon 1}$ *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

A Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.

C 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.

D 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.

E Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

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

Project Name: I-85 Bridge Over Rocky Creek
Project Number: 1426-15-009, Phase 105

Report Date: April 8, 2019
Reviewed By: Jason B. Burgess

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
BR-2	NQ-1	38.7 - 39.3	4.45	1.98	A	3.08	164.5	71	48,407	15,717	0.1
BR-2	NQ-2	41.4 - 42.5	4.39	1.98	A	3.08	163.0	82	54,175	17,589	0.1
BR-2	NQ-3	44.8 - 45.5	4.40	1.98	A	3.08	171.4	43	18,168	5,899	0.1
BR-2	NQ-4	49.3 - 50.2	4.43	1.98	A	3.08	163.3	50	21,407	6,950	0.1
BR-2	NQ-5	55.0 - 56.3	4.44	1.98	D	3.08	166.4	81	45,293	14,706	0.1

NOTES: Effective (as received) unit weight as determined by RTH 109-93.
Loading rates were selected to target reaching failure between 2 and 15 minutes.
Test results for specimens not meeting the requirements of ASTM D4543-08$^{\epsilon 1}$ may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08$^{\epsilon 1}$ *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

A Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.

C 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.

D 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.

E Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

S&ME, Inc. - Knoxville 3313 Topside Road, Louisville, TN 37777

Project Name: I-85 Bridge Over Rocky Creek
Project Number: 1426-15-009, Phase 105

Report Date: April 8, 2019
Reviewed By: Jason B. Burgess

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
BR-3	NQ-1	31.5 - 32.3	4.47	1.98	A	3.08	163.6	77	64,325	20,885	0.1
BR-3	NQ-2	35.8 - 36.9	4.47	1.99	A	3.11	162.8	73	48,574	15,619	0.1
BR-3	NQ-3	40.8 - 42.0	4.45	1.98	A	3.08	166.0	87	50,752	16,478	0.1
BR-3	NQ-4	46.6 - 47.7	4.21	1.98	C	3.08	162.8	43	10,633	3,452	0.5

NOTES: Effective (as received) unit weight as determined by RTH 109-93.
Loading rates were selected to target reaching failure between 2 and 15 minutes.
Test results for specimens not meeting the requirements of ASTM D4543-08$^{\epsilon 1}$ may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08$^{\epsilon 1}$ *Standard Practice for Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerance* Section 1.2 - "Rock is a complex engineering material that can vary greatly as a function of lithology, stress history, weathering, moisture content and chemistry, and other natural geologic processes. As such, it is not always possible to obtain or prepare rock core specimens that satisfy the desirable tolerances given in this practice. Most commonly, this situation presents itself with weaker, more porous, and poorly cemented rock types and rock types containing significant or weak (or both) structural features. For these and other rock types which are difficult to prepare, all reasonable efforts shall be made to prepare a specimen in accordance with this practice and for the intended test procedure. However, when it has been determined by trial that this is not possible, prepare the rock specimen to the closest tolerances practicable and consider this to be the best effort and report it as such and if allowable or necessary for the intended test, capping the ends of the specimen as discussed in this practice is permitted."

A Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness & parallelism, and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness. Specimen prepared to closest tolerances practicable.

C 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.

D 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.

E Test specimen measurements met the desired shape tolerances of ASTM D4543-08$^{\epsilon 1}$ for end flatness and end perpendicularity to axis. Specimen did not meet the desired tolerance for side straightness and parallelism. Specimen prepared to closest tolerances practicable.

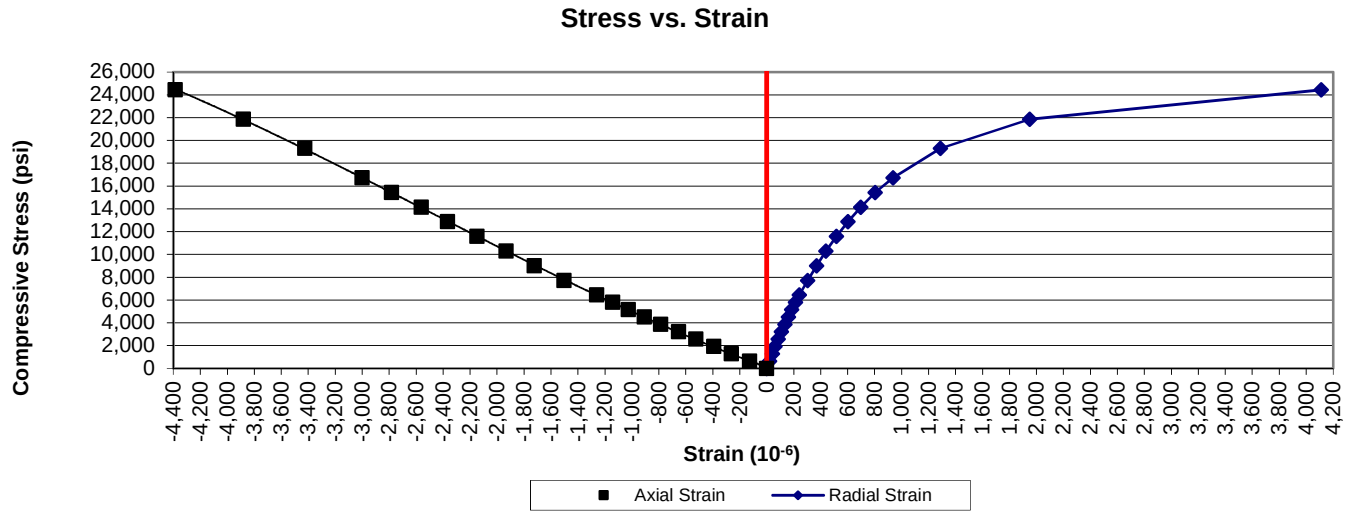
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.99	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.47	**Tested by:**	BKP / TDV
Boring Id:	BR-1	**Unit Weight, pcf:**	166.0	**Reviewed by:**	JBB
Sample No:	NQ-1	**Moisture Content, %:**	0.2		
Depth (ft):	29.6 - 30.6	**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	0.00	0.00	
2	-126	20	2,000	643	5.10	0.16	
3	-262	41	4,000	1,286	4.91	0.16	
4	-391	62	6,000	1,929	4.93	0.16	
5	-526	85	8,000	2,572	4.89	0.16	
6	-653	108	10,000	3,215	4.92	0.17	
7	-786	134	12,000	3,859	4.91	0.17	
8	-906	160	14,000	4,502	4.97	0.18	
9	-1,025	184	16,000	5,145	5.02	0.18	
10	-1,143	213	18,000	5,788	5.06	0.19	
11	-1,260	242	20,000	6,431	5.10	0.19	
12	-1,503	304	24,000	7,717	5.13	0.20	
13	-1,724	369	28,000	9,003	5.22	0.21	
14	-1,932	439	32,000	10,289	5.33	0.23	
15	-2,148	516	36,000	11,576	5.39	0.24	
16	-2,366	601	40,000	12,862	5.44	0.25	
17	-2,560	696	44,000	14,148	5.53	0.27	
18	-2,782	805	48,000	15,434	5.55	0.29	
19	-2,999	937	52,000	16,720	5.58	0.31	
20	-3,425	1,287	60,000	19,293	5.63	0.38	
21	-3,881	1,951	68,000	21,865	5.63	0.50	
22	-4,385	4,112	76,000	24,437	5.57	0.94	
23			76,507	24,600			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)



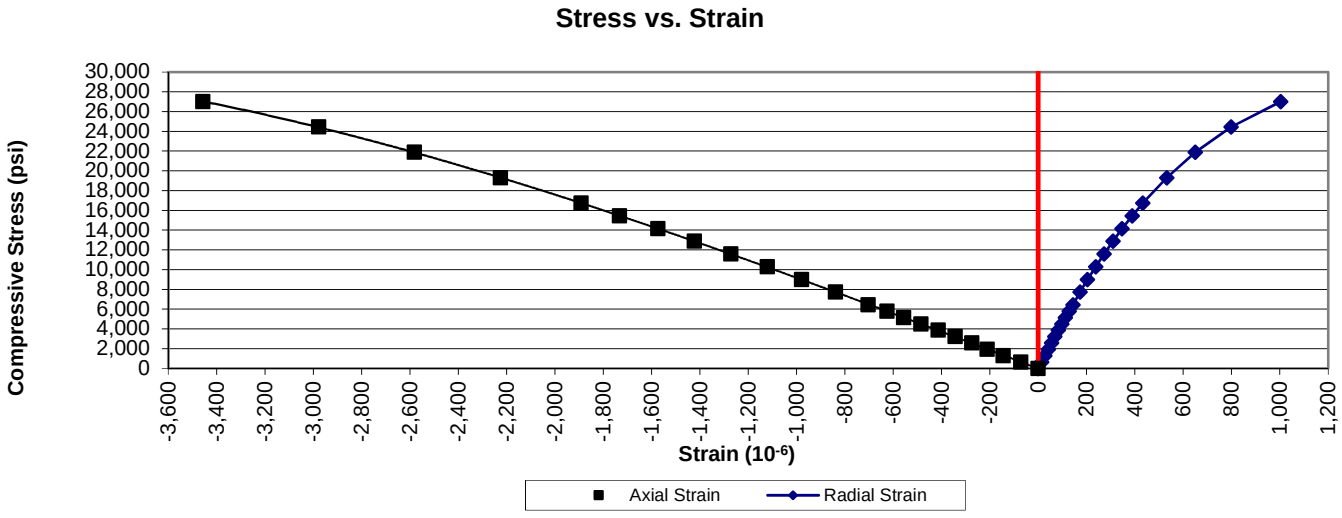
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.99	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.45	**Tested by:**	BKP / TDV
Boring Id:	BR-1	**Unit Weight, pcf:**	164.7	**Reviewed by:**	JBB
Sample No:	NQ-2	**Moisture Content, %:**	0.1		
Depth (ft):	33.9 - 34.6	**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	0.00	0.00	
2	-72	14	2,000	643	8.93	0.19	
3	-144	27	4,000	1,286	8.93	0.19	
4	-211	42	6,000	1,929	9.14	0.20	
5	-274	55	8,000	2,572	9.39	0.20	
6	-343	69	10,000	3,215	9.37	0.20	
7	-413	83	12,000	3,859	9.34	0.20	
8	-485	98	14,000	4,502	9.28	0.20	
9	-556	112	16,000	5,145	9.25	0.20	
10	-625	128	18,000	5,788	9.26	0.20	
11	-704	144	20,000	6,431	9.13	0.20	
12	-839	173	24,000	7,717	9.20	0.21	
13	-979	204	28,000	9,003	9.20	0.21	
14	-1,121	238	32,000	10,289	9.18	0.21	
15	-1,271	272	36,000	11,576	9.11	0.21	
16	-1,422	310	40,000	12,862	9.05	0.22	
17	-1,573	347	44,000	14,148	8.99	0.22	
18	-1,733	389	48,000	15,434	8.91	0.22	
19	-1,891	433	52,000	16,720	8.84	0.23	
20	-2,225	532	60,000	19,293	8.67	0.24	
21	-2,582	650	68,000	21,865	8.47	0.25	
22	-2,978	799	76,000	24,437	8.21	0.27	
23	-3,457	1,004	84,000	27,010	7.81	0.29	
24			88,076	28,320			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)



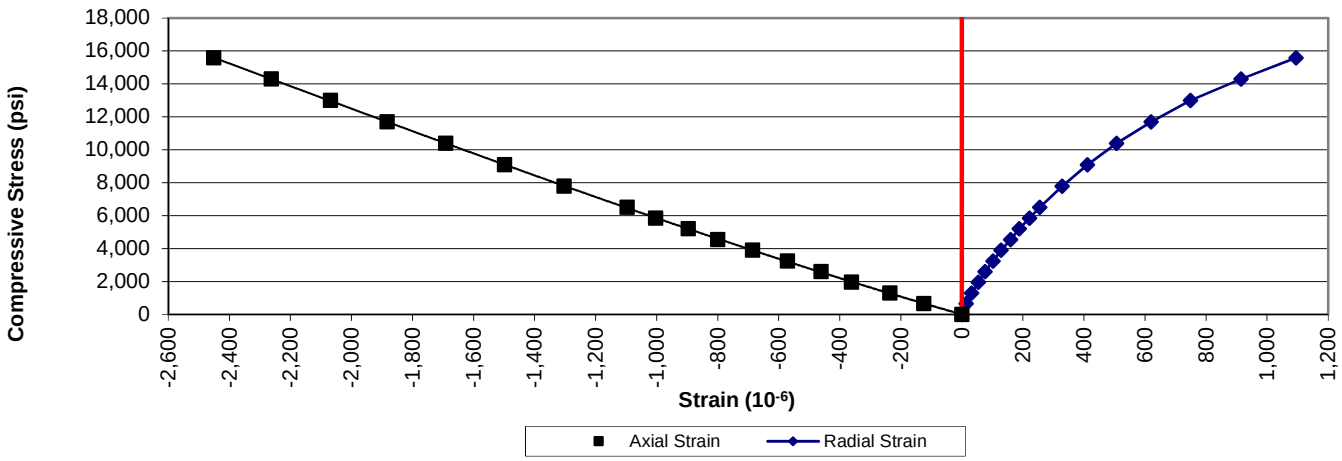
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.46	**Tested by:**	BKP / TDV
Boring Id:	BR-1	**Unit Weight, pcf:**	163.7	**Reviewed by:**	JBB
Sample No:	NQ-3	**Moisture Content, %:**	0.1		
Depth (ft):	39.8 - 40.6	**Load Rate, psi/sec:**	70		

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	-124	14	2,000	649	5.23	0.11	
3	-236	32	4,000	1,299	5.50	0.14	
4	-361	54	6,000	1,948	5.40	0.15	
5	-461	76	8,000	2,597	5.63	0.16	
6	-571	102	10,000	3,247	5.69	0.18	
7	-685	128	12,000	3,896	5.69	0.19	
8	-800	160	14,000	4,545	5.68	0.20	
9	-896	188	16,000	5,195	5.80	0.21	
10	-1,003	222	18,000	5,844	5.83	0.22	
11	-1,096	255	20,000	6,494	5.93	0.23	
12	-1,303	328	24,000	7,792	5.98	0.25	
13	-1,498	411	28,000	9,091	6.07	0.27	
14	-1,691	507	32,000	10,390	6.14	0.30	
15	-1,883	620	36,000	11,688	6.21	0.33	
16	-2,068	749	40,000	12,987	6.28	0.36	
17	-2,262	915	44,000	14,286	6.32	0.40	
18	-2,451	1,095	48,000	15,584	6.36	0.45	
19			50,960	16,545			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)



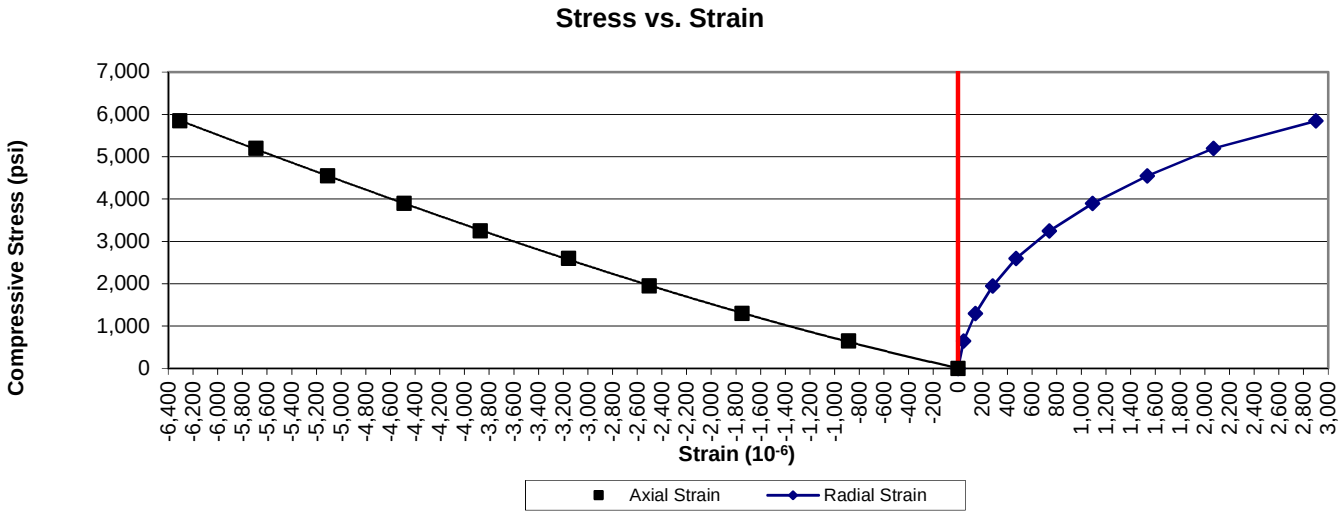
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	3.93	**Tested by:**	BKP / TDV
Boring Id:	BR-1	**Unit Weight, pcf:**	170.4	**Reviewed by:**	JBB
Sample No:	NQ-4	**Moisture Content, %:**	0.2		
Depth (ft):	42.9 - 43.5	**Load Rate, psi/sec:**	82		

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	-886	44	2,000	649	0.73	0.05	
3	-1,750	142	4,000	1,299	0.74	0.08	
4	-2,502	281	6,000	1,948	0.78	0.11	
5	-3,156	470	8,000	2,597	0.82	0.15	
6	-3,871	741	10,000	3,247	0.84	0.19	
7	-4,488	1,091	12,000	3,896	0.87	0.24	
8	-5,108	1,535	14,000	4,545	0.89	0.30	
9	-5,688	2,070	16,000	5,195	0.91	0.36	
10	-6,307	2,900	18,000	5,844	0.93	0.46	
11			20,837	6,765			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.



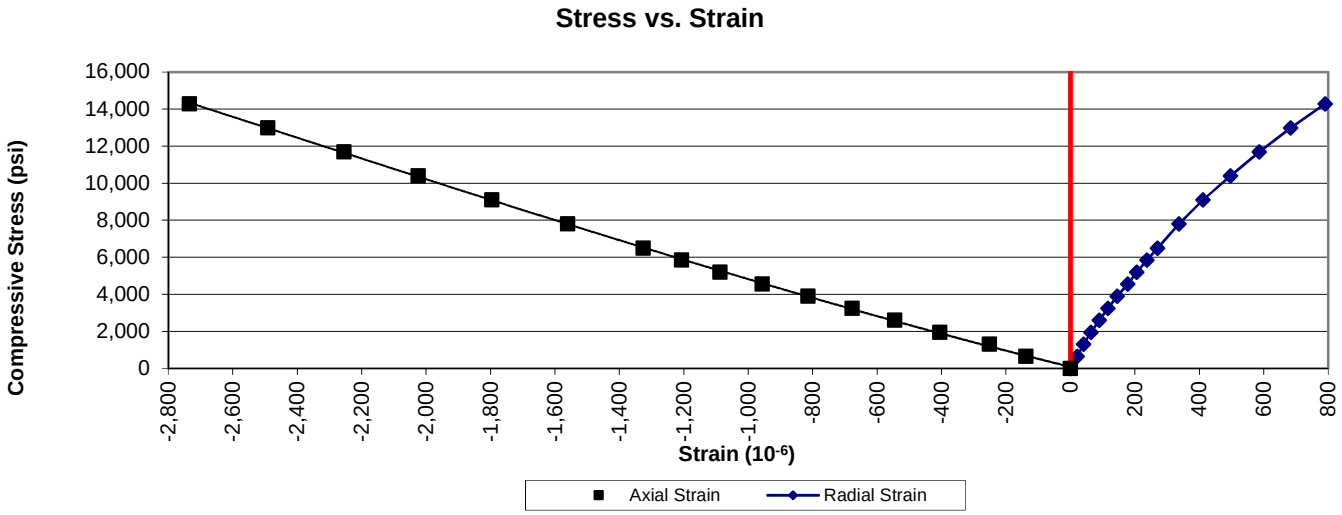
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.45	**Tested by:**	BKP / TDV
Boring Id:	BR-2	**Unit Weight, pcf:**	164.5	**Reviewed by:**	JBB
Sample No:	NQ-1	**Moisture Content, %:**	0.1		
Depth (ft):	38.7 - 39.3	**Load Rate, psi/sec:**	71		

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	-138	21	2,000	649	4.70	0.15	
3	-251	41	4,000	1,299	5.18	0.16	
4	-405	64	6,000	1,948	4.81	0.16	
5	-545	90	8,000	2,597	4.77	0.17	
6	-677	116	10,000	3,247	4.80	0.17	
7	-814	145	12,000	3,896	4.79	0.18	
8	-956	178	14,000	4,545	4.75	0.19	
9	-1,088	206	16,000	5,195	4.77	0.19	
10	-1,207	238	18,000	5,844	4.84	0.20	
11	-1,326	270	20,000	6,494	4.90	0.20	
12	-1,560	337	24,000	7,792	4.99	0.22	
13	-1,796	411	28,000	9,091	5.06	0.23	
14	-2,024	497	32,000	10,390	5.13	0.25	
15	-2,255	586	36,000	11,688	5.18	0.26	
16	-2,491	684	40,000	12,987	5.21	0.27	
17	-2,734	791	44,000	14,286	5.23	0.29	
18			48,407	15,717			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)



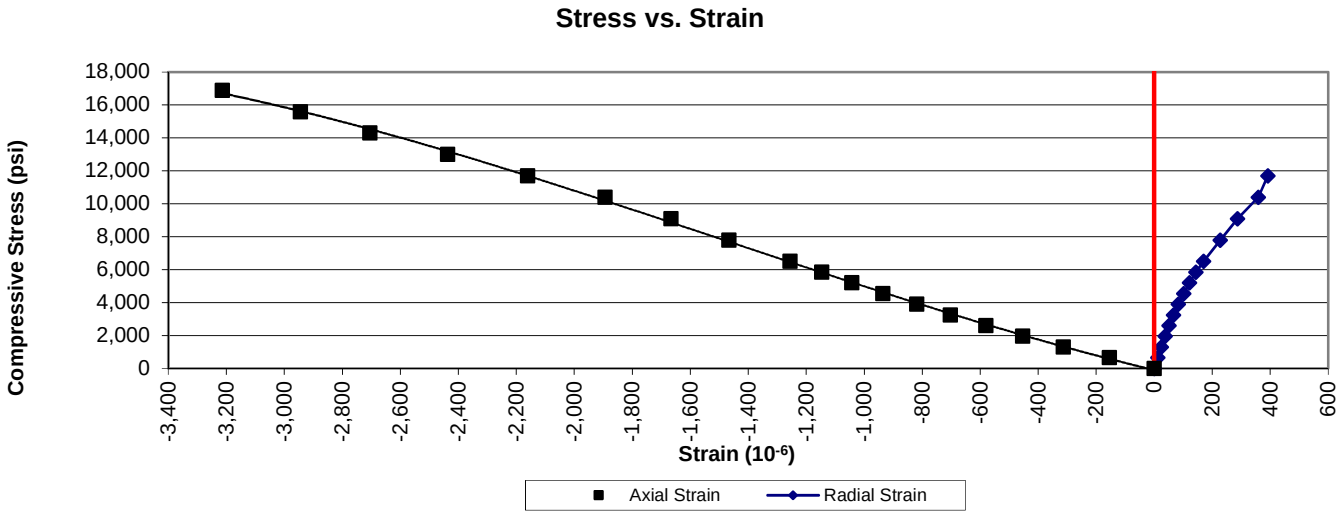
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/5/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.39	**Tested by:**	BKP / TDV
Boring Id:	BR-2	**Unit Weight, pcf:**	163.0	**Reviewed by:**	JBB
Sample No:	NQ-2	**Moisture Content, %:**	0.1		
Depth (ft):	41.4 - 42.5	**Load Rate, psi/sec:**	82		

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	-154	13	2,000	649	4.21	0.08	
3	-313	25	4,000	1,299	4.15	0.08	
4	-453	38	6,000	1,948	4.30	0.08	
5	-580	51	8,000	2,597	4.48	0.09	
6	-703	67	10,000	3,247	4.62	0.10	
7	-819	83	12,000	3,896	4.76	0.10	
8	-936	102	14,000	4,545	4.86	0.11	
9	-1,042	122	16,000	5,195	4.99	0.12	
10	-1,146	144	18,000	5,844	5.10	0.13	
11	-1,256	170	20,000	6,494	5.17	0.14	
12	-1,466	228	24,000	7,792	5.32	0.16	
13	-1,666	287	28,000	9,091	5.46	0.17	
14	-1,893	359	32,000	10,390	5.49	0.19	
15	-2,160	392	36,000	11,688	5.41	0.18	
16	-2,436		40,000	12,987	5.33	0.00	lost radial gage
17	-2,705		44,000	14,286	5.28	0.00	
18	-2,944		48,000	15,584	5.29	0.00	
19	-3,213		52,000	16,883	5.25	0.00	
20			54,175	17,589			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)



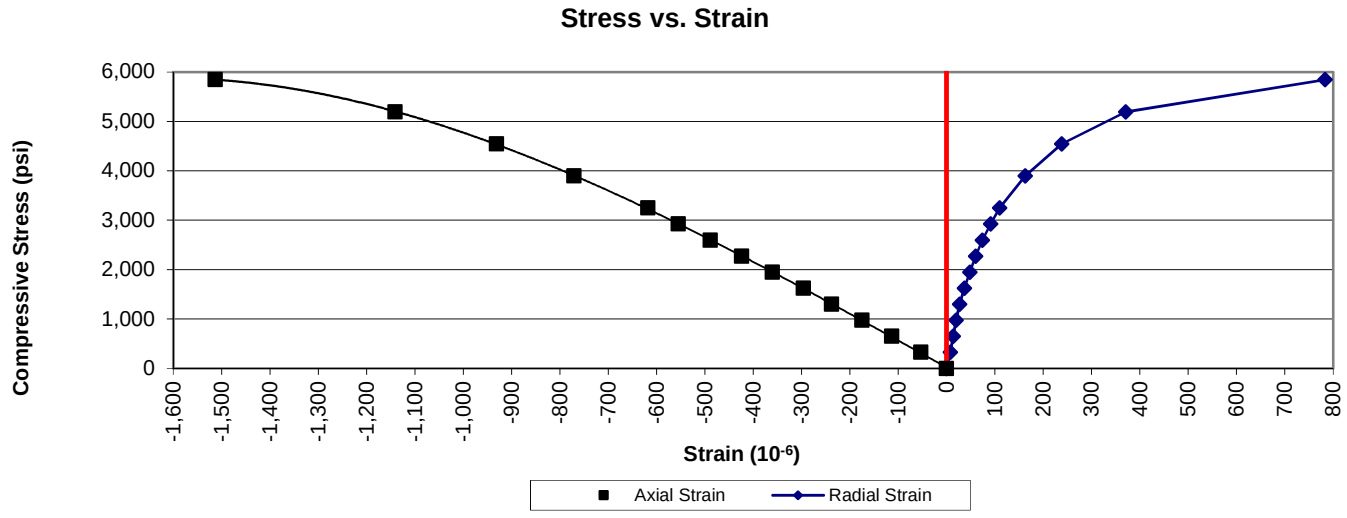
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/5/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.40	**Tested by:**	BKP / TDV
Boring Id:	BR-2	**Unit Weight, pcf:**	171.4	**Reviewed by:**	JBB
Sample No:	NQ-3	**Moisture Content, %:**	0.1		
Depth (ft):	44.8 - 45.5	**Load Rate, psi/sec:**	43		

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	8	1,000	325	6.13	0.15	
3	-113	14	2,000	649	5.74	0.12	
4	-175	20	3,000	974	5.57	0.11	
5	-238	27	4,000	1,299	5.46	0.11	
6	-296	37	5,000	1,623	5.48	0.13	
7	-360	48	6,000	1,948	5.41	0.13	
8	-424	60	7,000	2,273	5.36	0.14	
9	-489	74	8,000	2,597	5.31	0.15	
10	-555	91	9,000	2,922	5.26	0.16	
11	-618	110	10,000	3,247	5.25	0.18	
12	-771	163	12,000	3,896	5.05	0.21	
13	-931	238	14,000	4,545	4.88	0.26	
14	-1,141	371	16,000	5,195	4.55	0.33	
15	-1,513	783	18,000	5,844	3.86	0.52	
16			18,168	5,899			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)



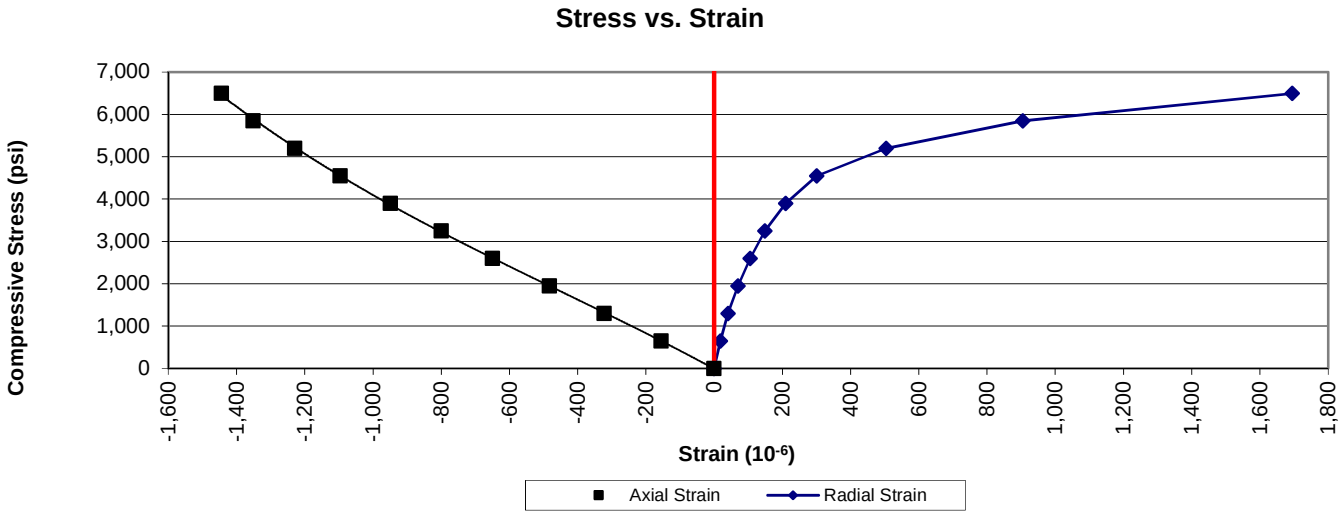
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/5/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.43	**Tested by:**	BKP / TDV
Boring Id:	BR-2	**Unit Weight, pcf:**	163.3	**Reviewed by:**	JBB
Sample No:	NQ-4	**Moisture Content, %:**	0.1		
Depth (ft):	49.3 - 50.2	**Load Rate, psi/sec:**	50		

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	0.00	0.00	
2	-155	18	2,000	649	4.19	0.12	
3	-322	41	4,000	1,299	4.03	0.13	
4	-483	70	6,000	1,948	4.03	0.14	
5	-650	106	8,000	2,597	4.00	0.16	
6	-800	149	10,000	3,247	4.06	0.19	
7	-949	210	12,000	3,896	4.11	0.22	
8	-1,096	301	14,000	4,545	4.15	0.27	
9	-1,229	504	16,000	5,195	4.23	0.41	
10	-1,351	905	18,000	5,844	4.33	0.67	
11	-1,444	1,695	20,000	6,494	4.50	1.17	
12			21,407	6,950			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)



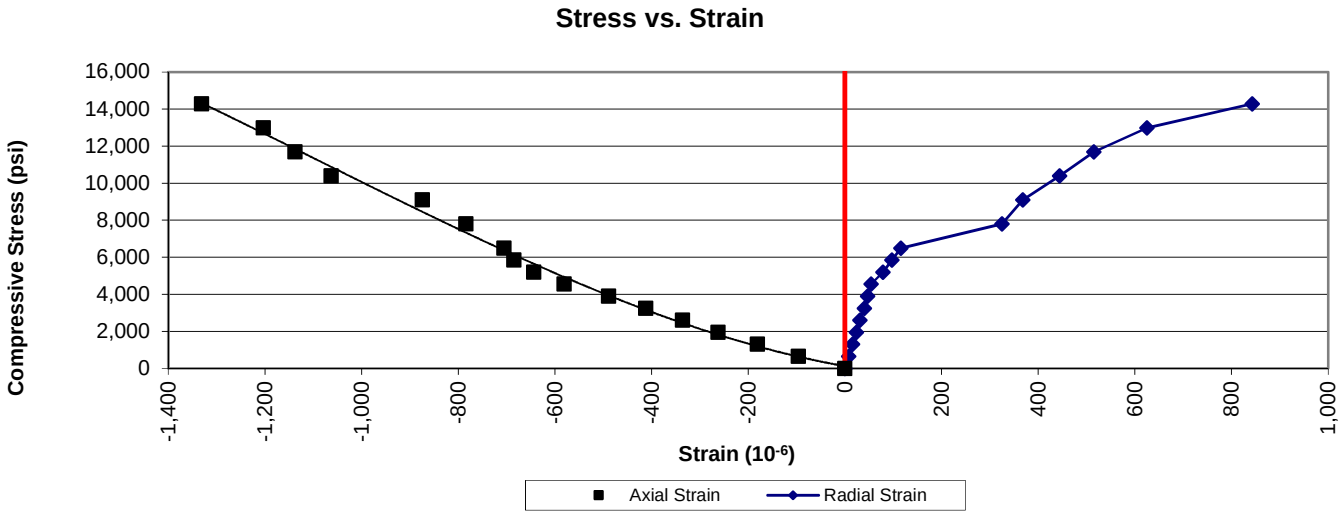
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/5/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.44	**Tested by:**	BKP / TDV
Boring Id:	BR-2	**Unit Weight, pcf:**	166.4	**Reviewed by:**	JBB
Sample No:	NQ-5	**Moisture Content, %:**	0.1		
Depth (ft):	55.0 - 56.3	**Load Rate, psi/sec:**	81		

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	-96	8	2,000	649	6.76	0.08	
3	-181	16	4,000	1,299	7.18	0.09	
4	-262	24	6,000	1,948	7.44	0.09	
5	-336	31	8,000	2,597	7.73	0.09	
6	-412	40	10,000	3,247	7.88	0.10	
7	-489	47	12,000	3,896	7.97	0.10	
8	-581	54	14,000	4,545	7.82	0.09	
9	-644	79	16,000	5,195	8.07	0.12	
10	-685	97	18,000	5,844	8.53	0.14	
11	-705	116	20,000	6,494	9.21	0.16	
12	-784	325	24,000	7,792	9.94	0.41	
13	-874	368	28,000	9,091	10.40	0.42	
14	-1,063	444	32,000	10,390	9.77	0.42	
15	-1,138	515	36,000	11,688	10.27	0.45	
16	-1,203	625	40,000	12,987	10.80	0.52	
17	-1,331	843	44,000	14,286	10.73	0.63	
			45,293	14,706			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.



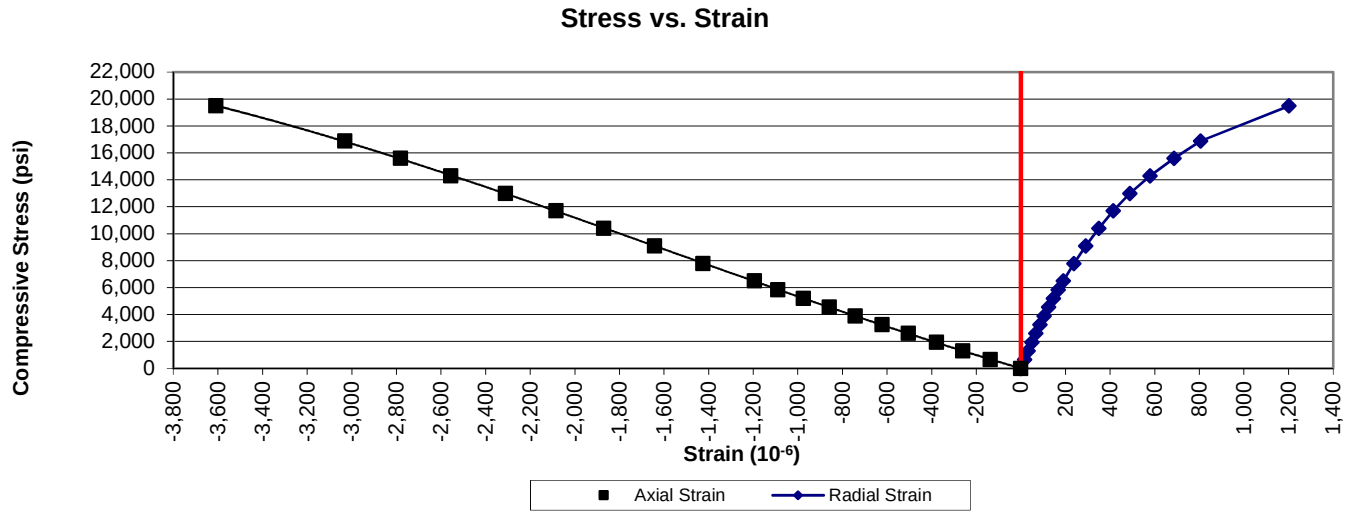
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.47	**Tested by:**	BKP / TDV
Boring Id:	BR-3	**Unit Weight, pcf:**	163.6	**Reviewed by:**	JBB
Sample No:	NQ-1	**Moisture Content, %:**	0.1		
Depth (ft):	31.5 - 32.3	**Load Rate, psi/sec:**	77		

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	0.00	0.00	
2	-137	17	2,000	649	4.74	0.12	
3	-261	33	4,000	1,299	4.98	0.13	
4	-378	49	6,000	1,948	5.15	0.13	
5	-504	67	8,000	2,597	5.15	0.13	
6	-622	85	10,000	3,247	5.22	0.14	
7	-743	104	12,000	3,896	5.24	0.14	
8	-859	124	14,000	4,545	5.29	0.14	
9	-975	145	16,000	5,195	5.33	0.15	
10	-1,089	167	18,000	5,844	5.37	0.15	
11	-1,194	190	20,000	6,494	5.44	0.16	
12	-1,425	238	24,000	7,792	5.47	0.17	
13	-1,642	290	28,000	9,091	5.54	0.18	
14	-1,870	350	32,000	10,390	5.56	0.19	
15	-2,084	414	36,000	11,688	5.61	0.20	
16	-2,311	488	40,000	12,987	5.62	0.21	
17	-2,556	579	44,000	14,286	5.59	0.23	
18	-2,781	687	48,000	15,584	5.60	0.25	
19	-3,031	806	52,000	16,883	5.57	0.27	
20	-3,609	1,202	60,000	19,481	5.40	0.33	
21			64,325	20,885			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)



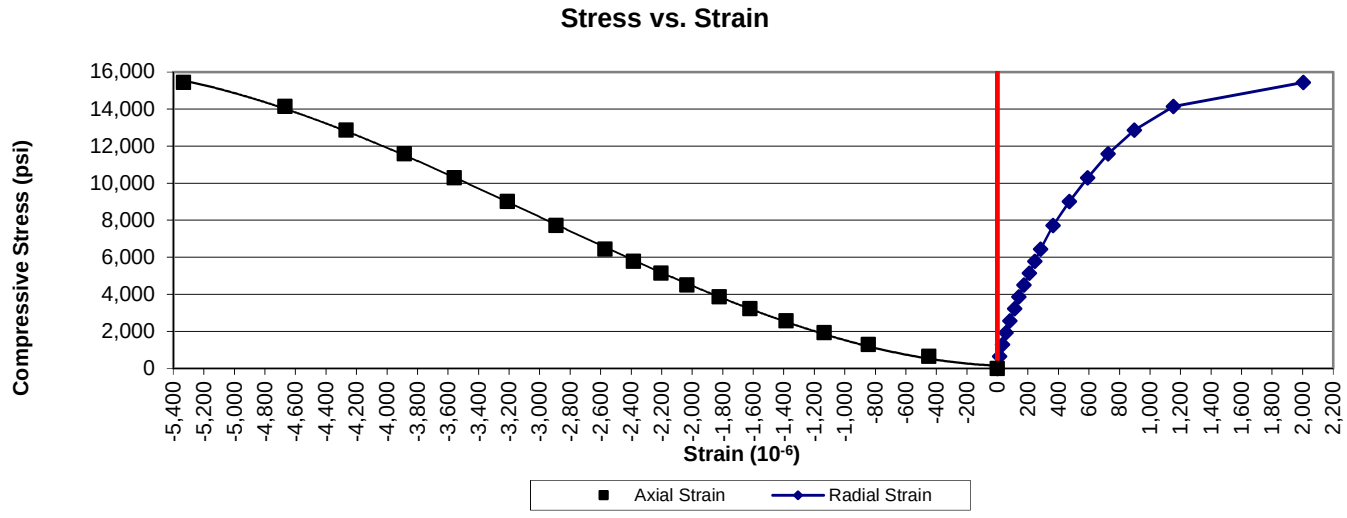
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.99	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.47	**Tested by:**	BKP / TDV
Boring Id:	BR-3	**Unit Weight, pcf:**	162.8	**Reviewed by:**	JBB
Sample No:	NQ-2	**Moisture Content, %:**	0.1		
Depth (ft):	35.8 - 36.9	**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	0.00	0.00	
2	-450	14	2,000	643	1.43	0.03	
3	-846	34	4,000	1,286	1.52	0.04	
4	-1,135	57	6,000	1,929	1.70	0.05	
5	-1,384	82	8,000	2,572	1.86	0.06	
6	-1,621	112	10,000	3,215	1.98	0.07	
7	-1,823	141	12,000	3,859	2.12	0.08	
8	-2,034	174	14,000	4,502	2.21	0.09	
9	-2,205	209	16,000	5,145	2.33	0.09	
10	-2,384	246	18,000	5,788	2.43	0.10	
11	-2,572	283	20,000	6,431	2.50	0.11	
12	-2,891	365	24,000	7,717	2.67	0.13	
13	-3,210	471	28,000	9,003	2.80	0.15	
14	-3,558	591	32,000	10,289	2.89	0.17	
15	-3,886	726	36,000	11,576	2.98	0.19	
16	-4,268	898	40,000	12,862	3.01	0.21	
17	-4,669	1,153	44,000	14,148	3.03	0.25	
18	-5,332	2,004	48,000	15,434	2.89	0.38	
19			48,574	15,619			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)



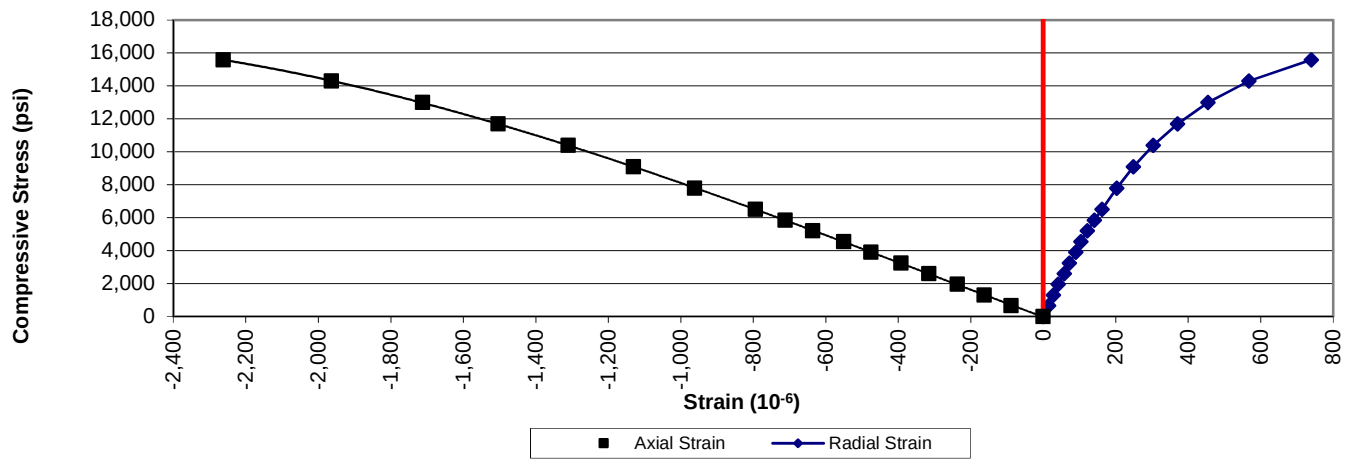
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.45	**Tested by:**	BKP / TDV
Boring Id:	BR-3	**Unit Weight, pcf:**	166.0	**Reviewed by:**	JBB
Sample No:	NQ-3	**Moisture Content, %:**	0.1		
Depth (ft):	40.8 - 42.0	**Load Rate, psi/sec:**	87		

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	-88	15	2,000	649	7.38	0.17	
3	-163	28	4,000	1,299	7.97	0.17	
4	-237	41	6,000	1,948	8.22	0.17	
5	-315	58	8,000	2,597	8.24	0.18	
6	-392	72	10,000	3,247	8.28	0.18	
7	-475	90	12,000	3,896	8.20	0.19	
8	-550	104	14,000	4,545	8.26	0.19	
9	-636	122	16,000	5,195	8.17	0.19	
10	-712	141	18,000	5,844	8.21	0.20	
11	-794	162	20,000	6,494	8.18	0.20	
12	-962	203	24,000	7,792	8.10	0.21	
13	-1,130	249	28,000	9,091	8.05	0.22	
14	-1,310	304	32,000	10,390	7.93	0.23	
15	-1,504	371	36,000	11,688	7.77	0.25	
16	-1,712	455	40,000	12,987	7.59	0.27	
17	-1,964	568	44,000	14,286	7.27	0.29	
18	-2,262	740	48,000	15,584	6.89	0.33	
19			50,752	16,478			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)



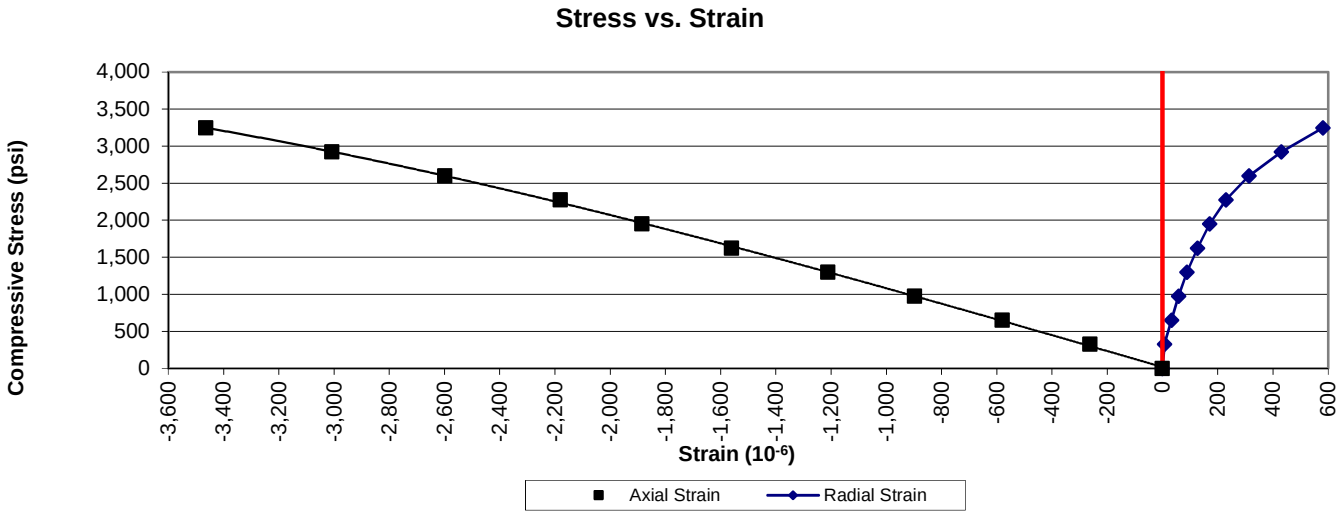
UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

Project:	I-85 Bridge Over Rocky Creek	**Diameter, in.:**	1.98	**Date:**	4/4/2019
Project No.:	1426-15-009, Phase 105	**Length, in.:**	4.21	**Tested by:**	BKP / TDV
Boring Id:	BR-3	**Unit Weight, pcf:**	162.8	**Reviewed by:**	JBB
Sample No:	NQ-4	**Moisture Content, %:**	0.5		
Depth (ft):	46.6 - 47.7	**Load Rate, psi/sec:**	43		

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	0.00	0.00	
2	-262	7	1,000	325	1.24	0.03	
3	-580	33	2,000	649	1.12	0.06	
4	-898	59	3,000	974	1.08	0.07	
5	-1,211	89	4,000	1,299	1.07	0.07	
6	-1,560	127	5,000	1,623	1.04	0.08	
7	-1,885	171	6,000	1,948	1.03	0.09	
8	-2,180	230	7,000	2,273	1.04	0.11	
9	-2,599	314	8,000	2,597	1.00	0.12	
10	-3,008	431	9,000	2,922	0.97	0.14	
11	-3,464	581	10,000	3,247	0.94	0.17	
12			10,633	3,452			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 VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

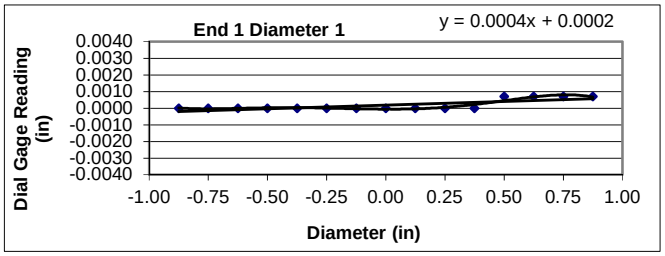
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.99	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.47	**Tested by:**	VLI
Boring Id:	BR-1	**Unit Weight (pcf):**	166.0	**Reviewed by:**	JBB
Sample No.:	NQ-1	**Moisture Content (%):**	0.2		
Depth (ft):	29.6 - 30.6				

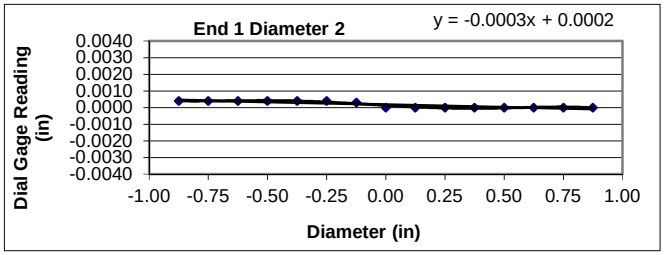
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

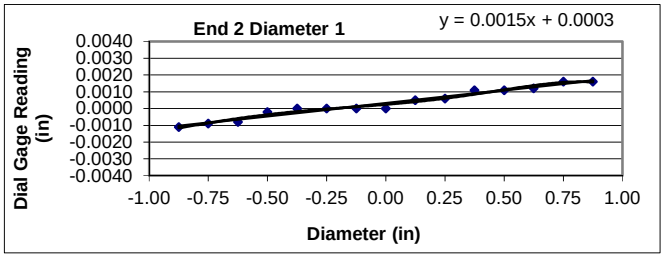
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0004	-0.0011	0.0002
- 6/8	0.0000	0.0004	-0.0009	0.0000
- 5/8	0.0000	0.0004	-0.0008	0.0000
- 4/8	0.0000	0.0004	-0.0002	0.0000
- 3/8	0.0000	0.0004	0.0000	0.0000
- 2/8	0.0000	0.0004	0.0000	0.0000
- 1/8	0.0000	0.0003	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0005	0.0000
2/8	0.0000	0.0000	0.0006	0.0000
3/8	0.0000	0.0000	0.0011	0.0000
4/8	0.0007	0.0000	0.0011	0.0000
5/8	0.0007	0.0000	0.0012	0.0000
6/8	0.0007	0.0000	0.0016	0.0000
7/8	0.0007	0.0000	0.0016	0.0000

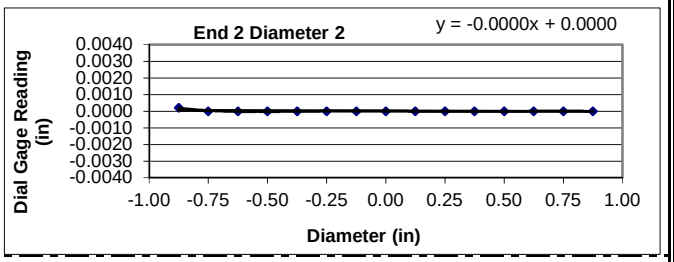




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00044
	Angle of Best Fit Line:	0.02521
End 2:	Slope of Best Fit Line:	0.00155
	Angle of Best Fit Line:	0.08856
	Max Angular Difference:	**-0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00032
	Angle of Best Fit Line:	-0.01817
End 2:	Slope of Best Fit Line:	-0.00004
	Angle of Best Fit Line:	-0.00229
	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	0.0007	0.0004	**YES**
End 1 Diam 2	0.0004	0.0002	**YES**
End 2 Diam 1	0.0027	0.0014	**YES**
End 2 Diam 2	0.0002	0.0001	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

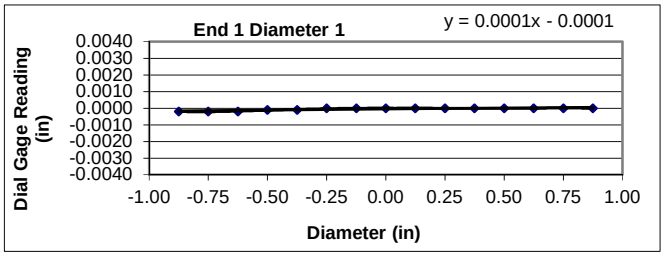
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.99	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.45	**Tested by:**	VLI
Boring Id:	BR-1	**Unit Weight (pcf):**	164.7	**Reviewed by:**	JBB
Sample No.:	NQ-2	**Moisture Content (%):**	0.1		
Depth (ft):	33.9 - 34.6				

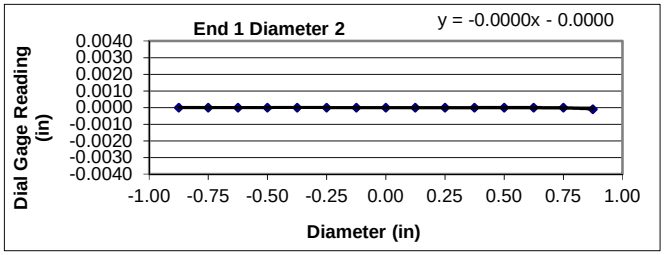
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

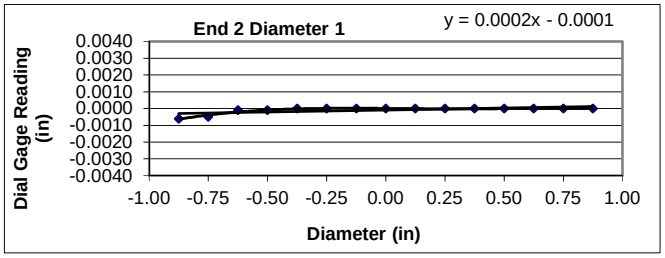
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0002	0.0000	-0.0006	0.0009
- 6/8	-0.0002	0.0000	-0.0005	0.0007
- 5/8	-0.0002	0.0000	-0.0001	0.0005
- 4/8	-0.0001	0.0000	-0.0001	0.0003
- 3/8	-0.0001	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	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	0.0000	0.0000	0.0000	0.0000
4/8	0.0000	0.0000	0.0000	0.0000
5/8	0.0000	0.0000	0.0000	0.0000
6/8	0.0000	0.0000	0.0000	0.0000
7/8	0.0000	-0.0001	0.0000	0.0000

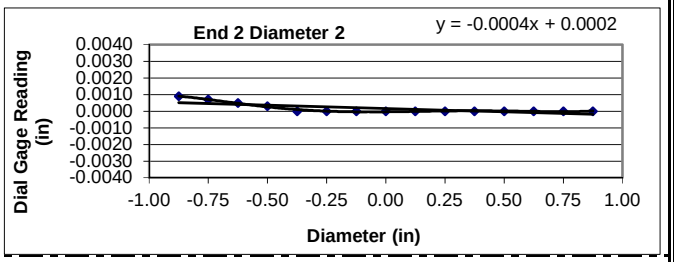




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00012
	Angle of Best Fit Line:	0.00704
End 2:	Slope of Best Fit Line:	0.00023
	Angle of Best Fit Line:	0.01326
	Max Angular Difference:	**-0.01**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00002
	Angle of Best Fit Line:	-0.00115
End 2:	Slope of Best Fit Line:	-0.00041
	Angle of Best Fit Line:	-0.02325
	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	0.0002	0.0001	**YES**
End 1 Diam 2	0.0001	0.0001	**YES**
End 2 Diam 1	0.0006	0.0003	**YES**
End 2 Diam 2	0.0009	0.0005	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

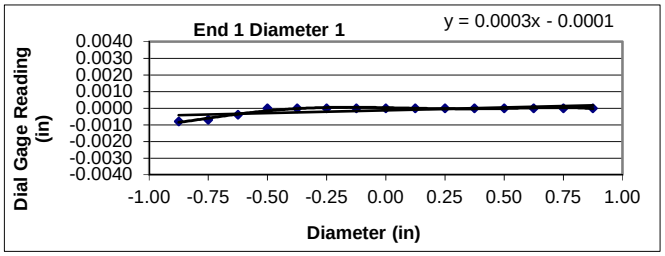
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.46	**Tested by:**	VLI
Boring Id:	BR-1	**Unit Weight (pcf):**	163.7	**Reviewed by:**	JBB
Sample No.:	NQ-3	**Moisture Content (%):**	0.1		
Depth (ft):	39.8 - 40.6				

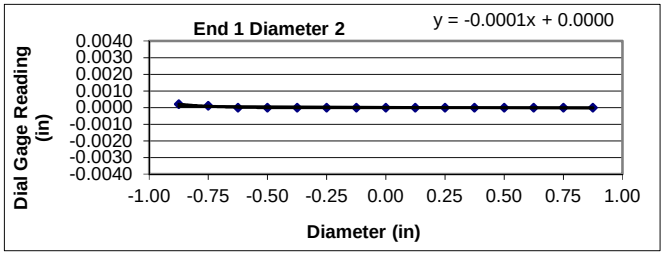
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

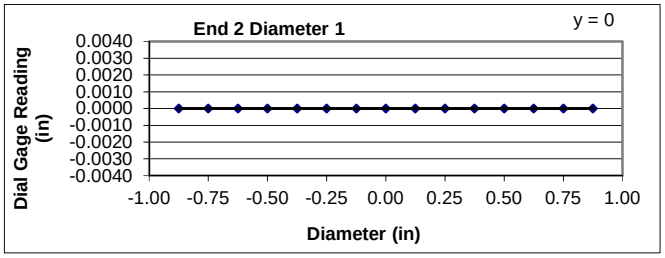
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0008	0.0002	0.0000	0.0002
- 6/8	-0.0007	0.0001	0.0000	0.0001
- 5/8	-0.0004	0.0000	0.0000	0.0001
- 4/8	0.0000	0.0000	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	0.0000
3/8	0.0000	0.0000	0.0000	0.0000
4/8	0.0000	0.0000	0.0000	0.0000
5/8	0.0000	0.0000	0.0000	0.0000
6/8	0.0000	0.0000	0.0000	0.0000
7/8	0.0000	0.0000	0.0000	0.0000

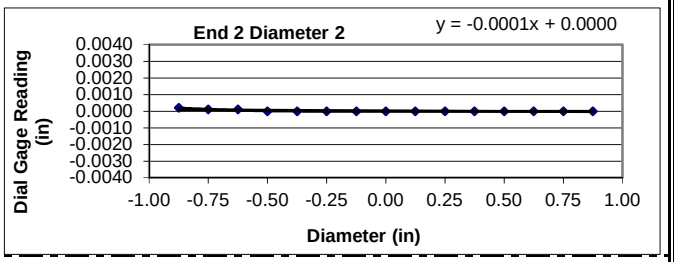




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00034
	Angle of Best Fit Line:	0.01932
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.02**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00006
	Angle of Best Fit Line:	-0.00327
End 2:	Slope of Best Fit Line:	-0.00007
	Angle of Best Fit Line:	-0.00409
	Max Angular Difference:	**0.00**

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	0.0008	0.0004	**YES**
End 1 Diam 2	0.0002	0.0001	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0002	0.0001	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

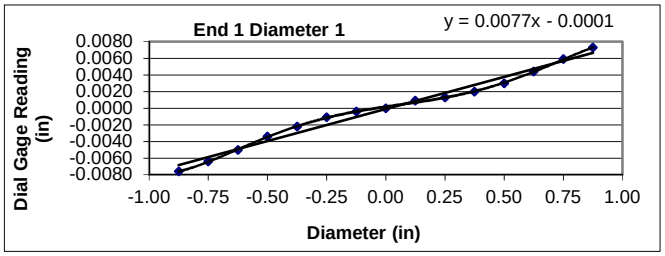
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	3.93	**Tested by:**	VLI
Boring Id:	BR-1	**Unit Weight (pcf):**	170.4	**Reviewed by:**	JBB
Sample No.:	NQ-4	**Moisture Content (%):**	0.2		
Depth (ft):	42.9 - 43.5				

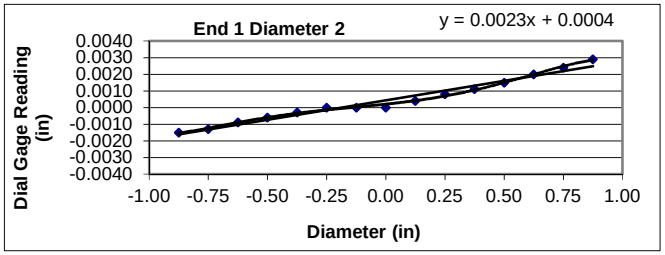
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

End Flatness and Parallelism Readings (Procedure FP1)

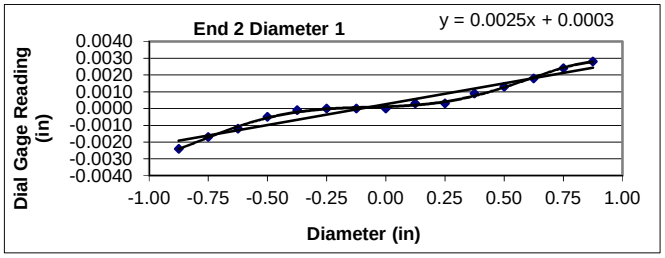
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0076	-0.0015	-0.0024	0.0038
- 6/8	-0.0064	-0.0013	-0.0017	0.0034
- 5/8	-0.0050	-0.0009	-0.0012	0.0026
- 4/8	-0.0034	-0.0006	-0.0005	0.0020
- 3/8	-0.0022	-0.0003	-0.0001	0.0015
- 2/8	-0.0011	0.0000	0.0000	0.0005
- 1/8	-0.0004	0.0000	0.0000	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0009	0.0004	0.0003	0.0002
2/8	0.0013	0.0008	0.0003	0.0002
3/8	0.0020	0.0011	0.0009	0.0002
4/8	0.0030	0.0015	0.0013	-0.0003
5/8	0.0044	0.0020	0.0018	-0.0011
6/8	0.0059	0.0024	0.0024	-0.0016
7/8	0.0073	0.0029	0.0028	-0.0022

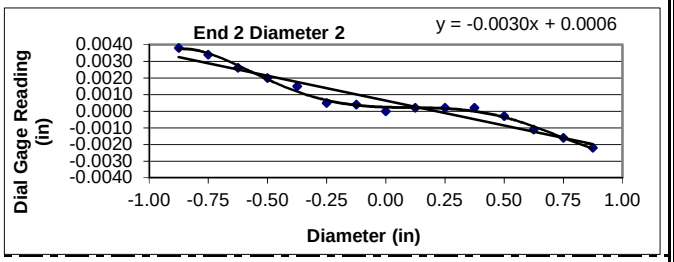




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00770
	Angle of Best Fit Line:	0.44101
End 2:	Slope of Best Fit Line:	0.00249
	Angle of Best Fit Line:	0.14258
	Max Angular Difference:	**0.30**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00235
	Angle of Best Fit Line:	0.13440
End 2:	Slope of Best Fit Line:	-0.00298
	Angle of Best Fit Line:	-0.17091
	Max Angular Difference:	**0.31**

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	0.0149	0.0075	**NO**
End 1 Diam 2	0.0044	0.0022	**YES**
End 2 Diam 1	0.0052	0.0026	**YES**
End 2 Diam 2	0.0060	0.0030	**YES**

Perpendicularity Tolerance Met? **NO**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

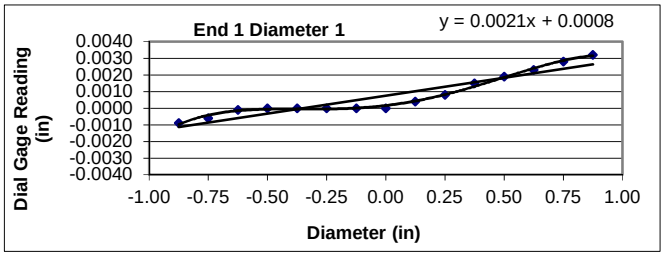
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.45	**Tested by:**	VLI
Boring Id:	BR-2	**Unit Weight (pcf):**	164.5	**Reviewed by:**	JBB
Sample No.:	NQ-1	**Moisture Content (%):**	0.1		
Depth (ft):	38.7 - 39.3				

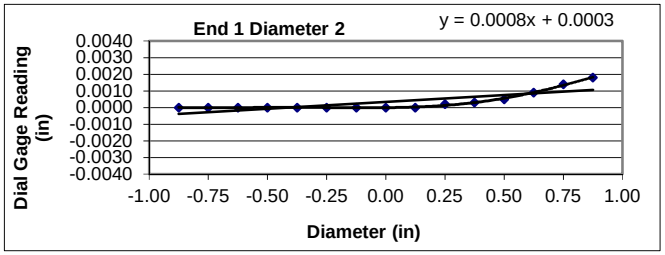
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

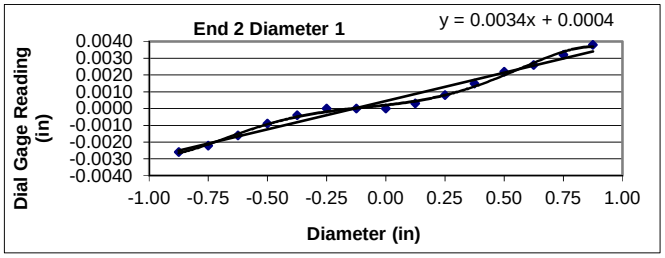
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0009	0.0000	-0.0026	0.0000
- 6/8	-0.0006	0.0000	-0.0022	0.0000
- 5/8	-0.0001	0.0000	-0.0016	0.0000
- 4/8	0.0000	0.0000	-0.0009	0.0000
- 3/8	0.0000	0.0000	-0.0004	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0004	0.0000	0.0003	0.0001
2/8	0.0008	0.0002	0.0008	0.0002
3/8	0.0015	0.0003	0.0015	0.0006
4/8	0.0019	0.0005	0.0022	0.0011
5/8	0.0023	0.0009	0.0026	0.0014
6/8	0.0028	0.0014	0.0032	0.0018
7/8	0.0032	0.0018	0.0038	0.0021

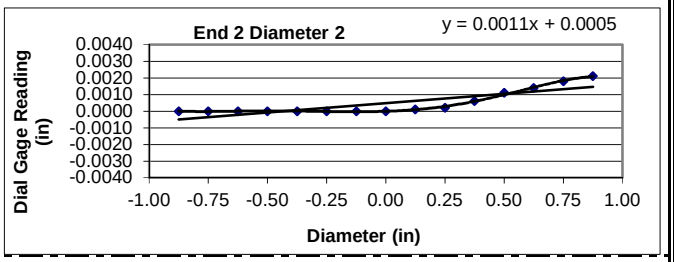




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00215
	Angle of Best Fit Line:	0.12310
End 2:	Slope of Best Fit Line:	0.00338
	Angle of Best Fit Line:	0.19350
	Max Angular Difference:	**-0.07**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00082
	Angle of Best Fit Line:	0.04715
End 2:	Slope of Best Fit Line:	0.00112
	Angle of Best Fit Line:	0.06417
	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	0.0041	0.0021	**YES**
End 1 Diam 2	0.0018	0.0009	**YES**
End 2 Diam 1	0.0064	0.0032	**YES**
End 2 Diam 2	0.0021	0.0011	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

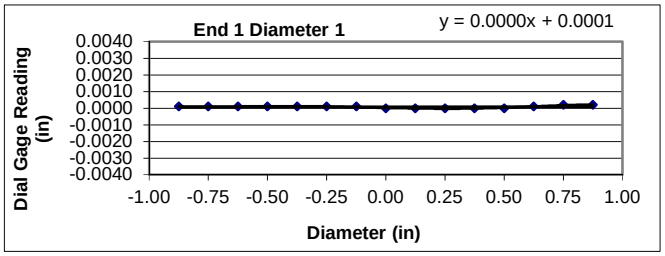
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.39	**Tested by:**	VLI
Boring Id:	BR-2	**Unit Weight (pcf):**	163.0	**Reviewed by:**	JBB
Sample No.:	NQ-2	**Moisture Content (%):**	0.1		
Depth (ft):	41.4 - 42.5				

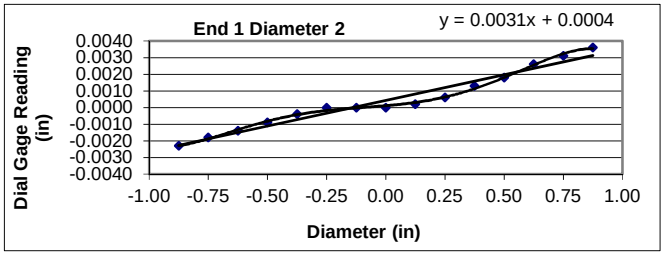
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

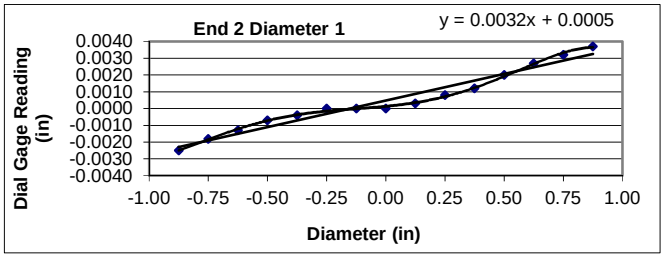
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0001	-0.0023	-0.0025	0.0000
- 6/8	0.0001	-0.0018	-0.0018	0.0000
- 5/8	0.0001	-0.0014	-0.0013	0.0000
- 4/8	0.0001	-0.0009	-0.0007	0.0000
- 3/8	0.0001	-0.0004	-0.0004	0.0000
- 2/8	0.0001	0.0000	0.0000	0.0000
- 1/8	0.0001	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0002	0.0003	0.0000
2/8	0.0000	0.0006	0.0008	0.0000
3/8	0.0000	0.0013	0.0012	0.0000
4/8	0.0000	0.0018	0.0020	0.0001
5/8	0.0001	0.0026	0.0027	0.0002
6/8	0.0002	0.0031	0.0032	0.0004
7/8	0.0002	0.0036	0.0037	0.0004

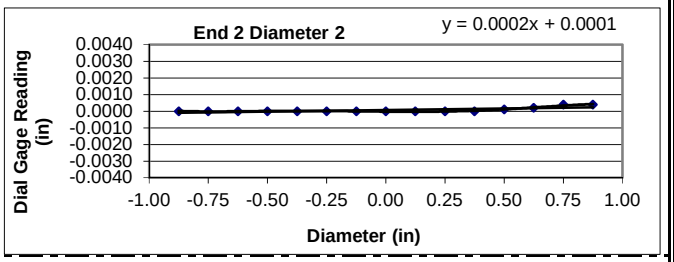




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00001
	Angle of Best Fit Line:	0.00049
End 2:	Slope of Best Fit Line:	0.00317
	Angle of Best Fit Line:	0.18155
	Max Angular Difference:	**-0.18**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00309
	Angle of Best Fit Line:	0.17680
End 2:	Slope of Best Fit Line:	0.00019
	Angle of Best Fit Line:	0.01080
	Max Angular Difference:	**0.17**

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	0.0059	0.0030	**YES**
End 2 Diam 1	0.0062	0.0031	**YES**
End 2 Diam 2	0.0004	0.0002	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

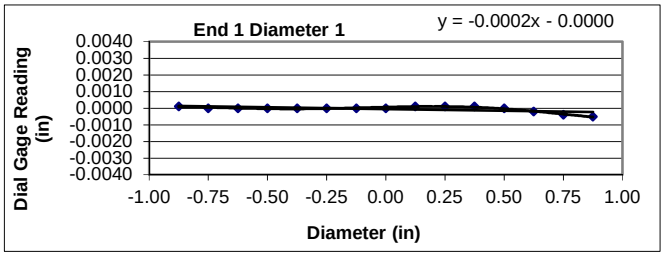
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.40	**Tested by:**	VLI
Boring Id:	BR-2	**Unit Weight (pcf):**	171.4	**Reviewed by:**	JBB
Sample No.:	NQ-3	**Moisture Content (%):**	0.1		
Depth (ft):	44.8 - 45.5				

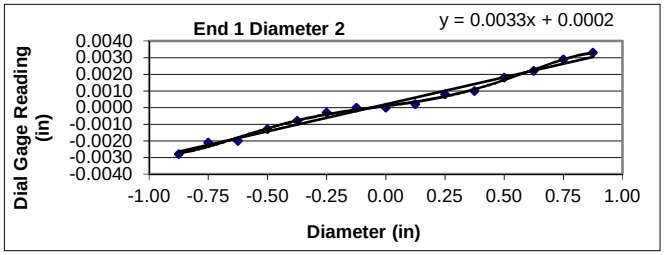
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

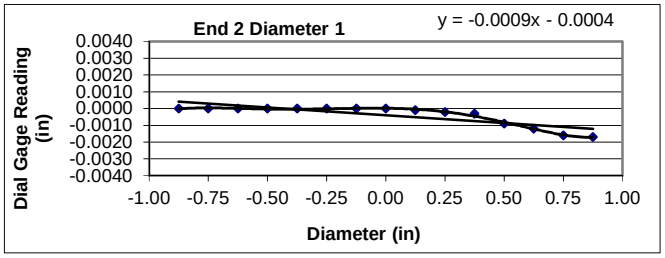
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0001	-0.0028	0.0000	-0.0026
- 6/8	0.0000	-0.0021	0.0000	-0.0018
- 5/8	0.0000	-0.0020	0.0000	-0.0011
- 4/8	0.0000	-0.0013	0.0000	-0.0004
- 3/8	0.0000	-0.0008	0.0000	0.0000
- 2/8	0.0000	-0.0003	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0001	0.0002	-0.0001	0.0004
2/8	0.0001	0.0008	-0.0002	0.0008
3/8	0.0001	0.0010	-0.0003	0.0012
4/8	0.0000	0.0018	-0.0009	0.0019
5/8	-0.0002	0.0022	-0.0012	0.0026
6/8	-0.0004	0.0029	-0.0016	0.0033
7/8	-0.0005	0.0033	-0.0017	0.0036

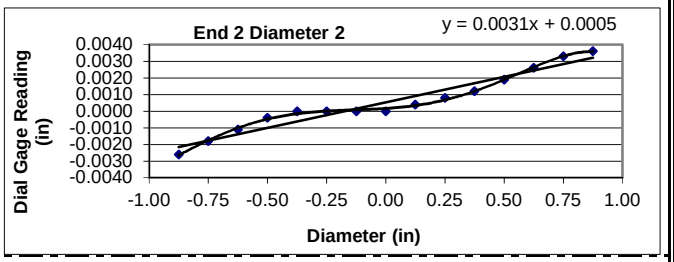




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	-0.00020
	Angle of Best Fit Line:	-0.01146
End 2:	Slope of Best Fit Line:	-0.00093
	Angle of Best Fit Line:	-0.05320
	Max Angular Difference:	**0.04**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00325
	Angle of Best Fit Line:	0.18646
End 2:	Slope of Best Fit Line:	0.00307
	Angle of Best Fit Line:	0.17565
	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	0.0061	0.0031	**YES**
End 2 Diam 1	0.0017	0.0009	**YES**
End 2 Diam 2	0.0062	0.0031	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

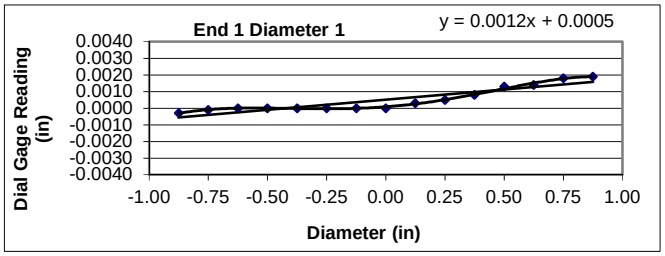
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.43	**Tested by:**	VLI
Boring Id:	BR-2	**Unit Weight (pcf):**	163.3	**Reviewed by:**	JBB
Sample No.:	NQ-4	**Moisture Content (%):**	0.1		
Depth (ft):	49.3 - 50.2				

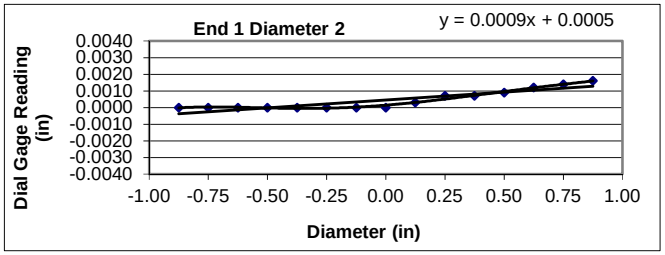
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

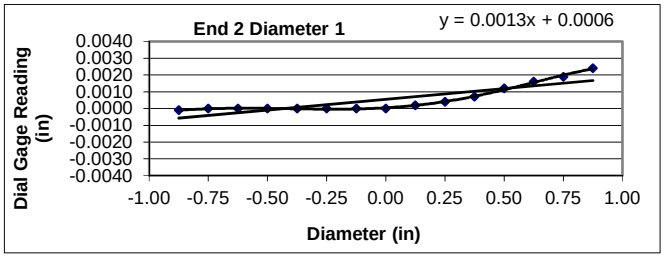
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0003	0.0000	-0.0001	0.0000
- 6/8	-0.0001	0.0000	0.0000	0.0000
- 5/8	0.0000	0.0000	0.0000	0.0000
- 4/8	0.0000	0.0000	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0003	0.0003	0.0002	0.0000
2/8	0.0005	0.0007	0.0004	0.0000
3/8	0.0008	0.0007	0.0007	0.0000
4/8	0.0013	0.0009	0.0012	0.0000
5/8	0.0014	0.0012	0.0016	0.0000
6/8	0.0018	0.0014	0.0019	0.0001
7/8	0.0019	0.0016	0.0024	0.0002

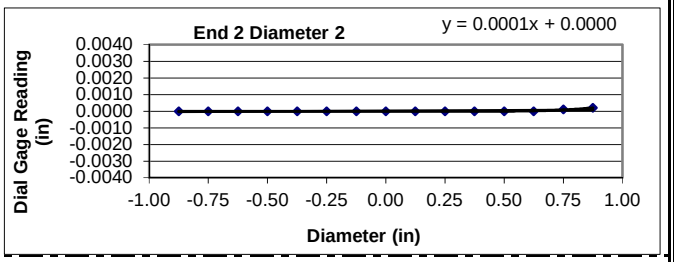




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00122
	Angle of Best Fit Line:	0.06990
End 2:	Slope of Best Fit Line:	0.00128
	Angle of Best Fit Line:	0.07334
	Max Angular Difference:	**0.00**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00094
	Angle of Best Fit Line:	0.05402
End 2:	Slope of Best Fit Line:	0.00006
	Angle of Best Fit Line:	0.00327
	Max Angular Difference:	**0.05**

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	0.0022	0.0011	**YES**
End 1 Diam 2	0.0016	0.0008	**YES**
End 2 Diam 1	0.0025	0.0013	**YES**
End 2 Diam 2	0.0002	0.0001	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

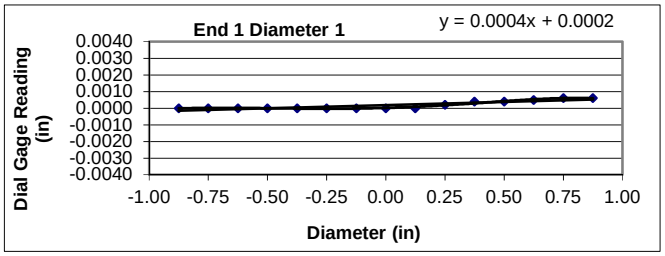
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.44	**Tested by:**	VLI
Boring Id:	BR-2	**Unit Weight (pcf):**	166.4	**Reviewed by:**	JBB
Sample No.:	NQ-5	**Moisture Content (%):**	0.1		
Depth (ft):	55.0 - 56.3				

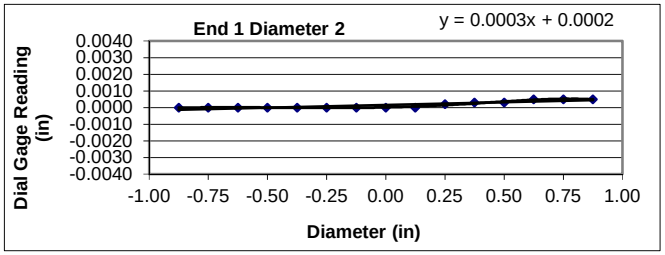
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

End Flatness and Parallelism Readings (Procedure FP1)

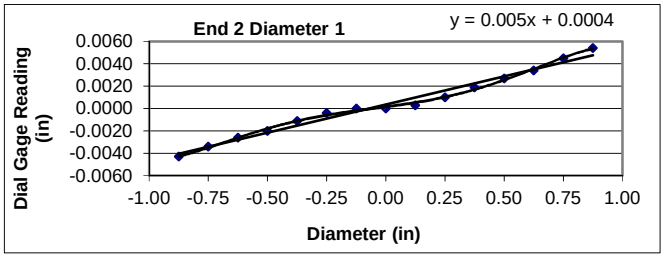
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0000	-0.0043	-0.0028
- 6/8	0.0000	0.0000	-0.0034	-0.0023
- 5/8	0.0000	0.0000	-0.0026	-0.0015
- 4/8	0.0000	0.0000	-0.0020	-0.0009
- 3/8	0.0000	0.0000	-0.0011	-0.0005
- 2/8	0.0000	0.0000	-0.0004	-0.0001
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0003	0.0000
2/8	0.0002	0.0002	0.0010	0.0004
3/8	0.0004	0.0003	0.0019	0.0008
4/8	0.0004	0.0003	0.0027	0.0015
5/8	0.0005	0.0005	0.0034	0.0024
6/8	0.0006	0.0005	0.0045	0.0030
7/8	0.0006	0.0005	0.0054	0.0034

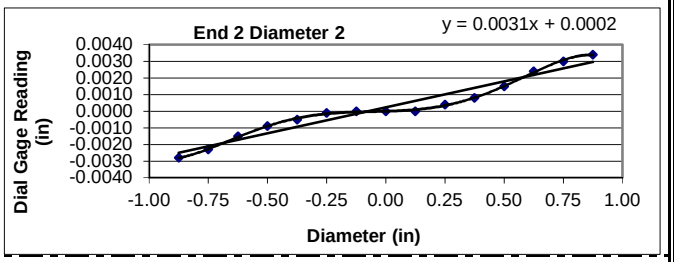




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00039
	Angle of Best Fit Line:	0.02210
End 2:	Slope of Best Fit Line:	0.00503
	Angle of Best Fit Line:	0.28844
	Max Angular Difference:	**-0.27**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00033
	Angle of Best Fit Line:	0.01883
End 2:	Slope of Best Fit Line:	0.00312
	Angle of Best Fit Line:	0.17876
	Max Angular Difference:	**-0.16**

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	0.0006	0.0003	**YES**
End 1 Diam 2	0.0005	0.0003	**YES**
End 2 Diam 1	0.0097	0.0049	**NO**
End 2 Diam 2	0.0062	0.0031	**YES**

Perpendicularity Tolerance Met? **NO**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

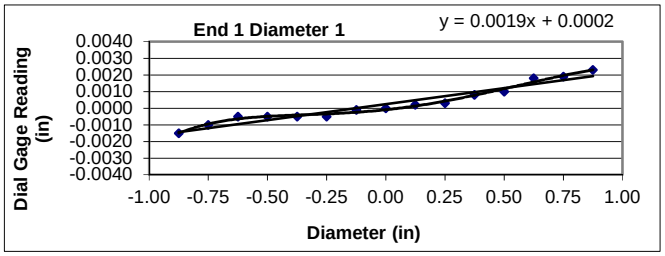
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.47	**Tested by:**	VLI
Boring Id:	BR-3	**Unit Weight (pcf):**	163.6	**Reviewed by:**	JBB
Sample No.:	NQ-1	**Moisture Content (%):**	0.1		
Depth (ft):	31.5 - 32.3				

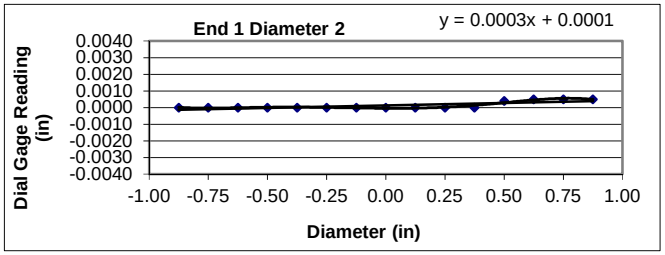
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

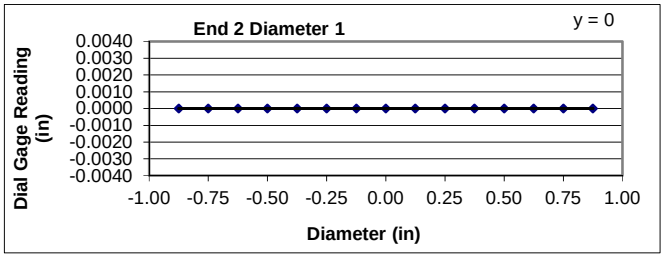
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0015	0.0000	0.0000	-0.0006
- 6/8	-0.0010	0.0000	0.0000	-0.0001
- 5/8	-0.0005	0.0000	0.0000	-0.0001
- 4/8	-0.0005	0.0000	0.0000	-0.0001
- 3/8	-0.0005	0.0000	0.0000	0.0000
- 2/8	-0.0005	0.0000	0.0000	0.0000
- 1/8	-0.0001	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0000	0.0000
2/8	0.0003	0.0000	0.0000	0.0000
3/8	0.0008	0.0000	0.0000	0.0004
4/8	0.0010	0.0004	0.0000	0.0006
5/8	0.0018	0.0005	0.0000	0.0007
6/8	0.0019	0.0005	0.0000	0.0011
7/8	0.0023	0.0005	0.0000	0.0013

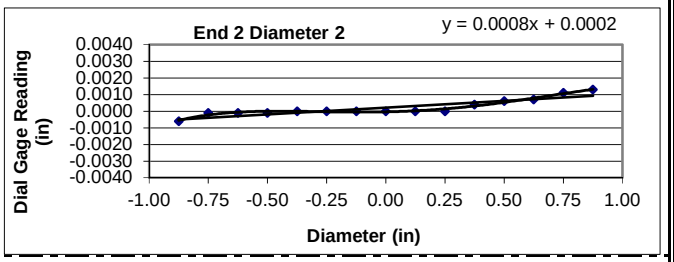




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00192
	Angle of Best Fit Line:	0.11017
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.11**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00030
	Angle of Best Fit Line:	0.01735
End 2:	Slope of Best Fit Line:	0.00081
	Angle of Best Fit Line:	0.04666
	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	0.0038	0.0019	**YES**
End 1 Diam 2	0.0005	0.0003	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0019	0.0010	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

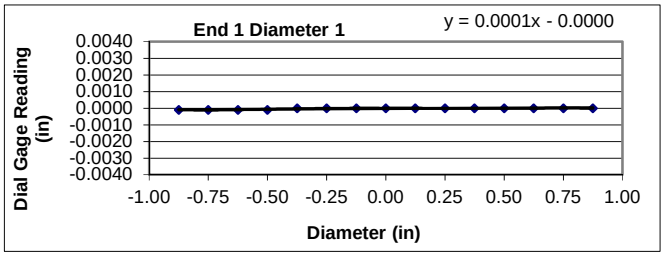
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.99	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.47	**Tested by:**	VLI
Boring Id:	BR-3	**Unit Weight (pcf):**	162.8	**Reviewed by:**	JBB
Sample No.:	NQ-2	**Moisture Content (%):**	0.1		
Depth (ft):	35.8 - 36.9				

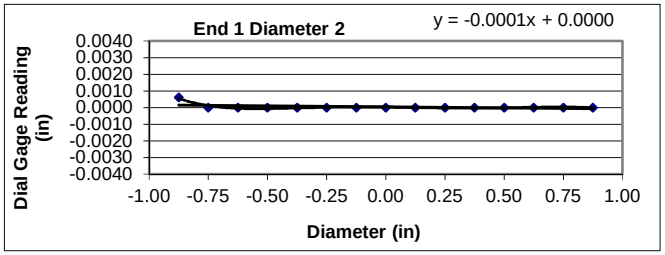
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

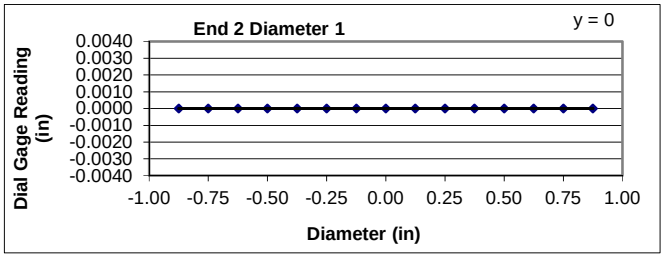
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0001	0.0006	0.0000	0.0004
- 6/8	-0.0001	0.0000	0.0000	0.0000
- 5/8	-0.0001	0.0000	0.0000	0.0000
- 4/8	-0.0001	0.0000	0.0000	0.0000
- 3/8	0.0000	0.0000	0.0000	0.0000
- 2/8	0.0000	0.0000	0.0000	0.0000
- 1/8	0.0000	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	0.0000	0.0000	0.0000
3/8	0.0000	0.0000	0.0000	0.0000
4/8	0.0000	0.0000	0.0000	0.0000
5/8	0.0000	0.0000	0.0000	0.0000
6/8	0.0000	0.0000	0.0000	-0.0002
7/8	0.0000	0.0000	0.0000	-0.0010

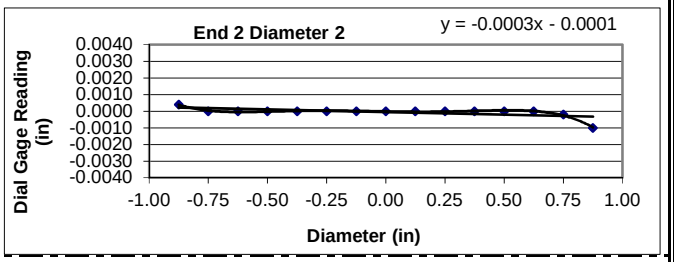




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00006
	Angle of Best Fit Line:	0.00360
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.00**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00012
	Angle of Best Fit Line:	-0.00688
End 2:	Slope of Best Fit Line:	-0.00031
	Angle of Best Fit Line:	-0.01801
	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	0.0001	0.0001	**YES**
End 1 Diam 2	0.0006	0.0003	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0014	0.0007	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

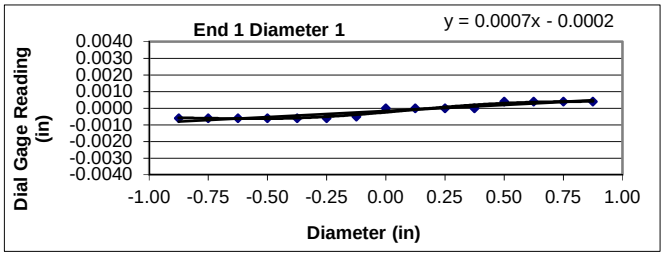
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.45	**Tested by:**	VLI
Boring Id:	BR-3	**Unit Weight (pcf):**	166.0	**Reviewed by:**	JBB
Sample No.:	NQ-3	**Moisture Content (%):**	0.1		
Depth (ft):	40.8 - 42.0				

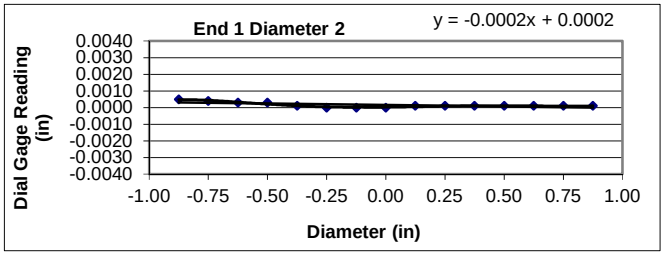
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

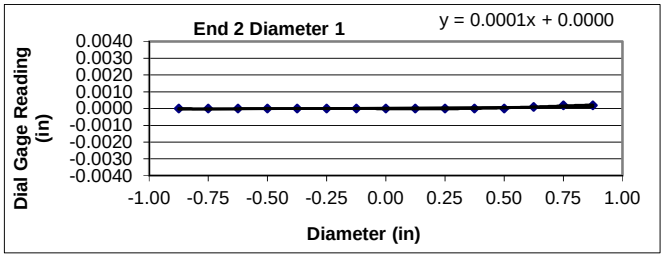
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0006	0.0005	0.0000	0.0003
- 6/8	-0.0006	0.0004	0.0000	0.0002
- 5/8	-0.0006	0.0003	0.0000	0.0000
- 4/8	-0.0006	0.0003	0.0000	0.0000
- 3/8	-0.0006	0.0001	0.0000	0.0000
- 2/8	-0.0006	0.0000	0.0000	0.0000
- 1/8	-0.0005	0.0000	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0001	0.0000	0.0000
2/8	0.0000	0.0001	0.0000	0.0000
3/8	0.0000	0.0001	0.0000	0.0000
4/8	0.0004	0.0001	0.0000	0.0000
5/8	0.0004	0.0001	0.0001	0.0000
6/8	0.0004	0.0001	0.0002	0.0000
7/8	0.0004	0.0001	0.0002	0.0000

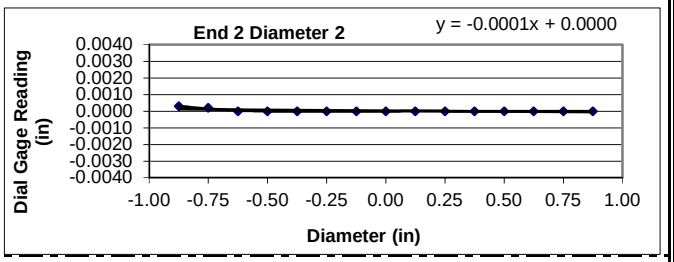




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00073
	Angle of Best Fit Line:	0.04174
End 2:	Slope of Best Fit Line:	0.00009
	Angle of Best Fit Line:	0.00507
	Max Angular Difference:	**0.04**

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:	-0.00009
	Angle of Best Fit Line:	-0.00540
	Max Angular Difference:	**0.00**

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	0.0010	0.0005	**YES**
End 1 Diam 2	0.0005	0.0003	**YES**
End 2 Diam 1	0.0002	0.0001	**YES**
End 2 Diam 2	0.0003	0.0002	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORES AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

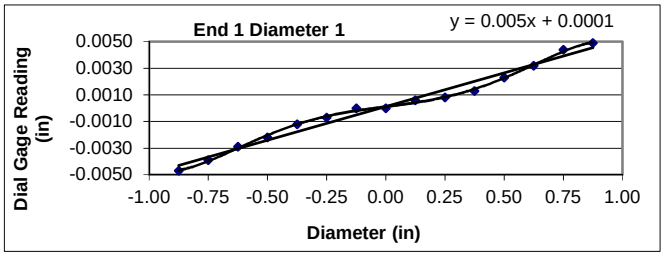
Project:	I-85 Bridge Over Rocky Creek	**Diameter (in):**	1.98	**Date:**	3/26/2019
Project No.:	1426-15-009, Phase 105	**Length (in):**	4.21	**Tested by:**	VLI
Boring Id:	BR-3	**Unit Weight (pcf):**	162.8	**Reviewed by:**	JBB
Sample No.:	NQ-4	**Moisture Content (%):**	0.5		
Depth (ft):	46.6 - 47.7				

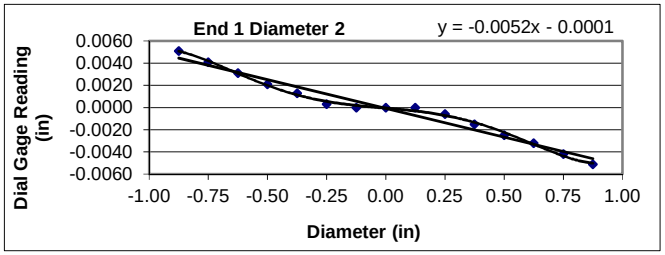
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **NO** Straightness Tolerance Met? **NO**

End Flatness and Parallelism Readings (Procedure FP1)

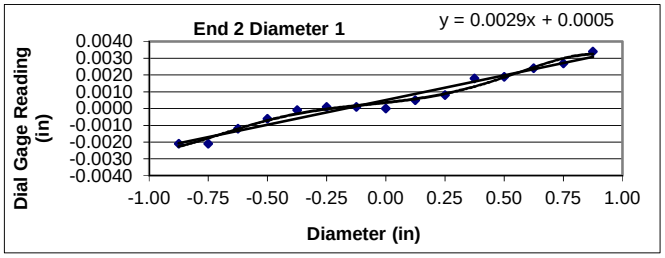
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0047	0.0051	-0.0021	0.0038
- 6/8	-0.0039	0.0041	-0.0021	0.0030
- 5/8	-0.0029	0.0031	-0.0012	0.0024
- 4/8	-0.0022	0.0021	-0.0006	0.0017
- 3/8	-0.0012	0.0013	-0.0001	0.0009
- 2/8	-0.0007	0.0003	0.0001	0.0003
- 1/8	0.0000	0.0000	0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0006	0.0000	0.0005	0.0000
2/8	0.0008	-0.0006	0.0008	0.0000
3/8	0.0013	-0.0015	0.0018	-0.0003
4/8	0.0023	-0.0025	0.0019	-0.0013
5/8	0.0032	-0.0032	0.0024	-0.0017
6/8	0.0044	-0.0042	0.0027	-0.0023
7/8	0.0049	-0.0051	0.0034	-0.0026

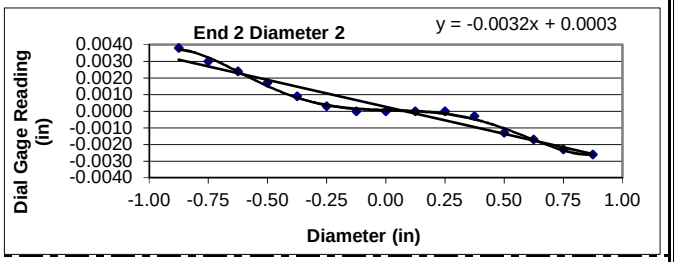




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

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:	0.00505
	Angle of Best Fit Line:	0.28910
End 2:	Slope of Best Fit Line:	0.00294
	Angle of Best Fit Line:	0.16829
	Max Angular Difference:	**0.12**

Parrallelism Diameter 2

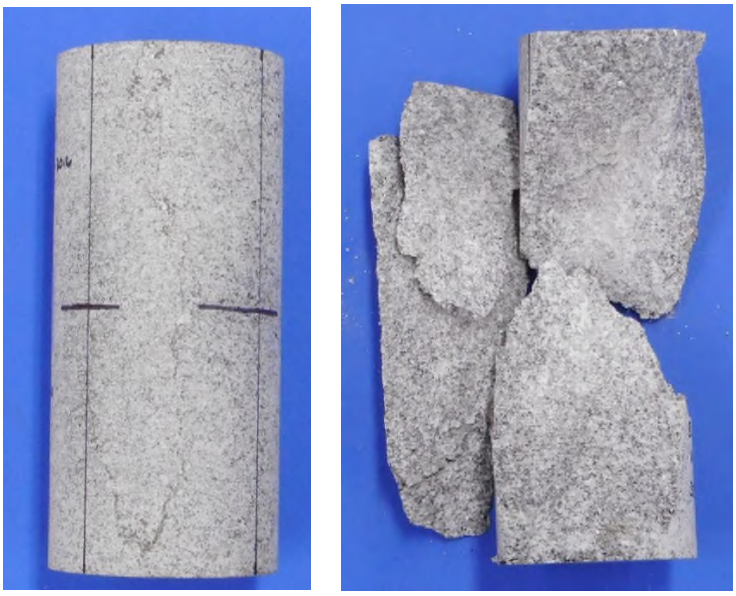
End 1:	Slope of Best Fit Line:	-0.00518
	Angle of Best Fit Line:	-0.29679
End 2:	Slope of Best Fit Line:	-0.00324
	Angle of Best Fit Line:	-0.18547
	Max Angular Difference:	**-0.11**

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	0.0096	0.0048	**NO**
End 1 Diam 2	0.0102	0.0052	**NO**
End 2 Diam 1	0.0055	0.0028	**YES**
End 2 Diam 2	0.0064	0.0032	**YES**

Perpendicularity Tolerance Met? **NO**



Date: 4/4/2019

Photographer: Ben Painter

1	**Location / Orientation**	BR-1, NQ-1 (29.6' – 30.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/4/2019

Photographer: Ben Painter

2	**Location / Orientation**	BR-1, NQ-2 (33.9' – 34.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/4/2019

Photographer: Ben Painter

3	**Location / Orientation**	BR-1, NQ-3 (39.8' – 40.6')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/4/2019

Photographer: Ben Painter

4	**Location / Orientation**	BR-1, NQ-4 (42.9' – 43.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/4/2019

Photographer: Ben Painter

5	**Location / Orientation**	BR-2, NQ-1 (38.7' – 39.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/5/2019

Photographer: Ben Painter

6	**Location / Orientation**	BR-2, NQ-2 (41.4' – 42.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/5/2019

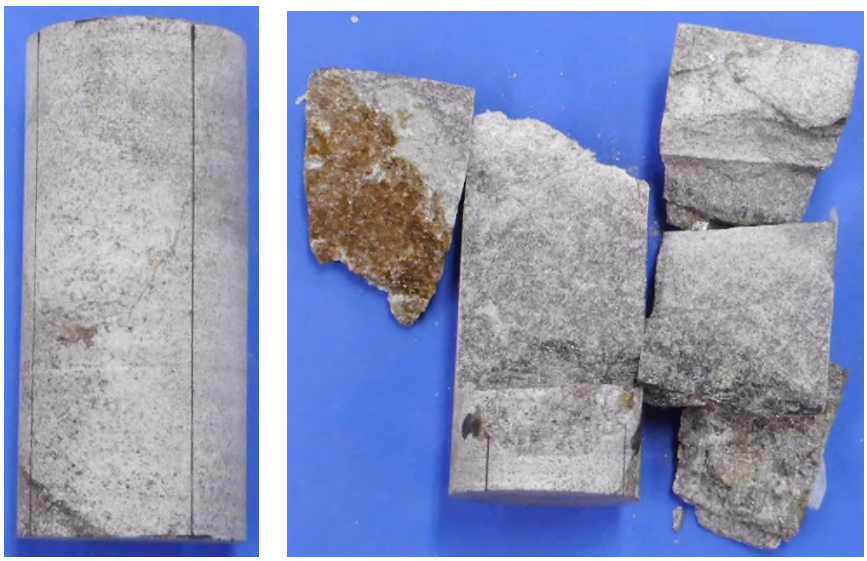
Photographer: Ben Painter

7	**Location / Orientation**	BR-2, NQ-3 (44.8' – 45.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/5/2019

Photographer: Ben Painter

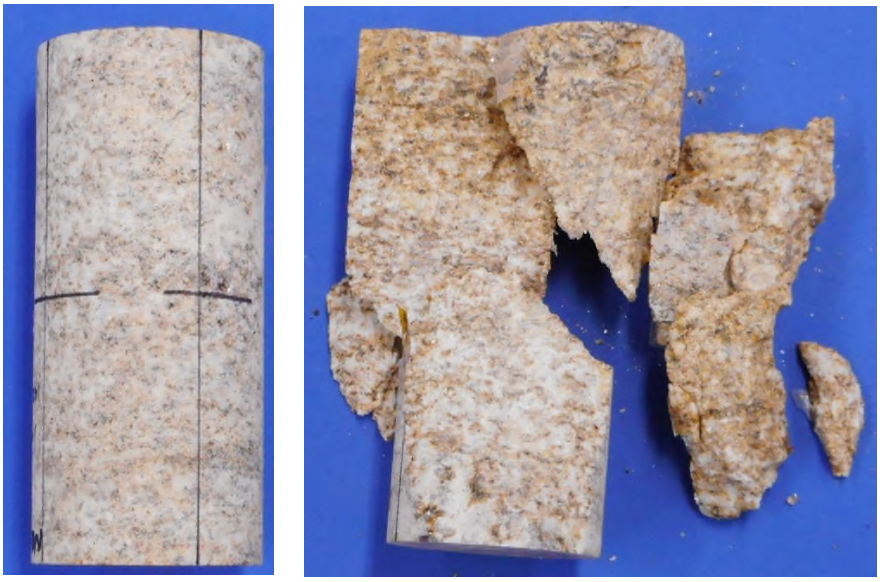
8	**Location / Orientation**	BR-2, NQ-4 (49.3' – 50.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 4/5/2019

Photographer: Ben Painter

9	**Location / Orientation**	BR-2, NQ-5 (55.0' – 56.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 4/4/2019

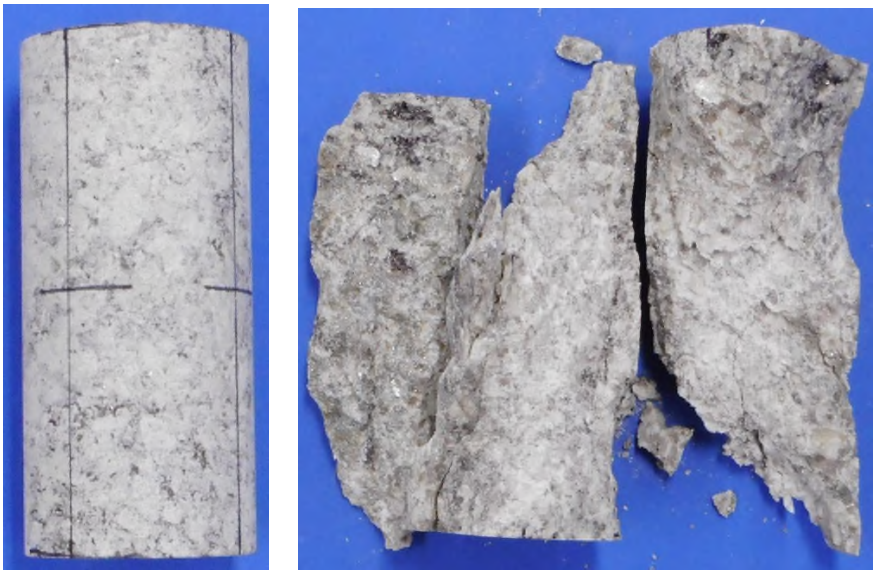
Photographer: Ben Painter

10	**Location / Orientation**	BR-3, NQ-1 (31.5' – 32.3')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)

Date: 4/4/2019

Photographer: Ben Painter

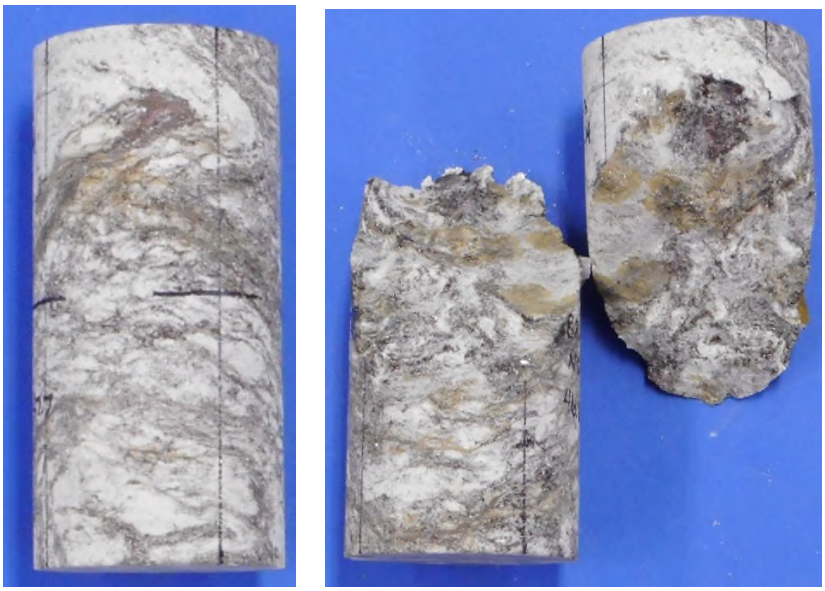
11	**Location / Orientation**	BR-3, NQ-2 (35.8' – 36.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 4/4/2019

Photographer: Ben Painter

12	**Location / Orientation**	BR-3, NQ-3 (40.8' – 42.0')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)



Date: 4/4/2019

Photographer: Ben Painter

13	**Location / Orientation**	BR-3, NQ-4 (46.6' – 47.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012)