

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.)



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Michael Baker International 700 Huger Street Columbia, South Carolina 29201 Attention: Ms. Reneé Tison, P.E.

Reference: Geotechnical Baseline Report (GBLR) I-85 Bridge Over Rocky Creek 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. S&ME. INC NO. 21570 Josh Gathro, E.I.T., G.I.T. Gant M. Taylor, P.E. NO. C0047 Staff Professional Senior Engineer gtaylor@smeinc.com jgathro@smeinc.com



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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 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.

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

Table 2-1: Soil Testing Location Table

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.



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

Table 2-2: Rock Coring Summary at Bridge Borings

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:

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

Table 2-3: UD Samples and Bulk Samples

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 on gravel and/or larger cobbles in the alluvial soil zone. CPT-4 (approximately 10 feet, apparently on gravel and/or larger cobbles 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:

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

Table 3-1: Soil Stratification Table



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:



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

Table 4-1: Laboratory Testing Summary

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

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

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

Appendix IV – Rock Core Data

Rock Core Photographs Unconfined Compressive Strength Test Data

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



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R-3 RS5-21	BORING LOCATION PLAN (PROJECT LIMITS)	I-85 BRIDGE OVER ROCKY CREEK SCDOT PROJECT ID: P038111 GREENVILLE COUNTY, SOUTH CAROLINA
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48 Brookfield Oaks Drive, Suite F Greenville, South Carolina 29607



0.5 Mi. SW of Pelham Road (Exit 54), Greenville County, SC SCDOT Project ID P038111; S&ME #1426-15-009 (Ph. 105)



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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	Depth	Elevation	Station	Offset	Surveyed Coordinates			
Number	(ft)	(ft)	Station	(ft)	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
СРТ	Refusal	Elevation	Station	Offset		Estimated (Coordinates	
Number	(ft)	(ft)	Station	(ft)	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) CONSISTENCY OF COHESIVE SOILS (Shown in Graphic Log) STD. PENETRATION RESISTANCE CONSISTENCY **BLOWS/FOOT** Fill Very Soft 0 to 2 Soft 3 to 4 Asphalt Firm 5 to 8 Stiff 9 to 15 Very Stiff 16 to 30 ₽ ↓ Concrete Hard 31 to 50 Over 50 Very Hard Topsoil RELATIVE DENSITY OF COHESIONLESS SOILS 0 Gravel (GW, GM, GP) STD. PENETRATION RESISTANCE Sand (SW, SP) **RELATIVE DENSITY BLOWS/FOOT** Very Loose 0 to 4 Loose 5 to 10 Silt (ML) Medium Dense 11 to 30 31 to 50 Dense Over 50 Clay (CL, CH) Very Dense Organic (OL, OH) SAMPLER TYPES **CONSTITUENT MODIFIERS** (Shown in Samples Column) Trace: <5% Silty Sand (SM) Few: 5 to <15% Shelby Tube Little: 15 to <30%Some: 30 to <50% Clayey Sand (SC) \square Split Spoon Mostly: 50 to 100% **Rock Core** Sandy Silt (ML) No Recovery Clayey Silt (MH) TERMS Sandy Clay (CL, CH) Standard - The Number of Blows of 140 lb. Hammer Falling Penetration 30 in. Required to Drive 1.4 in. I.D. Split Spoon Silty Clay (CL, CH) Resistance Sampler 1 Foot. As Specified in ASTM D-1586. REC - Total Length of Rock Recovered in the Core Partially Weathered Barrel Divided by the Total Length of the Core Rock Run Times 100%. Cored Rock 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 WATER LEVELS N.E. - Not Encountered (Shown in Water Level Column) \square = Water Level At Termination of Boring T = Water Level Taken After 24 Hours = Loss of Drilling Water

 \underline{HC} = Hole Cave

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Elev.:	855.4	ft	Latitude:		34.85	5494	Longi	ude:	-82	2.268465	Date	Starte	ed:	3/13	/2019		
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Core SI	ze:	NQ		Drille	er:	J. MIIIW	000		Ground	dwater:	IOB	N/A (F	(VV) 24	HK	9.3 ft		
												SPT N VALUE					
															-		
tion (÷						d hic	t ple	ple		lue		X		\rightarrow		
eva (ff)	(ff)	Ν	/ATERIAL	DES	CRIPT	ION	Log	Gep (f)	am o./T	e" "9	6" Va		▲ FINES (CONTE	NT (%)		
Ш								0,-	0°ž	1st 2nc 3rd	Ath Ath	0 10	20 30 40	50 60	70 80 90		
		fine to	medium, ma -plagioclase-	ssive te	exture,	quartz-		30.6				-					
	_	fresh to	slightly wea	thered	l (stainii	ng at			-								
-	-	- depths 33.9 and 34.6 ft), VH-H, J (dipping 0-40 deg) VC-C, partly open to very wide						-						-			
-	-	PI-Ir-St	-Ir-St, SR-VR, No, granitic pegmatite at				NQ-2			REC=	99%, RQD	=95%, (q _u =28,320 psi [−]				
-	-	35.1-35	5.3 ft	-					_						-		
820.4-	_	RMR (2	. (28.1-36.6 ft)=70 (Class II);					_									
020.4		001-70	5.00					35.6				-					
	36.6																
-	-	Granite	e Pegmatite	with la	i yers of and ara	with			-					: :			
-	-	yellowi	sh-tan, medi	um to v	very coa	arse,			NQ-3			REC=	98%, RQD	=74%, (u=16,545 psi [−]		
_	_	thickly	foliated, qua	rtz-plag	gioclase)- frach			_								
045.4		-siiima weathe	rina. H-MH.	arnet, : J (dipp	slight to ina 0-2	5 dea: 75											
815.4-	-	and 50	deg fracture	s at 37	7.8 and	38.6 ft),		40.6						: :			
-	-	VC, op healed	en to very wi	de, St- re frea	Ir, SR-V	VR, two preatest			-								
-	40.0	betwee	on 37.8 and 3	9.5 ft;	RMR (36.6-42.6			-					: :	÷ ÷ ÷ -		
_	42.6	°ft)=31 (Class IV); GSI=40-45			ass IV); GSI=40-45							REC-	-90% ROD-	-61%	1 – 6 765 psi –		
		Sillimanite Schist - dark brown, gray and		Sillimanite Schist - dark brown, gray and				Sillimanite Schist - dark brown, gray and							-3070, RGD-	-0170, 0	_{1u} =0,700 p3i
		thinly fo	oliated, sillim	anite-q	uartz-n	nica-											
810.4-	45.2-	-chlorit	e-garnet, slig	ht to fr	resh we	athering,		45.6	-								
-	-	extrem	ely wide (voi	d from), vC, 0 44.2-44	4.6 ft), SR			-						-		
_	-	No; R	MŘ (42.6-45.	2 ft)=2	3 (Clas	s IV);			_								
_	_	651=40	J-45]					DEC-		100%			
		Gneiss coarse	sic Granite -	gray ai ed. qua	nd white artz-biot	e, fine to ite-garnet-	. 🕅						- 100 /8, 1102	-100/			
		-chlorit	e-sulfides, fr	esh to	slightly												
805.4-	50.6	weathe	ered, MH-H, . ht to modera	J (dippi telv on	ing 0-35 en Ir S	5 deg), SR-R No			-					: :			
-	-	RMR (4	45.2-50.6 ft)=	=67 (Cl	ass II);				-						-		
	-	GSI=75	o-80						-								
	_	Coring	Terminated	at 50.6	feet				4								
	1																
800.4-	-								1								
-	-								-								
	-								-								
	_																
	-								1								
			SAMPLER	TYPE					-		DRILLI	NG MET	THOD]		
SS - S	Split Spo	ion hed Samr	h	NQ - R	ock Cor	e, 1-7/8"			A - Hollo	w Stem Au	ger at Augers	RV	V - Rotary	Wash			
AWG-F	Rock Co	re 1-1/8"		CT - C	ontinuoi	is Tube			C - Drivi	na Casina	it / tuget3			010			

Project	Project ID: P038111 County: Greenville Boring No.: BR-2																	
Site De	scripti	on:	I-85 Brid	lge Over Ro	ocky Cree	k									Rout	e: I-8	35	
Eng./G	eo.: J	.Gathro	(S&ME)	Boring L	ocation:	413+3	7		Offs	et:	(3 ft L	Т	Aliç	gnme	nt: M	Mainlin	e CL
Elev.:	855.4	ft	Latitude	34.8	55741	Longit	tude: -82.26836						Sta	rted: 3/25/2019				
Total D	epth:	61.5	ft Sc	oil Depth:	37.3 ft	Co	ore De	pth:	24	4.2 f	t l	Date	Cor	nplet	ed:	3/25	5/2019	
Bore H	ole Dia	ameter (in): 6	S" Sam	pler Conf	iguratio	on	Line	er R	equ	ired:	Y	()	Line	r Used	: Y	N
Drill Ma	achine	CM	E 750X	Drill Meth	od: HS	A/RC		Hamm	er T	ype	Aut	omat	ic	E	nergy	Ratio	: 84.0	%
Core S	ize:	NQ		Driller:	S. Gow	an		Ground	dwa	ter:	TO	3	16 ft		2	4HR	N/A	
																ΝΙΛΔΙΙ		
														_				
tion	Ę					hic	th e	ole vpe				lle		ч >	L (—X	
eva (ft)	(ff)	N	/ATERIA	_ DESCRIP	TION	Log	Dep (ff)	sam o./T	ē.	- 10	و" و"	l Va			FINES	CONTE	NT (%)	
Ē	0.0	Top of	Pavement			0	0) —	° z	1st	2nc	3rd 4th	2	0 1	0 20	30 40	50 60	70 80	90
	10-	Aspha	lt - 15 inche	es (no stone b	ase)													
	1.3	Fill - M	edium dens	se, brown, gra	y and tan,	800	1.5											÷
-	-	fine to	medium, sil	ty SAND (SM	A-4), trace		2.0	SS-1	6	8	7	15		•				
-	-	ft, foot	of micaceo	us sandy silt a	sanu at 3.5 it 4-5 ft		3.0											-
-		Bulk-"1	A" (1-7 ft):	NMC=16			-	SS-2	8	9	97	18						-
850.4-		SS-3:1	MC=16, L		5.0													
-		%200=	38					SS-3	6	6	66	12			★ ▲			-
_	7.0					7.0							:	: :	: :	: :		
		Fill - S	tiff, red and															
-		(ML/A-	4), trace ro	ck fragments	uy SIL I		0.0	- 55-4	3	4	5 /	9)				
-	9.0	Fill - Lo	oose, slight	ly moist, gray,	brown and		9.0											
845.4-		tan, fin	e to coarse	, silty SAND (SM/A-4), silt_clay			SS-5	3	4	68	10		×				
-	-	layers	in SS-6	113, 364113 01	Siit, Clay									Ò				-
-		Bulk-1	(1-15 ft, SC	C/A-6): LL=33,	PL=22,			_						÷				-
_	_	PI=11,	%200=47															-
		- SS-6: NMC=19, LL=30, PL=24, PI=6,	SS-6: NMC=19, LL=30, PL=24, PI=6,	- SS-6: NMC=19, LL=30, PL=24, Pl=6,														
		%200=	43	,	0,			SS-6	5	4	5	9						
840.4-	-																	
-	16.0	∠ Alluviu	m - Very lo	ose, wet, gray	and tan,		-							-				-
- 19		mediur	n to fine, po	orly graded S	AND with			-										-
- 6/4		layer o	f fine sandy	silt with orga	nics		18 5	-						-				-
- 10	-	NMC=2	28, %200=7	,			10.0	007	2	2	2	1		-	0			-
835.4-								33-1		۷	۷	4						
1.000	21.0																	
		Alluviu	im - Mediur	n dense, wet,	tan, fine to													
	1 -	(SP-SN	л, роопу gr Л/А-3)	aueu SAIND W	ini oll			1										-
	-	NMC=2	22, %200=9)			23.5	1										-
- DAT	24.0_	Residu	ium - Medii	um dense to v	ery loose.	·····································		SS-8	6	8	8	16		•0				-
830.4-	-	moist,	light gray, c	ark gray and	an,		-											
- 12	-	(SM/A-	1-b), rock f	ragments at 2	8.5 ft			-										-
- <u>10</u>	-	NMC=	16, %200=1	5				_										-
																		-
	29.0						28.5											
- <u>18</u>	1 _0.0_	Very lo	ose to med	ium dense, m	oist, gray,		-	SS-9	4	1	2	3	•	×	× 1			-
51500	I					LE	GEND)	1			1	<u> </u>	•	Co	ntinue	d Next	Page
1426	SAMPLER TYPE DRILLING METHOD																	
L SS -	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																	
ပ္တ AWG -	Rock Co	re, 1-1/8"		CT - Continu	ous Tube		DC	- Drivi	ng C	asing	Ĭ	.						

Project ID: P038111 County: Greenville Boring No.: BR-2																		
Site Desc	riptio	on:	I-85 Bride	ge Over Ro	cky Cree	k							Rout	e: I-8	35			
Eng./Geo).: J.	Gathro	(S&ME)	Boring L	ocation:	413+3	7	(Offset:		6 ft L	Т	Alignme	nt: I	Mainline CL			
Elev.: 8	55.4	ft	Latitude:	34.8	55741	Longit	gitude: -82.26836 Date Starte						ed:	3/25	5/2019			
Total Dep	oth:	61.5	ft Soi	I Depth:	37.3 ft	Co	ore De	epth:	24.2	ft	Date	Com	oleted:	3/25	5/2019			
Bore Hole	e Dia	meter (i	n): 6'	' Sam	pler Con	figuratio	on	Line	er Requ	iired	: Y	N	Line	r Used	: Y Ŋ			
Drill Mac	hine:	CME	E 750X	Drill Meth	od: HS	A/RC		Hamme	er Type	: Au	tomat	ic	Energy	Ratio	: 84.0%			
Core Size):	NQ		Driller:	S. Gow	/an	Groundwater: TOB 16 ft 24							4HR	N/A			
														NI \/AT I				
											• 3F1	IN VAL	JE 🛡					
ion	e					.ic _	e ri	be be			en		PL X		——X			
(ft)	de (E)	Μ	IATERIAL	DESCRIP	TION	Log	amp Jepi	amp		<u>ة</u> و	<al></al>			CONTE	NT (%)			
Ū,						0	I S	νž	1st 2nd	3rd		0 10	20 30 40	50 60	<u>) 70 80 90</u>			
		yellow b	brown to dar	k brown, mic	aceous,								: : :					
	-	NMC-3	9 SAND (SP 0 11-20 P	VI/A-2-4) I	%200-34			-										
-	-		0, LL-23, I	L-24, 1 1-3, 1	/0200-04			-										
-	-					33 5	-											
_	_						00.0		1.0	40	40							
820.4								55-10	4 6	10	16							
020.4	36.0									_								
		Partially	y Weathere	d Rock - Ver	y dense	15(1)		1										
- ;	37.3-	(based	on rate of di	rilling); not sa	Impled		37.3	-	50/0"				÷ ÷ ÷					
-	-	Refusal	encountere	ed at 37.3 fee	t;		37.3	NQ-1	50/0		50/0	RFC	=100% RC	D=46%	<pre><< a></pre>			
_	_	Granod	iorite - grav	white, and I	black, verv		39.3						- 100 /0, 113		, q _u =10,111 po			
815.4-		fine to c	oarse, weal	kly foliated, q	uartz-													
010.4		-biotite-i	muscovite-s	eathered, H-MH, J), V (dipping 25-80 deg		es,							÷ ÷ ÷					
	41.5	(dipping	0-35 deg),											1 00/	- 17 500			
-	-	VC, tigh	t to wide ap	width, (37 3-41 5			_ NQ-2				REC=83%, R)=42%,	q _u =17,589 psi				
-	-	ft)=44 (Class III); GSI=60-65			-65			-										
	_	Sillimar	Sillimanite Schist with lavers of Gneiss -				44.3	_										
810.4-		gray, br	gray, brown, and white, fine to very coarse, very thin to thin foliations, guartz-sillimanite-			, 📉		_										
		very thir	n to thin folia vite-chlorite∙	ations, quartz -sulfides, slia	- 📈													
	1	weather	ring, H-LH,	J (dipping 0-3), 🕅								D-6304	a - E 900 poi				
	-	partly of 42.8-43	pen to extre 2 ft), Wa-Ir	mely wide (ve . SR. few it. s	. 188						REC	=100%, KG	(D=03%)	, q _u =၁,699 psi				
	48.5	RMR (4	1.5-48.5 ft)=	=29 (Class IV	'); GSI=60	,		-										
	-	Granite	Pegmatite	- gray and ye	ellowish		49.3	_										
805.4-	_	tan, fine	to very coa	arse, thickly fo sillimanite-mi	oliated, ca-sulfides			_										
		fresh we	eathering, V	H-H, T (dippi	ng 0-40													
		deg), V(modera	C-C, tight to telv fracture	open, Ir-Wa d 48,8-49 3 f	, K-SK, No t. few	,		NO-4				REC	=99% R∩Γ)=94%	a =6.950 nei			
	1	strands	of mineral a	alignment; R	MR								5570, TOSC	5170,	- ₁₀ -,000 poi			
	-	(48.5-49	9.3 tt)=15 (C	ass V); GSI	=55			1										
	54.2-	4) אועוא (4 GSI=85 ∖	ອ.ວ-ວ4.2 m)= -90	Uass II) co=	,		54.3											
800.4	4	Biotito	Gnoice with	Schiet whi		-' 🕅		-					<u> </u>					
	_	and bro	wn, very fin	e to coarse, t	hin to thick			_										
-		foliation	s, quartz-bio	otite-chlorite-	muscovite-			NQ-5				REC	=99%, RQ[)= 58%.	q_=14,706 psi			
	7	coating	of graphite	present at loc	cations													
	-	betweer	1 57.2-59.3			1												
	-	J (dippir	ng 0-40 deg), V (dipping	0-20 deg),	' 🕅	59.3	-			_	-						
		VC, par	tly open to	very wide, T-	VN, PI-Ir,			<u> </u>				:	: : :	ntinun	d Novt Door			
			SAMPI FR	TYPE				,						nunue	u Nexi Page			
SS - Spl	lit Spo			NQ - Rock Co	ore, 1-7/8"		HS	A - Hollo	w Stem /			R\	N - Rotary	Wash				
<u>AWG - Ro</u>	ck Cor	e, <u>1</u> -1/8"		CO - Cuttings CT - Continue	ous Tube			A - Cont	ng Casing	ignt A <u>3</u>	uyers	R		Jule				

Project ID: P038111 County: Greenville Boring No.: BR-2																	
Site D	Site Description:I-85 Bridge Over Rocky CreekRoute:I-85																
Eng./C	Geo.: J	.Gathro	(S&ME)	Boring	_ocation:	413+3	7		Offset:	Offset: 6			Alignm	ent:	Mainlin	e CL	
Elev.:	855.4	ft	Latitude	:: 34.8	855741	Longit	ude:	-82	2.26836		Date	Star	ted:	3/2	3/25/2019		
Total I	Depth:	61.5	5 ft S	oil Depth:	37.3 f	t Co	re De	epth:	24.2 f	24.2 ft Date			pleted:	3/2	25/2019		
Bore H	lole Dia	ameter ((in):	6" San	pler Con	figuratio	on	Lin	er Requ	ired:	Y	N	Lin	er Use	d: Y	N	
Drill M	lachine	: CN	1E 750X	Drill Meth	od: HS	SA / RC		Hamm	er Type	er Type: Automat			Energ	y Rati	atio: 84.0%		
Core S	Size:	NQ		Driller:	S. Gov	van		Groun	dwater:	ТО	B	16 ft 24HR N/A					
											-	-					
													● SF	PT N VA	LUE		
Ę						0	۵	<u>م</u> 0			0		ΡĻ	MC	ĻĻ		
(atic	ft)					ihd og	± bth	Typ (-		alu		X		——X		
	۵°	'		E DECOI	non	5	, De Sal	No./	st 6' nd 6	th G	ź		▲ FINE	S CONT	FENT (%)		
		R-SR	Pa-No fra	cture frequenc	v areatest			NO-6	5 7	ω 4		0 10 PEC	<u>) 20 30</u> 	<u>40 50 (</u> 22-00-23	<u>60 70 80</u> %	<u>90</u>	
		betwee	en 59.2 and	d 60.7 ft; RMR	(54.2-61.5	5 🕅		-					J=100 /0, F	(QD=23	/0		
	61.5	<u>ft)=32</u>	(Class IV);	GSI=60-65								1					
		Coring	Terminate	d at 61.5 feet													
	1 -	1						1									
		+						-								-	
790.4		-						-									
								_								-	
	7 -	1															
		-						-								-	
		-						-								-	
785.4		-						_						<u> </u>			
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	7 -	1															
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		-						_				1		: :	: : :	-	
		-						_								-	
790 /														: :			
700.4														: :	: : :	-	
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19		-						-				1		÷	: : :	-	
6/4/		-						_								-	
.GDT														: :		-	
2015.																	
°∏ 775.4	1 -	1						1									
5		1						-								-	
LATE		-						_								-	
EMP																	
TAT																-	
DA	1 -	1						1									
770.4		1						-						<u> </u>			
ō C								-								-	
<u>G.G</u>								_								-	
ZZ														: :			
	1 -	1						1								-	
- 185		-						-								-	
2009							0							: :	: : :		
4561:																	
ss -	Split Spo	oon	SAIVIPLE	NQ - Rock C	ore, 1-7/8"		н	SA - Hollo	ow Stem A	L Auger		F	RW - Rota	ary Wasł	า		
	UD - Undisturbed Sample CU - Cuttings CFA - Continuous Flight Augers RC - Rock Core																
ω <u></u>	NUCK CU	, i-1/0							ng Casilly	1							

Proje	Project ID: P038111 County: Greenville Boring No.: BR-3 Site Description: L 95 Bridge Over Deslay Oregit Description: Description:																	
Site I	Descrip	t ion: I-8	5 Bridg	ge Over Ro	cky Cree	k	·							F	Rout	: e: -8	35	
Eng./	Geo.:	J.Gathro (S&	ME)	Boring L	ocation:	414+2	0		et:	9	92 ft	LT	Aligr	ımer	nt:	Mainlin	e CL	
Elev.	: 847.	9 ft Lat	itude:	34.8	5605	Longi	jitude: -82.268224 Date						Star					
Total	Depth:	50.8 ft	Soi	I Depth:	31.5 ft	Co	ore De	pth:	19	9.3 ft		Date	Com	plete	d:	3/12	2/2019	
Bore	Hole D	ameter (in):	2.	.95" Sam	pler Conf	igurati	on	Line	er R	equi	red:	Y	N)	_iner	r Usec	I: Y	N
Drill	Machine	E Diedric	h D50	Drill Metho	od: RW	/ / RC		Hamm	er T	ype:	Aut	omat	ic	En	ergy	Ratio	: 98.1	%
Core	Size:	NQ		Driller:	J. Millw	ood		Ground	dwa	ter:	TO	3	N/A ((RW)	24	4HR	7.6 f	t
														•	SPT	N VAL	UE ●	
5						U	m	0.0				a a		ΡĻ		MC	ĻĻ	
/atic	epth [МАТ	idda og	epth (ft)	Typ				/alu		X		_0	——X				
Ele		Top of Grou	und (2"			5	S Q	No.	st 6	pud 6	th 6	ź	0 10	▲ F	INES		ENT (%)	0.00
	0.0	Fill - Firm to	o soft, m	noist to very n	noist,		0.0		-	(1) (<u>ע</u>			<u>20 3</u>	0 40	<u>. 70 ot</u>	90 	
	-	brown, red	and gray	y, fine to med	ium, sandy		-	SS-1	3	2 3	35	5		×	\rightarrow			
	_		-20 II-	-35 PI -21 I	anu graver PI=14		2.0						-					-
	_	%200=54	,	-00,1 2-21,1	,		-	SS-2	4	3 5	55	8	•	:	: :			÷ _
		SS-3: NMC	3: NMC=26, LL=31, PL=20, PI=11,		4.0								:					
		%∠00=56						00.0		•				ý a				
842.	ອ 5.5	Allender	Voriat	ft von maist	dork area		60	55-3	1	2 2	∠ 1	4		- <u>* 0</u> .	*			:
	-	fine, lean C	LAY with	h sand (CL/A	-6), trace		0.0											-
	-	I roots and de ■ of medium et la sectore de la secto	roots and decaying organic matter, seams				-	SS-4	0	1 '	1 1	2		X	$\rightarrow \!$			-
	-	UD-2 (6'-8')	6'-8'): NMC=39, LL=36, PL=22,									-						
	-	_ PI=14, %20	0=79	, ,	,		-	SS-5	0	0 0	0 0	0		Х—	$\times \circ$			-
837.	9-	SS-5 (8'-10	'): NMC= 0=79	=40, LL=33, F	PL=20,		-							×	× 		<u> </u>	
	_	UD-3 (8'-10	'): NMC:	=31, LL=31, I	PL=20,		-											
		PI=11, %20	Ó=76		·										-			
	13.0																	
		Alluvium -	Medium	dense to loo	se, wet,		13.5											
	-	gray, mediu (SP-SM/A-1)	im to fin I), seam	SIIT		-	SS-6	3	3 1	1	14		• ^O					
832.	9-	NMC=24, %	6200=10)		-								<u>.</u>		<u> </u>		
	-	-					-	-										-
6	-	-						-										
6/4/2	_	_					40 5	-										
.GDT	_ 19.0						18.5											
827	a_	Residuum - white and a	- Very lo reenish	ose, wet, ligh arav. fine to (nt tan, coarse. silt	,		55-7	3	2 2	2	4						
		SAND (SM/	A-2-4),	some rock fra	agments	′												
	1	NMC=26, L	L=36, P	L=27, PI=9, %	6200=34													
APLA	1	-					-											
	-	-					23.5	_										-
DAT	-	-					-	SS-8	0	1 3	3	4		×				-
822.	9-	-					-											
N N	-	-					-	-						:				: -
1 <u>6</u> .6	27.0	De stielle bri					- 1	4										: -
		moist, brow	n, oranc	u ROCK - Very ge and white.	fine to	11/31								:				
		coarse, silty	SAND	(SM/A-2), tra	ce rock		28.5	SS-9	50/4	"		50/4"						>>
90 [_] 00		nagments				KK (II	1						1 :					
6150						LE	GEND)							Со	ntinue	d Next	Page
20	- Snlit Sr	SA	MPLER		ro 1-7/9"		ЦС		W/ C+	۵m ۸.	D	RILLIN	IG MI) Potore	Wash		
	- Undistu	rbed Sample	(CU - Cuttings			CF	A - Cont	inuo	us Flig	ght Au	gers	F	RC - F	Rock (Core		
ပ္တ <u>AWG</u>	- Rock C	ore, 1-1/8"	(CT - Continuc	ous Tube		DC	- Drivi	ng Ca	asing								
Project	ID: P	038111						Co	unty:	Green	ville		Borir	ng No.:	BR	-3		
--------------	------------------	----------------------	------------------------------	---------------------	------------------------	-----------------------------	---------	--------	----------------------	------------	----------	--------	------------	----------	---------------	----------------------------		
Site De	scripti	on:	I-85 Brid	dge O	ver Ro	cky Creel	۲						F	Route:	I-8	5		
Eng./G	e o.: J	.Gathro	(S&ME)	B	oring L	ocation:	414+2	20	(Offset:	92	ft LT	Aligr	nment:	N	lainline CL		
Elev.:	847.9	ft	Latitude		34.8	5605	Longi	tude:	-82	2.268224	Dat	e Sta	rted:		3/11	/2019		
Total D	epth:	50.8	ft Sc	oil De	pth:	31.5 ft	Co	ore De	epth:	19.3 ft	Dat	e Cor	nplete	d:	3/12	/2019		
Bore H	ole Dia	ameter (i	in): 2	2.95"	Sam	pler Conf	igurati	on	Line	er Requi	red:	Y () 	_iner U	sed:	Y N		
Drill Ma	chine:	: Died	drich D50	Dril	I Metho	od: RW	/ RC		Hamme	er Type:	Autom	atic	Ene	ergy R	atio:	98.1%		
Core Si	ze:	NQ		Dril	ler:	J. Millwo	ood		Ground	dwater:	TOB	N/A	(RW)	24H	R	7.6 ft		
																F 🗖		
															0			
tion (th						d hic	e te	ple		2		PL X-	IV(\rightarrow	—X		
leva (ft)	Dep (ff)	N	1ATERIA	L DES	SCRIP	TION	Log	Dep	Sam o./T	"0" 10"	9 9	5	▲ F	INES CO		NT (%)		
Ξ								0,	°'z	1st 2nc	4th 4th	0 1	0 20 3	0 40 5	0 60	70 80 90		
							15/11											
	31.5	Pofuco	Loncountor	rod at i	21 5 foo	+-		31.5	7			_						
-	-	comme	nced NQ r	ock co	ring:	ι,			-							-		
-	-	Gneiss	ic Granite	- white	and da	rk gray,							0 0 70/					
-	-	fine to v -mica-s	very coarse	e, weal arnet-	kly foliate	ed, quartz- ase-sulfides			- NQ-1			RE	C=97%,	RQD=8	57%, C	l _u =20,885 psi		
812.9-	_	slight to	fresh wea	thering	g, MH-H	, J (dipping	" 🕅		_									
_	_	0-40 de	eg), VC-C, t R_few_vein:	tight to s throu	modera	ately open,		35.8	_			_						
		RMR (N	√Q-1,2,3)=	67 (Cla	ass II); G	GSI=65-70												
_	_		, ,-,	- (-	,, -				1									
-	_								NQ-2			RE	C=99%,	RQD=9	4%, c	l_=15,619 psi		
-	-								-									
807.9-	_								_									
	_							40.8	_									
-	-							2	1									
-	-								NQ-3			RE	C=100%	6, RQD=	86%,	q_=16,478 psi		
-	-								-									
802.9-	_								_									
	46.2-							45.8				_						
		Sillima	nite Schist	interla	ayed witl	h Gneiss -												
	_	verv thi	gray and gr nlv to thinly	een, v / foliat	ery fine i ed. quar	to coarse, tz-			1									
-	-	-sillima	nite-mica-c	hlorite	-sulfides	s, slightly			NQ-4			RE	C=100%	6, RQD=	87%,	q _u =3,452 psi		
-	-	at 46.2	ft). H-LH.	es con J (dipp	npletely ina 0-40	dea). VC.			-							-		
797.9-	_	partly o	pen to wid	e, N, Ir	, ŠR-R,	Fi			-									
_	50.8		NQ-4)=38 (Class	IV); GSI	=55						_						
	_	Coring	Terminated	d at 50	.8 feet				_									
_	-								1									
-	-								1									
792.9-	-								-									
-	-								-									
	_								_									
	_]									
-	-								1									
							 		<u>ו</u>				:	. :	. :	: : :		
			SAMPLE	R TYP	E		LC		,		DRIL	LING M	IETHOD)				
SS - S	Split Spc	on		NQ -	Rock Co	ore, 1-7/8"		HS	A - Hollo	w Stem A	uger		RW - F	Rotary W	ash			
AWG-F	Rock Co	re, 1-1/8"	ne -	CT -	Continuo	ous Tube			Cont Cont Cont	ng Casing	in Auger	5	NG - P		e			

SC_DOT 142615009_85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

Project	t ID: F	P038111						C οι	inty:	G	ree	nville	9		Bor	ing N	lo.: R	2W-1	
Site De	escript	ion:	I-85 B	Bridge	e Over R	ocky Cree	k									Rou	te: I-	-85	
Eng./G	ieo.:	I.Gathro	(S&ME	E)	Boring	Location:	410+9	0		Offs	set:		89 ft	LT	Alig	ynme	ent:	Mainli	ne CL
Elev.:	849.7	' ft	Latituc	de:	34.8	355672	Longit	ude:	-82	2.26	922	6	Date	Star	ted:		4/1	1/201	9
Total D	Depth:	34 ft		Soil	Depth:	34 ft	Co	re De	pth:	0	ft		Date	Con	nplet	ed:	4/1	1/201	9
Bore H	lole Dia	ameter (in):	6"	San	pler Conf	iguratio	on .	Line	er R	lequ	ired	<u>Y</u>	<u>.</u>	<u>ل</u>	Line	er Use	d: Y	<u>N</u>
			E 45				A 		Hamm	er I	ype		itomai		E	nergy	y Ratio	0: 80.	3%
Core S	ize:	IN/A		L	Driller:	Indeper	idence	ןוויט	Ground	awa	iter:		В	9 11		4	4 H K	8 11	
																• SP	T N VAI	LUE ●	
															D	-	MC	-	
()	f f						g	ele (ple				lue		×	L 		——X	
leva (ft	Dep		IAIER	IALL	DESCRIP	PHON	Lo	Dep (ft	Sam lo./T	t 6"	d 6"	ي 19				FINES	S CONT	ENT (%)
ш	0.0	Top of	Ground	(2" To	opsoil)	ad an al fin a			"Z	1st	2n	3rc	ř –	0 10	<u>20</u>	30 4	0 50 6	<u>50 70 8</u>	80 90
_		to med	rm to so ium. san	π, gra idv lea	an CLAY ((na rea, fine CL/A-6), few		0.0	SS_1	2	2	3 3	5 5						
		roots in	upper 2	2 ft, tra	ace rock fra	agments and	1 /////	20	00-1	2	2	5 2	- 5				-		
-	-					0/000 50													
-			25, LL=3	5, PL=	=22, PI=13	, %200=56		-	SS-2	1	1	2 2	2 3						
-	4.0	Fill - Se	oft slight	tlv mo	ist red an	d brown		4.0_						-					-
844.7-		fine to	medium,	sand	y SILT (MI	_/A-5), few		-	SS-3	4	2	2 3	3 4			×	× 🔺		
_	6.0	nock fra	agments,	, sean 1 PI -	n of sand a =31 PI=10	t 5.5 ft; %200=51		6.0											
			m - Ven	1,100	- moist b	rown and	-		00.4		~	<u> </u>							
-	1 -	_gray, fi	ne to me	dium,	silty SAN	D (SM/A-2),		• •	55-4	2	2	2 4	4		ک ب				
	8.5	Iayer of	clay 7 to	0 7.5 ft	ft, some sa	and with silt		0.0						1 :	:	:		: :	
-			20, %200)=24				-	SS-5	2	1	2 1	3		×	×			
839.7-		Alluviu	m - Soft	, mois	st, brown a	nd gray,		-										<u> </u>	<u> </u>
-		fine, sa	ndy lear		Y (CL/A-4)	, trace		-	_										
		NMC-3	ayer 010 81 11–2	ayey QPI-	-21 PI-8	ว II %200–55								:	÷			: :	: :
-	130), LL-2	3, T Ľ -	-21,11-0,	/0200-33		-]						:				
-		Alluviu	m - Very	/ loose	e, wet, gra	y with		13.5	-				_		÷				
		brown,	fine, SA	ND wi	ith silt (SP- top and bo	-SM/A-2),		-	SS-6	3	1	2	3			Ò			
834.7-		layer		no at				-						:	:			: :	: :
-		NMC=3	80, %200	D=11				-	_					:	:				
_								-											
_	1 100	1						18.5	- 				_						
-	19.0	Residu	um - Me	edium	dense, mo	oist, orange,		-	SS-7	5	6	9	15		•				
829.7-		red and	l brown,	fine to	o medium,	silty SAND		-											
			<u>~)</u> 9. %2∩∩)=18				-	-						:				
- I	-		2, 70200					-]						:				
	23.0														÷				
		Mediun	n dense,	mois	t, white, br	own and		23.5						-	÷				
-	1 -	(SM/A-	, inte to (2), few r	ock fr	e, silly SAI	ND.		-	SS-8	3	8	11	19		۰		÷		
824.7-								-					_						
-		-						-	-						:				
-	-	-						-	-						:				
_															:				
	29.0							28.5	<u> </u>	10	50/r		EO/E		:				
-]	Partial	y Weath	nered	Rock - Ve	ry dense,	15/11	-	55-9	16	oU/5		50/5	-					>>
L	1	1						GEND)	1			I	<u> </u>	•	C	ontinu	ed Nex	xt Pade
	0 //: -		SAMPI	LERT	YPE					-			DRILLI	NG M	ETHO				
UD -	Split Spo Undistur	oon bed Samr	ole	N CI	Q - Rock C U - Cuttina	ore, 1-7/8" S		HS/	A - Hollo A - Cont	ow St inuo	tem / us Fl	Auger iaht A	uaers	F	≺₩ - 3C -	Rotar Rock	y Wash Core	ו	
AWG-	Rock Co	ore, 1-1/8"	-	C	T - Continu	ious Tube		DC	- Drivi	ng C	asin	3	50						

Pro	oject	ID: F	°03811′	1						Co	unty:	Gre	eenv	ille			Borin	g No.:	RV	V-1	
Site	e De	scripti	on:	I-85 E	Bridg	e Over	Roc	ky Cree	k								F	Route:	I-8	5	
En	g./Ge	eo.: J	.Gathro	(S&MI	E)	Borir	ng Lo	cation:	410+9	90		Offse	et:	8	39 ft I	LT	Align	ment:	N	lainline	e CL
Ele	v.:	849.7	′ ft	Latitu	de:	3	4.85	5672	Longi	tude:	-82	2.269	226	1	Date	Start	ed:		4/11	/2019	
Tot	al D	epth:	34 f	t	Soil	Depth	:	34 ft	C	ore De	pth:	0 ft	t	1	Date	Com	oleted	d:	4/11	/2019	
Bo	re Ho	ole Dia	ameter ((in):	6"	S	amp	ler Con	figurati	on	Lin	er Re	quir	ed:	Y	N	L	iner U	lsed:	Y	N
Dri	II Ma	achine	: CM	IE 45		Drill M	etho	d: HS	A		Hamm	er Ty	pe:	Auto	omat	ic	Ene	ergy R	atio:	80.3%	6
Co	re Si	ze:	N/A			Driller:		Indepe	ndence	Drill	Groun	dwate	er:	TOE	3 9	9 ft		24H	R	8 ft	
								-												•	
																	•	SPT N	VALU	IE 🔴	
L C											. 0						PL	Ν	IC	LL	
atic	£	ipth ft)					лот		od phi	ft pft	Typ				alue		X	()	—×	
		۵°				DLOOI	XII I		U B	Sar	Sar Vo./	st 6"	70 10 10	њ б	z		▲ FI	NES CO	ONTE	NT (%)	
-			slightly	moist t	an w	hite and	oran	ae fine ta			-	÷ (ର ଜ	4		0 10	20 3	<u>0 40 5</u>	<u>60 60</u>	70 80	90
	_	-	coarse	, silty SA	AND (SM/A-2)	, few	rock		ι.	_						-	÷	: :	: :	-
			fragme	ents					\mathbb{Z}												
									KK (1								:		:		
	-	-	1						NG II	33.5					50/50						-
	-	34.0_	Boring	Termina	ated u		ounte	erina		34.0	<u>SS-10</u> SS-11	50/3" 50/0"			50/3" 50/0"					: :	:>>
81	4.7-	-	auger	refusal /	split-s	spoon re	fusal	at 34 ft		.						1					
		_								.											÷ _
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80	197-	_																			
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80)4.7-	-																			
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015.0		_]														:	:	: :	: :	
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IMPI																					:
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																				: :	:
12615									LE	GEND)					<u></u>	TUGE				
r ⊢ SS	- 5	Split Spo	oon	SAMP	LER N	I YPE IQ - Roc	k Cor	e, 1-7/8"		HS	A - Holle	ow Ste	m Au	Dl ger	KILLIN	NG ME R'	THOD N - R	otary W	/ash		
) - L	Jndistur	bed Sam	ple	C	U - Cutt	ings	- T -1		CF.	A - Con	tinuous	s Fligh	nt Au	gers	R	C - R	ock Co	re		
S AN	/G - F	KOCK CO	ore, 1-1/8"		C	🗸 - Con	แทนอเ	ISIUDE			- Driv	ing Ca	sing								

Proje	ct ID: F	203811 ⁻	1					Co	unty:	G	ree	nville)		Bo	oring	No.:	RW-	2	
Site D	Descripti	on:	I-85 B	ridge	over Ro	ocky Cree	k									Ro	ute:	I-85		
Eng./	Geo.: J	.Titus (S&ME)		Boring L	_ocation:	415+7	8	(Offs	set:		77 ft	RT	A	ignm	ent:	Ma	inline	e CL
Elev.:	849.9	ft	Latitud	le:	34.8	55801	Longi	ude:	-82	2.26	751	3	Date	Sta	rted	:	3	/13/2	019	
Total	Depth:	33.5	5 ft 🛛 🕄	Soil I	Depth:	33.5 ft	Co	ore De	pth:	0	ft		Date	Cor	mple	eted:	3	/13/2	019	
Bore	Hole Dia	ameter ((in):	6"	Sam	pler Conf	igurati	on	Line	er R	equ	lired	: Y	((N)	Lin	er Us	ed:	Y	N
Drill N	Machine	: Die	drich D	50 C	Drill Meth	od: HS	A		Hamme	er T	ype	: Au	toma	tic		Energ	y Ra	tio:	98.1%	ó
Core	Size:	N/A			Driller:	J. Millw	ood		Ground	dwa	ter:	TC	B	18.5	5 ft		24HR	· /	10.4 f	t
																			•	
																• 31		ALUE	•	
ion	Ę						.c	e c	be be				ne			PL X		;	LL —X	
(ft)	(ft)	1	MATERI	AL D	ESCRIP	TION	Log)ept		<u>.</u>	.9	ي و	Val				s col		- (0/.)	
Ē	0.0	Top of	Ground	(No T	opsoil)		G	S	S S	1st	2nd	3rd 1th		0 1	0 20	0 30 4	40 50	<u>60</u> 7	(<i>1</i> 8) 70 80	90
		Fill - S	tiff, dark g	gray a	and brown,	fine to		0.0								:	: :	:	: :	:
	-	layer c	rushed st	tone	(CL/A-6),	trace roots			- SS-1	6	8	67	14		•					
	_ 2.0_	Fill - M	ledium de	ense t	o loose, sli	ahtly		2.0						-						-
		moist,	brown red	d, fine	to coarse	, silty SAND			- SS-2	5	6	68	12		• C	××				-
		gravel	-4), with c	slay, ti	race roots,	layers of		4.0					_	_						
844 0	a	NMC=	19, LL=33	3, PL=	=26, PI=7, °	%200=38			- 55-3	2	З	5 6	8							
	6.0							6.0		-	Ū	0 0								
		Fill - L	oose, sl. r	moist,	, brown, or	ange and														
		gray, n (SM/A·	nica., fine -2-4); NM	e to me /IC=20	ealum, siity), LL=33, F	/ SAND PL=26, PI=7	,		- SS-4	2	3	7 5	10) () : :			-		
	8.0	_ <u>%200=</u>	=30					8.0						_		:		-		
		Fill - ∨	ery soft, s	slightl	y moist, da	rk brown			- SS-5	2	0	1 1	1	•		×.	<u> </u>	Á		
839.9	9	and re (ML/A-	d, fine to i ·7-5)	mediu	im, sandy :	SILI											<u> </u>		<u> </u>	
		UD-1 (8'-10'): NI	MC=3	30, LL=47,	PL=30,			_											_
	12.0	PI=17,	%200=60	0												:				:
		Alluviu	um - Very	loose	e, wet, dark	k gray, fine			_											
		to med	lium, SAN	ND wit	h silt (SP-የ ጉፍ	SM/A-1),		13.5	-							:				
		NMC=	44. %200)=10	63				SS-6	1	1	1	2	• 4	k		0			
834.9	э		, /0200												<u> </u>				<u> </u>	
	_ 16.0_							-	_											-
		brown.	uum - Loc micaceo	ose, v ius. fir	ery moist, o ne to mediu	orangish im. siltv												-		_
8/4/19		SAND	(SM/A-2-	·5), tra	ace rock fra	agments														
5	1 -	<u></u> ∠NMC=	52, LL=52	2, PL=	=43, PI=9, '	%200=25		18.5						_						
015.G									SS-7	2	3	5	8	•			× 8	\$		-
^ଅ 829.9	э- -									-						:				
6	_ 21.0_	Mediu	m dense	Wet to	n moist da	rk brown			-							:		÷		-
LATE		and re	d, micace	eous, f	fine to coar	rse, silty			_							:				-
EMP		SAND	(SM/A-2)	, lens	es of partia	ally .9														-
TAT		NMC=	33, %200)=22	, 5 00-	-		23.5		-				-		:		÷		
T DA	1 -		,						SS-8	6	10	13	23			•		-		
824.9	9- -																			
El Classica de la Cla									-							:				
NG.O									-							:		÷		-
DEN									_							:				-
35 WI								∠8.5						-						
31_00									SS-9	7	9	14	23							
6150							LE	GEND)					•		С	ontin	ued l	Vext I	Page
200	- Split Sp	non	SAMPL	ER T	YPE	ore 1-7/9"		ЦС		w 9	tom /		ORILLI	NG N				sh		
	- Undistur	bed Sam	ple	CL	J - Cuttings	5 i - 1/0		CF	A - Cont	inuo	us Fl	ight A	ugers		RC	- Roci	Core	311		
୍ଡ AWG	 Rock Co 	re, 1-1/8"	1	С	Γ - Continu	ous Tube		DC	: - Drivii	ng C	asing	g								

Project	t ID: F	2038111					Co	unty:	Gree	nville			Boring	No.: [RW-2	
Site De	escripti	on:	I-85 Brid	lge Over F	Rocky Cree	ek							Ro	ute:	-85	
Eng./G	i eo.: J	.Titus (S	&ME)	Boring	Location:	415+78	3	(Offset:		77 ft	RT	Alignm	nent:	Mainli	ne CL
Elev.:	849.9	ft L	atitude:	34.	.855801	Longit	ude:	-82	2.26751	3	Date	Starte	ed:	3/	13/2019	9
Total D	epth:	33.5 f	t So	il Depth:	33.5 f	t Co	re De	epth:	0 ft		Date	Com	oleted:	3/	13/2019	9
Bore H	ole Dia	ameter (ir	ı): 6	Sa Sa	mpler Con	figuratic	n	Line	er Requ	uired:	Y	N	Lir	ner Üse	ed: Y	N
Drill Ma	achine	: Died	rich D50	Drill Met	hod: HS	SA		Hamme	er Type	: Au	tomat	ic	Ener	gy Rati	o: 98.1	1%
Core S	ize:	N/A		Driller:	J. Millv	vood		Ground	dwater	: ТО	B	18.5 f	t	24HR	10.4	4 ft
				•	•										•	
													• S	PT N VA	LUE	
								a O					PL	MC	LL	
atio (t)	t) th	N.4.				phic D	apt Pth€	Typ			alue		×—		——X	
(f	De	IVI/		DESCRI	PTION	L a	San De	San Jo./	t6" d6	d 6"			▲ FIN	ES CON	TENT (%)
								~ ~	1s 2r	3r 4t		0 10	20 30	40 50	<u>60 70 8</u>	<u>30 90</u>
	_															
	31.5	Partially	Weather	d Rock - \/	erv dense							:	: :	: :	: :	: :
-	1 -	(based c	n N value	and observ	ed rate of	NLLIN		1								
-	33.5	drilling);	no recove	ry in SS-10		1214	33.5	-								
-	-	Boring T	erminated	upon encou	untering			SS-10	50/0"		50/0'					>>
814.0-		auger re	fusal / spli	t-spoon refu	isal at 33.5 f	t										
014.9																
-	1 -							1								
	-							-								-
-	-							4							: :	-
_																
809.9-								-								
								-								-
								_								
-	1 -	1						1								
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804.9-	-							-				:		: :		: :
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۲94.9- ایر	1 -	1						1								: :
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- 19	-							-								
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- 18	1 -							1								
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						LEC		, 					THOD			
	Split Spo	on		NQ - Rock (Core, 1-7/8"		HS	A - Hollo	w Stem	Auger		R\	N - Rot	ary Was	h	
	Undistur Rock Co	bed Sample	9	CU - Cutting	gs wous Tube			A - Cont	inuous F na Casin	light Ai a	ugers	R	ن - Roo	ck Core		
		,/0		0.001			1 00	. 20170	.g Juon	3						

Project	ID: F	038111					Co	unty:	G	ireei	nville	;		Bor	ing No.	: R-	1	
Site De	scripti	on:	I-85 Brid	ge Over Ro	cky Creel	٢									Route:	 - 8	5	
Eng./G	eo.: J	.Gathro	(S&ME)	Boring L	ocation:	409+1	0		Offs	set:		63 ft	RT	Aliç	gnment	: N	lainline	e CL
Elev.:	860.1	ft	Latitude:	34.8	5509	Longi	tude:	-82	.26	956	9	Date	Star	ted:		3/14	/2019	
Total D	epth:	20 ft	So	il Depth:	20 ft	Co	ore De	epth:	0	ft		Date	Con	plet	ed:	3/14	/2019	-
Bore H	ole Dia	ameter (i	in): 6	" Sam	pler Confi	igurati	on	Line	er R	equ	ired	: Y			Liner l	Jsed	: Y	N
Drill Ma	achine:		drich D50	Drill Metho	od: HSA	<u> </u>		Hamme	er I	ype	: Au	toma		E	nergy R		98.19	6
Core Si	ize:	N/A		Driller:	J. Millwo	DOC		Ground	lwa	iter:)B	13 ft		24	IR	/.1 ft	
															• SPT N	VALU	JE 🜒	
														Р	N	10		
(tion	÷.					d	ple c	ple				lue		>		\ominus	\xrightarrow{LL}	
leva (ft	Dep (#	∿	IATERIAL	. DESCRIP	TION	3rap Lo	Dep	o./T		d 6"	" "				FINES C	ONTE	NT (%)	
ш	0.0	Top of	Ground (No	o Topsoil)	Carta			°Z	1st	5ů	3rd	ř	0 10	<u>20</u>	30 40	50 60	70 80	90
_	_	medium	rm, red, bro n. sandv lea	wn and gray, n CLAY (CL//	tine to 4-7-6).		0.0	- 55-1	0	1	2 5	6		: CYY				
	2.0	trace si	ilt, roots and	gravel; NMC	C=19,		2.0	00-1		4	2 0							
_		LL=45,	PL=23, PI=	22, %200=51		/ 								÷				
-	-	Residu	i um - Stiff to black and v	o firm, moist, r ellow micace	eddish ous fine			- SS-2	4	4	57	9	•		0×	*		-
_		sandy e	elastic SILT	(MH/A-5), tra	ce rock		4.0						-			:		-
855.1-		fragme	nts		V 000 F4			- SS-3	2	2	4 4	6						
_	6.0_	NMC=4	1, LL=54, F	2=45, PI=9, 9	%200=51		6.0									:		
		Firm, ve	ery moist to	wet, brown, t	an, with			00.4		2								
_		SILT (N	/IL/A-5), few	le to medium, large rock fra	agments,		0.0	- 55-4	2	3	4 5					•		
_	-	micace	ous in SS-5	0	5		0.0	-					1	÷		: :	: :	-
-	-	NMC=4	19, LL=43, F	PL=35, PI=8, 9	%200=52			- SS-5	2	3	3 4	6						-
850.1-								_								<u> </u>		
_	_							_						÷		-		-
	12.0													:		: :	: :	
		Medium	n dense, vei	ry moist, blacl	k, brownish		•											
-	-	l≚orange SAND ((SM/A-2), so	ome to coarse	, siity ments		13.5	-										-
-	-	NMC=1	16, %200=22	2				SS-6	8	11	10	21		0∳				-
845.1-	-												:	:	: :	:::		:
_	_						•	_						:		: :		-
_	17.0_							_										
		Loose,	very moist,	brown, black	and gray,													
_	_	(SM/A-	4), with rock	fragments	SILY SAND		18.5						-					
-	-								2	4	6	10	Ó					-
840.1-	20.0	Boring	Terminated	at 20 feet			•									: :		
_								_						÷		: :	: :	-
_	_							_										
	_							_						÷				
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835.1-	_							-								: :		
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	I	1					GENF)	I				<u> </u>	•	· ·	· ·		·
			SAMPLER	TYPE								DRILLI	NG M	ETHC	D			
SS - S	Split Spo	oon bed Samn	le	NQ - Rock Co	ore, 1-7/8"		HS	A - Hollo	w St	tem /	luger	uners	F	- Ws RC -	Rotary V	Vash		
AWG-F	Rock Co	re. 1-1/8"		CT - Continue	ous Tube			C - Drivir	na C	asing	י, יייפי. ז	-9010	'			. •		

SC_DOT 142615009_185 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

Project	ID: F	038111					C οι	inty:	Gr	eenv	/ille			Boring	g No.:	R-2	2	
Site De	scripti	on:	I-85 Bri	dge Over R	ocky Creel	k								R	oute:	1-85	5	
Eng./G	eo.: J	.Gathro	(S&ME)	Boring	Location:	417+2	4	(Offse	et:	1	12 f	t LT	Align	ment:	M	lainlin	e CL
Elev.:	849.5	ft	Latitude	: 34.8	356437	Longit	ude:	-82	.267	'326	1	Date	Star	ed:	:	3/11/	/2019	
Total D	epth:	20 ft	S	oil Depth:	20 ft	Co	ore De	pth:	0 f	t	1	Date	Com	pleted	: ;	3/11/	/2019	
Bore H	ole Dia	ameter (i	i n):	6" San	pler Conf	igurati	on	Line	er Re	quir	ed:	Y	(N) Li	ner U	sed:	Y	N
Drill Ma	achine	: Died	drich D50	Drill Meth	od: HS/	4	I	Hamme	er Ty	pe:	Auto	omat	ic	Ene	rgy Ra	atio:	98.1	%
Core S	ize:	N/A		Driller:	J. Millw	ood	(Ground	dwat	er:	TOE	3	6.3 ft		24H	R	2.4 ft	t
				•														
														•	SPT N '	VALU	Ε●	
c							0	. 0						PL	М	С	LL	
atio ft)	f) bth	N/				phid D	nple ft)	Type		-		alue		X	C)	—X	
						Gra	Sar De	No./	st 6"	9 p. 9 p.	р 6 Р 6	z		▲ FIN	IES CC	NTE	NT (%)	
	0.0	Fill - Lo	Ground (3	<u>" Topsoll)</u> t. reddish brov	vn		0.0	-	÷.	3 7	4		0 10	20 30	40 5	<u>0 60</u>	70 80	90
		micace	ous, fine to	o medium, silt	/ SAND		- 0.0	SS-1	2	23	5	5		X	X	÷	: :	-
		(SM/A-	7-5), few r	oots			2.0											
	3.0	▼NMC=3	80, LL=43,	PL=31, PI=12	, %200=47											-		-
-	0.0_	Fill - Fi	rm to soft,	moist, gray a	nd brown,		-	SS-2	3	35	5	8				÷	1	
	-	fine to r	nedium, sa	andy lean CLA	Y (CL/A-6)		4.0_						1					
844.5-		NMC=2	27, LL=37,	PL=22, PI=15	, %200=59		-	SS-3	2	22	2	4	•		X	-		
_	6.0_	₩					6.0									÷		
		≚Alluviu	m - Very s	oft, very mois	t, gray and			00.4			~							
-		sand (C	CL/A-6), tra	ace roots, san	d seams	' \////	-	55-4	2	1 1	2	2				÷		
	8.5	NMC=3	5, LL=38,	PL=24, PI=14	, %200=71		8.0_						1					-
		Alluviu	m - Very lo	oose, wet, bro	wn, fine to		-	SS-5	0	0 1	1	1	•	$\times \rightarrow 0$		-		-
839.5-		medium	n, silty/clay	ey SAND (SC	-SM/A-4)		-											
			.o, LL=20,	PL=10, PI=1,	%200=30		_											
	12.0																	
-	12.0	Alluviu	m - Firm, v	wet, gray, sligl	ntly		-									-		
	-	Micace	ous, fine to	o medium, sar	idy CLAY		13.5							÷ :		:	: :	
-	14.5		<i>)</i> , adoo ro	010			-	SS-6	0	32		5				÷		-
834.5-	-	Alluviu	m - Loose	, wet, gray to	an,		-										<u> </u>	
_	_	(SM/A-2	ous, fine to 2)	o medium, silt	/ SAND		_									-		
	17.0	(011771	_)															
4/19		Residu	um - Medi	um dense, mo	oist, orange		-	1								÷		
- 10	-	and tan	, fine to cc 4)	oarse, silty SA	ND		18.5									-		-
- 2.6		(0.1.7.1	•)				-	SS-7	3	56		11				-		-
829.5-	20.0	Destant	T	1 - 1 00 (1		_ 142	-											
- 11_30	_	Boring	rerminate	d at 20 feet			_											
							-]								-		: -
- TE								1										-
- DAT	-						-	-										
824.5-	-						-	-								<u> </u>		
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	-						-	1										
- 85							-	1										
15009													:	: :	: :	:	: :	:
1426			SAMPLE	R TYPE		LE					DI		NG ME	THOD				
SS -	Split Spo	on		NQ - Rock C	ore, 1-7/8"		HS	A - Hollo	w Ste	m Au	ger		F	W - Ro	otary W	ash		
S AWG-I	Rock Co	<u>re, 1-1</u> /8"		CT - Continu	ous Tube			<u> </u>	ng Ca	s riigi sing		yers	۲ 	KO		e		

Project	ID: F	038111	1					Co	unty:	G	Gree	nville	Э		Bori	ng No.	: R-3	3	
Site De	scripti	on:	I-85 Bric	lge C	ver Ro	cky Cree	k									Route:	I-8	5	
Eng./G	eo.: J	.Titus (S	S&ME)	В	oring L	ocation:	419+1	7	(Offs	set:		76 ft	RT	Alig	nment	: N	lainline	e CL
Elev.:	850.6	ft	Latitude:		34.85	56179	Longi	ude:	-82	2.26	648	3	Date	Star	ted:		3/13	/2019	
Total D	epth:	20 ft	t Sc	il De	pth:	20 ft	Co	ore De	pth:	0	ft		Date	Com	plete	ed:	3/13	/2019	
Bore H	ole Dia	imeter ((i n): 6	5"	Sam	oler Conf	igurati	on	Line	er R	Requ	ired	: Y	<u>N</u>		Liner l	Jsed:	Y	N
Drill Ma	chine	Die	drich D50	Dri	I Metho	d: HS	A		Hamme	er T	уре	: Aı	utoma	tic	En	ergy R	latio:	98.19	6
Core Si	ze:	N/A		Dri	ler:	J. Millw	ood		Ground	dwa	ater:	Т	DB	17 ft		24⊦	IR	10.0	ft
																	V/A11		
																	VALO		
ion	£						ie –	e t	/pe				е		PL ×	. N	∧C ⊖	—X	
evai (ft)	(ff)	Ν	MATERIA	_ DE	SCRIPT	ION	Log	(ff)		وً	.0	0	Val Val		A F	INES C		NT (%)	
Ē	0.0	Top of	Ground (N	о Тор	soil)		0	<u></u> м–	νž	1st	2nc	3rd		0 10	20 3	30 40	50 60	70 80	90
		Fill - M	ledium dens	se, sl.	moist, re	d and		0.0	00.4		0		- 40						
_	2.0	with cr	ushed stone	ə, ənty Ə		Sivi/⊼-4),		20	- 55-1	6	8	4 :	5 12						1
_	2.0_	Fill - Lo	oose, slight	y moi	st, gray a	nd brown,		2.0							÷	: :	: :	÷ :	
-	-	SAND	micaceous	, fine	to coarse	e, clayey		1	- SS-2	4	4	5	7 9	•	сх—				-
-	-	few roo	ots and orga	inic o	dor	ciay, with		4.0	_					-					-
845.6-	_	NMC=	19, LL=35, I	PL=21	, PI=14,	%200=49			- SS-3	3	3	4 4	4 7				-		
_	6.0_							6.0			_				-				
		Fill - Fi	irm, slightly	moist	, red brow	wn, m. condu													
_	_	SILT (N	ML/A-7-5)	, inte	to mealu	in, sanuy			- SS-4	3	3	3 4	4 6		0	XX			
-	_	NMC=2	23, LL=43, I	PL=32	2, PI=11,	%200=50		8.0	-						-				
-	9.0_	Fill - M	ledium dens		nist reddi	sh brown			- SS-5	4	5	6	7 11)				
840.6-	_	⊈ tan and	d gray, fine	to coa	rse, silty	SAND							_						
_	_	(SM/A-	-4), with sea	ims of	clay and	l silt								÷	÷	: :	: :		
	12.0																		
_		Possib	ole Alluvium	ı - Vei	y loose,	wet, light			7										
-	-	(SM/A-	2 red, fine to ·2). some ro	o coar ck fra	se, siity t aments	SAND		13.5											-
-	-	NMC=2	24, %200=2	2	5				SS-6	1	2	1	3	•					
835.6-	-								-				_	:	:	::	<u>:</u>	: :	:
_	16.0_	<u> </u>	0.11					4	_										-
_	_	Residu ∑and tar	ium - Stiff, s n. sliahtlv m	icace	y moist, t ous. fine	brown, red to medium													
		sandy	SILT (MĹ/A	-4)	,														
_	_							18.5					_	-					
-									SS-7	8	5	8	13						-
830.6-	20.0_	Borina	Terminated	at 20	feet				+	-							<u> </u>		
-	-	5			·				-					:	-				÷ -
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825.6-	-								1										
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	I						LE	GEND)				I	·			•		·
	D=14 O-		SAMPLE		E Deels O	4 7/0"			A 11-11		1 a.v 1	^	DRILLI	NG M	THO) Determine	last		
55 - 5 UD - 1	Split Spo Jndistur	on bed Sami	ole	NQ - CU -	ROCK CON Cuttinas	re, 1-7/8"		HS CF	A - Hollo A - Cont	inuo	tem /	Auger ight A	lugers	ק ק	kvv -l RC -l	≺otary V Rock Co	vash re		
AWG - F	Rock Co	re. 1-1/8"		CT -	Continuo	us Tube		DC	- Drivir	na Ĉ	asino	ຊັ	2						

SC_DOT 142615009_85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

Project	ID: P	038111							Οοι	inty:	G	ree	nville			Bori	ng No).: R	-4	
Site De	scripti	on:	I-85	Bridg	ge Over F	locky C	Creek										Route	e: -	85	
Eng./G	eo.: J	.Gathro	(S&N	1E)	Boring	Locati	ion:	401+2	8		Offs	et:		57 ft	LT	Alig	nmer	nt:	Mainli	ne CL
Elev.:	869.4	ft	Latitu	ude:	34.	85541	4	Longit	ude:	-82	.26	971	4	Date	Star	ted:		4/1	1/2019	9
Total D	epth:	20 ft		Soil	Depth:	20) ft		ore De	pth:	0	ft		Date	Con	nplete	ed:	4/1	1/2019	9
Bore H		meter (<u>in):</u>	6"	Sai Drill Mot	npler (guratio	on		er R	equ		<u> </u>	<u>(N</u>) En	Liner	Used	1: Y	<u>(N)</u> 20/
	acnine:		E 45		Drillor:	noa:	0000	<u>donco</u>	Drill (er r t	ype tor:		oma >			ergy		0: 80 NI/A	3%
Core S	12 .	IN/A			Dimer.	Inu	epen	uence		Ground	JVVa	lei.			Cave		24			
																	SPT	N VAL	UE 🔴	
c										0						PL		MC	LL	
atio ft)	ft)	Ν	10 TCI					phic	nple ft)	Type				alue		×		-0	—×	
Elev		Top of				non		Gra	Sar De (j	Sar No./	st 6"	9 pu	th 6"	> z		▲ F	INES	CONT	ENT (%))
	0.0	Fill - Lo	Sose to	nedii	um dense,	red, bro	wn		0.0		-	2	<u>ω</u> 4		0 10) 20 :	30 40	50 6	0 70 8	30 90
-		and gra	ay, fine	to me	dium, silty	clayey S	SAND		-	SS-1	3	5	4 4	9		×				
-		fragme	nts and	roots	ins of sill, i S	ew lock			2.0						_					
_		NMC=1	12, LL=	19, Pl	L=15, PI=4	, %200=	=34		-	- SS-2	3	4	75	11						÷ ÷ .
_	4.0_								4.0_			-								
	7	Residu	ium - L	oose,	orange an		, fine			00.0			0 0	10						
864.4-		LL=39,	PL=31	, PI=8	8, %200=43	+), INIVIO 8	0-21,		60	55-3	4	4	69	10			x x	•		
_	0.0	Mediun	n dens	e, yell	ow, tan and	d brown,	,		0.0											
-	-	slightly	micace silty S	eous t SAND	o micaceo (SM/A-2-4)	us, fine t few ro	to ck		-	SS-4	3	4	7 11	11		0	X			-
-		fragme	nts bel	ow 8 f	t	, 100 10	ÖR		8.0_						-			:		
-		NMC=2	23, LL =	37, Pl	L=30, PI=7	, %200=	-32		-	SS-5	8	7	66	13		•		:		
859.4-									-								<u> </u>			<u> </u>
									_											
									_									:		
-									-											
-	-								13.5							-		:		
-									-	SS-6	5	10	11	21		•				
854.4-									-						:		: :	<u>:</u>		: :
-									-							-				
									-	_										
5/4/1																				
101									18.5						-					
015.0	200								-	SS-7	5	10	13	23		•				
^ବ 849.4 - ଚ	20.0	Boring	Termir	nated a	at 20 feet				-											
- 10	-								-	-										
	-								-	-								:		-
									-	-										
ATA									-	-								:		
									_											· · ·
0-4.4																				
.GPJ									-	1										
	-								-	1								:		
	-								-	1										
- 185 /	-								-	-										
2009								<u> </u>	0 = 1 =							:		<u> </u>		<u>:</u> :
4561:			2014					LE	GEND					RILL		FTHO	<u> </u>			
5 SS - 5	Split Spo	on			NQ - Rock (Core, 1-7	7/8"		HS	A - Hollo	w St	em /	Auger	IVILLI		RW - I	Rotary	Wash		
≏ UD - U ຜ່AWG - F	Undisturi Rock Co	oed Samp re, 1-1/8"	le	(CU - Cutting CT - Contin	gs uous Tu	be		CF/ DC	۲ - Cont Drivir -	nuoi ng Ca	us Fl asino	ight Au 1	gers	F	۲C - I	Kock C	Jore		

Project	ID: F	038111						Co	unty:	G	reen	ville			Borir	ng No).: R-:	5	
Site De	scripti	on:	I-85 Bri	dge	Over Roo	cky Creek	(F	Route	e: I-8	5	
Eng./G	eo.: J	.Gathro	(S&ME)		Boring Lo	ocation:	393+1	4		Offs	et:		46 ft I	LT	Aligr	nmen	nt: N	lainline	e CL
Elev.:	877.8	ft	Latitude	:	34.85	53577	Longit	ude:	-82	.274	4578		Date	Start	ed:		4/11	/2019	
Total D	epth:	17 ft	S	oil C	Depth:	17 ft	Co	ore De	pth:	0	ft		Date	Com	plete	d:	4/11	/2019	
Bore He	ole Dia	ameter (i	i n) :	6"	Samp	oler Confi	guratio	on	Line	er R	equi	red:	Y	N		_iner	Used:	Y	N
Drill Ma	achine	CMI	E 45	D	rill Metho	d: HSA	۹		Hamme	er Ty	ype:	Aut	omati	ic	En	ergy	Ratio:	80.3%	6
Core Si	ze:	N/A		D	riller:	Indepen	dence	Drill	Ground	lwa	ter:	ТО	B (Cave	d 15'	24	HR	N/A	
													-	1					
															•	SPT	N VALL	Ε	
L.	_						U	e _	e e				e		PL		MC	LL	
vatio (ft)	epth (ft)	N	IATERIA	LD	ESCRIPT	ION	aphi og	epth (ff)			۰ ۳		/alu				0		
Шe		Top of I	Pavement	(2" /	Asphalt 7"	Stone Base	, ⁶	Sa	No.	st 6	nd 6	th o	ź	0 10	▲ F	INES		NT (%)	
	0.0	Fill - Lo	ose, brow	/n an	d red, sligh	tly	<u>"</u>			-	(1 (7 (<u>0 10</u>	<u>_20_3</u> :	0 40	50 60	10 80	<u>90</u>
	-	micace	ous, fine t	o me	dium, silty	SAND		1.0	-						÷		: :	: :	
_	_		4), trace i 6 11–22		agments	200-41			- SS-1	6	5 5	56	10		0 ×	× 🔺			-
	3.0_		0, LL-33,	FL-	23, F1=0, 7	5200-41		3.0											
		Fill - Lo	ose to me	dium	n dense, bro	own, red									÷		: :	: :	
1	-	medium	n, silty SA	ND (S	SM/A-6), la	vers of			- SS-2	4	3 7	' 8	10						
872.8-	-	clay and	d gray sar	nd, tra	ace rock fra	agments		5.0	-									<u> </u>	
-	-	NMC=2	0, LL=40,	PL=	27, Pl=13,	%200=46			- SS-3	7	10 1	1 10	21		ė×			÷ ÷	÷ -
	7.0_							7.0	_										_
		Fill - Me	edium der	nse, t	an, white to	brown חע			00.4	45	4 - 0	· · ·							
	_	(SM/A-2	2), layers	of roo	ck fragment	ts at 8 ft		0.0	- 55-4	15	15 9	96	24		-				
-	-	and 10	ft (*likely a	ampli	ified N valu	es)		9.0	_										
867.8-	-	NMC=8	8, %200=2	3					- SS-5	5	6 2	2 24	28						
_	_																		-
	_								_										
	13.0														÷		÷	: :	
-	10.0	Appare	nt Boulde	er Fil	I - Very den	ise, gray	0.0	13.5	1										
-	_	and bro	wn, fine to	o coa 4-2)	arse, gravel some large	ly SAND	• 🔿		- SS-6	40 5	50/5"		50/5"						>>
862.8-	-	fragmer	nts and co	bble:	s (based or	observed	0		-					:		: :	: :	: :	
_	_	rate of o	difficult dri	illing)			• O		_								: :		-
	17.0_						• ()												
		Boring	Terminate	d up	on encount	ering													
-	_	whethe	r refusal v	vas c	aused by la	arge			-										
-	-	boulder	or mass	rock)					-										-
857.8-	_	Offset a	approx. 17	ft so	buth of R-5	(approx.			-										
	_	boring "	'R-5A" (no	sam	npling, auge	er probe			_										-
		only). E	Based on	obse	rved rate of	drilling,													
7		conditio	ons to dep	th of	16 ft, possi	ble PWR													1
-	-	from 16	-18 ft, and	d aug	ger refusal (possible			1									: :	- 1
-	-	Thop of	JUK) at 18	າເ. ດນີ2	8 ft north of	P_5			-								: :		-
852.8-	-	(approx	. Sta. 393	6435)	, and perfor	med offset			-										
	_	auger b	oring "R-5	5B" (r	no sampling	g, auger			_						÷		: :	: :	
		drillina.	R-5B enc	ea or counte	ered genera	ally similar													
	_	fill cond	litions to c	lepth	of 20 ft, po	ssible			7										1
-	-	PWR fr (possib	om 20-25 le mass ro	.5 ft, ock) :	and auger i at 25.5 ft.	retusal			-						÷				-
-	_	1223010		,					-										-
													-						
SS - 5	SAMPLER TYPE DRILLING METHOD SS - Split Spoon NQ - Rock Core, 1-7/8" HSA - Hollow Stem Auger RW - Rotary Wash																		
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																			
		10, 1-1/0		01	Continuo				וועווס - י	iy Ua	Joing								

SC_DOT 142615009_85 WIDENING.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 6/4/19

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

I	File No	. : 23.	038111	Project	: No. (PIN):			Co	unty:	Gree	nville	Э		E	ng./G	ieo.:	S. E	Berry	
	Site De	escripti	ion:	I-85/I-385	5 Intercha	nge Imp	rove	ments								R	oute:			
I	Boring	No.:	B-73	Во	ring Loca	tion:	4	114+4	5	(Offse	et:	1	06' L	.t. /	Alignr	nent:	-8	85	
I	Elev.:	847.9	ft	Latitude:	34	.85611	I	ongi	tude:	82	.268	17	C	Date	Starte	ed:	9	9/25/	2012	
-	Total D	epth:	30 ft	So	I Depth:	30.0	0 ft	Co	ore De	pth:	ft		0)ate	Comp	oleted	l: !	9/25/	2012	
Ī	Bore H	ole Dia	ameter ((in): 4	Sa	mpler C	onfi	gurati	ion	Lin	er Re	quir	ed:	Y	(N)	Li	ner U	sed:	Y	(N)
	Drill Ma	achine	: CM	E 45C	Drill Met	hod:	HSA			Hamm	er T\	/pe:	Auto	mati	c	Ene	rgy R	atio:	79%	
	Core S	ize:	NA		Driller:	C. F	razie	er		Groun	dwat	ter:	TOE	3			24H	R		
																•	SPT N	VALUE	•	
	-															PI	M	С	П	
	atior ()	t)			DF00D	DTION		g	the check	ype				alue		×)	$-\overline{\times}$	
	f	Del (f	N	VIATERIAL	DESCRI	PTION		Gal	San Dej	San lo./	t 6"	d 6'	16"	» z		▲ FIN	NES CC	NTEN	IT (%)	
	ш	0.0								<i>" 2</i>	- <u>s</u>	2n	Зrc	~	0 10	20 30	40 5	0 60	70 80	90
	-		Loose to	o medium de active silty S	ense, tan & AND (SM/A	white,			20	-						: :	: :	÷		-
	-		LL=27	PL=26. Pl=1	I. NMC=16	4.			2.0	SS-1	3	4	5	9	•	•				-
	_		%#200=	=35.5	,	,			4.0		ļ		-	-				:		-
	842.9-	5.8							60	SS-2	4	6	16	22						
	_		Medium	n dense to ve	ery dense, t	an, white &	&		0.0	SS-3	7	21	26	47						-
	_		gray, no	on-reactive, s	silty SAND	(SM/A-2-4	1).		8.0		<u> </u>		20							-
	_	-	LL=NP, %#200-	, PL=NP, PI= =28.4	=NP, NMC=	:15.0,			10.0	SS-4	20	10	13	23				:		-
	837.9-		/0#200-	-20.4					10.0	SS-5	17	12	11	23						
	_]]										12		20				÷		
	-								13.5	-						÷ :		:		: -
	-									SS-6	13	36	22	58 🕽	k ic			<u>ک</u>		-
	832.9-															: :	: :		1	
	-	16.8	Vory de	neo tan 8 w	hite non re	active eil	tv.			-										
	-		SAND ((SM/A-2-4).		active, Si	ity		18.5											
	-		LL=NP,	, PL=NP, PI=	=NP, NMC=	:13.7,				- <u>SS-7</u>	32	50/0.3		50/0.3		: :	: :	÷		:>>
	827.9-		%#200	=30.0																
	-									-						÷	: :	÷		-
	-								23.5		50/0 5			50/0 5						>>
	822.9-										10.0.	,		00/0.2						
	-									-										/
	-									1						: :	: :	÷		
	_								28.3		20	25	28	53						
	817.9-	30.0		unal 9 Danim							20	25	20	55		: :	: :	<u> </u>		
	_	-	(Elev. 8	usai & Boring 817.9).	y reminate	u @ 30.0			.	-										-
7/13	-	1 1	、 ·	,						1										:]
11	_									-								:		-
T.GD	812.9-	-								-					;					
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sc	_								.	-										-
GPJ	-	-							.	-								:		-
NTS.	807.9-	-																		:
EME	_]							.	-								÷		-
ROV	-	-							.	-								:		-
MP	002.0																	:	<u> </u>	
NGE	002.9-]							.	4						: :		:		-
CHA	_	-							.	-								÷		-
TER	-	-								1								:		-
	-																			-
								LE	GEND											
Ψ	SS - 9	Snlit Snor		SAMPLER		Core 1_7/9	2"		ЦС		W Sto	m Διιο	Di	RILLIN			tary W/	ash		
B	ST - S	Shelby Tu	ube		CU - Cutting	gs			CF	A - Cont	inuous	s Fligh	t Auge	ers	RC	- Ro	ck Core	9		
S	AWG - I	Rock Cor	e, 1-1/8"		CT - Contin	uous Tube	;		DC	- Drivii	ng Cas	sing								

File No	.: 23.0	038111	Project	t No. (Pl	N):			Co	unty:	Gree	nville	;			Eng./0	Geo.:	S.	Berry	
Site De	scripti	on:	I-85/I-385	5 Intercha	ange li	nprov	ements	6							F	Route	:		
Boring	No.:	B-74	Во	ring Loc	ation:		413+0	0		Offse	et:	8	8' R		Align	ment	:: -	85	
Elev.:	848.9	ft	Latitude:	34	4.8554	6	Longi	tude:	82	.2683	5	D)ate	Star	ted:		10/3	/2012	
Total D	epth:	33.7	ft So i	il Depth:	: 3	33.7 ft	C	ore De	epth:	ft		D	ate	Com	plete	d:	10/4	/2012	
Bore H	ole Dia	ameter (in): 4	S	ample	r Con	figurat	ion	Lin	er Re	quir	ed:	Y	N	L	iner	Used	Y	N
Drill Ma	achine	CME	E 45C	Drill Me	ethod:	HS	A		Hamm	er Ty	pe:	Auto	mati	С	Ene	ergy F	Ratio:	86%	
Core S	ize:	NA		Driller:	N	I. Fraz	lier		Groun	dwat	er:	тов	8			24ł	IR		
										1									
															•	SPIN	I VALU	E♥	
u	ے						.e	ے ف	e e				е		PL ×	1			
evati (ft)	(ff)	N	IATERIAL	DESCR	RIPTIO	N	Log	(f)		5	<u>.</u>		Valı						
Ш	0.0						Ū	ы С	N ^N N	1st (2nd	3rd	z	0 10	▲ FI 20 30	NES C 0 40	ONTER 50 60	NT (%) 70 80	90
_		Firm, bro	own, non-re	active, sa	ndy lear	CLAY													
	-	(CL/A-6)).					2.0				_	_				: :		: .
-	3.8							4.0	SS-1	2	2	3	5	7					
843.9-	57	Very sof	ft to firm, bro	own, non-r	reactive	sandy			- ST-1						X ×	0 <u>i</u>			
-	5.7	$\int LL = 30$ F	PL=23 PI=7	7. NMC=3	3.1			6.0	66.2		MUUN	wоц	0			×	· · ·		· · ·
	7.8	\%#200=	50.9	, 11110 0	. ,			8.0	_ 33-2	WOIN	worn	won	0 1						
-		Verv sof	ft. brown. no	on-reactive	e. sandv	lean	-	10.0	_ SS-3	WOH	5	5	10)					
838.9-		CLÁY (C	CL/A-6).		, ,			10.0	SS-4	3	3	3	6		×× ×				
	12.5	LL=33, F	PL=22, PI=1 -66.4	11, NMC=:	31.0,				_		-	-	-						
-	-	/0#200-	-00.4					13.5	-								· · ·		-
833.9-		Loose, g	gray, non-re 2-4)	active, silty	y SAND				SS-5	8	4	6	10	•			: :		
-		LL=21. F	 PL=18. PI=3	3. NMC=30	0.0.				-										
		%#200=	27.1	.,	,			19.5											
-		Loose, v	white & gray	, non-read	tive, silt	v SANI	5	10.5	SS-6	4	4	4	8			< !			-
828.9-		(SM/A-1	l-b).																
	21.8	_LL=31, F ∖%#200=	PL=27, PI=4 :18 9	1, NMC=2	3.4,		/		_										-
-	-	/0#200-	-10.9					23.5	-								: :		-
823.9-		Dense to	o very dense ctive silty S	e, black & AND (SM)	gray, (A-2-4)				SS-7	8	14	29	43			<u> </u>			
-	-	LL=33, F	PL=33, PI=N	NP, NMC=	:16.1,				-										-
		%#200=	21.3	·	·			29.5											
-								20.5	SS-8	50/0.3		E	50/0.3						>>
818.9-	-							s									: :	: :	:
,									_										
-	33.7							33.5		50/0 2			50/0 2						>>
813.9-		No Refu	isal & Boring	g Terminat	ted @ 3	3.7']	[
-	-		10.2).						-										-
									1								· · ·		-
-									-								· · ·		-
808.9-	-								-								· ·	: :	<u> </u>
									_										-
-	-								-										-
803.9-																			
-	-								-										-
-																			
									-										
j L l									<u> </u>	1									<u> </u>
			SAMPLER	TYPE			LC		,			DF	RILLIN	IG ME	THOD				
SS - S	Split Spor	on Ibo		NQ - Rock	Core, 1	-7/8"		HS	A - Hollo	w Sten	n Aug	er • Au~-		R	W - R	otary V	Vash		
AWG - F	Rock Cor	e, 1-1/8"		CT - Cont	inuous T	ube			- Drivi	ng Cas	ing	. Auge	5	R	с - к		10		

F	ile No	.: 23.	038111	Projec	t No. (PIN):			Cou	unty:	Gree	envill	е			Eng.	./Geo.	: S.	Berry	
S	ite De	escript	ion:	I-85/I-38	5 Intercha	nge Imp	orove	ments									Rout	e:		
B	oring	No.:	B-58	Bo	oring Loca	tion:		399+9	8		Offs	et:	Ş	99' R	t.	Alig	Inmer	nt: -	-85	
E	lev.:	863.8	ft	Latitude:	34.	85398		Longi	tude:	82.	2723	3	1	Date	Star	ted:		9/25	6/2012	
Т	otal D	epth:	15 ft	So	il Depth:	15	.0 ft	Co	ore De	pth:	ft		[Date	Con	nplet	ed:	9/25	/2012	
B	ore H	ole Dia	ameter ((in): 4	Sa	mpler (Confi	igurati	ion	Line	er Re	equi	red:	Y	(N		Liner	Used	: Y	(N)
D	rill Ma	achine	: CM	E 45C	Drill Met	hod:	HSA	1		Hamm	er Ty	ype:	Auto	omat	ic	E	nergy	Ratio	: 86%	
C	ore S	ize:	NA		Driller:	M. 1	Frazie	er		Groun	dwa	ter:	TO	3			24	HR		
																	SPT	N VALL	JE 🕈	
	c									. 0						PI	L	MC	LL	
	atio	t) t)						phic D	t) pth	Type		-		alue		×	×	-0	\rightarrow	
	, t	De	N			TION		Gra	San De	San Vo./	st 6"	9 pt	19 p	> Z			FINES	CONTE	NT (%)	
_	ш —	0.0		top ⁰ rod p	on roadiiya					~	- <u>~</u>	7	а		0 10	20	30 40	50 60	70 80	90
	-		(SM/A-2	2-7).	on-reactive,	Silly SAP	ND		20	-										-
	_		LL=66,	, PL=46, PI=2	20, NMC=34	1.4,				SS-1	2	5	5	10	Ì		0	X	\times^{1}	
	_	3.8	%#200=	=19.7					4.0											-
	858.8-	5.8	Loose	red, non-rea	active, siltv S	AND			60	SS-2	3	3	4	7	* • :					
	_		(SM/A-:	2-4).	., , .					SS-3	2	3	3	6			· · ·	· · ·		
	-	-	LL=NP,	PL=NP, P	=NP, NMC=	35.7,			8.0		-		-	_		į				-
		-	%#200	=27.0					10.0	SS-4	2	3	2	5	 • :	A	C			-
	853.8-		Very loo	ose to loose	, gray, tan &	black,				SS-5	2	2	3	5	•					-
	-		non-rea	ictive, silty S	SAND (SM/A	-2-5).			-											-
	-		LL=59, %#200=	PL=55, PI= =18.5	4, NMC=42.	6,			13.5	-										-
	848.8-	15.0	/0200						-	SS-6	2	2	2	4	•					
			No Refu	usal & Borin	g Terminate	d @ 15.0)'		-	-										-
	-		(Elev. o	9 4 0.0 <i>)</i> .					-	-										
	_								-							-				-
	843.8-								-	-										
	-								-	-										-
	_								-						:	÷				
	_								-	-										-
	838.8-								-	-					:			: :		
	_								-											
	-								-	-					:	:				-
	-								-	-						÷				-
	833.8-								-						:	:	: :	: :		
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1/7/1	-	-							-	-						-				-
SDT	828.8-								-]										
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PJ (_								-]										
TS.G	823.8-	-							-	-						:				
MEN	-	-							-	1						:				-
OVE	_								-	1										
MPR(-	-							-	-						:				-
E E B	818.8-	-							-	1										
HAN	_								-	1										
ERC	_	- 1							-	-						:			•	-
INT	-	-							-	1										-
-385								LE	GEND)					·					
<u>8</u>				SAMPLEF	RTYPE						_		D	RILLI	NG MI	ETHO	D			
101	SS - S	Split Spo	on Ibe		NQ - Rock (Core, 1-7/	8"			A - Hollo	w Ste	m Aug	ger	ore	F	RW -	Rotary	Wash		
SC_SC	AWG - F	Rock Cor	e, 1-1/8"		CT - Contin	uous Tub	e			- Drivir	ng Cas	sing	ruy	0.0	г 	.0 -	NUCK U	0.0		

	File No	.: 23.0	038111	Projec	t No. (P	IN):			Co	unty:	Greei	nville			Eng./Ge	o.: S.	Berry	
	Site De	scripti	on:	I-85/I-38	5 Interch	nange	Improv	ements							Rou	ite:		
	Boring	No.:	B-59	Bo	ring Lo	cation	:	420+1	1		Offse	t:	94' L	t.	Alignme	ent:	-85	
	Elev.:	850.6	ft	Latitude:	3	34.856	71	Longi	tude:	82.	2664	3	Date	Star	ted:	10/3	8/2012	
1	Total D	epth:	39 ft	So	il Depth	า:	39.0 ft	Co	ore De	pth:	ft		Date	Com	pleted:	10/4	/2012	
	Bore H	ole Dia	meter ((in): 4		Sample	er Con	figurati	ion	Line	er Re	quire	ed: Y	N	Line	er Used	: Y	N
	Drill Ma	achine	CM	E 45C	Drill N	lethod	: HS	A		Hamm	er Ty	pe: A	utoma	tic	Energ	y Ratio	: 79%	
	Core Si	ize:	NÁ		Driller	: (C. Fraz	ier		Groun	dwate	er: T	ОВ			24HR		
															• SF	T N VALU	JE 🕈	
	c									. O					PL	MC	LL	
	atio	t) th				סודתום		bind D	pth ft	Typ		-	alue		Х	-0	\longrightarrow	
	(f	D	N			RIPTIC	ЛN	Gra	San De (1	San Vo./	st 6"	9 pt	_9 p 2		▲ FINE	S CONTE	NT (%)	
-	ш —	0.0	Madium	donacitos		ton ro	d white			2		2	<u>م</u>	0 10	20 30 4	0 50 60	70 80	90
	-		& browr	n dense to v n. non-react	ery dense ive. siltv S	e, tan, re SAND	a, white		20	-								-
	_		(SM/A-2	2-4).	-,,				2.0	SS-1	4	9	15 24					
	-	_	LL=NP,	PL=NP, PI	=NP, NM	C=8.4,			4.0									
	845.6-		%#200=	=19.4					60	SS-2	17	23	34 57	<u>x q</u>	<u> </u>			
									0.0	SS-3	21	27	29 56					: -
									8.0	SS-4	50/0 3		50/0	3				>>
	-	9.8							10.0		0.0.0		00/01					-
	840.6-		Very de	nse, tan & v	white, nor	-reactiv	e, silty		10.0		50/0.2		50/0.	2				>>
			SAND (SM/A-2-4).		. - .												
	-		LL=26, %#200=	PL=23, PI= =24 2	3, NMC=	17.3,			13.5		-		50/0	,	\sim			_
	025.6	-	70#200-	-27.2							00/0.3			ə				
	835.0-																	
	-	16.8	Verv de	nse tan br	own. grav	, black	& white			-					•	· · · ·		
	-	-	non-rea	ctive, silty S	SAND (SN	//A-4).			18.5	-				_				-
	830.6-		LL=30,	PL=26, PI=	4, NMC=	12.6,				SS-7	17	33 50	0/0.483/0.	9				;>>7
			%#200=	=38.2						-					• •	· · · ·		
	-								00.0	-								
									23.3	SS-8	20 5	50/0.5	50/0.	5 .0				>>
	825.6-									_								:
	-									-								
	_								20 5									
	-								20.5	55-9	12	27	38 65					-
	820.6-	-								00-5	12	21	00 00				-	
	_	31.8														· · · ·		···]
/7/13]]	Very de	nse, tan & (SM/4-4)	gray, non-	reactive	, silty		33.5	-					• •			
11	_		11=33	PI = 26 PI=	7 NMC=	28.6				SS-10	10 5	0/0.2	50/0.	2	XOX			>>
Т.G	815.6		%#200=	=48.3	,	_0.0,									: :			
8	_	_								-								-
) SC	-	30 0							38.5				F0/0	-				_
GP	810 6		No Refu	usal & Borin	g Termina	ated @ 3	39.0'				pu/0.5			ບ 				>>]
NT	010.0	_	(Elev. 8	11.6).	-	_								:				
/EMI	-	-								-						· · · ·		-
NO.	-	-																: -
Ξ	805.6-]								-								
ANG	-	-								-								-
SCH	-	-																-
ΠΠ]]								
³⁸⁵ ∎										<u> </u>							: :	;
- ₽ ₽								LE)			י ו ווסח		THOD			
-1-1	SS - 5	Split Spoo	on	SAWFLEP	NQ - Roo	k Core,	1-7/8"		HS	A - Hollo	w Sten	n Auge	r	R	W - Rota	y Wash		
ŭ	ST - S	Shelby Tu	ibe		CU - Cut	tings	Tubo		CF	A - Conti	inuous	Flight	Augers	R	C - Rock	Core		
йL	AVVG - H	LOCK COL	e, i-1/8		UI - UOP	IUIIUOUS	Jupe			- Drivir	iy Casi	ng						

SCDƏT

File N	lo.: 2	3.038111	Proi	ect No.	(PIN):		0	County	: Gr	eenv	ville		E	ng./Ge	o.: B	lake	Ellis		
Site D)escrip	tion: I-8	5 and	I-385 Ir	terchange	Design	I			-	-			Ro	ute:	I-85	/ 1-385		╡
Borin	g No.:	R85-19		Boring	Location:	389+99	0	ffset:	RT 5	3			Alig	nment	: 1-85				
Elev.:	874.	5 ft. Lat	itude	34.8	5291328	Longi	ude:	-82.2	75328	62	C)ate	Star	rted:	3/15/2	2015			
Total	Depth:	11.5 ft.	Soil I	Depth:	11.5 ft.	C	ore De	pth: (D.0 ft.			Date	Cor	nplete	d: 3	/15/2	2015		
Bore	Hole D	iameter (in): 3-	7/8	Sampler C	onfigurat	ion	Line	r Requ	uired	:	No)	Liner	Used	:	NA		
Drill N	lachin	e: CME 5	50X	Drill M	ethod: M	र	Hamm	er Typ	e: A	utom	natic			Ener	gy Ra	tio:	88%		
Core	Size:	NA		Driller	TE		Groun	dwate	r: TO	B	۷.E.			24 H	RN	I.O.			
Depth (ft)	Elevation (ft)	Λ	1ATER	IAL DESC	CRIPTION		Graphic Log	ample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value			PT N lows / MC	VALUE foot)	L <	
0.0								ŝ						▲ 10_2	FINES 0 30 4	CON 10 50	1ENI (%	%)▲ 80.90	,
		Approximatel	y 19 in	ches of a	sphalt.			1.5							<u> </u>		00 70		'
		Medium dens to medium gr A-7-6(3)), FIL	e, moi ained, .L, LL=	st, reddis with mica 46 PL=27	n brown and b , CLAYEY SA PI=19 NMC=	rown, fine ND (SC, 21.1		-	SS-1	5	7	7	14	•		▲ ×			-
5.0	870.0	Medium dens coarse graine RESIDUUM	e, moi ed, with	st, white a mica, SI	and dark brow LTY SAND (S	n, fine to M, A-2),		3.5 _	SS-2	16	12	12	24		•				-
		Dense, moist grained, with	, dark mica,	brown and SILTY SA	d white, fine to ND (SM, A-1-	medium b(0)),		5.5	SS-3	6	10	24	34>	<	•				-
		84200=14.8 Dense, RESI	LL=NF DUUM	PL=NP1	JENP NMC=	7.1		7.5							_				_
	865.0	Very dense,	noist, (dark brow	n and brown,	fine to		9.5	SS-4	26	21	13	34	• • •	•	· · · · · · · · · · · · · · · · · · ·			-
		medium grain A-2-4(0)), RE NMC=22.0 %	ned, wi SIDUL #200=	th mica, S JM, LL=N 22.0	ILTY SAND (P PL=NP PI=I	SM, NP		_	SS-5	13	25	32	57>	<		· · · · · · · · · · · · · · · · · · ·	•		-
		Boring Termi	nated a	at 11.5 fe	et.														-
							LEGE	ND											\dashv
SS - S ST - S DCP	Split Spo Shelby T - Dynam	oon ube iic Cone Pene	SAMPL	ER TYPE. - AC - - GB - er NQ -	Auger Cutting Grab Bag Rock Core	S		HS/ SS/ HA	A - Hollo A - Solid - Hand J	w Ste Sten Auger	em Au n Aug	DRILI ugers jers	LING	METHO I F	DD //R - Mi RC - Ro	ud Ro ick Co	tary Wa pring	sh	

SCDƏT

File N	lo .: 2	3.038111	Pro	ject No.	(PIN):		(County	/: Gr	een	/ille		E	ng./Geo.:	Steph	en Wri	ght
Site D	Descrip	otion: G	roup 2	Borings	6									Rout	e: 185		
Borin	g No.:	185-106		Boring	Location: 4	04+97.	31 O	ffset:	65.68	B RT			Alig	nment:	85		
Elev.:	865.	.2 ft. La	titude	: 34.8	5463047	Longi	ude:	-82.2	70811	37	C	Date	Sta	rted: 9/*	16/2015		
Total	Depth:	: 40.0 ft.	Soil	Depth:	40 ft.	C	ore De	epth:	0 ft.			Date	Cor	npleted:	9/16/2	2015	
Bore	Hole D	iameter (i	n): 3-	7/8	Sampler Con	nfigurat	ion	Line	er Requ	uirec	l:	N/.	A	Liner U	sed:	N/A	
Drill N	Nachin	e: CME	550	Drill M	ethod: HSA	·	Hamm	ner Typ	De: A	uton	natic			Energy	Ratio:	83%	
Core	Size:	N/A		Driller	Southern D	Drill	Groun	Idwate	r: TO	B	32 ft			24 HR	N.O.		
Jepth (ft)	evation (ft)		MATER	RIAL DESC	CRIPTION		raphic Log	ple Depth (ft.)	ample ./Type	1st 6"	nd 6"	3rd 6"	Value	PL	SPT N (blows / MC	VALUE 'foot)	Ļ
	Ē						0	Sam	ν Ž				z	▲ FIN		TENT (%) ▲
0.0	865.0						<u> </u>							10 20 3	30 40 50	60 70	80 90
		Stiff to very SANDY SIL	stiff, mo T (RES.	oist, light t IDUUM)	prown to yellow b	rown,		_									
			,	,				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	•			
								70	<u> </u>	5	7	٩	16				-
		Medium de grained SIL	nse, mo TY SAN	ist, white a ID (RESII	and light brown, f OUUM)	fine		-			-	5					_
_ 10.0 _	_855.0_							9.0	SS-5	6	8	10	18				
		Very stiff, m	noist, lig	ht orangis	h brown, SANDY	/ SILT											-
	 	(RESIDUUI	M)					-	SS-6	5	8	8	16	•			
_ 15.0 _	850.0																
								-									-
								-									
								-									
20.0	 845.0							18.5	SS-7	7	10	12	22	•			
	[]							-									-
		Donoo me	ot rod -	rown ord	brown fine areis	and									· · · ·	· · ·	-
	╞╴╶┥	SILTY SAN	ID (RES	IDUUM)	brown, nne grair	ieu		-									-
25.0	840.0							23.5	SS-8	8	13	20	33		•		
								_									
	[]							_								· · ·	
L _	[]							00 5	00.0	40	10	0.1	07			· · ·	
30.0								28.5	55-9	10	16	21	37		•		
							LEGE	ND									
	0		SAMPI						A 11 !!	~		DRILL	ING	METHOD	Marte	4	L
SS - S ST - S DCP	Split Spo Shelby T - Dynam	oon Tube Nic Cone Pen	etromet	AC - GB - er NQ -	Auger Cuttings Grab Bag Rock Core			HS SS HA	A - Hollo A - Solic - Hand	ow Ste I Sten Auge	em Au n Aug	ugers Jers		MR RC	- Mud Ro - Rock Co	tary Was pring	sh

SCDƏT

File N	lo.: 2	3.03811	1 Pr	oject No	. (PIN):			County	: Gr	eenv	ville		E	ng./Geo.:	Steph	en Wright
Site D	Descrip	otion:	Group	2 Boring	S									Rout	e: 185	
Borin	g No.:	185-106		Boring	J Location:	404+97	.31 (Offset:	65.68	B RT			Alig	nment: I	85	
Elev.:	865.	.2 ft. L	.atitud	le: 34.8	5463047	Longi	tude:	-82.2	70811	37		Date	Sta	rted: 9/1	6/2015	i
Total	Depth:	: 40.0 ft.		il Depth:	40 ft.		ore D	epth:	0 ft.			Date	e Col	mpleted:	9/16/2	2015
Bore	Hole D		(in): ;	3-7/8	Sampler C	Configura	tion		er Requ	ured	l: 	N/	A	Liner Us	Sed:	N/A
			550			SA		ner Typ		utom		;				83%
Core	Size.	N/A		Drille	. Souther	n Dhii	Grou	luwale		D,	32 II	•		24 NK	N.U.	
															SPT N	
	L.						0	epth	<u>م</u> و				a)		(blows /	foot)
epth (ft)	vatic (ft)		MATE	ERIAL DES	CRIPTION		aphic	e D	mple /Typ	st 6"	"9 pt	_9 p	/alu	PL	МС	C LL
Δ	Ele						5	amp	S. S.	÷	2	ы З	ź			
30.0	835.0							S						10 20 3	1ES CON 80 40 50	60 70 80 90
								-								
_ ⊻ _								·. 	-						· · · ·	
	[]	(RESIDU	o stiff, r JM)	noist, dark	brown, SANE	IN SILT		-	-							
								33.5	SS-10	9	10	9	19			
_ 35.0 _	830.0															
								-							· · · ·	
								-	-							-
								-								
40.0								38.5	SS-11	4	7	6	13	•		
		Boring ter	minated	d at 40.0 fe	et.		1									
																-
															· · · ·	
							LEGE	ND						· · · · ·		
			SAM	PLER TYF	E							DRIL	LING	METHOD		
SS - ST - S DCP	Split Spo Shelby T - Dynam	oon Tube Iic Cone Pe	enetrom	AC GB eter NQ	- Auger Cuttin - Grab Bag - Rock Core	igs		HS SS HA	A - Hollo A - Solid - Hand /	w Ste Sten Augei	em Ai n Aug	ugers jers	6	MR RC	- Mud Ro - Rock Co	tary Wash pring

SCE

File N	lo .: 2	3.03811	1 P r	ojec	t No.	(PIN):			С	ounty	: Gr	een	/ille		E	ng./	Geo).: [Blak	e Ellis	6	
Site D	Descrip	otion:	I-85 ar	nd I-3	385 Ir	nterchan	ge Design										Roi	ute:	I-85	5 / I-3	35	
Borin	g No.:	R85-20		Bo	oring	Locatio	n: 405+04	4	Of	fset:	LT 5	8		4	Alig	nme	ent:	I-8	5			
Elev.:	865	.0 ft.	Latituc	le:	34.85	5494252	Long	gitude	e:	-82.2	70969	49	۵	Date	Sta	rted	l: 3	8/15/	201	5		
Total	Depth	: 10.0 ft	t. So	il De	pth:	10.0 ft.		Core	Dep	pth: (0.0 ft.			Date	Со	mpl	etec	1: 3	3/15/	2015		
Bore	Hole D	lameter	(in):	3-7/8	3	Sample	r Configur	ation	1	Line	r Requ	lirec	1:	No	כ	Liı	ner	Use	d:	N	4	
Drill N	Nachin	e: CME	E 550X	D	rill M	ethod:	MR	Har	nme	er Typ	e: A	uton	natic	;		Er	nerg	y Ra	atio:	889	6	
Core	Size:	NA		D	riller:	TE		Gro	ound	dwate	r: TO	B	10.0	ft.*		24	HR		N.O.			
										oth								€ ● ()	SPT N blows	VALU	ΙE	
÷) (hic	D	Dep Dep	ple ype		.9	.9	Ilue			``		,		
Dep (ft	(ft		MATI	ERIAL	DESC	RIPTION		Grap	2	nple (ft.	Sam Jo./T	1st	2nd	3rd	N Va		Ę	р∟ Х—	M		LL —X	
	ш									Sar	~ 2				_		▲ F	INES	s coi	NTENT	- (%) 🛦	.
0.0	865.0	Approxim	natelv 4 i	nches	s of tor	soil		- Kiti	-	0.0						10	<u>20</u>	30	40 5	0 60	<u>70 80</u>	90
		Loose, m	noist, bro	wn ar	nd dark	brown, fir	ne to medium			_	SS-1	2	4	3	7 >	* •	0 :					
		FILL, LL=	NP PL=	NP P	I=NP N	IMC=14.2	%#200=25.6	;		20 -							-	÷	-			÷ _
_		FILL	dense, d	ark bi	rown a	nd brown,	with mica,				66.2	5	0	0	17							
										4.0	00-2	5	0	3	17			:				
5.0	860.0	Dense, n	noist, ligi	nt bro	wn and	l brown, fii	ne to medium	- 14		4.0 -							÷	÷	-			: 1
		A-2-4(0))	, RESID	UUM,	LL=N	PL=NP	PI=NP				SS-3	11	14	17	31>	K i	- 0 -	-				:
		Medium	.9 %#20 dense, d	0=27. ark bi	.7 rown ai	nd white, v	vith mica,		가는 사람	6.0 -												-
		RESIDU	UM							_	SS-4	6	7	11	18		•					-
		Madium	damaa ka		and lin	b b b b b b b b b b				8.0 -												-
		RESIDU	dense, b UM	rown	and lig	nt brown,	with mica,			_	SS-5	5	10	18	28			•				
10.0	855.0										000	Ũ	10	10	20		-					:
_		Boring Te	erminate	d at 1	0 0 fee	≥ t																:
		*Obcorr	ad at time	a of h	oroboli	oomoloti	~															1
		Observe	su at tim		orenoid	completi	011.										-	:				1
																						-
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																	÷	:	-			:
								LEC	GEN	ID												
55	Solit So	non	SAM	PLEF		Auger Cut	tinas			не		w St	em ∆		LING	6 ME	THO M	D R - M	9 hul	otary	Vash	
ST - ST DCP	Shelby T - Dynam	ube nic Cone P	enetrom	eter	GB - NQ -	Grab Bag Rock Cor	e			SS/ HA	A - Solid	Sten	n Aug r	gers	,		R	C - R	ock C	Coring	1001	

SCET

File N	lo.: 2	3.038111	Project No.	(PIN):	-	County	/: Gr	een	ville		E	ng./	Geo	.: N	licha	ael Dav	is
Site D	Descrip	otion: I-85	and I-385 I	nterchange Design									Rou	te:	I-85	/ I-385	
Borin	g No.:	R85-21	Boring	Location: 423+99)	Offset:	RT 5	9			Alig	nme	ent:	I-85	5		
Elev.:	856	.6 ft. Latit	i de: 34.8	5676061 Long	itude	: -82.2	65038	24	1	Date	Sta	rted	l: 5	/12/2	2015	0	
Total	Depth	: 11.0 ft. S	oil Depth:	11.0 ft.	Core D	Depth:	0.0 ft.			Date	Co	mpl	eted	: 5	/12/2	2015	
Bore	Hole D	iameter (in):	3-7/8	Sampler Configura	ation	Line	er Requ	uirec	:	N	0	Li	ner l	Jsec	1:	NA	
Drill N	<i>l</i> lachin	e: CME 550	X Drill N	lethod: MR	Ham	mer Typ	De: A	uton	natio	2		Er	nergy	/ Ra	tio:	79%	
Core	Size:	NA	Driller	: SCI	Grou	Indwate	er: TO	B	9.0 1	ft.		24	HR	Ν	1.0.		
						_											
						÷								• S	PT N	VALUE	
th	tion				, ic	Dep	ype	5	<u>"</u>	.0	Ine			(D	104437	1001)	
Dep (ff)	eva (ft)	MA	TERIAL DES	CRIPTION	Srap		sami o./T	1st (2nd	3rd (I Va		P >	L ((Ĺ
	Ξ					Sam	0°ž				2		▲ F	INES	CON	TENT (%	b) ▲
0.0			0.1									1(<u>20</u>	30 4	<u>40 50</u>	60 70	80 90
		Approximately	2 inches of a	isphalt. 	_	10 -											: : _
	855.0	Medium dense	moist, reddis	h brown and dark brown	, <u>8</u> 8	1.0								-			
		FILL, LL=NP P	=NP PI=NP	NMC=16.6 %#200=29.9			SS-1	6	8	6	14)	* :	•	A			
	FILL, LL=NP PL=NP NMC=16.6 %#200=29.9 Loose, mica, FILL 3.0																
						: -	SS-2	2	3	4	7			:			: : -
_ 5.0 _		Stiff moist roo	lish brown b		- ///	5.0-								:	<u>:</u> :		· · ·
		mica, SANDY I	EAN CLAY (CL, A-7-6(17)),		- 1	SS-3	7	6	6	12		; • ×	:	÷ ×		
_	_850.0_	RESIDUUM, LI L%#200=66.8	=49 PL=22 F	1=27 NMC=20.8		70-			-	-							· · ·
		Firm, moist, br	wn and reddi	sh brown, with mica,		7.0 -											
		LL=50 PL=24 F	LAY (CH, A-7 I=26 NMC=2	-6(10)), RESIDUUM, 9.6 %#200=51.3		-	SS-4	1	3	3	6		: ×				: : -
- 🔽 -		Soft, wet, brow	, RESIDUUN	1		9.0 -											
- 10.0 -						-	SS-5	1	1	3	4						
																	-
		Boring Termina	ted at 11.0 fe	et.													÷ ÷ -
														:			
														:			· · · · · · · · · · · · · · · · · · ·
														:	<u>: :</u> : :		
														:			
																	: : -
														:			
														:			
														:			
					LEG	END											
<u> </u>	Colit Co	SA	MPLER TYP	E Augor Cuttings		ЦС		NA 01	om ^	DRIL	LING	6 ME	THO)		ton	ъ
SS - S ST - S DCP	Shelby T - Dynam	ube ic Cone Penetro	GB meter NQ	- Grab Bag - Rock Core		HS SS HA	A - Holic A - Solic - Hand	I Ster Auge	n Aug r	gers	5		RC	c - M C - Ro	ock Co	oring) I I



















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

Shear Wave Velocity, Vs (ft/s)



Pile Dynamics, Inc. SPT Analyzer Results

Summary of SPT Test Results

Project: DIEDR	ICH D-50 SN	382, Test D	ate: 2/15/2019										
BPM: Blows/M	inute										CSX: Compre	ession Stress I	Maximum
FMX: Maximur	m Force										DFN: Final D	splacement	
VMX: Maximur	n Velocity										EFV: Maximu	im Energy	
DMX: Maximur	n Displaceme	ent									ETR: Energy	Transfer Ratio	o - Rated
Instr.	Start	Final	Blows	Ν	N60	Average	Average	Average	Average	Average	Average	Average	Average
Length	Depth	Depth	Applied	Value	Value	BPM	FMX	VMX	DMX	CSX	DFN	EFV	ETR
ft	ft	ft	/6"			bpm	kips	ft/s	in	ksi	in	ft-lb	%
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
			Ov	erall Average	e Values:	41.6	43	20.3	0.81	23.5	0.61	343	<mark>98.1</mark>
				Standard D	Deviation:	0.4	1	0.6	0.50	0.8	0.49	6	1.8
			Ove	erall Maximu	ım Value:	42.3	47	22.4	2.46	25.6	2.00	355	101.4
			Ov	erall Minimu	ım Value:	40.6	40	19.1	0.45	21.8	0.25	326	93.2

Pile Dynamics, Inc. SPT Analyzer Results

Summary of SPT Test Results

Project: CME-7	'50X (SN 322	938), Test D	Date: 4/25/2019	9									
BPM: Blows/M	inute										CSX: Compre	ession Stress N	/laximum
FMX: Maximur	m Force										DFN: Final D	isplacement	
VMX: Maximur	m Velocity										EFV: Maximu	um Energy	
DMX: Maximur	m Displaceme	ent									ETR: Energy	Transfer Ratio	- Rated
Instr.	Start	Final	Blows	Ν	N60	Average	Average	Average	Average	Average	Average	Average	Average
Length	Depth	Depth	Applied	Value	Value	BPM	FMX	VMX	DMX	CSX	DFN	EFV	ETR
ft	ft	ft	/6"			bpm	kips	ft/s	in	ksi	in	ft-lb	%
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
			Ov	erall Average	e Values:	50.5	25	19.3	0.52	20.8	0.33	294	84.0
				Standard D	eviation:	1.0	2	1.5	0.07	1.3	0.06	8	2.3
			Ove	erall Maximu	m Value:	51.5	29	22.4	0.66	24.5	0.43	308	88.0
			Ov	erall Minimu	m Value:	48.2	21	15.9	0.40	17.8	0.20	271	77.3

Pile Dynamics, Inc. SPT Analyzer Results

Summary of SPT Test Results

Project: CME-5	5 Truck (SN3	31845), Tes	t Date: 2/13/2	019									
BPM: Blows/M	inute										DFN: Final Di	splacement	
FMX: Maximur	m Force										CSX: Compre	ession Stress M	Maximum
VMX: Maximur	n Velocity										EFV: Maximu	ım Energy	
DMX: Maximur	n Displaceme	ent									ETR: Energy	Transfer Ratio	- Rated
Instr.	Start	Final	Blows	Ν	N60	Average	Average	Average	Average	Average	Average	Average	Average
Length	Depth	Depth	Applied	Value	Value	BPM	FMX	VMX	DMX	DFN	CSX	EFV	ETR
ft	ft	ft	/6"			bpm	kips	ft/s	in	in	ksi	ft-lb	%
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
			Ov	erall Averag	e Values:	43.6	30	15.9	0.70	0.62	24.5	281	80.3
				Standard D	Deviation:	3.3	0	0.6	0.22	0.25	0.3	10	2.8
			Ove	erall Maximu	ım Value:	46.4	31	17.0	1.33	1.20	25.4	295	84.3
			Ov	erall Minimu	ım 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.



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) <u>No Plan or Sketch Provided</u> – 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) <u>Unscaled Sketch</u> – 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) <u>Scaled Survey Property Plat</u> – 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) <u>Scaled Topographic Site Survey</u> – 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) <u>Scaled Building Layout Plan</u> – 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) <u>No Elevation Information Provided</u> – 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 largescale 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) <u>Interpolation From Topographic Site Plan</u> – 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) <u>Use of Spirit Level</u> – 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) <u>Leveling Survey by Others</u> - 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) <u>Reconnaissance Methods</u> - 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) <u>Rough Measurement</u> - 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) <u>Handheld Global Positioning System</u> – 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) <u>Surveyed and Marked by Others Prior to Exploration</u> – 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) <u>Surveyed and Marked by Others Subsequent to</u> <u>Exploration</u> – 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.



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) <u>ATV Access Over Sloping Ground</u> - 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) <u>Access Restricted by Soft, Marshy Ground</u> - Truckmounted 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) <u>Access Restricted by Parked Vehicles</u> – 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) <u>Access Restricted by Overhead Utilities</u> - 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) <u>Access Along Highways</u> – 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) <u>Use of Temporary Work Barriers Required</u> – 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) <u>Heavy Vegetation, Dozer Clearing</u> - 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.



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.


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 semiautomatic 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.

SAN	DS	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	5 - 8	Firm		
	Dense	9 - 16	Stiff		
30 - 50	Dense	16 - 30	Very Stiff		
>50	Very	31 – 50	Hard		
	Dense	>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 <u>not</u> 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.



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.

<u>UD Shelby Tube Insertion by Pushing</u> - 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.



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 groundwater 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.



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 <u>not</u> 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.



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.



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

PAGE 1 OF 1

PROJECT ID (TBD)

PROJECT NAME 1-85 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

PAGE 1 OF 1

PROJECT ID (TBD)

PROJECT NAME 1-85 Bridge Over Rocky Creek

					PRO	JECT COUN	ITY Greenv	ille			
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			







PROJECT ID (TBD)

INDEX PROPS 142615009_185 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19

PROJECT NAME 1-85 Bridge Over Rocky Creek



SCDƏT

INDEX PROPERTIES VERSUS DEPTH

PROJECT ID (TBD)

INDEX PROPS 142615009_185 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19

PROJECT NAME 1-85 Bridge Over Rocky Creek





PROJECT ID (TBD)

INDEX PROPS 142615009_185 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19

PROJECT NAME 1-85 Bridge Over Rocky Creek





PROJECT ID (TBD)

PROJECT NAME 1-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville



INDEX PROPS 142615009_I85 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19



PROJECT ID (TBD)

PROJECT NAME 1-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville



INDEX PROPS 142615009_I85 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19



PROJECT ID (TBD)

INDEX PROPS 142615009_185 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19

PROJECT NAME 1-85 Bridge Over Rocky Creek





PROJECT ID (TBD)

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PROJECT COUNTY Greenville



INDEX PROPS 142615009_I85 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19



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PROJECT NAME 1-85 Bridge Over Rocky Creek

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INDEX PROPS 142615009_I85 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19



PROJECT ID (TBD)

PROJECT NAME 1-85 Bridge Over Rocky Creek

PROJECT COUNTY Greenville



INDEX PROPS 142615009_185 WIDENING.GPJ GINT STD US LAB.GDT 5/10/19

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



AASHTO T 265 - ASTM D 1140

AASHIO I 265 - ASIM D 1140								
S&ME	E, Inc Greer	nville 48 Br	rookfield Oal	ks Dr., Suite F	Greenville,	SC 29607		
Project #: 142	ect #: 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: Colu	umbia, SC							
Concelling Mathematic	Sample Dates: Various							
Sampling Method:		Don		с С	oakod 🗸	Sook Ti	ma 21 hrs	
Sample Identification	L D	Taro \\/t +	Taro \//t +	Taro W/t +	Wator W/t	SUdk II	% Passing	
Sample Identification		Wet Wt	Dry Wt	Dry Wt after		Moisture	#200	
		wee we	Diy We	Wash		Wolstare		
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	2 Calibrati	on Date: 9,	/11/18 #2	00 Sieve: 2	23239 Cal	ibration Date:	2/19/19	
Notes / Deviations / Refer	ences: AST	M D1140: Amou	unt of Material	in Soil Finer Tha	n the No. 200 (7	75-um)) Sieve		
Method B uses a defloccu	ulating agent su	ch as Sodium H	lexametaphosp	hate while soaki	ing the specime	n for at least 2	hours.	
AASHTO T 265: Test Meth	nod for Laborate	ory Determination	on of Moisture	Content of Soils	5			

*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
 Project Mgr. / Senior Engr.
 4/01/19

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 Date

Form No: TR-D1140-3

Revision Date: 8/2/17

Revision No. 1

3201 Spring Fo**Bast I<u>R</u>øhul_**BR-3 (Moisture Content & Wash #200)_reordered.xlsm Raliegh, NC. 27616 Page 1 of 1

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



AASHTO T 265 - ASTM D 1140

		773111	01205 A51	11101140			
	S&ME, Inc Green	ville 48 Br	ookfield Oal	<s dr.,="" f<="" suite="" td=""><td>Greenville,</td><td>SC 29607</td><td></td></s>	Greenville,	SC 29607	
Project #:	1426-15-009 (Ph	ase 105)		F	Report Date:	4/22	2/19
Project Name:	I-85 Bridge Over	Rocky Creek	<		Test Date(s):	3/21 - 4	4/18/19
Client Name:	MBI						
Client Address	: Columbia, SC						
				Sa	mple Dates:	4/12	1/19
Sampling Met	nod: Split-spc	on					
Method:	A 🗆 B	\checkmark		S	oaked 🗹	Soak Ti	me 2+ hrs.
Sample Identifi	cation Tare Weight	Tare Wt.+	Tare Wt. +	Tare Wt. +	Water Wt.	Percent	% Passing

Sample Identification	Tare Weight	Tare Wt.+	Tare Wt. +	Tare Wt. +	Water Wt.	Percent	% Passing
		Wet Wt	Dry Wt	Dry Wt. after		Moisture	#200
				Wash			
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	2 Calibrati	on Date: 9	/11/18 #2	00 Sieve:	23239 Cal	ibration 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 Technician Name

Form No: TR-D1140-3

Revision Date: 8/2/17

Revision No. 1

At M. J.C.

NICET 1172264/22/19Certification Type/No.DateProject Mgr. / Senior Engr.
Position4/22/19
DatePositionDate

Gant M. Taylor, P.E. Technical Responsibility

Signature

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



AASHTO T 265 - ASTM D 1140

			701011	101205 713				
S	&ME	, Inc Greer	nville 48 Br	ookfield Oal	ks Dr., Suite F	Greenville,	SC 29607	
Project #:	142	6- <u>15-009 (</u> Ph	ase 105)		F	Report Date:	4/01	L/19
Project Name:	I-85	Bridge Over	Rocky Creel	<		Test Date(s):	3/21 - 4	4/18/19
Client Name:	MB	[
Client Address:	Client Address: Columbia, SC							
					Sa	mple Dates:	Vari	ous
Sampling Metho	od:	Split-spo	oon					
Method:	Α		\checkmark		S	oaked 🗹	Soak Ti	me 2+ hrs.
Sample Identificat	tion	Tare Weight	Tare Wt.+	Tare Wt. +	Tare Wt. +	Water Wt.	Percent	% Passing
			Wet Wt	Dry Wt	Dry Wt. after		Moisture	#200
					Wash			
Boring #, Sample #, D	Pepth	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	1	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%

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

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

227.33

239.66

231.98

255.98

9/11/18

155.48

141.83

125.12

195.97

#200 Sieve:

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

51.21

38.53

45.47

19.63

23239

22.5%

16.1%

19.6%

7.7%

Calibration Date:

31.6%

40.8%

46.1%

23.4%

2/19/19

<u>Benjamin Kovaleski</u>		NICET 117226	<u>4/01/19</u>
Technician Name		Certification Type/No.	Date
<u>Gant M. Taylor, P.E.</u>	Art M. Sge	<u>Project Mgr. / Senior Engr.</u>	<u>4/01/19</u>
Technical Responsibility	Signature	Position	Date
This report sh	all not he reproduced except in full wit	hout the written approval of S&MF_Inc	

R-4, SS-4, 6-8' R-5, SS-1, 1-3'

R-5, SS-3, 5-7'

R-5, SS-4, 7-9'

Balance ID.:

0.00

0.00

0.00

0.00

Calibration Date:

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

13942

Notes / Deviations / References:

278.54

278.19

277.45

275.61

Form No: TR-D1140-3

Revision Date: 8/2/17

Revision No. 1

3201 Spring Fores**RR**oatlir_R-5 (Moisture Content & Wash #200)_reordered.xlsm Raliegh, NC. 27616 Page 1 of 1

Form No. TR-126-T88-2			
Revision No. 0	Particle Size Analysis of Second	oils	_
Revision Date: 08/17/11	AASHTO T 88		E
	S&ME. Inc Greenville 48 Brookfield Oaks Dr., Suite	e 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		



I	&
m.	=

Single sieve set			ASTM	D6913				
	S&ME, Inc	Greenville:	48 Brookfield	l Oaks Dr., S	uite F Gree	enville, SC	29607	
Project #:	1426-15-00	09 (Phase 10	5)				Report Date:	4/9/2019
Project Name:	I-85 Bridge	Over Rocky Cr	eek				Test Date:	4/04 - 4/09/19
Client Name:	MBI							
Client Address:	Columbia, S	С						
Boring #:	BR-2			Log #:	32g	S	Sample Date:	3/25/19
Sample #:	SS-7			Туре:	Split-spoor	n	Depth:	18.5 - 20'
Sample Description	on: Poorly	graded SAND	with silt (SP-SN	/I / A-3)				
	3" 2" 15" 1	" 3/4" 3/8"	#4 #10	#20	#40 #60 #	#100 #140 #	#200	
100%	• • • •			•	• • • • •			
90%								
5070								
ि ३०%								
<u>້</u> ພ 70% -				\				
is				N				
60%					\mathbf{N}			
50%					•			
Lei 40%								
					-			
30%					4			
20%						<u> </u>		
10%						X.		
10%								
0%		10.00	Millimotors	1.00	•	0.10		0.01
100.0		10000	winnineters	1.00		0.10		
Cobbles	< 300	0 mm (12") and	> 75 mm (3")	Fin	e Sand	< ().425 mm and :	> 0.075 mm
Gravel	< 7	75 mm and > 4.	75 mm (#4)		Silt		< 0.075 and > ().005 mm
Coarse Sand	< 4.	75 mm and >2.	00 mm (#10)		Clay		< 0.005 n	nm
Medium Sand	< 2.0	10 mm and > 0.4	425 mm (#40)	Moist	olloids Dicn	orsion Bros	< 0.001 n	nm
Maximu	m Particle Siz	e #4	anning specimen	Coarse San	id 2.7%		Fine Sand	44.2%
	Grave	el 1.4%		Medium San	d 44.2%	, D	Silt & Clav	7.4%
	Liquid Limi	it N/A		Plastic Lim	it N/A		Plastic Index	N/A
	1	,			,			
			Na	tural Moistur	re 27.8%	, D		
		2		•	D (D	-	046	

				Natu		13ture 27.070		
		Cc = D	$D_{30}^{2}/(D_{10} \times D_{60})$	1.122		$Cu = D_{60}/D_{10}$	3.846	
D10 =	0.13	D30 =	0.27	D60 =	0.5	D50 =		D90 =
Notes / Deviatio	ns / References:							

Gant M. Taylor, P.E. Technical Responsibility

CAT M. VgC Signature

Project Mgr. / Senior Engr. Position

<u>4/9/2019</u> Date

3201 Spring Forest Road Raleigh, NC. 27616

SIEVE ANALYSIS OF SOIL



Single sieve set		ASTI	M D6913			
	S&ME, Inc Greenville:	48 Brookfie	ld Oaks Dr., S	Suite F Greenville,	SC 29607	
Project #:	1426-15-009 (Phase 105	5)			Report Date:	4/9/2019
Project Name:	I-85 Bridge Over Rocky Cre	eek			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)		Туре:	Split-spoon	Depth:	23.5 - 24'
Sample Description	on: Poorly graded SAND	with silt (SP-S	SM / A-3)			
100%	3" 2" 1.5" 1" 3/4" 3/8"	#4 #:	10 #20	#40 #60 #100 #14	0 #200	
90%						

	80%	-																
g (%	70%	-																
assin	60%	-										Ţ						
ent P	50%	-										1						
Perc	40%																	
	30%	-																
	20%	_											×					
	10%	_																
	10 %														•			
	0% 10(0.00			10.	00	Mi	limete	rs	1.00	1	•		0.10	•		0.01	J
	Cobbles		< 3	00 m	m (12")	and >	75 m	ım (3"))		Fir	ne Sai	nd	<	0.425 n	nm and >	0.075 mm	
	Gravel		<	75 m	nm and	> 4.7	5 mm	(#4)				Silt			< 0.075	5 and > 0.	.005 mm	
(Coarse San	d	< 4	4.75 r	nm and	>2.00) mm	(#10)				Clay		_	~	< 0.005 m	m	
N	ledium Sa	nd	< 2	.00 m	im and	> 0.42	25 mm	n (#40)			C (olloic	ls Di	<u> </u>	~	< 0.001 m	m .	
Met	hod: B		۲ ticlo Ci	rocec	dure for	obtai	ning S	specim	ien:	Mo	oist a Can	d	Dispei	sion Pro	cess:	Disp a Sand	ersant	
	IVIAXIII	ium Par	ticle Si	ze	#10	,				Coarse	e San	u J	0.5%				40.0%	
			Gra	/ei •.	0.19	o			N	vieaiun	n San		41.9%		SIIT		8.8%	
		Liq	uid Lin	nıt	N/A	\				Plasti	c Lim	iit	N/A		Plastic	c Index	N/A	
									NIat	ural M	-i <i>c</i> +	~~	22.20/					
					D ²	//D		- 1	ivali			r	22.5%		1 500			
	D10	0.10			$z = D_{30}$	27	(D ₆₀)		.020	0.45	C	u = L	D_{60}/D_{10}	4	1.500	D00 -		—

Notes / Deviations / References:

Gant M. Taylor, P.E. Technical Responsibility

CAT M. Joh Signature

Project Mgr. / Senior Engr. Position

<u>4/9/2019</u> Date

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3201 Spring Forest Road Raleigh, NC. 27616

Form No. TR-126-T88-2			
Revision No. 0	Particle Size Analysis of Soils		
Revision Date: 08/17/11	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		



301 Zima Park Drive Spartanburg, SC 29301

BR-2 (24-25') Hydrometer.xlsx

Form No. TR-126-T88-2			
Revision No. 0	Particle Size Analysis of Soils	S	
Revision Date: 08/17/11	AASHTO T 88		[] Ξ
	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		



301 Zima Park Drive Spartanburg, SC 29301

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			AS	TM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&MI	E, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SO	29607		
Proje	ct #	:	1426-1	5-009 (Pha	se 105)					Report I	Date:	4/01/2	19
Proje	ct N	lame:	I-85 Bri	dge Over R	ocky Cre	ek				Test l	Date:	3/27/3	19
Client	t Na	ime:	MBI										
Client	t Ad	ldress:	Columb	oia, SC									
Borin	g #:	: BR	-1		Lo	og #:	25g		San	nple Date:		Various	
Samp	le #	t: SS-	-1		Т	ype:	Split-sp	oon		Depth:		0 - 2'	
Samp	le D	Descripti	on:	Clayey SA	AND (SC ,	/ A-6)							
Туре с	and S	Specificat	tion	S&ME ID)#	Cal Date:	Туре	and Spec	ification	S8	ME ID #	Cal	Date:
Baland	ce ((0.01 g)		13942	<u>.</u>	9/11/2018	Groo	wing tool			23214	11/11	L/2018
LL App	oara	tus		23158	8	2/1/2019							
Oven				13978	5	10/8/2018	1	11::+					
P	an #			Taro #·	1	2	Liquic	i Limit			1	Plastic Limi	t
-		Taro Wo	iaht	Tale #.	26.70	26.46	26.20				4 25.02		
			Waight	^	20.70	20.40	42.00				23.32		
В		wet son	weight +	A	47.48	40.37	43.90				37.35		
		Dry Soli	vveignt +	A	42.36	41.06	38.78				35.12		
D		Water W	eight (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		% Moist	ure (D/E)*1	100	32.7%	36.4%	41.0%				24.2%		
N		# OF DR	OPS		29	23	16				Moisture C	ontents det	ermined by
LL		LI	. = F * FAC	TOR							A	ASHTO T 20	65
Ave			Average	2								24.2%	
	45	0 -									One Point I	Liquid Lim	it
	40.	." <u> </u>								N	Factor	N	Factor
	_				_	_				20	0.974	26	1.005
r I	40.	.0		$\searrow \vdash$						21	0.979	27	1.009
nte										23	0.99	20	1.011
ပိ	25									24	0.995	30	1.022
ure	35.	.0 1								25	1.000		
oist											NP, Non-P	lastic	
ĬΣ	30.	.0 📮									Liquid L	imit 3	35
%											Plastic L	imit 2	24
											Plastic Ir	ndex 1	.1
	25.	.0 +			+ +					(Group Syn	nbol SC	/A-6
		10	15	20	25 30	35 40	# of	Drops	100	Ν	Aultipoint N	Nethod	\checkmark
										C)ne-point N	Nethod	
Wet	Pre	paration)ry Preparati	on 🗸	Air Drie	ed 🗸		I	% Passing t	the #200 Si	eve:	39.4%
Notes	/ De	eviations	/ Referenc	es:									
AACLI	<u>ד 0 ז</u>		rmining +1	no Plastic Lim	nit & Dlast	ic Inday of	Soils		ΛΛςμτο	T QO: Dotor	mining the	Liquid	nit of Soils
AASH	101	30. Dele	annunung tr	ie Flustic Lill	ni a Piusi	ic muex of	50115		AAJTIU	1 03. Delei	munung the		
	В	enjami	n Kovale	ski		4/01/19		Gar	nt Taylor	, P.E.		4/0	1/19

Technician Name

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Date

Technical Responsibility

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			A	STM D 4318		AASHTO	T 89 🖸	a AAS	SHTO T 90	\boxtimes			
			S&N	IE, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	:	1426-1	5-009 (Pha	se 105)					Report I	Date:	4/01/	19
Proje	ct N	lame:	I-85 Br	idge Over R	Rocky Cre	ek				Test I	Date:	3/27/	19
Client	t Na	ime:	MBI										
Client	t Ad	dress:	Colum	bia, SC						-			
Borin	g #:	BR	-1		Lo	og #:	25g		San	nple Date:		Various	
Samp	ole #	t: SS	-5		Т	Гуре:	Split-spo	oon		Depth:		8 - 10'	
Samp	ole D	Descript	ion:	Silty SAN	ID (SM / /	A-7-5)							
Туре с	and S	Specifica	tion	S&ME IE)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Baland	ce (l	0.01 g)		13942	2	9/11/2018	Groo	ving tool			23214	11/12	1/2018
LL Ap	para	tus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
P	an #			Tara #1		6	Liquic	Limit			0	Plastic Lim	t
—		T 14/	• • •	Tare #:	5	0	/				8 27 20		
A		Tare we	eignt		26.96	27.83	26.30				27.30		
В		Wet Soi	l 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 V	Veight (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		% Moist	ure (D/E)*	100	42.3%	44.2%	47.8%				32.0%		
N		# OF DF	ROPS		29	23	16				Moisture Co	ontents det	ermined by
LL		L	L = F * FA	CTOR							A	ASHTO T 2	65
Ave	2.		Averag	е						•		32.0%	
7											One Point I	_iquid Lim	nit
	54.	• T								Ν	Factor	N	Factor
										20	0.974	26	1.005
E	49.	.0 🖾								21	0.979	27	1.009
ter										22	0.985	28	1.014
lo U										23	0.99	29	1.018
re	44.	.0							_	24	1.000	50	1.022
stu						_					NP, Non-Pl	astic	
Moi	20	<u> </u>									Liquid L	.imit 4	14
8	59.										Plastic L	imit 3	32
	-										Plastic Ir	ndex 1	12
	34.	.0 [_	_		C	Group Svn	nbol SM/	A-7-5
		10	15	20	25 30	35 40	# of	Drops	100	N	Aultipoint N	/ethod	
								brops		 C)ne-point N	/lethod	
Wet	Pre	paration		Drv Prenarati	ion 🗸	Air Drie	v l			e Passing t	the #200 Si	eve.	43.8%
Notes	/ De	eviations	/ Referen	ces:		7.01 2.11				e i deenig i			
	, = -		,,										
AASH	TO 1	90: Det	ermining t	the Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	В	eniami	n Kovale	eski		4/01/19		Gar	nt Tavlor	, P.E.		4/0	1/19

Technician Name

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Date

Technical Responsibility

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D 4318		AASHTO	T 89 [x AAS	SHTO T 90	X			
			:	S&ME, Inc Gre	eenville	48 Brook	field Oal	ks Dr., Suit	te F Gre	enville, SC	29607		
Proje	ct #:	:	14	26-15-009 (Pha	se 105)					Report [Date:	4/01/	/19
Proje	ct N	ame	: I-8	35 Bridge Over F	Rocky Cre	ek				Test [Date:	3/28/	/19
Client	: Na	me:	М	BI									
Client	: Ad	dres	s: Co	olumbia, SC						-			
Borin	g #:		BR-1		Lo	og #:	25g		Sam	nple Date:		Various	5
Samp	le #	:	SS-7		٦	Гуре:	Split-sp	oon		Depth:		18.5 - 20)'
Samp	le D)escr	ription:	Clayey S	AND (SC ,	/ A-4)							
Type o	ind S	Speci	fication	S&ME II	D #	Cal Date:	Туре	and Speci	fication	S&	ME ID #	Cal	Date:
Baland	:e (().01 (g)	1394.	2	9/11/2018	Groo	oving tool			23214	11/1	1/2018
LL App Oven	bara	tus		2315	8	2/1/2019							
P	an #			1337		10/0/2010	Liqui	d Limit				Plastic Lim	nit
				Tare #:	9	10	11				12		
Α		Tare	Weight		26.83	26.74	26.66				26.64		
В		Wet	Soil Wei	ght + A	48.06	47.30	44.14				37.33		
C		Dry S	Soil Weig	ght + A	42.92	42.08	39.57				35.29		
D		Wate	er Weigh	it (B-C)	5.14	5.22	4.57				2.04		
E		Dry S	Soil Weig	ght (C-A)	16.09	15.34	12.91				8.65		
F		% M	oisture (D/E)*100	31.9%	34.0%	35.4%				23.6%		
Ν		# OF	DROPS		35	27	19				Moisture Co	ontents de	termined by
LL			LL = F	* FACTOR							A	ASHTO T 2	265
Ave			Aı	verage								23.6%	
	44.	.0 т								(One Point I	Liquid Lin	nit
		F								N 20	Factor	N 26	1 005
	I	F								20	0.979	20	1.009
ent	39.	• †								22	0.985	28	1.014
ont		F								23	0.99	29	1.018
e O	34.	0 +								24	0.995	30	1.022
stui		F							_	25	NP, Non-Pl	astic	
Moi	20	۰Ē									Liquid L	.imit	34
8	29.	Ĕ									Plastic L	.imit	24
		E									Plastic Ir	ndex	10
	24.	0 +			-			_		(Group Syn	nbol SC	/A-4
		10		15 20	25 30	35 40	# of	Drops	100	N	1ultipoint N	/lethod	\checkmark
										C	ne-point N	/lethod	
Wet	Pre	parat	ion 🗌	Dry Preparat	ion 🗸	Air Drie	ed ✓		ç	% Passing t	he #200 Si	eve:	48.3%
Notes	/ De	eviati	ons / Rej	terences:									
AASH	то т	90: 1	Determir	ning the Plastic Lii	mit & Plasi	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	В	enia	imin Ko	ovaleski		4/01/19		Gar	nt Tavlor	. P.E.		4/()1/19
	-	Tec	chnician N	Jame		Date		<u>echn</u> Techn	ical Respon	sibility		<u>., c</u>)ate

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			ASTM D 4318		AASHTO T	T 89 🗵	a AAS	нто т 90	X			
			S&ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Suit	e F Gre	enville, SC	29607		
Proje	ct #	:	1426-15-009 (Pha	se 105)					Report [Date:	4/01/2	19
Proje	ct N	lame:	I-85 Bridge Over F	Rocky Cre	ek				Test [Date:	3/28/2	19
Client	t Na	ame:	MBI	-								
Client	t Ac	ldress:	Columbia, SC									
Borin	g #	: BR-	-1	Lo	og #:	25g		Sam	ple Date:		Various	
Samp	ole #	ŧ: SS-	·8	٦	Гуре:	Split-spc	oon		Depth:		23.5 - 25	ı
Samp	ole [Descripti	on: Silty SAN	ID (SM / J	A-2-4)							
Туре о	and	Specificat	tion S&ME II) #	Cal Date:	Туре	and Speci	fication	S&	ME ID #	Cal	Date:
Baland	ce (0.01 g)	13942	2	9/11/2018	Groo	ving tool			23214	11/11	/2018
LL Ap	para	itus	2315	3	2/1/2019							
Oven P	an #		13978	3	10/8/2018	Liquid	Limit				Plastic Limi	t
,	un "		Tare #:	13	14	15	Linne			16		
A		Tare We	ight	26.78	26.64	27.58				26.58		
В		Wet Soil	Weight + A	44.33	43.76	46.25				37.10		
С		Dry Soil	Weight + A	40.03	39.41	41.09				34.90		
D		y Water W	/eight (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		% Moist	ure (D/E)*100	32.5%	34.1%	38.2%				26.4%		
N		# OF DR	OPS	35	28	18				Moisture Co	ontents det	ermined by
LL	_	LL	= F * FACTOR							AA	ASHTO T 26	55
Ave	2.		Average								26.4%	
	45	0							(One Point L	iquid Lim.	it
	45	U T							NI	Factor	N	Factor
		·•							IN	ractor	IN	
									20	0.974	26	1.005
t	40	.0							20 21 22	0.974 0.979 0.985	26 27 28	1.005 1.009 1.014
ntent	40	.0							20 21 22 23	0.974 0.979 0.985 0.99	26 27 28 29	1.005 1.009 1.014 1.018
Content	40	.0							20 21 22 23 24	0.974 0.979 0.985 0.99 0.995	26 27 28 29 30	1.005 1.009 1.014 1.018 1.022
ure Content	40 35	.0							20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000	26 27 28 29 30	1.005 1.009 1.014 1.018 1.022
oisture Content	40 35	.0							20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl	26 27 28 29 30 astic	1.005 1.009 1.014 1.018 1.022
Moisture Content	40 35 30	.0							20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L	26 27 28 29 30 astic imit 3	1.005 1.009 1.014 1.018 1.022
% Moisture Content	40 35 30	.0							20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L	26 27 28 29 30 astic imit 3 imit 2	1.005 1.009 1.014 1.018 1.022 5 5 6
% Moisture Content	40 35 30	.0							20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In	26 27 28 29 30 astic imit 3 imit 2 idex 9	1.005 1.009 1.014 1.018 1.022 5 6 9
% Moisture Content	40 35 30 25	.0	15 20	25 30	35 40			100	20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym	26 27 28 29 30 astic imit 3 imit 2 idex 9 hbol \$M/	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4
% Moisture Content	40 35 30 25	.0	15 20	25 30	35 40	# of I	Drops	100	20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym	26 27 28 29 30 astic imit 3 imit 2 idex 9 hbol SM/ Iethod	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4
% Moisture Content	40 35 30 25	.0 .0 .0 .0 .0 10	15 20	25 30	35 40		Drops	100	20 21 22 23 24 25	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M	26 27 28 29 30 astic imit 3 imit 2 dex 9 hbol 5M/ 1ethod	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4 20.2%
% Woisture Content	40 35 30 25	.0 .0 .0 .0 .0 10	15 20	25 30	35 40 Air Drie	# of I	Drops	100	20 21 22 23 24 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M	26 27 28 29 30 astic imit 3 imit 2 idex 9 hbol SM/ 1ethod 1ethod eve:	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4 30.3%
% Woisture Content	40 35 30 25 : Pre / Do	.0 .0 .0 .0 10 paration	15 20	25 30	35 40 Air Drie	# of I	Drops	100	20 21 22 23 24 25 (0 (0 (0 (0 (0 (0 (0 (0 (0 (0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M	26 27 28 29 30 astic imit 3 imit 2 imit 2 idex 9 hbol 5M/ 1ethod 1ethod 1ethod	1.005 1.009 1.014 1.018 1.022 5 6 9 A-2-4 5 3 0.3%
% Woisture Content	40 35 30 25 : Pre / Du	.0 .0 .0 .0 10 paration	15 20	25 30	35 40 Air Drie	d ✓	Drops	100	20 21 22 23 24 25 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M	26 27 28 29 30 astic imit 3 imit 2 idex 4 hbol SM/ Method lethod eve:	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4 30.3%
% Wet Notes	40 35 30 25	.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	15 20 The second secon	25 30 ion 🖸	35 40 Air Drie	d ✓	Drops	100 9 AASHTO	1 20 21 22 23 24 25 0 </td <td>0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M</td> <td>26 27 28 29 30 astic imit 3 imit 3 imit 2 dex 9 hbol 5M/ Method fethod fethod fethod</td> <td>1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4 ☑ 30.3%</td>	0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym fultipoint Mone-point M	26 27 28 29 30 astic imit 3 imit 3 imit 2 dex 9 hbol 5M/ Method fethod fethod fethod	1.005 1.009 1.014 1.018 1.022 5 5 6 9 A-2-4 ☑ 30.3%

<u>Benjamin Kovaleski</u>	4/01/19	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				AS	TM D 4318		AASHTO	T 89 🛛	⊠ AAS	SHTO T 90	X			
				S&ME	E, Inc Gre	enville	48 Brook	field Oal	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #:	:	14	426-15	5-009 (Pha	se 105)					Report I	Date:	4/16	/19
Proje	ct N	ame	e: I-	85 Brid	dge Over R	locky Cre	ek				Test I	Date:	4/15	/19
Client	t Na	me:	: N	1BI	-	-								
Client	t Ad	dre	ss: C	olumb	oia, SC						-			
Borin	g #:		BR-2			Lo	og #:	32g		San	nple Date:		3/25/1	9
Samp	le #	:	SS-3			1	Гуре:	Split-sp	oon		Depth:		5 - 7'	
Samp	ole D)esc	ription:		Silty SAN	ID (SM / 2	A-4)							
Туре с	and S	Spec	ification		S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Ca	Date:
Baland	ce (C	0.01	g)		13942	2	9/11/2018	Groo	oving tool			23306	3/3	0/2019
LL Ap	parat	tus			23158	3	2/1/2019							
Oven P	an #				13978	5	10/8/2018	Liquid	limit				Plastic Lin	nit
	un "				Tare #:	26	27	28				29		
A	ŀ	Tare	e Weight	t		27.31	26.93	26.80				27.00		
В		Wet	: Soil We	eight +	A	42.83	47.12	44.43				39.81		
С		Dry	Soil We	ight + /	A	39.49	42.52	40.25				37.31		
D		Wat	er Weig	ht (B-C)	3.34	4.60	4.18				2.50		
E		Dry	Soil We	ight (C-	-A)	12.18	15.59	13.45				10.31		
F		% N	loisture	(D/E)*1	L00	27.4%	29.5%	31.1%				24.2%		
N	:	# O	F DROPS	S		35	24	18				Moisture Co	ontents de	etermined by
LL			LL =	F * FAC	TOR							A	ASHTO T .	265
Ave	2.		A	verage	,		<u> </u>			<u> </u>			24.2%	
	20	<u> </u>										One Point I	Liquid Lir	nit
	59.	۳Ŧ									N	Factor	Ν	Factor
	_	E									20	0.974	26	1.005
ht	34.	٥f								-	21	0.979	27	1.009
nte		ŀ									23	0.99	29	1.018
Ŭ	29	۰ŧ								_	24	0.995	30	1.022
ture		Ĕ									25	1.000		
lois		ŀ										NP, Non-Pl	astic	<u> </u>
N N	24.	ᅆ										Liquia L	.imit	29
	•	ļ												5
	19.	ړ ه						+ +	+ +		(Fiastic II Group Syn	abol SN	J 1/A_4
		10)	15	20	25 30	35 40	# of	Drons	100	N	Aultinoint N	Aethod	
								<u>" 01</u>	ыорз		C	ne-point N	/lethod	
Wet	Prep	oara	tion 🗆	1 D) Pry Preparati	on 🗸	Air Drie	ed 🗸			~ % Passing t	the #200 Si	eve:	37.5%
Notes	/ De	eviat	ions / Re	eference	es:									
AASH	то т	90:	Determ	ining th	ne Plastic Lin	nit & Plasi	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid L	imit of Soils
	Be	enia	<u>amin </u> K	ovales	<u>ski</u>		<u>4/16/1</u> 9		<u>G</u> ar	<u>nt Taylor</u>	<u>, P.E.</u>		<u>4</u> /2	16/1 <u>9</u>

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D 4318		AASHTO	T 89 🖸	AAS	SHTO T 90	\mathbf{X}			
			S	&ME, Inc Gr	eenville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SO	29607		
Project #: 1426-15-009 (Pha				ise 105)					Report Date:		4/16/19		
Project Name:			I-85	I-85 Bridge Over Rocky Creek						Test	Date:	4/15/	19
Clien	t Na	me:	MB	I	-								
Clien	t Ad	ldress	: Col	umbia, SC						-			
Borin	ng #:	: E	3R-2		Log #: 32g				San	nple Date:		3/25/19	
Samp	ole #	ŧ: <u>s</u>	S-6		٦	уре:	Split-sp	oon		Depth:		13.5 - 15	1
Samp	ole D	Descri	otion:	Silty SA	ND [SM / J	A-4(0)]							
Туре о	and :	Specifi	cation	S&ME I	D #	Cal Date:	Туре	and Speci	ification	S8	ME ID #	Cal	Date:
Balance (0.01 g)			1394	2	9/11/2018	Groo	oving tool			23306	3/30	/2019	
LL Apparatus		2315	8	2/1/2019									
Oven				1397	'8	10/8/2018							•.
P	'an #			Tara #1	1	2	Liquic	i Limit	1	1	1	Plastic Lim	It
•		Tara	Voight	Tale #.		2	26 21				4		
A			veignt		20.09	20.40	20.31				25.92		
В		Wet Soll Weight + A		46.87	44.58	46.81				39.39			
C	Dry Soil Weight + A		42.36	40.37	41.90				36.83				
D	D Water Weight (B-C)		4.51	4.21	4.91				2.56				
E	E Dry Soil \		oil Weigł	nt (C-A)	15.67	13.91	15.59				10.91		
F % Moist		isture (D	/E)*100	28.8%	30.3%	31.5%				23.5%			
N # OF D		OROPS		31	24	17				Moisture C	ontents det	ermined by	
LL LL =		LL = F '	FACTOR							A	ASHTO T 2	65	
Ave.		Ave	erage								23.5%		
40.0 -										One Point I	Liquid Lim	nit	
	40.	•								N	Factor	N	Factor
		F								20	0.974	26	1.005
t	35.	.0 두								21	0.979	27	1.009
nte										22	0.985	20	1.014
Ō		. =								24	0.995	30	1.022
are	30.	30.0								25	1.000		
ist										NP, Non-Plastic			
β	25.	.0 上									Liquid L	imit 3	30
%											Plastic L	imit 2	24
											Plastic Ir	ndex	6
	20	.0 +		+ +	+ +		<u> </u>	<u> </u>		(Group Syn	nbol SM	/A-4
		10		15 20	25 30	35 40	# of	Drops	100	Ν	Aultipoint N	Nethod	\checkmark
							· · · ·			C	Dne-point N	/lethod	
Wet	t Pre	paratio	on 🗌	Dry Prepara	tion 🗸	Air Drie	ed 🗸		(% Passing	the #200 Si	eve:	43.2%
Notes	/ De	eviatio	ns / Refe	erences:									
AASH	TO T	90: D	etermini	ng the Plastic L	mit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
Benjamin Kovaleski					4/16/19		Gar	nt Tavlor	. P.E.	4/16/19			

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			,	ASTM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&I	ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Project #: 1426-15-009 (Phas				ase 105)					Report I	Date:	e: 4/16/19		
Project Name: I-85 Brid			Bridge Over R	Rocky Cre	ek				Test l	Date:	te: 4/15/19		
Client	t Na	ame:	MBI		,								
Client	t Ad	ldress:	Colun	nbia, SC						-			
Boring #: BR-2			Lo	og #:	32g		San	nple Date:		3/25/19			
Sample #: SS-9			Т	ype:	Split-sp	oon	Depth:			28.5 - 30'			
Samp	ole D	Descript	ion:	Silty SAN	ID (SM / /	A-2-4)	• •			•			
Туре с	and :	Specifica	tion	S&ME ID) #	Cal Date:	Туре	and Spec	ification	S8	ME ID #	Cal	Date:
Balance (0.01 g) 139		13942	2	9/11/2018 Grooving tool 23306					23306	3/30	/2019		
LL Apparatus 23158		3	2/1/2019										
Oven				13978	3	10/8/2018							
P	an #			T awa #1	0	10	Liquic	l Limit	1	T	10	Plastic Limi	t
		-	• • •	Tare #:	9	10	11				12		
A		Tare We	eight		26.85	26.75	26.67				26.65		
В	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	D Water Weight (B-C)		-C)	2.97	3.81	4.19				2.44			
E	E Dry So		Weight	(C-A)	10.84	13.57	13.82				10.16		
F	F %		Moisture (D/E)*100			28.1%	30.3%				24.0%		
N # 0		# OF DF	ROPS		35	28	18				Moisture Co	ontents det	ermined by
LL LL = F * FACTOR								A	ASHTO T 20	65			
Ave. Average		ge						_		24.0%			
				9						One Point I	Liquid Lim	it	
	40.	.0 -								Ν	Factor	Ν	Factor
										20	0.974	26	1.005
Ŧ	35.	.0 두								21	0.979	27	1.009
Iter										22	0.985	28	1.014
G										23	0.99	30	1.018
re	30.	.0 +								25	1.000	50	1.022
istu										NP, Non-Pl	n-Plastic 🛛		
Ν	25	_ [—			_						Liquid L	imit 2	29
8	23.	.•									Plastic L	imit 2	24
											Plastic Ir	ndex	5
	20	.0 두								(Group Syn	nbol SM/	A-2-4
		10	1!	5 20	25 30	35 40	# of	Drops	100	N	1ultipoint N	Nethod	~
										C)ne-point N	Nethod	
Wet	Pre	paration		Dry Preparati	ion 🗸	Air Drie	ed 🗸			% Passing t	he #200 Si	eve:	33.8%
Notes	/ De	eviations	/ Refere	nces:						5			
			-										
_													
AASH	то т	⁻ 90: Det	ermining	the Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	В	eniami	n Kova	leski		4/16/19		Gar	nt Taylor	P.E.		4/1	6/19

<u>Benjamin Kovaleski</u>	4/16/19	<u>Gant Taylor, P.E.</u>	4/16/19							
Technician Name	Date	Technical Responsibility	Date							
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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



		ASTM D 4318		AASHTO T	T 89 🛛	a AAS	SHTO T 90	\boxtimes			
		S&ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	ite F Gre	enville, SC	29607		
Project #: 1426-15-009 (Phas			ase 105)					Report I	Date:	4/01/19	
Project N	lame: I-	85 Bridge Over F	Rocky Cre	ek				Test I	Date:	: 3/28/19	
Client Na	ame: N	BI									
Client Ad	ldress: C	olumbia, SC						-			
Boring #: BR-3			Lo	og #:	25g		San	nple Date:		Various	
Sample #: SS-1			Т	ype:	Split-spo	oon		Depth:		0 - 2'	
Sample D	Description:	Sandy LE	AN CLAY	(CL / A-6))						
Type and Specification S&ME ID) #	Cal Date:	Туре	and Spec	ification	cation S&ME ID #) # Cal Date:	
Balance (0.01 g)		13942	2	9/11/2018	Groo	ving tool			23214	11/1	1/2018
LL Apparatus 23158		3	2/1/2019								
Oven		13978	3	10/8/2018					-		
Pan #		T "	17	10	Liquid	Limit	1	1	20	Plastic Lim	it
-	L	lare #:	1/	18	19				20		
A	Tare Weight		26.63	26.78	26.66		_		26.82		
В	Wet Soil We	ight + A	42.26	44.48	44.13				37.53		
С	Dry Soil Wei	ght + A	38.35	39.86	39.37				35.66		
D	Water Weig	nt (B-C)	3.91	4.62	4.76				1.87		
E	Dry Soil Wei	ght (C-A)	11.72	13.08	12.71				8.84		
F	% Moisture	(D/E)*100	33.4%	35.3%	37.5%				21.2%		
Ν	# OF DROPS		33	21	15				Moisture Co	ontents det	ermined by
LL LL = F * FACTOR		* FACTOR							AA	ASHTO T 2	65
Ave. Average		veraae			I			<u>I</u>		21.2%	
			l						One Point L	Liquid Lim	nit
45.	.0							Ν	Factor	N	Factor
								20	0.974	26	1.005
<u> </u>								21	0.979	27	1.009
ten								22	0.985	28	1.014
u o				_				23	0.99	29	1.018
ຍ 35.	.0							24	0.995	30	1.022
stu								25	NP Non-Pl	Plastic 🛛	
Joi										imit :	25
≥ 30.	.0								Diactic L	imit ())
											L4 /A 6
25	0				• •			,	sroup syn		A-0
25.	.0 10	15 20	25 30	35 40	# - 6		100		Aultin aint N	1 ath a d	
25.	.0 10	15 20	25 30	35 40	# of	Drops	100	N	Aultipoint N	/lethod	
25.	.0 +	15 20	25 30	35 40	# of	Drops	100	N C	Aultipoint N Dne-point N	Aethod Aethod	
25. Wet Prep	.0 + 10	15 20	25 30 ion	35 40 Air Drie	# of ed ✓	Drops	100	N C % Passing †	Aultipoint N Dne-point N the #200 Si	/lethod /lethod eve:	54.3%
Wet Prep Notes / De	.0 + 10 paration _ eviations / Re	15 20 Dry Preparat	25 30	35 40 Air Drie	# of I	Drops	100	N C % Passing t	Aultipoint N One-point N the #200 Si	Nethod Nethod eve:	54.3%
Wet Prep Notes / De	.0 + 10 paration _ eviations / Re	15 20 Dry Preparat	25 30	35 40 Air Drie	# of I	Drops	100	N C % Passing t	Aultipoint N Dne-point N the #200 Si	Aethod Aethod eve:	54.3%
Wet Prep Notes / De	.0 10 paration eviations / Re	15 20 Dry Preparat	25 30 ion ☑ nit & Plast	35 40 Air Drie	ted ✓	Drops	100 AASHTO	N C % Passing 1 7 89: Deter	Aultipoint N Dne-point N the #200 Si	Aethod Aethod eve: Liquid Lir	54.3%

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Technical Responsibility
LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				AST	M D 4318		AASHTO	T89 🖸	a AAS	SHTO T 90	X			
				S&ME,	Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	:	14	126-15-	009 (Pha	se 105)					Report [Date:	4/01/2	19
Proje	ct N	lame:	: I-8	85 Brido	ge Over R	locky Cre	ek				Test [Date:	3/28/2	19
Client	t Na	me:	М	BI		-								
Client	t Ad	dress	s: Co	olumbia	i, SC						-			
Borin	g #:	:	BR-3			Lo	og #:	25g		Sam	ple Date:		Various	
Samp	le #	ŧ:	SS-3			1	Гуре:	Split-spo	oon		Depth:		4 - 6'	
Samp	le D	Descri	iption:		Sandy LE	AN CLAY	(CL / A-6)						
Туре а	and :	Specif	ication		S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal I	Date:
Balanc	ce (0.01 g	J)		13942	2	9/11/2018	Groo	ving tool			23214	11/11	/2018
LL App	oara	tus			23158	3	2/1/2019							
Oven					13978	}	10/8/2018						DI	
Po	an #				Taro #:	21	22	Liquic	Limit	1	1	24	Plastic Limi	t
		Tara	Woight		Tare #.	21	22	23 27 22				24		
				iaht i A		20.07 AE 14	20.00 40.00	27.25				25.90		
В		vvet :				45.14	45.55	40.99				27.00		
		Dry S		$\frac{gnt + A}{r(B,C)}$		41.28	39.19	42.18				35.90		
D		wate	r Weigh	nt (B-C)		3.86	4.16	4.81		-		1.98		
E		Dry S	oil Wei	ght (C-A	.)	13.21	13.53	14.95				9.92		
F		% Mo	oisture ((D/E)*10	0	29.2%	30.7%	32.2%				20.0%		
N		# OF	DROPS	;		35	27	20				Moisture C	ontents det	ermined by
LL				* FACT	OR							A.	ASHTO T 26	5
Ave			A	verage							•		20.0%	
\square	41.	.0 —				1 1						One Point	Liquid Lim	it Footoo
		ļ.									N 20	0.97/	N	1 005
	1	E									20	0.979	20	1.009
ent	36.	.0 +									22	0.985	28	1.014
onte		E									23	0.99	29	1.018
Ŭ	21	۰Ŀ									24	0.995	30	1.022
ure	51.	•								-	25	1.000		
oist		F				_				_	I	NP, Non-P	astic	
Σ	26	.0 두										Liquid l	.imit 3	1
%		E										Plastic L	imit 2	20
		Ŀ										Plastic Ir	ndex 1	.1
	21.	.0 +				-	+ +		<u> </u>		(Group Syr	nbol CL/	'A-6
		10		15	20	25 30	35 40	# of	Drops	100	N	1ultipoint N	Nethod	\checkmark
											С	ne-point N	/lethod	
Wet	Pre	parati	on 🗌	Dry	[,] Preparati	on 🗸	Air Drie	ed √		ç	% Passing t	:he #200 Si	eve:	55.9%
Notes	/ De	eviatio	ons / Re	ferences	:									
ΛΛΟΙΙ	70 7	r 00. r	Dotomo:	ning the	Diactic Lin	nit QI DI	tic Index of	Soils		AACUTO	T OOL Data	minina +	Liquid Lin	ait of Caila
AASHI	101	90. L	vetermi	nang trie	FIUSTIC LIN	$m \propto Plus$	at muex of	20115		AASHIU	i oy. Deleri	munung ine	ειγμία είη	
	B	enja	min Ko	ovalesk	<u>i</u>		<u>4/01/19</u>		<u>Gar</u>	nt Taylor	<u>, P.E.</u>		4/0	<u>1/19</u>

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D	4318		AASHTO	T 89 🖸		SHTO T 90) 🗵			
			S	&ME, Inc.	- Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	eenville, SC	29607		
Proje	ct #	•	142	6-15-009	(Pha	se 105)					Report I	Date:	4/01/	19
Proje	ct N	ame:	I-85	Bridge O	ver R	Rocky Cre	ek				Test I	Date:	3/28/	19
Clien	t Na	me:	MBI	[
Clien	t Ad	dress:	Colu	umbia, SC										
Borin	ig #:	BI	R-3			Lo	og #:	25g		Sar	nple Date:		Various	
Samp	ole #	: S	5-5			٦	Гуре:	Split-sp	oon		Depth:		8 - 10'	
Samp	ole D	Descrip	tion:	LEA	N CL	AY with	Sand (CL /	A-6)						
Туре о	and :	Specific	ation	S&	ME ID)#	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balan	ce (l	0.01 g)			13942	2	9/11/2018	Groc	oving tool			23214	11/1	1/2018
LL Ap	para	tus			23158	3	2/1/2019							
Oven					13978	3	10/8/2018					-		
P	'an #			Ток	o #•	27	25	Liquic	i Limit			20	Plastic Lim	it
		T 14		Tar	e #:	27	25	26				28		
A		Tare w	eight			26.92	26.78	27.33				26.80		
В		Wet So	il Weigh	nt + A		43.64	42.02	45.35		-	_	38.38		
C		Dry Soi	l Weigh	nt + A		39.62	38.24	40.77				36.43		
D		Water V	Weight	(B-C)		4.02	3.78	4.58				1.95		
E		Dry Soi	l Weigh	nt (C-A)		12.70	11.46	13.44				9.63		
F		% Mois	sture (D,	/E)*100		31.7%	33.0%	34.1%				20.2%		
N		# OF D	ROPS			35	27	22				Moisture Co	ontents det	ermined by
LL	-		LL = F *	FACTOR								A	ASHTO T 2	65
Ave	2.		Ave	rage						•	_		20.2%	
7				5								One Point I	iquid Lim	nit
	43.	• T		-							N	Factor	N	Factor
				_							20	0.974	26	1.005
<u>ب</u>	38.	o 🗖									21	0.979	27	1.009
ten											22	0.985	28	1.014
lon Lo											23	0.99	29	1.018
re (33.	.0 +									24	1 000	30	1.022
stu		-					◄					NP, Non-Pl	astic	
Noi	20	_F										Liquid L	imit 3	33
N 8	28.	° †										Plastic I	imit 2	20
	-											Plastic Ir	ndex 1	13
	23.	o 崖									(Group Syn	hol CL	/Δ-6
		10		15 2	0	25 30	35 40	# of	Drons	100	N	Aultinoint N	Aethod	
								# 01	Diops			ne-noint N	Aethod	
Wet	• Dro	naratio	ר ר	Dry Pre	narati	ion 🔽	Air Drie	d V			% Passing t	he #200 Si		78 5%
Notes	/ De	pulation	s / Refe	rences:	puluti						70 Tussing (.110 # 200 51		/0.5/0
	/ _ <		<i>,</i> ,											
AASH	то т	90: De	terminir	ng the Plas	tic Lin	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	В	eniam	in Kov	valeski			4/01/19		Gar	nt Tavlo	r. P.E.		4/0	1/19

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		ASTM D 4318		AASHTO T	T 89 🖸		SHTO T 90				
		S&ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Su	ite F Gre	enville, SC	29607		
Project	#:	1426-15-009 (Pha	se 105)					Report I	Date:	4/01/	19
Project	Name:	I-85 Bridge Over F	Rocky Cre	ek				Test I	Date:	3/28/	19
Client N	lame:	MBI	-								
Client A	Address:	Columbia, SC						_			
Boring	#: BR-	-3	Lo	og #:	25g		Sar	nple Date:		Various	
Sample	#: SS-	8	7	Гуре:	Split-sp	oon		Depth:		23.5 - 25	;'
Sample	Descripti	on: Silty SAN	ID (SM /	A-2-4)							
Type and	d Specificat	ion S&ME IL) #	Cal Date:	Туре	and Spec	cification	S&	ME ID #	Cal	Date:
Balance	(0.01 g)	13942	2	9/11/2018	Groc	ving tool			23214	11/1	1/2018
LL Appa	ratus	23158	3	2/1/2019							
Oven	#	13978	3	10/8/2018	Liquic	Limit				Plactic Lim	: +
Pun	#	Tare #·	20	30	21				32		
Δ.	Taro Woi	Tate π .	26.98	27.36	28.60				27.60		
	Wot Soil	Weight $\pm \Lambda$	20.30	27.30 45.10	20.00 46.31				27.00		
	Dry Soil		40.40	40.22	40.J1 /1 10				26.11		
	Diy Sul	weight + A	41.34	40.33	41.10 F 10				2.27		
		elgint (B-C)	4.94	4.//	5.15 12.50				2.27		
		weight (C-A)	14.56	12.97	12.58				8.51		
F	% Moisti	ure (D/E)*100	33.9%	36.8%	40.8%				26.7%		
N	# OF DR	OPS	30	22	15				Moisture Co	ontents det	termined by
LL		. = F * FACIOR							A/	ASHIOTZ	65
Ave.		Average								26.7%	•
4	ю.0 т	- I I							One Point I	Iquid Lim	nt Factor
								20	0.974	26	1 005
								21	0.979	27	1.009
P ent	1.0							22	0.985	28	1.014
b T								23	0.99	29	1.018
Ŭ	36.0							24	0.995	30	1.022
ture								25	1.000		
ois									NP, Non-Pl		
Σ 3	31.0								Liquid L	imit :	36
8	- F		_						Plastic L	imit	27
									Plastic Ir	idex	9
2	10	15 20	25 20	25 40			100	(Group Syn	nbol SM/	A-2-4
	10	15 20	25 30	35 40	# of	Drops	100	N	Iultipoint N	/lethod	\checkmark
					<u> </u>			C	ne-point N	/lethod	
Wet Pr	reparation	Dry Preparati	ion 🗸	Air Drie	ed ∠			% Passing t	:he #200 Si	eve:	34.0%
Notes / I	Deviations ,	/ References:									
AASHTO) T 90; Dete	rmining the Plastic I ir	nit & Plas	tic Index of	Soils		ΔΔΩΗΤΟ	T 89. Deter	minina the	Liquid Lir	nit of Soils
•		,						1 00. Detter		Ligulu Li	

<u>Benjamin Kovaleski</u>	<u>4/01/19</u>	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			,	ASTM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&I	ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	ite F Gre	enville, SC	29607		
Proje	ct #	:	1426-	·15-009 (Pha	se 105)					Report I	Date:	4/23/	19
Proje	ct N	lame:	I-85 B	Bridge Over R	Rocky Cre	ek				Test l	Date:	4/22/	19
Client	t Na	ame:	MBI		,								
Client	t Ad	ldress:	Colun	nbia, SC						-			
Borin	g #:	: RV	V-1		Lo	og #:	40g		San	nple Date:		4/11/19	
Samp	le #	ŧ: SS	-1		Т	ype:	Split-sp	oon		Depth:		0 - 2'	
Samp	ole D	Descript	ion:	Sandy LE	AN CLAY	(CL / A-6)						
Туре с	and :	Specifica	tion	S&ME ID)#	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Baland	ce (0.01 g)		13942	2	9/11/2018	Groo	wing tool			23306	3/30	/2019
LL App	para	itus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
Po	an #			T	1		Liquic	l Limit	T	r	4	Plastic Limi	t
				lare #:	1	2	3				4		
A		lare We	eight		26.70	26.47	26.31				25.92		
В		Wet Soi	l 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 V	Veight (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		% Moist	ure (D/E)*100	34.6%	35.9%	38.0%				22.4%		
N		# OF DF	ROPS		29	22	15				Moisture Co	ontents det	ermined by
LL		L	L = F * F,	ACTOR							A	ASHTO T 20	55
Ave			Avera	ge								22.4%	
	4-				9						One Point I	iquid Lim	it
	45.	.0 —								Ν	Factor	Ν	Factor
										20	0.974	26	1.005
Ŧ	40	.0								21	0.979	27	1.009
Iter										22	0.985	28	1.014
Co										23	0.99	30	1.018
re	35.	.0								25	1.000	50	1.022
istu		E									NP, Non-Pl	astic	
Moi	20	_									Liquid L	imit 3	35
8	50.	.•			_						Plastic L	imit 2	22
											Plastic Ir	idex 1	3
	25.	.0 두					+ +			(Group Svn	nbol CL	/A-6
		10	15	5 20	25 30	35 40	# of	Drops	100	N	Aultipoint N	/ethod	✓
										C) ne-point N	lethod	
Wet	Pre	paration		Dry Preparati	ion 🗸	Air Drie	ed 🗸			% Passing t	the #200 Si	eve:	55.9%
Notes	/ De	eviations	/ Refere	nces:						5			
			-										
_													
AASH	то т	⁻ 90: Det	ermining	the Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	R	eniami	n Kova	leski		4/23/19		Gai	nt Taylor	. P.E		4/2	3/19

Technician Name

Date

Technical Responsibility

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			ASTM D	9 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&ME, Inc	: Gre	eenville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	:	1426-15-00	9 (Pha	se 105)					Report [Date:	4/23/	19
Proje	ct N	lame:	I-85 Bridge	Over F	Rocky Cre	ek				Test [Date:	4/22/	19
Client	: Na	ame:	MBI										
Client	: Ad	ldress:	Columbia, S	С						-			
Borin	g #:	: RV	V-1		Lo	og #:	40g		San	nple Date:		4/11/19	
Samp	le #	ŧ: SS	-3		٦	Гуре:	Split-sp	oon		Depth:		4 - 6'	
Samp	le D	Descripti	ion: Sa	ndy SI	LT (ML / /	A-5)							
Туре а	ind .	Specifica	tion S	&ME IE) #	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balanc	e (0.01 g)		13942	2	9/11/2018	Groo	ving tool			23306	3/30	/2019
LL App	oara	tus		23158	3	2/1/2019							
Oven	a a #			13978	3	10/8/2018	Liquia	Lingit			ſ	Diactic Line	+
PO	un #		Та	no #·	5	6	Liquic 7				8		
Δ		Tare We	iaht	nc <i>"</i> .	26.98	27.80	26.29				27.29		
B		Wet Soi	Weight + A		43 37	46.18	44.00				39.88		
		Dry Soil	Weight + Λ		38.80	40.10	38 56				36.01		
		Motor M	Veight (R C)		1 4 9	5 21	5 1 1				2.07		
			Woight (C_A)		11 01	12.07	12.77				0.62		
		Dry Soli			27.69/	10.6%	12.27				3.02		
					37.0%	40.0%	44.3%				30.9%		
N					35	25	18				Moisture Co	ontents det	ermined by
		L	$L = F ^ FACTOR$								A		5
Ave	•		Average							1 4	One Deint I	30.9%	:.
(51	.0 T							—)	N	Factor	Liquia Lim N	Factor
		- F								20	0.974	26	1.005
	40	_ F								21	0.979	27	1.009
tent	40	.0 —	•							22	0.985	28	1.014
on		-								23	0.99	29	1.018
e O	41	.0								24	0.995	30	1.022
stu		-								25	NP. Non-Pl	astic	
Ioi	20					\					Liquid I	imit 4	.1
1 %	30	.0 -									Plastic L	imit 3	1
	•	-									Plastic Ir	ndex 1	10
	31	.0 [C	Group Svn	nbol ML	/A-5
		10	15	20	25 30	35 40	# of	Drops	100	N	1ultipoint N	Vethod	~
										С) ne-point N	/lethod	
Wet	Pre	paration	Dry Pr	eparat	ion 🗸	Air Drie	ed 🗸			% Passing t	he #200 Si	eve:	51.4%
Notes	/De	eviations	/ References:										
AASH	το 1	7 90: Dete	ermining the Pla	astic Lir	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lin	nit of Soils
	R	eniami	n Kovaleski			4/23/19		Gar	nt Taylor	PF		4/2	3/19

Technician Name

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Date

Technical Responsibility

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				AS	TM D 4318		AASHTO	T 89 🛛	× AAS	SHTO T 90	X			
				S&ME	E, Inc Gre	enville	48 Brook	field Oak	ks Dr., Suit	te F Gre	enville, SC	29607		
Proje	ct #:	:	1	426-15	5-009 (Pha	se 105)					Report I	Date:	4/23,	/19
Proje	ct N	lam	e: I	-85 Brid	dge Over R	locky Cre	ek				Test I	Date:	4/22,	/19
Client	t Na	me	: N	/BI										
Client	t Ad	dre	ss: C	Columb	ia, SC						_			
Borin	g #:		RW-1			Lo	og #:	40g		San	nple Date:		4/11/19	9
Samp	ole #	ŧ:	SS-5			7	Гуре:	Split-sp	oon		Depth:		8 - 10'	
Samp	ole D	Desc	ription	:	Sandy LE	AN CLAY	′ (CL / A-4))						
Type o	and S	Spec	ification	ו	S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Baland	ce (l	10.01	g)		22150	2	9/11/2018	Groo	oving tool			23306	3/3	0/2019
Oven	para	tus			13978	> }	10/8/2019							
P	an #				10076	,	10,0,2010	Liquio	d Limit				Plastic Lim	nit
					Tare #:	9	10	11				12		
A		Tare	e Weigh	t		26.83	26.75	26.67				26.65		
В		Wet	Soil W	eight +	A	48.46	45.19	46.01				40.65		
C		Dry	Soil We	eight + /	A	43.84	41.04	41.47				38.21		
D		Wat	er Weig	ht (B-C)	4.62	4.15	4.54				2.44		
E		Dry	Soil We	eight (C-	-A)	17.01	14.29	14.80				11.56		
F		% N	1oisture	(D/E)*1	.00	27.2%	29.0%	30.7%				21.1%		
N		# O	F DROP	S		35	25	16				Moisture C	ontents de	etermined by
LL			LL =	F * FAC	TOR							A,	ASHTO T 2	?65
Ave	2.		1	Average							-		21.1%	
$\left(\right)$	39.	.0 т										One Point I	Liquid Lir	nit Factor
		F									20	0.974	26	1.005
	34	ĥ									21	0.979	27	1.009
tent	54.	Τ									22	0.985	28	1.014
on		E		•							23	0.99	29	1.018
re (29.	.0 +									24	1.000	- 50	1.022
istu		ŀ										NP, Non-Pl	astic	
l₿	24.	.o ‡										Liquid L	imit	29
%												Plastic L	.imit	21
		ļ								\rightarrow		Plastic Ir	ndex	8
	19.	0 10)			+ +	-++			100	(Group Syn	nbol CL	/A-4
				15	20	25 30	35 40	# of	Drops		N	Iultipoint N	/lethod	\checkmark
	_		<u> </u>	_							C	ne-point N	/lethod	
Wet	Prep	para			ory Preparati	on 🗸	Air Drie	ed ∠			% Passing 1	the #200 Si	eve:	55.0%
Notes	<i>/ D</i> e	eviui	IUIIS / N	ejerence	es.									
AASH	то т	90:	Determ	ining th	ne Plastic Lin	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	В	eni	amin k	Covales	ski		4/23/19		Gar	nt Tavlor	, P.E.		4/2	23/19
	-	<u></u>		N			<u>Data</u>		Tochn	ical Docnor	<u>, i i i i i</u>		<u> </u>	

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			ASTM D 4318		AASHTO	T89 🖸	a AAS	нто т 90	X			
			S&ME, Inc Gr	eenville	48 Brook	field Oak	s Dr., Suit	te F Gre	enville, SC	29607		
Proje	ct #	:	1426-15-009 (Pha	ase 105)					Report I	Date:	4/01/	19
Proje	ct N	lame:	I-85 Bridge Over	Rocky Cre	ek				Test I	Date:	3/28/	19
Clien	t Na	ame:	MBI	-								
Clien	t Ad	dress:	Columbia, SC						-			
Borin	g #:	: RV	1-2	Lo	og #:	25g		Sam	nple Date:		Various	
Samp	ole #	≠: SS-	-2	7	Гуре:	Split-spo	oon		Depth:		2 - 4'	
Samp	ole D	Descripti	on: Silty SAI	ND (SM /	A-4)							
Туре о	and S	Specificat	tion S&ME I	D #	Cal Date:	Туре	and Specif	fication	S&	ME ID #	Cal	Date:
Balan	ce (l	0.01 g)	1394	2	9/11/2018	Groo	ving tool			23214	11/13	1/2018
LL Ap	para	itus	2315	8	2/1/2019							
Oven	an #		1397	8	10/8/2018	Liquid	Limit				Plastic Limi	+
,	un "		Tare #:	33	34	35	Linne			36		
A		Tare We	ight	26.68	28.26	26.96				25.64		
В		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		y Water W	/eight (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		9 % Moist	ure (D/E)*100	31.0%	32.5%	35.1%				25.7%		
N		# OF DR	OPS	33	25	17				Moisture Co	ontents det	ermined by
LL		LI	_ = F * FACTOR							AA	ASHTO T 2	55
LL Ave	2.	LI	_ = F * FACTOR Average							AA 	25.7%	55
LL Ave	2		_ = F * FACTOR Average							AA One Point L	25.7% iquid Lim	iit
Ave	2. 43.	.0	= F * FACTOR Average						N	AA One Point L Factor	25.7% iquid Lim	iit Factor
Ave	43.	.0	_ = F * FACTOR Average						N 20	One Point L Factor 0.974	25.7% iquid Lim <u>N</u> 26	it Factor 1.005
Ave	43. 38.	.0	_ = F * FACTOR <i>Average</i>						N 20 21 22	One Point L Factor 0.974 0.979	25.7% iquid Lim 26 27 28	it Factor 1.005 1.009
ntent	43. 38.	.0	_ = F * FACTOR Average						N 20 21 22 23	One Point L Factor 0.974 0.979 0.985 0.99	25.7% iquid Lim 26 27 28 29	it Factor 1.005 1.009 1.014 1.018
Content	43.	.0	_ = F * FACTOR Average						N 20 21 22 23 24	One Point L Factor 0.974 0.979 0.985 0.99 0.995	25.7% iquid Lim N 26 27 28 29 30	it Factor 1.005 1.009 1.014 1.018 1.022
ure Content	43. 38. 33.	.0	_ = F * FACTOR <i>Average</i>						N 20 21 22 23 24 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000	25.7% iquid Lim N 26 27 28 29 30	it Factor 1.005 1.009 1.014 1.018 1.022
oisture Content	43. 38. 33.	.0	_ = F * FACTOR Average						N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl	25.7% iquid Lim N 26 27 28 29 30 astic	it Factor 1.005 1.009 1.014 1.018 1.022 □
Moisture Content	43. 38. 33.	.0	_ = F * FACTOR Average						N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L	25.7% iquid Lim N 26 27 28 29 30 astic imit	it Factor 1.005 1.009 1.014 1.018 1.022
% Moisture Content	43. 38. 33. 28.	.0	_ = F * FACTOR Average						N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L	25.7% iquid Lim 26 27 28 29 30 astic imit	it Factor 1.005 1.009 1.014 1.018 1.022
% Moisture Content	43. 38. 33. 28.	.0	_ = F * FACTOR Average						N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit adex	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7
% Moisture Content	43. 38. 33. 28. 23.		_ = F * FACTOR Average						N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit imit imit adex bol SM	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4
% Moisture Content	43. 38. 33. 28. 23.		_ = F * FACTOR Average	25 30	• • • • • • • • • • • • • • • • • • • •	# of	Drops	100	N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym	ASHTO T 20 25.7% iquid Lim 26 27 28 29 30 astic imit imit imit imit adex bol SM Aethod	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4
% Moisture Content	43. 38. 33. 28. 23.		_ = F * FACTOR Average	25 30	• • • • • • • • • • • • • • • • • • • •			100	N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-PI Liquid L Plastic L Plastic In Group Sym	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit imit idex hbol SM Aethod	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4 \bigtriangledown
Moisture Content	43. 38. 33. 28. 23.	.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	_ = F * FACTOR Average Average 15 20 Dry Preparation	25 30	• • • • • • • • • • • • • • • • • • •	# of	Drops	100	N 20 21 22 23 24 25 (M C % Passing t	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym Aultipoint M One-point M the #200 Sim	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit imit adex bol SM Aethod Aethod	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4 37.5%
% Woisture Content	43. 38. 33. 28. 23. : Pre / De	.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	F * FACTOR Average Image: Image and the second s	25 30	• • • • • • • • • • • • • • • • • • •		Drops	100	N 20 21 22 23 24 25 (((M C % Passing t	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym Aultipoint N One-point N the #200 Sid	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit imit idex hbol SM Aethod Aethod eve:	it Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4 37.5%
Wet Notes	43. 38. 33. 28. 23. : Pre / De	.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	F * FACTOR Average Image: Image and the second s	25 30	• • • • • • • • • • • • • • • • • • •	# of		100	N 20 21 22 23 24 25 ((((((((((((((((((One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym Aultipoint N One-point N the #200 Sin	ASHTO T 20 25.7% iquid Lim N 26 27 28 29 30 astic imit imit adex bol SM Aethod Aethod	iit Factor 1.005 1.009 1.014 1.018 1.022 33 26 7 /A-4 ☑ 37.5%
Weit Notes	43. 38. 33. 28. 23. 23.	.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0	F * FACTOR Average Average 15 20 Dry Prepara / References:	25 30 tion ☑	Air Drie	# of Soils		100	N 20 21 22 23 24 25 ((M C % Passing t	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pl Liquid L Plastic L Plastic In Group Sym Aultipoint M One-point M the #200 Sid	25.7% iquid Lim 26 27 28 29 30 astic imit imit imit imit dex bol SM Aethod Aethod eve: Liquid Lir	it Factor 1.005 1.009 1.014 1.014 1.018 1.022 33 26 7 /A-4 37.5%

<u>Benjamin Kovaleski</u>	<u>4/01/19</u>	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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			ASTM D 4318		AASHTO	T 89 🖸	AAS	SHTO T 90	\mathbf{X}			
			S&ME, Inc Gre	eenville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	<u>+</u> :	1426-15-009 (Pha	se 105)					Report [Date:	4/01/	19
Proje	ct N	lame:	I-85 Bridge Over F	Rocky Cre	ek				Test [Date:	3/28/	19
Clien	t Na	ame:	MBI	-								
Clien	t Ac	dress:	Columbia, SC						_			
Borin	ng #	: RV	V-2	L	og #:	25g		Sam	ple Date:		Various	
Samp	ole ‡	#: SS	-4	-	Гуре:	Split-sp	oon		Depth:		6 - 8'	
Samp	ole [Descript	ion: Silty SAN	ID (SM /	A-2-4)							
Туре о	and	Specifica	tion S&ME II	D #	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Balan	ce (0.01 g)	1394	2	9/11/2018	Groo	oving tool			23214	11/12	L/2018
LL Ap	para	atus	2315	8	2/1/2019							
Oven P	an #	<u>l</u>	1297	0	10/0/2010	Liquid	l Limit				Plastic Limi	t
			Tare #:	37	28	39				40		
A		Tare We	eight	26.19	26.29	25.88				26.27		
В		Wet Soi	l Weight + A	44.70	46.69	46.75				38.90		
C		Dry Soil	Weight + A	40.19	41.53	41.27				36.26		
D	1	Water V	Veight (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		% Moist	cure (D/E)*100	32.2%	33.9%	35.6%				26.4%		
N		# OF DF	ROPS	29	22	15				Moisture C	ontents det	ermined by
LL	-	L	L = F * FACTOR							A	ASHTO T 20	55
Ave	2.		Average								26.4%	
	13	0							(One Point I	Liquid Lim	it
									N	Factor	N	Factor
	_								20	0.974	26	1.005
int	38	.0							21	0.979	27	1.009
nte									23	0.99	29	1.018
Ŭ	33								24	0.995	30	1.022
tur									25	1.000		
lois									I	NP, Non-Pl		
Σ	28	.0								Liquid L	limit	33
<u> </u>										Plastic L	lmit 4	26
	23											1
		10	15 20	25 30	35 40	# -6	Drong	100		Jioup Syn	Aothod	A-2-4
						# 01	Drops			na-point N	Aethod	V
Wet	Pre	paration	Dry Preparat	ion 🔽	Air Drie	d 🗸			6 Passing t	he #200 Si	eve.	30.2%
Notes	:/D	eviations	/ References:		741 0110			,	er ussning t			50.270
_												
AASH	TO	T 90: Det	ermining the Plastic Lii	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	D	onionai	n Kovalacki		1/01/10		Car	st Taylor	DE		1/0	1 /10

<u>Benjamin Kovaleski</u>	4/01/19	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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			A	STM D 4318		AASHTO T	T 89 🖸		SHTO T 90				
			S&N	/IE, Inc Gre	enville	48 Brook	field Oak	s Dr., Su	ite F Gr	eenville, SC	29607		
Projec	:t #	:	1426-2	15-009 (Pha	se 105)					Report [Date:	4/01/	19
Projec	t N	lame:	I-85 Bi	ridge Over R	locky Cre	ek				Test [Date:	3/29/	19
Client	Na	ime:	MBI		-								
Client	Ad	dress:	Colum	ibia, SC						_			
Boring	g #:	RV	V-2		Lo	og #:	25g		Sai	nple Date:		Various	
Samp	le #	t: SS	-7		1	Гуре:	Split-sp	oon		Depth:		18.5 - 20)'
Samp	le D	Descript	ion:	Silty SAN	D (SM /	A-2-5)	• •			•			
Туре а	nd S	Specifica	tion	S&ME ID)#	Cal Date:	Туре	and Spec	cification	S&	ME ID #	Cal	Date:
Balanc	e ((0.01 g)		13942	2	9/11/2018	Groo	oving tool			23214	11/1	1/2018
LL App	ara	tus		23158	3	2/1/2019							
Oven	#			13978	3	10/8/2018	1	11:					:.
Pa	in #			Taro #:	7	Q	Liquic	i Limit			10	Plastic Lim	it
	1	Taro W/c	viaht	I dle #.	7	0 27.21	26.94				26.75		
		Wot Soi	l Woight		20.29	27.31	/1 72				20.75		
		Dry Call	Weight	T A	24.24	40.52	41.72				30.82		
		Dry Soll	weight +	- A	34.34	35.92	50.48				33.79		
		water v	Veignt (B-		3.98	4.40	5.24				3.03		
E		Dry Soll	weight (C-A)	8.05	8.61	9.64				7.04		
F		% Moist	ure (D/E)	*100	49.4%	51.1%	54.4%				43.0%		
N		# OF DF	ROPS		35	28	20				Moisture Co	ontents dei	termined by
LL		L	L = F * FA	ACTOR							A/	ASHTO T 2	65
Ave.			Averag	је						-		43.0%	
\bigcap	62.	.0 т									One Point I	_iquid Lin	nit Faataa
										N	0.974	26	1 005
										20	0.974	20	1.009
ent	57.	.0 +								22	0.985	28	1.014
b te										23	0.99	29	1.018
Ŭ	52	。上								24	0.995	30	1.022
iure	5									25	1.000		_
oist											NP, Non-Pl	astic	
Σ	47.	.0 -									Liquid L	.imit	52
8											Plastic L	.imit 4	43
	40	. F									Plastic Ir	ndex	9
	42.	.0 +	15	20	25 20	25 40			100	(Group Syn	nbol SM/	'A-2-5
		10	15	20	25 30	35 40	# of	Drops	100	N	Iultipoint N	/lethod	\checkmark
										C	ne-point N	/lethod	
Wet	Pre	paration		Dry Preparati	on 🗸	Air Drie	ed _∕			% Passing t	:he #200 Si	eve:	24.7%
Notes ,	/ De	eviations	/ Referen	ices:									
AASHT	07	- 90: Det	erminina	the Plastic Lin	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	minina the	Liquid Lir	nit of Soils
											9	1	,

<u>Benjamin Kovaleski</u>	<u>4/01/19</u>	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			A.	STM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&M	IE, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	:	1426-1	.5-009 (Pha	se 105)					Report I	Date:	4/01/2	19
Proje	ct N	lame:	I-85 Br	idge Over R	Rocky Cre	ek				Test l	Date:	3/29/3	19
Client	: Na	ame:	MBI		,								
Client	: Ad	ldress:	Colum	bia, SC						-			
Borin	g #:	: R-	1		Lo	og #:	25g		San	ple Date:		Various	
Samp	le #	ŧ: SS	-1		Т	уре:	Split-sp	oon		Depth:		0 - 2'	
Samp	le D	Descript	ion:	Sandy LE	AN CLAY	(CL / A-7	-6)						
Туре а	ind :	Specifica	tion	S&ME ID)#	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balanc	:e (0.01 g)		13942	2	9/11/2018	Groc	ving tool			23214	11/11	L/2018
LL App	bara	itus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
Po	an #			Tara #1	11	10	Liquic	l Limit			14	Plastic Limi	t
		Tere \4/e	:	Tare #:	20.00	12	13				14 20.05		
A		Tare we	light		26.66	26.64	26.77				20.05		
В		Wet Soi	Weight +	r A	44.16	42.48	44.11				37.54		
C		Dry Soil	Weight +	A	38.98	37.57	38.54				35.54		
D		Water V	/eight (B-0	C)	5.18	4.91	5.57				2.00		
E		Dry Soil	Weight (C	2-A)	12.32	10.93	11.77				8.89		
F		% Moist	ure (D/E)*	100	42.0%	44.9%	47.3%				22.5%		
Ν		# OF DF	ROPS		35	25	17				Moisture Co	ontents det	ermined by
LL		L	L = F * FA	CTOR							A	ASHTO T 20	55
Ave	•		Averag	е								22.5%	
					9						One Point I	iquid Lim	it
	55.	.0 F								Ν	Factor	Ν	Factor
										20	0.974	26	1.005
Ę	50.	.0								21	0.979	27	1.009
nter										22	0.985	28	1.014
Ğ				\sim						23	0.995	30	1.010
Ire	45.	.0								25	1.000		
istu											NP, Non-Pl	astic	
Ň	40										Liquid L	imit 4	5
%											Plastic L	imit 2	23
											Plastic Ir	idex 2	2
	35.	.0 –					+ +			(Group Syn	nbol CL//	A-7-6
		10	15	20	25 30	35 40	# of	Drops	100	N	Aultipoint N	/lethod	~
							I	<u> </u>		C	, Dne-point N	/lethod	
Wet	Pre	paration		Dry Preparati	ion 🗸	Air Drie	ed 🗸			% Passing 1	the #200 Si	eve:	51.0%
Notes	/ De	eviations	/ Referen	ces:									
_													
AASH	го т	90: Det	ermining t	he Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lin	nit of Soils
	R	eniami	n Kovale	eski		4/01/19		Gar	nt Taylor	. P.E.		4/0	1/19

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Technician Name

Date

Technical Responsibility

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D 4318		AASHTO	T 89 🛛	X AASI	нто т 90	\boxtimes			
			9	S&ME, Inc Gre	eenville	48 Brook	field Oal	ks Dr., Suit	e F Gre	enville, SC	29607		
Proje	ct #	•	14	26-15-009 (Pha	se 105)					Report [Date:	4/01,	/19
Proje	ct N	ame	: I-8	5 Bridge Over F	Rocky Cre	ek				Test [Date:	3/29,	/19
Client	t Na	me:	M	3I									
Client	t Ad	dres	s: Co	lumbia, SC						_			
Borin	g #:		R-1		Lo	og #:	25g		Sam	ple Date:		Various	5
Samp	ole #	:	SS-2		Т	уре:	Split-sp	oon		Depth:		2 - 4'	
Samp	ole D)escr	iption:	Sandy EL	ASTIC SIL	_T (MH / A	A-5)						
Туре о	and S	Speci	fication	S&ME IE) #	Cal Date:	Туре	e and Specif	fication	S&	ME ID #	Cal	Date:
Baland	ce ((0.01 g	g)	13942	2	9/11/2018	Groo	oving tool			23214	11/1	.1/2018
LL Apparatus 2315 Oven 1397					3	2/1/2019							
Oven P	an #			13978	5	10/8/2018	Liqui	d Limit				Plastic Lin	nit
, ,	un "			Tare #:	15	16	17				18		
A		Tare	Weight		27.58	26.57	26.64				26.77		
В	A Tare Weight B Wet Soil Weight + A				44.49	43.67	43.78				36.91		
С	B Wet Soil Weight + A C Dry Soil Weight + A				38.71	37.62	37.59				33.77		
D		Wate	er Weigh	t (B-C)	5.78	6.05	6.19				3.14		
E		Dry S	Soil Weig	ht (C-A)	11.13	11.05	10.95				7.00		
F		, % M	oisture (I	D/E)*100	51.9%	54.8%	56.5%				44.9%		
N		# OF			34	23	19				Moisture Co	ontents de	termined by
11		-	LL = F	* FACTOR			-				A	ASHTO T 2	265
Ave	2.		Av	rerage		<u> </u>		<u> </u>		<u> </u>		44.9%	
7		_		5						(One Point I	_iquid Lir	nit
	64.	۰F								Ν	Factor	Ν	Factor
		F							_	20	0.974	26	1.005
r I	59.	.0 -								21	0.979	27	1.009
nte		F								23	0.99	20	1.018
Ů	54	۰E							_	24	0.995	30	1.022
ture	54.	ľ							_	25	1.000		
oist		E								1	NP, Non-Pl	astic	
N N N	49.	0 +									Liquid L	.imit	54
<u> </u>		ŀ									Plastic L	.imit	45
	44	٥È								(9 J/A E
		10		15 20	25 30	35 40	# of	Drong	100		Jultinoint N	Aethod	1/A-5
							# 01	Drops		IV C	ne-noint N	/lethod	
Wet	Prei	narat	ion 🗆	Dry Preparati	ion 🗸	Air Drie	v be			6 Passing t	he #200 Si	eve.	51.4%
Notes	/ De	eviati	ons / Ref	erences:		7.11 0110			,	o russing (51.170
AASH	TO T	90: 1	Determin	ing the Plastic Lir	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	В	enia	min Ko	valeski		4/01/19		Gan	t Tavlor	. P.E.		4/()1/19
		2	,			<u>Data</u>		Tochni	ical Pornon	cibility		<u>.,,</u>	<u></u>

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			ASTM D 4318		AASHTO	T 89 🖸	a AAS	нто т 90	X			
			S&ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Suit	te F Gre	enville, SO	29607		
Proje	ct #:	:	1426-15-009 (Pha	se 105)					Report I	Date:	4/01/2	19
Proje	ct Na	ime: 1	I-85 Bridge Over F	Rocky Cre	ek				Test I	Date:	3/29/2	19
Client	t Nan	ne:	MBI	-								
Client	t Add	lress:	Columbia, SC						-			
Borin	g #:	R-1		Lo	og #:	25g		Sam	ple Date:	:	Various	
Samp	ole #:	SS-4		٦	Гуре:	Split-spo	oon		Depth:	:	6 - 8'	
Samp	ole De	escriptior	n: Sandy SI	LT (ML / /	A-5)							
Туре с	and Sp	pecificatio	n S&ME IL) #	Cal Date:	Туре	and Speci	fication	S8	xME ID #	Cal	Date:
Baland	ce (0.	01 g)	13942	2	9/11/2018	Groo	ving tool			23214	11/11	/2018
LL Ap	paratu	JS	23158	3	2/1/2019							
Oven	an #		13978	3	10/8/2018	Liquic	Limit				Plastic Limi	t
	un "		Tare #:	19	20	21	Linne			22		
A	Т	are Weigl	nt	26.68	26.82	28.07				25.67		
В	W	Vet Soil W	/eight + A	42.44	46.78	45.53				36.16		
C	D	Dry Soil W	eight + A	37.80	40.71	40.04				33.45		
D	V	y Vater Wei	ght (B-C)	4.64	6.07	5.49				2.71		
E	D	Dry Soil W	eight (C-A)	11.12	13.89	11.97				7.78		
F	%	6 Moisture	e (D/E)*100	41.7%	43.7%	45.9%				34.8%		
N	#		PS	35	22	15				Moisture Co	ontents det	ermined by
LL		LL =	F * FACTOR							AA	ASHTO T 26	55
Ave			Averaae					1			34.8%	
										One Point L	iquid Lim.	ıt
	53.0	Ī							N	One Point L Factor	iquid Lim. N	Factor
$\left[\right]$	53.0							\square	N 20	One Point L Factor 0.974	iquid Lim N 26	It Factor 1.005
	53.0 48.0								N 20 21 22	One Point L Factor 0.974 0.979	iquid Lim N 26 27 28	Factor 1.005 1.009
ntent	53.0 48.0								N 20 21 22 23	One Point L Factor 0.974 0.979 0.985 0.99	iquid Lim N 26 27 28 29	Factor 1.005 1.009 1.014 1.018
Content	53.0 48.0								N 20 21 22 23 24	One Point L Factor 0.974 0.979 0.985 0.99 0.995	iquid Lim N 26 27 28 29 30	Factor 1.005 1.009 1.014 1.018 1.022
ure Content	53.0 48.0 43.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000	iquid Lim N 26 27 28 29 30	Factor 1.005 1.009 1.014 1.018 1.022
oisture Content	53.0 48.0 43.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla	iquid Lim 26 27 28 29 30 astic	Factor 1.005 1.009 1.014 1.018 1.022
Moisture Content	53.0 48.0 43.0 38.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L	iquid Lim N 26 27 28 29 30 astic imit 4	Factor 1.005 1.009 1.014 1.018 1.022
% Moisture Content	53.0 48.0 43.0 38.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Place Liquid L Plastic L	iquid Lim 26 27 28 29 30 astic imit 4 imit 3	Factor 1.005 1.009 1.014 1.018 1.022 □ 3 5
% Moisture Content	53.0 48.0 43.0 38.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-PL Liquid L Plastic L Plastic In	iquid Lim N 26 27 28 29 30 astic imit 4 imit 3 idex	Factor 1.005 1.009 1.014 1.018 1.022 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
% Moisture Content	53.0 48.0 43.0 38.0 33.0								N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym	iquid Lim N 26 27 28 29 30 astic imit 4 imit 3 idex 3 abol ML	Factor 1.005 1.009 1.014 1.018 1.022
% Moisture Content	53.0 48.0 43.0 38.0 33.0	10	15 20	25 30	35 40	# of	Drops		N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M	iquid Lim N 26 27 28 29 30 astic imit 4	Factor 1.005 1.009 1.014 1.018 1.022
% Moisture Content	53.0 48.0 43.0 38.0 33.0	10		25 30	35 40	# of	Drops	100	N 20 21 22 23 24 25	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M Dne-point M	iquid Lim N 26 27 28 29 30 astic imit 4 imit 3 idex 4 imit 3 idex 4 idex	Factor 1.005 1.009 1.014 1.018 1.022
Met	53.0 48.0 43.0 38.0 33.0	10	15 20	25 30	35 40		Drops	100	N 20 21 22 23 24 25 0 0 0 0 0 0 0 0 0 0 0 0 0	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M Dne-point M the #200 Sid	iquid Lim N 26 27 28 29 30 astic imit 4	Factor 1.005 1.009 1.014 1.018 1.022
% Woisture Content	53.0 48.0 43.0 38.0 33.0 : Prepa / Dev	10	15 20	25 30	35 40	# of	Drops	100	N 20 21 22 23 24 25 (M C % Passing 1	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M Dne-point M the #200 Sid	iquid Lim N 26 27 28 29 30 astic imit 4 imit 4 imit 4 idex 1 thod 1 thod 4 4 thod 14 thod 4 thod 4 thod 4 thod	rt Factor 1.005 1.009 1.014 1.018 1.022 ■ 3 5 8 /A-5 ■ 51.7%
% Woisture Content	53.0 48.0 43.0 38.0 33.0	10	15 20	25 30	35 40 Air Drie		Drops	100	N 20 21 22 23 24 25 0 0 0 0 0 0 0 0 0 0 0 0 0	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M Dne-point M the #200 Sid	iquid Lim N 26 27 28 29 30 astic imit 4 1 imit 4 i 4 imit 4 imit 4 imit 4 imit 4 imit 4 imit 4	Factor 1.005 1.009 1.014 1.018 1.022
% Woisture Content	53.0 48.0 43.0 38.0 33.0 : Prepa / Dev	10	15 20	25 30	35 40 Air Drie	# of Soils	Drops	100	N 20 21 22 23 24 25 (M C % Passing 1 7 89: Deter	One Point L Factor 0.974 0.979 0.985 0.99 0.995 1.000 NP, Non-Pla Liquid L Plastic L Plastic In Group Sym Aultipoint M Dne-point M the #200 Sid	iquid Lim N 26 27 28 29 30 astic imit 4 imit 3 dex 4 tethod 4 tethod eve: Liquid Lin	It Factor 1.005 1.009 1.014 1.018 1.022 ■ 3 5 8 /A-5 ■ 51.7%

<u>Benjamin Kovaleski</u>	<u>4/01/19</u>	<u>Gant Taylor, P.E.</u>	<u>4/01/19</u>
Technician Name	Date	Technical Responsibility	Date
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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			AS	TM D 4318		AASHTO	T89 🖸	a AAS	SHTO T 90	\mathbf{X}			
			S&ME	E, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ect #	:	1426-15	5-009 (Pha	se 105)					Report I	Date:	4/01/	19
Proje	ct N	lame:	I-85 Brid	dge Over R	Rocky Cre	ek				Test I	Date:	3/29/	19
Clien	t Na	ame:	MBI										
Clien	t Ad	ldress:	Columb	ia, SC						_			
Borin	ng #:	: R-	2		Lo	og #:	25g		San	nple Date:		Various	
Samp	ole #	ŧ: SS	-1		٦	Гуре:	Split-spo	oon		Depth:		0 - 2'	
Samp	ole D	Descript	ion:	Silty SAN	ID (SM / J	A-7-5)							
Туре о	and :	Specifica	tion	S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Balan	ce (0.01 g)		13942	2	9/11/2018	Groo	ving tool			23214	11/12	L/2018
LL Ap	para	itus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
P	°an #			Tara #1	22	24	Liquic	Limit			26	Plastic Limi	t
		Tere \4/e	: la 4	Tare #.	25	24	25				20		
A		Tare we	ignt	•	27.25	25.99	26.79				27.33		
В		Wet Soi	Weight +	A	47.41	45.58	44.28			-	39.71		
C		Dry Soil	Weight + /	Ą	41.60	39.75	38.65				36.75		
D)	Water V	/eight (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		% Moist	ure (D/E)*1	.00	40.5%	42.4%	47.5%				31.4%		
Ν		# OF DF	OPS		35	27	15				Moisture C	ontents det	ermined by
LL	-	L	L = F * FAC	TOR							A	ASHTO T 20	<u>55</u>
Ave	2.		Average									31.4%	
					9					(One Point I	Liquid Lim	it
	53.	.0 F								Ν	Factor	Ν	Factor
										20	0.974	26	1.005
۲.	48.	.0								21	0.979	27	1.009
Iter										22	0.985	28	1.014
G		<u> </u>								23	0.99	30	1.018
re	43.	.0								25	1.000	50	1.022
istu											NP, Non-Pl	astic	
Mo	20										Liquid L	.imit 4	13
%	50.	.•			_						Plastic L	imit	31
	Г	-									Plastic Ir	ndex 1	12
	33.	.0 [(Group Svn	nbol SM/	A-7-5
		10	15	20	25 30	35 40	# of	Drops	100	N	Aultipoint N	Nethod	~
										C)ne-point N	/lethod	
Wet	t Pre	paration		rv Preparati	ion 🔽	Air Drie	ed 🗸			~ % Passing t	he #200 Si	eve:	46.5%
Notes	/De	eviations	/ Reference	es:						<u></u>			
AASH	то т	7 90: Det	ermining th	ne Plastic Lin	nit & Plasi	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils
	В	eniami	n Kovale	ski		4/01/19		Gar	nt Tavlor	, P.E.		4/0	1/19

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Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			AS	STM D 4318		AASHTO	T 89 🖸	a AAS	нто т 90	X			
			S&M	E, Inc Gre	enville	48 Brook	field Oak	s Dr., Suit	te F Gree	enville, SC	29607		
Proje	ct #	:	1426-1	5-009 (Pha	se 105)					Report [Date:	4/03/2	19
Proje	ct N	lame:	I-85 Bri	dge Over R	ocky Cre	ek				Test I	Date:	4/02/2	19
Client	t Na	me:	MBI		,								
Client	t Ad	ldress:	Colum	oia, SC						-			
Borin	g #:	: R-	2		Lo	og #:	25g		Sam	ple Date:		Various	
Samp	ole #	t: SS	-3		Т	ype:	Split-spo	oon		Depth:		4 - 6'	
Samp	ole D	Descript	ion:	Sandy LE	AN CLAY	(CL / A-6))			•			
Туре с	and :	Specifica	tion	S&ME ID)#	Cal Date:	Туре	and Speci	fication	S&	ME ID #	Cal I	Date:
Baland	ce (0.01 g)		13942		9/11/2018	Groo	ving tool			23306	3/30,	/2019
LL Apparatus 23					5	2/1/2019							
Oven				13978	8	10/8/2018						DI	
P	an #			Tara #:	F	6	Liquic	Limit		1	0	Plastic Limi	t
		To \A/a	:	Tare #:	20.05	0	/				8 27.20		
	A Tare Weight B Wet Soil Weight + A				20.95	27.82	20.79				27.30		
В	B Wet Soil Weight + A				42.44	44.96	45.38				37.51		
<u> </u>	C Dry Soil Weight + A				38.35	40.32	40.01				35.64		
D		Water V	Veight (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		% Moist	ure (D/E)*	100	35.9%	37.1%	40.6%				22.4%		
N		# OF DF	ROPS		32	25	15				Moisture C	ontents det	ermined by
LL		L	L = F * FAG	CTOR							A	ASHTO T 26	55
Ave	2.		Average	2								22.4%	
	47	.0 -								(One Point I	Liquid Lim	it
										N 20	Factor	N	Factor
										20	0.974	26	1.005
nt	42.	.0								21	0.985	28	1.005
nte										23	0.99	29	1.018
ů	27	_ [—								24	0.995	30	1.022
nre	57.	.º F								25	1.000		
oist										l	NP, Non-P	astic	
Σ	32.	.0 📮									Liquid L	imit 3	57
%											Plastic L	.imit 2	2
											Plastic Ir	ndex 1	.5
	27.	.0 +			+ +					(Group Syn	nbol CL/	'A-6
		10	15	20	25 30	35 40	# of	Drops	100	N	1ultipoint N	Nethod	\checkmark
										C	ne-point N	lethod	
Wet	Pre	paration		Dry Preparati	on 🗸	Air Drie	ed 🗸		9	6 Passing t	:he #200 Si	eve:	59.1%
Notes	/ De	eviations	/ Referenc	:es:									
AACU!	TO 7		orminic - 1	ha Dlast's L'	ait Q. DI	ic Indo f	Soils		AACUTO		mining the	liquid 1:	ait of Calle
AASH	101	90. Det	ermining ti	ie riustic Lin	$m \propto Plast$	ic muex of	20115		ΑΑΣΠΙΟΙ	og. Deter	munung the	<i>Liquia</i> Lin	111 01 20115
	B	enjami	n Kovale	<u>ski</u>		<u>4/03/19</u>		<u>Gan</u>	nt Taylor,	P.E.		4/0	<u>3/19</u>

Technician Name

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			ASTM L	D 4318		AASHTO	T 89 🖸		SHTO T 90				
			S&ME, In	c Gre	enville	48 Brook	field Oak	s Dr., Sui	ite F Gre	enville, SC	29607		
Proje	ct #	:	1426-15-00	9 (Pha	se 105)					Report I	Date:	4/03/	19
Proje	ct N	lame:	I-85 Bridge	Over F	Rocky Cre	ek				Test I	Date:	4/02/	19
Client	: Na	ime:	MBI		,								
Client	: Ad	ldress:	Columbia, S	SC						-			
Borin	g #:	: R-2	2		Lo	og #:	25g		Sar	nple Date:		Various	
Samp	le #	t: SS-	-4		1	Type:	Split-sp	oon		Depth:		6 - 8'	
Samp	le D	Descripti	on: LE	AN CL	AY with S	and (CL /	A-6)			•			
Туре а	ind :	Specificat	tion S	S&ME IE) #	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balanc	:e (0.01 g)		13942	2	9/11/2018	Groc	oving tool			23306	3/30	/2019
LL App	bara	tus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018	1	11:					±
PC	an #		т	aro #·	9	10	LIQUIC	i Limit	1	1	12	Plastic Limi	t
		Taro Wo	iaht	are π .	26.84	26.74	26.66				26.65		
		Wet Soil	Weight $\pm \Delta$		/3.26	20.74 /3.50	13.66				20.05		
		Dry Soil			20.05	20.05	20.00				26.50		
		Dry Soli	Velgiit + A		30.0J	30.0J	1 20				2 21		
			Woight (C A)		4.41	4.05	4.09				2.51		
			Weight (C-A)		12.01	12.11	12.11				9.00		
		% IVIOIST	ure (D/E)*100		36.7%	38.4%	40.4%				23.5%		
N		# OF DR			33	22	15				Moisture Co	ontents det	ermined by
		LI	_ = F * FACTOR	(A	43HTUT 20	00
Ave.	•		Average							1		23.5%	•.
	48.	.0 т		-					—)		Eactor	Liquia Lim	Eactor
										20	0.974	26	1.005
										21	0.979	27	1.009
tent	43.	.0 —								22	0.985	28	1.014
ont										23	0.99	29	1.018
e O	38.	.0								24	0.995	30	1.022
stui						•					NP Non-Pl	astic	
loi		. 듣									Liquid I	imit 3	18
₩ ₩	33.	.0 1									Plastic I	imit 2	24
											Plastic Ir	ndex 1	4
	28.	.0 🖾		_						(Group Svn	nbol CL	/A-6
		10	15	20	25 30	35 40	# of	Drops	100	N	1ultipoint N	/lethod	✓
										С) ne-point N	/lethod	
Wet	Pre	paration	Dry P	reparat	ion 🗸	Air Drie	ed 🗸			% Passing t	he #200 Si	eve:	71.0%
Notes	/ De	eviations	/ References:										
AASHT	101	90: Dete	ermining the Pl	astic Lir	nit & Plasi	tic Index of	Soils		AASHTO	I 89: Deter	mining the	Liquid Lir	nıt of Soils
	В	eniami	n Kovaleski			4/03/19		Gai	nt Taylor	. P.E.		4/0	3/19

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&	ME, Inc Gre	eenville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #	:	1426	-15-009 (Pha	se 105)					Report I	Date:	4/03/	19
Proje	ct N	lame:	I-85	Bridge Over F	Rocky Cre	ek				Test I	Date:	4/02/	19
Client	t Na	ime:	MBI										
Client	t Ad	dress:	Colu	mbia, SC						-			
Borin	g #:	R	-2		Lo	og #:	25g		San	nple Date:		Various	
Samp	ole #	t: 59	5-5		٦	Гуре:	Split-sp	oon		Depth:		8 - 10'	
Samp	ole D	Descrip	tion:	Silty, Cla	yey SAND) (SC-SM /	/ A-4)			•			
Туре с	and S	Specific	ation	S&ME II	D #	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Baland	ce (l	0.01 g)		13942	2	9/11/2018	Groo	oving tool			23306	3/30	/2019
LL Ap	para	tus		23158	8	2/1/2019							
Oven				13978	8	10/8/2018							
P	an #			Tara #	12	14		l Limit			16	Plastic Lim	t
		Tara \A/	aiaht	Tare #.	26.77	26.65	27.50				26 59		
A		Tare w	eignt	1	26.77	20.05	27.59				20.58		
В		wet So	li weigh	t + A	46.61	48.29	41.51				37.84		
C		Dry Soi	I Weight	. + A	42.72	43.91	38.57				36.13		-
D		Water	Neight (l	в-С)	3.89	4.38	2.94				1.71		
E		Dry Soi	l Weight	; (C-A)	15.95	17.26	10.98				9.55		
F		% Mois	ture (D/I	E)*100	24.4%	25.4%	26.8%				17.9%		
N		# OF D	ROPS		30	24	18				Moisture Co	ontents det	ermined by
LL			_L = F * F	ACTOR							A	ASHTO T 2	55
Ave	2.		Aver	age								17.9%	
	35	0								(One Point I	_iquid Lim	it
	55.									N	Factor	N	Factor
	_	-								20	0.974	26	1.005
r	30.	.0		<u>├──</u>						21	0.979	27	1.009
nte		-								23	0.99	20	1.018
Ů										24	0.995	30	1.022
ure	25.	.0 +								25	1.000		-
ist											NP, Non-Pl	astic	
Ĕ	20.	.0 📛									Liquid L	imit 🛛	25
%											Plastic L	imit 1	L8
											Plastic Ir	ndex	7
	15.	.0		 	- - 					(Group Syn	nbol <mark>sc-s</mark>	M/A-4
		10	1	.5 20	25 30	35 40	# of	Drops	100	N	1ultipoint N	/lethod	\checkmark
							۰ <u>ـــــ</u>			C	ne-point N	/lethod	
Wet	Pre	paratio	ו 🗌	Dry Preparat	ion 🗸	Air Drie	ed 🗸		(% Passing t	:he #200 Si	eve:	35.9%
Notes	/ De	eviation	s / Refere	ences:									
AASH	ΓΟ Τ	90: De	terminin	g the Plastic Lir	nit & Plas	tıc Index of	Soils		AASHTO	1 89: Deter	mining the	Liquid Lir	nit of Soils
	R	eniam	in Kova	aleski		4/03/19		Gai	nt Taylor	PF		4/0	3/19

Technician Name

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				AS	TM D 4318		AASHTO	T 89 🛛	🗵 AAS	нто т 90	\boxtimes			
				S&MI	E, Inc Gre	enville	48 Brook	field Oal	ks Dr., Suit	te F Gre	enville, SC	29607		
Proje	ct #:	•	1	.426-15	5-009 (Pha	se 105)					Report [Date:	4/03/	/19
Proje	ct N	ame	e: I	-85 Brie	dge Over R	locky Cre	ek				Test [Date:	4/02/	/19
Client	t Na	me:	N	ИBI										
Client	t Ad	dre	ss: C	Columb	oia, SC									
Borin	g #:		R-3			Lo	og #:	25g		Sam	ple Date:		Various	
Samp	ole #	:	SS-2			Т	уре:	Split-sp	oon		Depth:		2 - 4'	
Samp	ole D)esc	ription	:	Clayey S/	AND (SC ,	/ A-6)							
Туре о	and S	Spec	ificatior	ו	S&ME IC)#	Cal Date:	Туре	e and Speci	fication	S&	ME ID #	Cal	Date:
Balance (0.01 g) 139					13942	2	9/11/2018	Groo	oving tool			23306	3/30)/2019
LL Apparatus 231 Oven 139				23158	3	2/1/2019								
Oven 1397					13978	5	10/8/2018	Liqui	d Limit				Plastic Lim	nit
,	un "				Tare #:	17	18	19				20		
A	A Tare Weight					26.65	26.79	26.68				26.82		
В	A Tare Weight B Wet Soil Weight + A			A	44.11	42.63	43.56				39.22			
С	BWet Soil Weight + ACDry Soil Weight + A				A	39.73	38.48	38.90				37.04		
D	C Dry Soil Weight + A D Water Weight (B-C)				.)	4.38	4.15	4.66				2.18		
F		Drv	Soil We	eiaht (C-	, -A)	13.08	11.69	12.22				10.22		
F		, % N	1oisture	(D/E)*1	, LOO	33.5%	35.5%	38.1%				21.3%		
N		# O	F DROP	'S		31	22	15				Moisture Cu	ontents de	termined by
			LL =	F * FAC	TOR							A	ASHTO T 2	265
Ave	2			Averaae									21.3%	
		_		9 -							(One Point I	Liquid Lin	nit
	45.	°Ŧ									N	Factor	N	Factor
		F									20	0.974	26	1.005
t	40.	0 +									21	0.979	27	1.009
nte		F									22	0.985	28	1.014
ပိ	25	Ē									24	0.995	30	1.022
ure	35.	Ϋ́F									25	1.000		
oist		F								_	1	NP, Non-Pl	astic	
Σ	30.	0 [_		Liquid L	.imit	35
~		F										Plastic L	imit	21
	25	۰Ē										Plastic Ir	idex	14
	25.	.0 + 10)	15	20	25 30	35 40			100		sroup Syn		<u>/A-6</u>
				10	20	25 50	55 40	# of	Drops		IV C	iuitipoint N	/lethod	
Wet	Drop	nara	tion [)ru Proparati	on 🗸	Air Drig	d I			C Bassing t	he #200 Si		19 5%
Notes	Notes / Deviations / References:													
	, 20	, rur		ejerene										
AASH	то т	90:	Determ	nining th	ne Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	В	<u>enia</u>	amin k	<u>Kov</u> ale:	<u>ski</u>		<u>4/03</u> /19		Gan	<u>nt Taylor</u>	. P.E.		4/0)3/19
Benjamin Kovaleski Technician Name							Date		Techn	ical Respon	sibility		Ľ)ate

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			ASTM	D 4318		AASHTO	T 89 🖸		SHTO T 90				
			S&ME, In	c Gre	enville	48 Brook	field Oak	s Dr., Sui	te F Gre	enville, SC	29607		
Proie	ct #	:	1426-15-00)9 (Pha	se 105)					Report [Date:	4/03/	19
Proie	ct N	lame:	I-85 Bridae	Över F	, Rockv Cre	ek				Test [Date:	4/02/	19
Client	t Na	ame.	MBI									., , .	
Client	t Ad	ldress:	Columbia.	SC						-			
Borin	a #:	R-3	3		L	oa #:	25a		Sar	nple Date:		Various	
Samr	9) e #	±· 55-	-4			rvne [.]	Split-sp	oon	•	Depth:		6 - 8'	
Samp	ole D	Descripti	on: Sa	andv SI	LT (ML /	A-7-5)	opiit op			Deptil		0 0	
Туре с	and .	Specifica	tion .	s&ME IE) #	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Baland	ce (0.01 g)		13942	2	9/11/2018	Groo	oving tool			23306	3/30	/2019
LL Ap	para	itus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
P	an #		-		21		Liquic	d Limit	1		24	Plastic Limi	t
-		T 147	·	are #:	21	22	23				24		
A		Tare we			28.09	25.67	27.24				25.98		
B		wet Soli	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 W	/eight (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		% Moist	ure (D/E)*100		38.1%	40.8%	46.6%				31.6%		
N		# OF DR	OPS		35	28	20				Moisture C	ontents det	ermined by
LL		LI	_ = F * Factor	۲							A,	ASHTO T 20	<u>55</u>
Ave	2.		Average									31.6%	
	53	.0 -			_						One Point I	Liquid Lim	it
										N	Factor	N	1 OOF
										20	0.974	20	1.005
b t	48	.0 +								21	0.985	28	1.005
nte				\mathbf{N}						23	0.99	29	1.018
Ů	12									24	0.995	30	1.022
ure		.•							-	25	1.000		
oist											NP, Non-Pl	lastic	
ž	38	.0									Liquid L	imit 2	13
8											Plastic L	imit	32
											Plastic Ir	ndex 1	1
	33.	.0 +								(Group Syn	nbol ML/	A-7-5
		10	15	20	25 30	35 40	# of	Drops	100	N	Aultipoint N	Nethod	\checkmark
										C	ne-point N	lethod	
Wet	Pre	paration	Dry P	reparati	ion 🗸	Air Drie	ed ✓			% Passing t	the #200 Si	eve:	50.3%
Notes	/ De	eviations	/ References:										
AASH	тот	T 90: Dete	erminina the Pl	lastic I ir	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	minina the	Liquid Lir	nit of Soils
	5 1							-					
	R	eniami	n Kovaleski			4/03/19		Gar	nt Tavloi	r P F		4/0	3/19

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				ASTM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&	ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	ite F Gre	enville, SC	29607		
Proje	ct #	:	1426	-15-009 (Pha	se 105)					Report I	Date:	4/24/	19
Proje	ct N	lame:	I-85 E	Bridge Over R	Rocky Cre	ek				Test l	Date:	4/23/	19
Client	t Na	ime:	MBI										
Client	t Ad	dress:	Colur	nbia, SC						-			
Borin	g #:	R-	4		Lo	og #:	40g		San	nple Date:		4/11/19	
Samp	le #	t: SS	-1		Т	ype:	Split-sp	oon		Depth:		0 - 2'	
Samp	ole D	Descript	ion:	Silty, Clay	ey SAND	O(SC-SM)	/ A-2-4)						
Туре с	and :	Specifica	tion	S&ME IE)#	Cal Date:	Туре	and Spec	ification	S8	ME ID #	Cal	Date:
Baland	ce (0.01 g)		13942	2	9/11/2018	Groo	ving tool			23306	3/30	/2019
LL Ap	para	tus		23158	3	2/1/2019							
Oven				13978	3	10/8/2018							
P	an #			Taro #:	1	2	Liquic	i Limit	1	1	1	Plastic Lim	t
		Taro W/	vight	Tale #.	26.70	26.47	26.21				4 25.01		
		Mot Soi	l Woight	- I A	20.70 19.77	47.26	20.31 45.20				20.65		
			Weight	. + A	40.77	47.50	43.39				39.03		
		Dry Soli	veight	+ A	45.52	45.90	42.24				57.00		
		vvater v		(C A)	3.45	3.38	3.15				1.79		
E		Dry Soil	Weight	(C-A)	18.62	17.51	15.93				11.95		
F		% Moist	ture (D/E	:)*100	18.5%	19.3%	19.8%				15.0%		
N		# OF DF	ROPS		35	25	19				Moisture Co	ontents det	ermined by
LL		L	L = F * F	ACTOR							A/	ASHTO T 2	<u>55</u>
Ave			Avera	ige								15.0%	
	30.	.0 _									One Point I	_iquid Lim	it
										N	Factor	<u>N</u>	Factor
										20	0.974	20	1.005
b t	25.	.0								22	0.985	28	1.005
nte		<u> </u>								23	0.99	29	1.018
ů	20	<u>_</u>				_				24	0.995	30	1.022
ure	20.	•								25	1.000		
oist											NP, Non-Pl	astic	
Σ	15.	.0 두									Liquid L	imit 1	19
%											Plastic L	imit 1	L 5
											Plastic Ir	ndex	4
	10	.0 1								(Group Syn	nbol sc-sm	Л/А-2-4
		10	1	5 20	25 30	35 40	# of	Drops	100	N	/lultipoint N	/lethod	\checkmark
										C	Dne-point N	/lethod	
Wet	Pre	paration		Dry Preparati	ion 🗸	Air Drie	ed 🗸			% Passing t	the #200 Si	eve:	34.3%
Notes	/ De	eviations	/ Refere	nces:									
						. , , -	<u> </u>			T 00 T			
AASH	101	90: Det	ermining	the Plastic Lin	nıt & Plast	tic Index of	Soils		AASHTO	1 89: Deter	mining the	Liquid Lir	nıt of Soils
	В	eniami	n Kova	leski		4/24/19		Gai	nt Taylor	P.E.		4/2	4/19

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				AS	TM D 4318		AASHTO	T 89 🛛	a AAS	SHTO T 90	\mathbf{X}			
				S&ME	E, Inc Gre	enville	48 Brook	field Oak	ks Dr., Sui	te F Gre	enville, SC	29607		
Proje	ct #:	:	1	426-15	5-009 (Pha	se 105)					Report [Date:	4/24/	/19
Proje	ct N	ame	e: I·	-85 Brid	dge Over R	locky Cre	ek				Test [Date:	4/23/	/19
Client	t Na	me:	Ν	/IBI										
Client	t Ad	dres	ss: C	Columb	oia, SC						-			
Borin	g #:		R-4			Lo	og #:	40g		San	nple Date:		4/11/19	}
Samp	le #	:	SS-3			Т	Гуре:	Split-sp	oon		Depth:		4 - 6'	
Samp	le D)esc	ription		Silty SAN	D (SM / /	A-4)							
Туре а	and S	Spec	ification	1	S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Balanc	ce (C).01	g)		13942	2	9/11/2018	Groo	oving tool			23306	3/30)/2019
LL App	bara	tus			23158	2	2/1/2019							
Po	an #				15570	,	10/0/2010	Liquio	d Limit				Plastic Lim	nit
					Tare #:	5	6	7				8		
Α	·	Tare	e Weigh	t		26.96	27.79	26.29				27.29		
В	1	Wet	Soil We	eight +	А	44.90	44.38	44.26				41.59		
C		Dry	Soil We	ight + /	A	40.19	39.77	38.96				38.22		
D	,	Wat	er Weig	Jht (B-C)	4.71	4.61	5.30				3.37		
E	t Address: Columbia, SC ng #: R-4 ole #: SS-3 ole Description: Silty and Specification S&/ ce (0.01 g) 1 paratus 2 Tare Weight Wet Soil Weight + A Dry Soil Weight + A Water Weight (B-C) Dry Soil Weight (C-A) Water Weight (C-A) Water Weight (C-A) Water Weight (C-A) Water Weight (C-A) Water Weight (C-A) Water Weight (C-A) A Moisture (D/E)*100 H # OF DROPS LL = F * FACTOR 2 44.0 39.0 10 15 20			-A)	13.23	11.98	12.67				10.93			
F	Pan # Tare Weight Wet Soil Weight + A Dry Soil Weight + A Water Weight (B-C) Dry Soil Weight (C-A) % Moisture (D/E)*100 H # OF DROPS L LL = F * FACTOR e. Average 44.0				L00	35.6%	38.5%	41.8%				30.8%		
Ν	Wet Soil Weight + A Dry Soil Weight + A Water Weight (B-C) Dry Soil Weight (C-A) % Moisture (D/E)*100 # OF DROPS LL = F * FACTOR # 0F DROPS 49.0					35	25	18				Moisture Co	ontents de	termined by
LL	% Moisture (D/E)*100 # OF DROPS L LL = F * FACTOR e. Average				TOR							A	ASHTO T 2	265
Ave			ŀ	Average							-		30.8%	
\bigcap	49.	0т										One Point I	Liquid Lin	nit Fastar
		ŀ								_	20	0 974	26	1 005
		ļ									21	0.979	27	1.009
tent	44.	°Ŧ									22	0.985	28	1.014
ont		F									23	0.99	29	1.018
re O	39.	٥Ŧ									24	0.995	30	1.022
istu		E										NP, Non-Pl	astic	
Δ	34	۰Ł										Liquid L	.imit	39
%		Ĕ										Plastic L	imit	31
		ŀ										Plastic Ir	ndex	8
	29.	0 +				+ +			_		(Group Syn	nbol SN	I/A-4
		10		15	20	25 30	35 40	# of	Drops	100	N	Iultipoint N	/lethod	\checkmark
											C	ne-point N	/lethod	
Wet	Prep	bara	tion [] D	Pry Preparati	on √	Air Drie	ed ✓		0	% Passing t	he #200 Si:	eve:	42.7%
Notes	/ De	eviat	ions / R	ejerenci	es:									
AASH	то т	90:	Determ	ining th	ne Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	B	enia	amin k	Covale	ski		4/24/19		Gar	nt Tavlor	, P.E.		4/2	24/19
		Te	chnician	Name			Date		Techn	nical Respon	sibility			Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			AS	STM D 4318		AASHTO T	T 89 🖸	AAS	SHTO T 90	\mathbf{X}			
			S&M	E, Inc Gre	enville	48 Brook	field Oak	s Dr., Suit	te F Gre	enville, SC	29607		
Proje	ect #	:	1426-1	5-009 (Pha	se 105)					Report I	Date:	4/24/	/19
Proje	ect N	lame:	I-85 Bri	dge Over R	locky Cre	ek				Test I	Date:	4/23/	/19
Clien	t Na	ame:	MBI										
Clien	t Ad	ldress:	Columb	oia, SC						-			
Borir	ng #:	: R-	4		Lo	og #:	40g		Sam	nple Date:		4/11/19)
Samp	ole #	ŧ: SS	-4		T	Гуре:	Split-sp	oon		Depth:		6 - 8'	
Samp	ole D	Descript	ion:	Silty SAN	D (SM / /	A-2-4)							
Туре	and S	Specifica	ition	S&ME ID)#	Cal Date:	Туре	and Speci	fication	S&	ME ID #	Cal	Date:
Balan	ce (l	0.01 g)		13942	2	9/11/2018	Groc	oving tool			23306	3/30	0/2019
	para	tus		23158	5 2	2/1/2019							
overi F	Pan #			13970)	10/0/2010	Liquic	l Limit				Plastic Lim	nit
				Tare #:	9	10	11				12		
A		Tare We	eight		26.83	26.75	26.67				26.65		
В		Wet Soi	il Weight +	А	43.05	42.46	45.21				36.80		
C		Dry Soil	Weight +	А	38.80	38.21	40.02				34.44		
D)	Water V	Veight (B-C	2)	4.25	4.25	5.19				2.36		
E		Dry Soil	Weight (C	-A)	11.97	11.46	13.35				7.79		
F	A Tare Weight B Wet Soil Weight + A C Dry Soil Weight (B-C) E Dry Soil Weight (C-A) E O Water Weight (D/E)*100 I # OF DROPS L LL = F * FACTOR e. Average				35.5%	37.1%	38.9%				30.3%		
N	Dry Soll Weight (B-C) Dry Soil Weight (C-A) % Moisture (D/E)*100 # OF DROPS LL = F * FACTOR 2. Average				30	25	20				Moisture Co	ontents de	termined by
LL	-	L	.L = F * FAC	CTOR							A	ASHTO T 2	?65
Ave	2.		Average	2					•			30.3%	
	47	0								(One Point I	iquid Lir.	nit
		." <u> </u>								N 20	Factor	<u>N</u>	Factor
	-									20	0.974	26	1.005
ent	42.	.0 +								22	0.985	28	1.014
Ť										23	0.99	29	1.018
Ŭ	37.	.0 ⊨								24	0.995	30	1.022
ţ										25	I.000	actic	
lois											Liquid I	imit	27
≥ 2	32.	.0 +									Plastic I	imit	37
											Plastic Ir	idex	7
	27.	.0 🖵								(Group Svn	nbol SM	- /A-2-4
		10	15	20	25 30	35 40	# of	Drops	100	N	1ultipoint N	1ethod	~
							۱ <u></u>	<u> </u>		C)ne-point N	1ethod	
We	t Pre	paration		Dry Preparati	on 🗸	Air Drie	ed 🗸		ç	% Passing t	:he #200 Si	eve:	31.6%
Notes	: / De	eviations	s / Referenc	ces:									
AASH	TO T	r 90: Det	ermining tl	he Plastic Lin	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
AASH	TO T	7 90: Det	ermining th	he Plastic Lin	nit & Plast	tic Index of	Soils	6	AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



				ASTM D 4318		AASHTO	T 89 🛛	🗵 AAS	нто т 90	\boxtimes			
			S&	uME, Inc Gre	enville	48 Brook	field Oak	ks Dr., Suit	te F Gre	enville, SC	29607		
Proje	ct #	:	1426	5-15-009 (Pha	se 105)					Report [Date:	4/24/	/19
Proje	ct N	lame:	I-85	Bridge Over R	locky Cre	ek				Test [Date:	4/23/	/19
Client	t Na	ime:	MBI										
Client	t Ad	dress	: Colu	mbia, SC						_			
Borin	g #:	: 1	२-5		Lo	og #:	40g		Sam	ple Date:		4/11/19)
Samp	le #	t: :	SS-1		Т	ype:	Split-sp	oon		Depth:		1 - 3'	
Samp	ole D	Descri	otion:	Silty SAN	D (SM / /	4-4)							
Туре с	and S	Specifi	cation	S&ME ID)#	Cal Date:	Туре	e and Speci	fication	S&	ME ID #	Cal	Date:
Balanc	ce ((0.01 g)	13942	2	9/11/2018	Groo	oving tool			23306	3/30	0/2019
LL App	para	tus		23158	3	2/1/2019							
Oven Pr	an #			13978	6	10/8/2018	Liquid	d Limit				Plastic Lim	nit
				Tare #:	13	14	15				16		
А		Tare V	Veight		26.78	26.65	27.61				26.58		
В		Wet S	oil Weigh	t + A	43.77	46.47	47.42				36.84		
С		Dry S	oil Weight	: + A	40.01	41.69	42.10				34.78		
D		Water	· Weight (I	B-C)	3.76	4.78	5.32				2.06		
E		Dry S	oil Weight	: (C-A)	13.23	15.04	14.49				8.20		
F		% Mo	isture (D/I	E)*100	28.4%	31.8%	36.7%				25.1%		
N	Pan # Tare Weight Wet Soil Weight + A Dry Soil Weight + A Water Weight (B-C) Dry Soil Weight (C-A) Moisture (D/E)*100 H # OF DROPS L LL = F * FACTOR e. Average 43.0 33.0				35	28	18				Moisture C	ontents de	termined by
LL	E Dry Soil Weight (C-A) F % Moisture (D/E)*100 N # OF DROPS L LL = F * FACTOR re. Average										A	ASHTO T 2	265
Ave	B Wet Soil Weight + A C Dry Soil Weight + A D Water Weight (B-C) E Dry Soil Weight (C-A) F % Moisture (D/E)*100 N # OF DROPS LL LL = F * FACTOR ve. Average 38.0					<u> </u>						25.1%	
7	42	•		5						(One Point I	Liquid Lin	nit
	43.	"F								N	Factor	Ν	Factor
	_	E								20	0.974	26	1.005
Ţ	38.	.0 -								21	0.979	27	1.009
nte		E							-	23	0.99	29	1.018
Ů	22	۰Ŀ								24	0.995	30	1.022
ture	55.	Ľ								25	1.000		_
oist										1	NP, Non-Pl		
Σ	28.	.0 +									Liquid L	.imit	33
	J										Plastic L	.imit .dov	25
	23.	E					_			(Plastic II		0 1/A_A
		10	1	15 20	25 30	35 40	# of	Drone	100		Jultinoint N	Aethod	I/A-4
							# 01	Diops		C)ne-point N	/lethod	
Wet	Prei	paratio	on 🗆	Dry Preparati	on 🗸	Air Drie	ed 🗸		9	6 Passing t	he #200 Si	eve:	40.8%
Notes	/ De	eviatio	ns / Refere	ences:						<u> </u>			
AASH	то т	90: D	etermining	g the Plastic Lin	nit & Plast	ic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Li	mit of Soils
	В	eniar	nin Kova	aleski		4/24/19		Gan	nt Tavlor	P.E.		4/2	24/19
	<u> </u>	Tech	nician Nan	ne		 Date		Techn	ical Respon	sibility		<u> </u>	Date

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LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



		ASTM D	9 4318		AASHTO T	T 89 🗵	a AAS	нто т 90	\mathbf{X}			
		S&ME, Inc	Gre	enville	48 Brook	field Oak	s Dr., Suit	te F Gree	enville, SC	29607		
Projec	t #:	1426-15-00	9 (Pha	se 105)					Report [Date:	4/24/1	19
Projec	t Name:	I-85 Bridge	Over R	locky Cre	ek				Test [Date:	4/23/1	19
Client	Name:	MBI										
Client	Address:	Columbia, S	С						-			
Boring	j#: R-	5		Lo	og #:	40g		Sam	ple Date:		4/11/19	
Sampl	e#: SS	-3		Т	ype:	Split-spc	on		Depth:		5 - 7'	
Sampl	e Descripti	on: Silt	ty SAN	ID (SM / A	4-6)	· ·			•			
Type ar	nd Specifica	tion S	&ME ID) #	Cal Date:	Туре	and Specif	fication	S&	ME ID #	Cal I	Date:
Balance	e (0.01 g)		13942	2	9/11/2018	Groo	ving tool			23306	3/30,	/2019
LL App	aratus		23158	3	2/1/2019							
Oven			13978	3	10/8/2018					-		
Pa	n #	-	,,	17	10	Liquid	Limit			20	Plastic Limi	t
		la · · · ·	are #:	1/	18	19				20		
A	Tare We	ight		26.63	26.79	26.68				26.81		
В	Wet Soi	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 W	/eight (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	% Moist	ure (D/E)*100		36.4%	40.2%	44.7%				26.9%		
N	# OF DF	OPS		34	24	15				Moisture C	ontents dete	ermined by
LL	L	_ = F * FACTOR								A	ASHTO T 26	55
Ave.		Average					j				26.9%	
		-							(One Point I	Liquid Lim	it
	50.0		-						Ν	Factor	Ν	Factor
									20	0.974	26	1.005
F	45.0		-						21	0.979	27	1.009
Iter			_						22	0.985	28	1.014
ē									23	0.995	30	1.010
e	40.0								25	1.000		
istu										NP, Non-P	astic	
₽	35.0									Liquid L	.imit 4	0
8	55.0									Plastic L	.imit 2	27
	-									Plastic Ir	ndex 1	.3
	30.0		_				-		(Group Syn	nbol SM	/A-6
	10	15	20	25 30	35 40	# of I	Drops	100	N	1ultipoint N	/lethod	~
									С) ne-point N	/lethod	
Wet F	Preparation	Dry Pr	eparati	on 🗸	Air Drie	d 🗸		9	6 Passing t	he #200 Si	eve:	46.1%
Notes /	, Deviations	/ References:							3			
AASHT	0 T 90: Dete	ermining the Pla	astic Lin	nit & Plast	ic Index of	Soils		AASHTO T	89: Deter	mining the	Liquid Lin	nit of Soils
	<u>Benjami</u>	n Kovaleski			4/24/19		Gan	it Taylor,	P. <u>E.</u>		4/24	4/19

Technician Name

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Technical Responsibility

Date

MOISTURE - DENSITY REPORT

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



Page 1 of 1

	S&ME, Inc Gi	reenville 48 Brookfield	Oaks Dr., Suite F G	reenville, SC 2960)7	
S&ME Project #:	1426-15-009	(Phase 105)		Report Date:	4/16/1	L9
Project Name:	I-85 Bridge O	ver Rocky Creek		Test Date(s):	4/04/1	19
Client Name:	MBI					
Client Address:	Columbia, SC					
Boring #:	BR-2	Log #:	32g	Sample Date:	3/25/1	19
Sample #:	Bulk-1 (Composite	e) Type:	Bulk	Depth:	1 - 15	5'
Sample Descripti	on: Clayey S	AND [SC / A-6(2)]				
Maximum D	ry Density 11	3.8 PCF.	(Optimum Moistur	e Content	14.3%
		AASHTO T 99	Method A			
					Soil Prop	erties
	Moisture-Density	Relations of Soil and	Soil-Aggregate M	ixtures	Natural	
119.0 +					Moisture	*
					Content	
-					Specific	2.650
-			N. I		Gravity of Soli	33
114.0					Plastic Limit	22
114.0					Plastic Index	11
					% Passi	ing
CF)					3/4"	100.0%
- <u></u>					3/8"	100.0%
109.0					#4	99.3%
Der			•		#10	96.0%
2.7					#40	75.4%
					#60	66.8%
104.0				- 2.65	#100	58.6%
_					#200	46.9%
					Oversize Fr	raction
_					Bulk Gravity	
99.0 🕂					% Moisture	
4.0	9.0	14.0	19.0	24.0	% Oversize	
		Moisture Content	t (%)		MDD	
					Opt. MC	
Moisture-Density C	Curve Displayed:	Fine Fraction 🗵	Corrected for	Oversize Fraction (A	STM D 4718)	
Sieve Size used to	separate the Oversize	Fraction: #4 S	sieve 🗵	3/8 inch Sieve 🛛	3/4 inch 9	Sieve 🛛
Mechanical Ramme	er 🗆 N	lanual Rammer 🗵	Moist Preparation		Dry Preparation	X
References / Comm	ents / Deviations:	*See Moisture Content	lest Report			
AASHTO T 265: Lat	oratory Determinatio	n of Moisture Content of S	oolis			
AASHTU T 99: MOI	sture-Density Relation	is of Soli Using a 5.5 Lb. Ra	immer and a 12 Dro	þ		
с т		CAT M VA			4 /1	c /1 o
Gant La	<u>ayıor, P.E.</u> Pesponsibility	Signature	Project M	gr. / Senior Eng	<u>r. 4/16</u>	<u>5/19</u>
rechnical i	This report shall	signature not be reproduced, excent in fi	ull. without the written a	pproval of S&MF. Inc	Do	11.5
S&ME Inc Corno	rate	3201 Spring F	orest Road	RR-2 (Ruli	k-1 1-15') Procto	or rlsr

Raleigh, NC. 27616



ASTM D6913

	S	&ME	, Inc.	- Gree	envi	lle:	48 E	Brool	cfield	l Oak	s Dr	r., S	uite	F	Gree	nville	e, SC	29	607					
Project #:	1426	5-15-	·009 (Phase	10	5)												Re	epoi	rt Da	ate:	4/3	16/19	9
Project Name:	I-85	Brid	ge Ov	er Ro	cky	Cree	ek											T	est l	Date	e(s): 4	4/04 -	4/09	9/19
Client Name:	MBI																							
Client Address:	Colu	mbia	a, SC																					
Boring #:	BR-2					S	Samp	le #:					32g	J				Sa	mpl	e Da	ate:	3/2	5/201	19
Location:	Bulk	-1 (C	ompo	osite)			Т	ype:					Bulk	<						Dep	oth:	1	- 15'	
Sample Descript	ion:	Clay	ey SA	ND [S	SC /	A-6	(2)]																	
(3" 2'	1.5"	1" 3/	'4"	3,	/8"	#4		#10		#20		#40) (#60 ;	#100	#140	#20	0					
100%	• •		-	•	•			-							•	•	•							
90%																								
80%																								
ີ້ 70%																								
iiss 60%																								
L L																								
																		>						
A 40%																								
30%																				_			-	
20%																								
2070									_											_			-	
10%																								
0%					10.0	<u> </u>				1			-				0.1(
100.					10.00	U	MI	ilimet	ers	1	.00						0.10	,					0.01	J
Cobbles		<	300 n	nm (12	2") a	nd >	75 m	<u>1m (3</u>	")			Fir	ne Sa	and			•	< 0.4	25 r	nm a	and >	0.07	5 mn	<u>1</u>
Gravel	4		< 75	mm ai	nd >	• 4.75	5 mm	(#4)	<u> </u>				Silt	,				<	0.07	$\frac{5}{2}$ and $\frac{1}{2}$	d > 0	.005 I	nm	
Medium San	d	<	2.00	mm ar	nd >	0.42	25 mn	(#10) n (#4()))			C	olloi	/ ds						< 0.0)01 m	nm		
Method: A	-		Proce	edure	for o	obtai	ning	Speci	men:		Mois	st			Disp	oersio	n Pr	oces	s:		Disp	oersai	nt	
Maxim	um Par	ticle	Size	Ŧ	#4					Coa	rse	Sar	nd		3.4%)			Fin	e Sa	and	28	8.5%	
		Gr	ravel	0.	.7%					Medi	um	Sar	nd	2	20.5%	6			Silt	& C	lay	40	5.9%	
	Liq	uid L	_imit	3	33					Pla	stic	Lim	nit		22			Pl	asti	c Ind	dex		11	
	() (
Notes / Deviations	/ Refere	ences	:																					
					(11-	+	- 1	,															
<u>Gant M</u> .	. Tayloı	, P.E.	÷		C	X	1 M.	. Vgl		_		P	rojeo	ct N	∕lgr.	/ Sen	nior	Eng	r.		4	/16/2	2019	
Technical	Respons	ibility					Signo	ature							Posi	tion						Dat	е	
		This	report	shall n	ot be	repro	oduced	d, exce	pt in j	full, wit	thout	t the	writt	ten d	approv	al of S	5&ME	, Inc.						

3201 Spring Forest Road Raleigh, NC. 27616 BR-2 (Bulk-1_1-15') Grain.xlsx Page 1 of 1

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX



			,	ASTM D 4318		AASHTO	T 89 🖸		SHTO T 90	\mathbf{X}			
			S&I	ME, Inc Gre	enville	48 Brook	field Oak	s Dr., Sui	ite F Gre	enville, SC	29607		
Proje	ct #	:	1426-	15-009 (Pha	se 105)					Report [Date:	4/16/	19
Projec	ct N	lame:	I-85 B	Bridge Over R	locky Cre	ek				Test [Date:	4/15/	19
Client	: Na	ame:	MBI										
Client	: Ad	ldress:	Colun	nbia, SC						-			
Borin	g #:	: BF	R-2		Lo	og #:	32g		San	nple Date:		3/25/19	
Samp	le #	ŧ: Βι	ılk-1 (Co	mposite)	1	Гуре:	Bulk			Depth:		1 - 15'	
Samp	le D	Descript	ion:	Clayey SA	AND [SC ,	/ A-6(2)]							
Туре а	ind .	Specifica	ition	S&ME ID)#	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balanc	e (0.01 g)		13942	2	9/11/2018	Groc	oving tool			23306	3/30	/2019
LL App	oara	itus		23158	3	2/1/2019							
Oven				13978	}	10/8/2018					1		
Po	an #			Tara #1		6	Liquic	l Limit	1	1	0	Plastic Lim	t
		Tara \//	iaht	Tare #.	26.07	0	7				0		
A		Tare w	eight		26.97	27.81	26.29				27.29		
В		wet So	i weight	+ A	41.93	46.28	44.50				38.26		
C		Dry Soi	Weight	+ A	38.36	41.65	39.67				36.25		
D		Water V	Veight (B	-C)	3.57	4.63	4.83		_		2.01		
E		Dry Soi	Weight	(C-A)	11.39	13.84	13.38				8.96		
F		% Mois	ture (D/E)*100	31.3%	33.5%	36.1%				22.4%		
Ν		# OF D	ROPS		33	22	15				Moisture C	ontents det	ermined by
LL		L	.L = F * F,	ACTOR							A	ASHTO T 2	65
Ave.	•		Avera	ge								22.4%	
	13	0								(One Point I	Liquid Lim	it
										N	Factor	N	Factor
		-			_					20	0.974	26	1.005
t	38	.0								21	0.979	27	1.009
nte			•		_					23	0.99	20	1.014
Ŝ										24	0.995	30	1.022
ure	33.	.0 —								25	1.000		
istı											NP, Non-Pl	astic	
Ĕ	28	.0 ⊨									Liquid L	.imit	33
%											Plastic L	imit 🛛	22
											Plastic Ir	ndex 1	1
	23	.0 +				+ +		<u> </u>		(Group Syn	nbol SC	/A-6
		10	15	5 20	25 30	35 40	# of	Drops	100	N	Iultipoint N	/lethod	\checkmark
										С	ne-point N	/lethod	
Wet	Pre	paratior		Dry Preparati	on 🗸	Air Drie	ed 🗸		C	% Passing t	:he #200 Si	eve:	46.9%
Notes	/De	eviation	s / Refere	nces:									
							a ''						
AASHT	101	90: Dei	ermining	the Plastic Lin	nıt & Plast	tic Index of	Soils		AASHTO	i 89: Deter	mining the	Liquid Lir	nıt of Soils
	R	eniam	in Kova	leski		4/16/19		Gai	nt Taylor	ΡF		4/1	6/19

Technician Name

3201 Spring Forest Road Raleigh, NC. 27616

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Date

Technical Responsibility

BR-2 (Bulk-1_1-15') PI.xlsx Page 1 of 1



Tested By: Benjamin Kovaleski

Form No: TR-D854-1B Revision No. 1 Revision Date: 08/09/17

SPECIFIC GRAVITY OF SOIL

&

Over	n dried Specim	ens			А	STM D	854	Metl	nod B					
		S&I	ME, I	nc Greenv	ille 48	Brook	field	Oaks	Dr., Suite F	Greer	nville, SC 29	9607		
Proj	ect #:	1426-	15-0	09 (Phase 1	05)					Repo	ort Date:	4	1/29/19	
Proj	ect Name:	I-85 B	Sridge	e Over Rock	y Creek					Test	Date(s):	4/19) - 4/26/	19
Clie	nt Name:	MBI												
Clie	nt Address:	Colun	nbia,	SC										
Bori	ng #:	BR-3			Log	, #:			39g		Sample	e Date:	3/11	/19
Loca	ation:	UD-2			Тур	be:		Ur	disturbed			Depth:	6 -	8'
Sam	ple Descripti	ion: L	EAN	CLAY with S	and [CL	. / A-6(10)]							
Mat	erial Exclude	d: 0)%								% Passing	g #4 Sieve	e: 1	.00%
Bala	nce ID.	0.01 gr	am	ID#:	139	42		Cal. D	ate:	9/11/18	3 Co	al. Due:	9/	11/19
Pycn	ometer ID No.		23	161 Co	al. Date:	2/	/10/1	.9	Balance Ve	rificatio	n Check	Mass:	500 g	Iram
	Pycnomete	er Volum	e (V _p		249.81	ml.				Mass I	Determinatio	on:	500.00	grams
	Pycnomet	ter Mass	(PM)		110.89	gram	IS	-	If [PM-M	p] is greater	r than .06	grams,	
	Ave. Pycnon	neter Ma	iss (M	p) •	110.89	gram	IS	Carl	recal	ıbrate t	he dry mass	of the pyc	cnometer.	
Met	noa B: Oven	-arlea	Spec	imens	No. 1 1	- ()		зоак	ing Time		ASTMIC	.127:24	<u>+</u> 4 nrs.	
Tac		0 854	250	Specimen L		s (g.)		ł		A	ggregate n	iot initial	ly aried	
			250-	ml. beaker	500-r	nl. beak	ker							
	SP, SP-SIVI		6	0 <u>+</u> 10	100) <u>+</u> 10		ł	Initial Dry	Mass o	of Test			
	SP-SC, SIVI, S		4	5 <u>+</u> 10	/5	+ 10		ł	Specimen -	not re	quired.			grams
	Slit or Clay	<u></u>		<u> + 5</u>	50	<u>+</u> 10								
	Mp	_{sw;t} =	Mas	s of the Pycr	ometer,	soil, ar	nd w	ater :	- 383.	98	grams			
Мс	ass of Dry Soi	l (grams	;)	Tare #	BB-	10		T _t =	Test T	empera	iture T _t		22.5	°C
Α	Tare Weight				206	.68		K =	Temperatu	ire Coet	fficient at T _t		0.99945	
С	Dry Wt. + Tar	re Wt.			244	.66		K =	Temperature	e Coeffi	cient at 23°	c (0.99933	
Ms	Dry Weight			C-A	37.	98	р	w;t =	Density	y of Wa	ter at T _t		0.99766	g./ml.
	M _{pw;t} =	Mass	of the	e Pycnometer	and wat	er at T _t			$M_{pw;t} = M_{pw;t}$	p + (Vp	x p _{w;t})		360.12	grams
	\mathbf{G}_{t} =	Spec	ific G	ravity of Soil	Solids at	the T _t			$G_t = M_s / (M_p)$	_{ow;t} - (M	_{psw;t} -M _s))		2.690	
	G =	Specifi	ic Gra	vity of Soil So	olids at th	ne 20°C			G =	$K \ge G_t$			2.689	
	Soils containi	ing plus	#4 n	naterial teste	d per			R =	% of Soil re	etained	on the #4	sieve	0.0%	
		ASTM	I C 1.	27				P =	% of Soil	passin	g the #4 si	eve	100.0%	6
	c	Ар	pare	nt Specific G	ravity o	f plus #	ŧ4 m	ateria	l at the 23°C	C per A	STM C127			
	G ₊₄		Ар	parent Spec	ific Grav	vity of p	olus	#4 ma	nterial correc	cted to	20°C			
	6	Total Sc	ımnlı	o Snocific	G	. –	-		1			_	2 689	
	Utotal	10101 50	Gravi	tv	Utota	-	-		R +		Р		2.089	
			Jun	^{cy}				100) x G ₊₄	10	0 x G			
Note	es / Deviations	/ Refere	nces:	ASTM D8	54: Spec	ific Grav	vity o	f Soil S	Solids by Wat	er Pycn	ometer			
					0									
	<u>Benjamin</u>	Kovales	<u>ski</u>	_	(Xt	M. 78	1		Proj	ject M	gr. / Senio	or Engr.	<u>4/</u>	29/19

Technician Name

Technical Responsibility

Project Mgr. / Senior Engr. Position

<u>4/29/19</u> Date

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SIEVE ANALYSIS OF SOIL



ASTM D6913 Single sieve set 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: Test Date: 4/19 - 4/25/19 I-85 Bridge Over Rocky Creek **Client Name:** MBI **Client Address:** Columbia, SC Boring #: BR-3 Log #: 39q Sample Date: 3/11/19 Sample #: UD-2 Type: Undisturbed Depth: 6 - 8' Sample Description: LEAN CLAY with Sand [CL / A-6(10)] #10 #40 #100 #140 #200 #4 #20 #60 1" 3/4" 3" 2" 1.5" 3/8' 100% 90%



3201 Spring Forest Road Raleigh, NC. 27616 BR-3 UD-2 (6-8') Grain.xlsx Page 1 of 1

SIEVE ANALYSIS OF SOIL



Single sieve set **ASTM D6913** S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607 1426-15-009 (Phase 105) Project #: 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 #: 39q Sample Date: 3/11/19 Sample #: UD-3 Type: Undisturbed Depth: 8 - 10' Sample Description: LEAN CLAY with Sand [CL / A-6(7)] #10 #20 #40 #100 #140 #200 #4 #60 1" 3/4" 3" 2" 1.5" 3/8" 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10%

100.00		10.00	Millimeters	1.00		0.10		0.01
Cobbles	< 300 m	ım (12") and >	75 mm (3")	Fine Sa	and	< 0.425 mm	and >	0.075 mm
Gravel	< 75 r	nm and > 4.75	5 mm (#4)	Silt		< 0.075 a	nd > 0.0	005 mm
Coarse Sand	< 4.75	mm and >2.00) mm (#10)	Clay	/	< 0	.005 mr	n
Medium Sand	< 2.00 n	nm and > 0.42	25 mm (#40)	Colloi	ds	< 0	.001 mr	n
Method: B	Proce	dure for obtai	ning Specimen:	Moist	Dispersio	n Process:	Dispe	ersant
Maximum Pa	rticle Size	2.00 mm		Coarse Sand	0.2%	Fine S	Sand	19.9%
	Gravel	0.0%		Medium Sand	4.4%	Silt &	Clay	75.5%
Lic	quid Limit	31		Plastic Limit	20	Plastic Ir	ndex	11

Natural Moisture

Notes / Deviations / References:

0%

*See Consolidated Undrained Triaxial Test Report

CAI M. J.C. Gant M. Taylor, P.E. Project Mgr. / Senior Engr. 4/29/2019 Technical Responsibility Signature Position Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc.

3201 Spring Forest Road Raleigh, NC. 27616 BR-3 UD-3 (8-10') Grain.xlsx Page 1 of 1 Single sieve set

SIEVE ANALYSIS OF SOIL

ASTM D6913



Page 1 of 1

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: 4/26 - 4/29/19 I-85 Bridge Over Rocky Creek Test Date: **Client Name:** MBI **Client Address:** Columbia, SC Boring #: RW-2 Log #: 39q Sample Date: 3/13/19 Sample #: UD-1 Type: Undisturbed Depth: 8 - 10' Sample Description: Sandy SILT [ML / A-7-5(9)] #10 #100 #140 #200 #4 #20 #40 1" 3/4" #60 3" 2" 1.5" 3/8' 100% 90% 80% Percent Passing (%) 70% 60% 50% 40% 30% 20% 10% 0% 10.00 1.00 0.10 0.01 100.00 Millimeters < 300 mm (12") and > 75 mm (3") < 0.425 mm and > 0.075 mm Cobbles Fine Sand < 75 mm and > 4.75 mm (#4) < 0.075 and > 0.005 mm Gravel Silt **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 Moist Method: В Procedure for obtaining Specimen: **Dispersion Process:** Dispersant Maximum Particle Size 9.50 mm **Coarse Sand** Fine Sand 20.3% 2.1% Gravel 2.5% Medium Sand 15.4% Silt & Clay 59.7% Liquid Limit 47 **Plastic Limit** 30 **Plastic Index** 17 Natural Moisture *See Conolidated Undrained Triaxial Test Report Notes / Deviations / References: CAT M. V. Gant M. Taylor, P.E. Project Mgr. / Senior Engr. 4/30/2019 Technical Responsibility Signature Position Date This report shall not be reproduced, except in full, without the written approval of S&ME, Inc. RW-2 UD-1 (8-10') Grain.xlsx S&ME, Inc. - Corporate 3201 Spring Forest Road

Raleigh, NC. 27616



			A	STM D 4318		AASHTO	T 89 🖸		SHTO T 90				
			S&N	IE, Inc Gre	eenville	48 Brook	field Oak	s Dr., Sui	ite F Gre	eenville, SC	29607		
Proje	ct #	:	1426-1	.5-009 (Pha	se 105)					Report [Date:	4/29/	19
Proje	ct N	lame:	I-85 Br	idge Over F	Rocky Cre	ek				Test I	Date:	4/26/	19
Client	: Na	ame:	MBI	5	,								
Client	: Ac	ldress:	Colum	bia, SC						_			
Borin	g #	: BF	R-3		Lo	og #:	39g		Sar	nple Date:		3/11/19	
Samp	le #	ŧ: UI	D-2		1	ype:	Undistur	bed		Depth:		6 - 8'	
Samp	le [Descript	ion:	LEAN CL	AY with S	and [CL /	A-6(10)]			I			
Туре а	ind	Specifica	ition	S&ME IL	D #	Cal Date:	Туре	and Spec	ification	S&	ME ID #	Cal	Date:
Balanc	ce (0.01 g)		13942	2	9/11/2018	Groo	oving tool			23306	3/30	/2019
LL App	oara	tus		2315	8	2/1/2019							
Oven	an #			13978	8	10/8/2018	Liquid	limit				Diactic Lim	+
PO	un #			Tare # [.]	5	6	7				8		11
Δ		Tare We	eiaht	Ture #.	26.96	27.81	26.29				27.29		
B		Wet So	l Weight 4	- A	41 56	44 57	43.01				40.22		
C		Dry Soi	Weight +	Δ	37 79	40.11	38 37				37.88		
		Water V	Veight (B-	0	377	4.46	4 64				2 34		
		Dry Soi	Weight (ς) Γ-Δ)	10.83	12 30	12.08				10.59		
		% Mois		:100	3/1.8%	36.3%	38.4%				22.1%		
				100	24.070	20.370	15				22.170		
					54	23	15				Moisture C	οπιεπις αει ΔSHTO T 2	65
												22.1%	
Ave	•		Aleruy	e							One Point I	iquid Lin	nit
	46	.0			-					N	Factor	N	Factor
										20	0.974	26	1.005
۲	41	.0 1								21	0.979	27	1.009
Iten										22	0.985	28	1.014
Con										23	0.99	30	1.018
Ire	36	.0 +								25	1.000		
istu											NP, Non-Pl	astic	
β	31	.0 上									Liquid L	imit	36
%											Plastic L	imit 2	22
											Plastic Ir	ndex	L4
	26	.0 +			+ +		-++			(Group Syn	nbol CL	/A-6
		10	15	20	25 30	35 40	# of	Drops	100	N	Iultipoint N	Nethod	\checkmark
										C)ne-point N	/lethod	
Wet	Pre	paratior		Dry Preparat	ion 🗸	Air Drie	ed √			% Passing t	the #200 Si	eve:	79.3%
Notes	/ D	eviations	: / Referen	ces:									
AASH	πο	T 90: Det	erminina t	he Plastic Liv	nit & Plas	tic Index of	Soils		AASHTO	T 89: Deter	minina the	Liquid Lin	nit of Soils
										5 5	9.10		0.40

<u>Benjamin Kovaleski</u>	<u>4/29/19</u>	<u>Gant Taylor, P.E.</u>	<u>4/29/19</u>				
Technician Name	Date	Technical Responsibility	Date				
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			AS	TM D 4318		AASHTO	T 89 🖸	AAS	SHTO 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				
Projec	t N	lame:	I-85 Brid	dge Over R	locky Cre	ek				Test [Date:	4/26/	19
Client	Na	ime:	MBI	5	, ,								
Client	Ad	ldress:	Columb	ia, SC						-			
Borinc	g #:	BR	-3		Lo	og #:	39g		Sar	nple Date:		3/11/19	
Sampl	le #	t: UD	-3		Т	Type:	Undistur	bed		Depth: 8 - 10'			
Sampl	le D	Descripti	on:	LEAN CL	AY with S	and [CL /	A-6(7)]			· ·			
Туре а	nd :	Specificat	tion	S&ME ID)#	Cal Date:	Туре	and Speci	ification	S&	ME ID #	Cal	Date:
Balance	e (0.01 g)		13942	2	9/11/2018	Groc	ving tool		23306 3/30/2019			
LL App	ara	tus		23158	}	2/1/2019							
Oven	n #			13978	3	10/8/2018	Liquic	Limit				Plactic Limi	+
Fu	<i>III</i> #			Tare #·	1	2	3				4		
Δ		Tare We	iaht	Ture #.	26.69	26.47	26.31				25.93		
B		Wet Soil	Weight +	Δ	45.98	43.43	43.45				37.15		
C		Dry Soil	Weight + A	Δ	41.65	39.45	39 31				35.31		
		Water W	leight (B-C)	4 33	3.98	4 1 4				1.84		
F		Dry Soil	Weight (C-	, -Δ)	14.96	12.98	13.00				9.38		
		% Moist	ro (D/F)*1	00	28.9%	30.7%	31.8%				19.6%		
				.00	20.570	25	18				10.070	antonta dat	armain ad hu
	_			TOP	55	25	10				Moisiure Co	ASHTO T 2	erminea by 65
			Avorago									10.6%	
Ave.			Averuge								One Point I	iquid Lim	nit
	41.								\square	N	Factor	N	Factor
										20	0.974	26	1.005
ि स्	36.									21	0.979	27	1.009
ten										22	0.985	28	1.014
l G										25	0.99	30	1.018
Ire	31.	.0 +								25	1.000		
istu						◄					NP, Non-Pl	astic	
Š	26.	.0 ⊨									Liquid L	imit 3	31
%											Plastic L	imit 🛛	20
											Plastic Ir	ndex 1	1
	21	.0 +			+ +					(Group Syn	nbol CL	/A-6
		10	15	20	25 30	35 40	# of	Drops	100	N	lultipoint N	/lethod	\checkmark
										C	ne-point N	/lethod	
Wet Preparation Dry Preparation 🗹 Air Dried 🗹 % Passing the #200 Sieve: 75.5%													
Notes / Deviations / References:													
AASHT	0 7	- 90: Dete	erminina th	e Plastic I in	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	minina the	Liauid Lir	nit of Soils

<u>Benjamin Kovaleski</u>	4/29/19	<u>Gant Taylor, P.E.</u>	<u>4/29/19</u>					
Technician Name	Date	Technical Responsibility	Date					
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			ASTM D 4318		AASHTO	T 89 🖸	AAS	SHTO T 90					
S&ME, Inc Greenville 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607													
Project #: 1426-15-009 (Phase 105)							Report I	Date:	4/30/	19			
Proje	ct N	lame:	I-85 Bridge Over F	Rocky Cre	ek				Test I	Test Date: 4/26/19		19	
Clien	t Na	ame:	MBI	-									
Clien	t Ac	ldress:	Columbia, SC										
Borin	ıg #	: RW	/-2	Lo	og #:	39g		Sar	nple Date:	ple Date: 3/13/19			
Samp	ole ‡	≠: UD	-1	Т	уре:	Undistur	bed		Depth: 8 - 10'				
Samp	ole [Description	on: Sandy SI	LT [ML / /	A-7-5(9)]								
Туре о	and	Specificat	ion S&ME IE)#	Cal Date:	Туре	and Speci	ification	S&ME ID # Cal Date:			Date:	
Balan	ce (0.01 g)	13942	2	9/11/2018	Groc	oving tool			23306	3/30)/2019	
LL Ap	para	itus	23158	3	2/1/2019								
Oven P	an #	:	13978	5	10/8/2018	Liquic	l I imit				Plastic Lim	it	
,	un		Tare #:	9	10	11				12			
A		Tare Wei	ght	26.84	26.74	26.68				26.65			
В		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 W	eight (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		% Moistu	ure (D/E)*100	45.3%	47.2%	49.7%				30.3%			
N		# OF DR	OPS	31	23	15				Moisture Co	ontents dei	termined by	
LL	-	LL	= F * FACTOR							AA	ASHTO T 2	65	
Ave	2.		Average								30.3%		
	57	0							One Point Liquid Limit				
	57	.•							N	Factor	N	Factor	
	-								20	0.974	26	1.005	
int	52	.0 0.							21	0.979	27	1.009	
nte									23	0.99	29	1.018	
S	47								24	0.995	30	1.022	
ture	- 1	."							25	1.000			
oist										NP, Non-Pl	astic		
Σ	42	.0								Liquid L	imit 4	47	
8		- E		_						Plastic L	imit	30	
	27									Plastic Ir	idex		
	57	.0	15 20	25 30	35 40			100		Jroup Syn		A-7-5	
			15 20	25 50	55 40	# of	Drops		N	/lultipoint N	lethod		
							50.7%						
Notes / Deviations / References:													
AASH	TO T	T 90: Dete	rmining the Plastic Lir	nit & Plast	tic Index of	Soils		AASHTO	T 89: Deter	mining the	Liquid Lir	nit of Soils	

<u>Benjamin Kovaleski</u>	4/30/19	Gant Taylor, P.E.	<u>4/30/19</u>					
Technician Name	Date	Technical Responsibility	Date					
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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. ∞ C

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.

	т	4/29/2019			
		CU with I	Pore Pressures		12:56 PM
Date:	3/11/19				
Client:	MBI				
Project:	I-85 Bridge Over R	locky Creek			
Project No.:	1426-15-009 (Phas	e 105)			
Location:	Soil Test Borings				
Depth:	8 - 10'		Sample Number:	BR-3	
Description:	LEAN CLAY with	Sand [CL / A	-6(7)]		
Remarks:	The specimens fail	ed with bulgin	ng. Failure selected at	t peak obliquity.	
	Percent passing the	#200 sieve: 7	75.5%		
Type of Sample:	Undisturbed				
Specific Gravity=2.6	61 LL= 31	PL=	20 PI= 11		
Test Method:	ASTM D 4767 Me	thod A			
	P	arameters f	or Specimen No. 1	1	
Specimen Paramet	ter	Initial	Saturated	Consolidated	Final
Moisture content: M	oist soil+tare, gms.	49.470			1069.230
Moisture content: D	ry soil+tare, gms.	37.570			815.600
Moisture content: Ta	are, gms.	0.000			0.000
Moisture, %		31.7	32.5	31.1	31.1
Moist specimen weig	ght, gms.	1094.21			
Diameter, in.		2 854	2842	2 822	
		2.054	2.045	2.022	
Area, in. ²		6.397	6.347	6.254	
Area, in.² Height, in.		6.397 5.625	6.347 5.603	6.254 5.569	
Area, in.² Height, in. Net decrease in heig	ht, in.	6.397 5.625	6.347 5.603 0.022	6.254 5.569 0.034	
Area, in.² Height, in. Net decrease in heig Net decrease in wate	ht, in. er volume, cc.	6.397 5.625	6.347 5.603 0.022	6.254 5.569 0.034 12.000	
Area, in. ² Height, in. Net decrease in heig Net decrease in wate Wet density, pcf	ht, in. er volume, cc.	6.397 5.625 115.8	2.343 6.347 5.603 0.022 118.0	6.254 5.569 0.034 12.000 119.2	
Area, in. ² Height, in. Net decrease in heig Net decrease in wate Wet density, pcf Dry density, pcf	ht, in. er volume, cc.	6.397 5.625 115.8 88.0	2.843 6.347 5.603 0.022 118.0 89.0	6.254 5.569 0.034 12.000 119.2 90.9	
Area, in. ² Height, in. Net decrease in heig Net decrease in wate Wet density, pcf Dry density, pcf Void ratio	ht, in. er volume, cc.	2.834 6.397 5.625 115.8 88.0 0.8883	2.843 6.347 5.603 0.022 118.0 89.0 0.8661	6.254 5.569 0.034 12.000 119.2 90.9 0.8277	
Area, in. ² Height, in. Net decrease in heig Net decrease in wate Wet density, pcf Dry density, pcf Void ratio Saturation, %	ht, in. er volume, cc.	6.397 5.625 115.8 88.0 0.8883 94.9	2.843 6.347 5.603 0.022 118.0 89.0 0.8661 100.0	$\begin{array}{c} 2.822\\ 6.254\\ 5.569\\ 0.034\\ 12.000\\ 119.2\\ 90.9\\ 0.8277\\ 100.0\end{array}$	

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 Re	adings fo	or Specim	en No	. 1		
No.	Def. Dial in.	Load Dial	Load Ibs.	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

F	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 Ibs.	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
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					Test Re	adings fo	or Specim	en No	. 2		
No.	Def. Dial in.	Load Dial	Load Ibs.	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

F	arameters	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 Ibs.	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 Re	adings fo	or Specim	en No	. 3		
No.	Def. Dial in.	Load Dial	Load Ibs.	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

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Over	n dried Specim	ens			A	STM D	854	Metl	nod B					
		S8	ιME,	Inc Green	ville 48	Brook	field	Oaks	Dr., Suite	F Gree	nville, SC 2	29607		
Proj	ect #:	1426	-15-	009 (Phase 1	05)					Rep	ort Date:		4/29/19	
Proj	ect Name:	I-85	Bridg	je Over Rock	y Creek					Tes	t Date(s):	4/1	9 - 4/26/	19
Clier	nt Name:	MBI												
Clier	nt Address:	Colu	mbia	, SC										
Bori	ng #:	BR-3			Log	g #:			39g		Samp	ole Date:	3/11	/19
Loca	ation:	UD-3	}		Тур	pe:		Ur	ndisturbed	b		Depth:	8 -	10'
Sam	ple Descripti	on: I	LEAN	I CLAY with S	Sand [CL	_ / A-6(7)]							
Mat	erial Exclude	d: (0%								% Passir	ng #4 Siev	/e: 1	.00%
Bala	nce ID.	0.01 g	ram	ID#:	139	942		Cal. D	ate:	9/11/1	8 (Cal. Due:	9/	11/19
Pycn	ometer ID No.		2	3162 C	al. Date:	2/	/10/1	.9	Balance	Verificatio	on Cheo	ck Mass:	500 g	jram
	Pycnomete	er Volun	ne (V	p)	249.82	ml.				Mass	Determinat	ion:	500.00	grams
	Pycnomet	er Mass	5 (PM)	115.02	gram	IS	-		If [PM-M	p] is great	er than .06	5 grams,	
	Ave. Pycnom	neter M	ass (I	И _р) •	115.02	gram	IS		re 	calibrate i	the dry mas	s of the py	cnometer.	
Met	hod B: Oven	-dried	Spe	cimens		()		Soak	ing lime		ASTM	C127:24	<u>+</u> 4 hrs.	
Tab		854	250	Specimen		s (g.)	,			P	Aggregate	not initia	lly dried	
			250	-ml. beaker	500-r	nl. beak	ker							
	SP, SP-SM	6	(50 <u>+</u> 10	100	<u>) +</u> 10			Initial D	ry Mass	of Test			
	SP-SC, SM, S	iC	4	45 <u>+</u> 10	/5	<u>+</u> 10		ļ	Specime	n - <i>not r</i> e	equired.			grams
	Silt or Clay			35 <u>+</u> 5	50	<u>+</u> 10								
	Mps	_{sw:t} =	Ma	ss of the Pycı	nometer,	soil, ar	nd w	ater :	- 38	88.18	grams			
Ma	iss of Dry Soil	l (gram	s)	Tare #	BB	-8		T _t =	Tes	t Temper	ature T _t		22.3	°C
Α	Tare Weight				204	.23		K =	Temper	ature Coe	fficient at T	t	0.99950	
С	Dry Wt. + Tar	e Wt.			242	2.53		K =	Temperat	ture Coeff	icient at 23	°C	0.99933	
Ms	Dry Weight			C-A	38.	.30	р	w;t =	Den	sity of Wa	ater at T _t		0.99770	g./ml.
P	M _{pw;t} =	Mass	of th	e Pycnometer	r and wat	er at T _t			M _{pw;t} =	$M_p + (V_p$	x p _{w;t})		364.27	grams
	\mathbf{G}_{t} =	Spee	cific C	Gravity of Soil	Solids at	the T _t			$G_t = M_s / ($	(M _{pw;t} - (N	1 _{psw;t} -M _s))		2.662	
	G =	Speci	fic Gr	avity of Soil S	olids at tl	he 20°C			($G = K \times G_t$			2.661	
	Soils containi	ng plus	; #4 i	material teste	ed per			R =	% of Soi	l retained	l on the #4	4 sieve	0.0%	
		ASTI	ИСІ	127				P =	% of S	oil passir	ng the #4 s	sieve –	100.09	6
	c	Ap	opare	ent Specific G	Gravity o	f plus #	ŧ4 m	ateria	l at the 23	3°C per A	STM C12	7		
	G ₊₄		A	pparent Spec	cific Grav	vity of p	olus	#4 ma	aterial cor	rected to	o 20°C			
	6	Total S	amn	le Specific	G		_			1		_	2 661	
	Ototal	rotat 5	Grav	it specific	Stota	I –	-		R	+	Р		2.001	
			Grav	uy				100) x G ₊₄	1	00 x G			
Note	s / Deviations	/ Refere	ences	: ASTM D8	354: Spec	ific Grav	vity o	t Soil S	Solids by W	Vater Pycr	nometer			
					0									
	<u>Benjamin I</u>	Kovale	ski	-	(XII	M. Age		•	<u>P</u>	<u>roject N</u>	<u>1gr. / Sen</u>	<u>ior Engr.</u>	<u>4/</u>	29/19

Technician Name

Technical Responsibility

Project Mgr. / Senior Engr. Position

Date



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.

	ті	RIAXIAL CO CU with I	MPRESSION TES Pore Pressures	ST	4/30/2019 4:29 PM
Date:	3/13/19				
Client:	MBI				
Proiect:	I-85 Bridge Over R	ockv Creek			
Project No.:	1426-15-009 (Phas	e 105)			
Location:	Soil Test Borings	,			
Depth:	8 - 10'		Sample Number	: RW-2	
Description:	Sandy SILT [(ML /	A-7-5(9)]			
Remarks:	Specimens failed w	ith bulging a	nd shearing. Failure	selected at peak pore	pressure, Specimen
	#1 and peak obliqu	ity, Specimen	#2.		
Type of Sample:	Undisturbed				
Specific Gravity=2.7	39 LL=47	PL=	30 PI= 17	7	
Test Method:	ASTM D 4767 Met	hod A			
	Р	arameters f	or Specimen No.	1	
Specimen Parame	ter	Initial	Saturated	Consolidated	Final
Moisture content: M	oist soil+tare, gms.	45.560			1146.420
Moisture content: D	ry soil+tare, gms.	36.590			896.460
Moisture content: Ta	are, gms.	0.000			0.000
Moisture, %		24.5	28.6	27.9	27.9
Moist specimen weig	ght, 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 heig	jht, in.		0.023	0.016	
Net decrease in wate	er 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	
	Te	st 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 Re	adings fo	or Specim	en No	. 1		
No.	Def. Dial in.	Load Dial	Load Ibs.	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

P	arameters	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 Ibs.	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
						0.0 1.4	F 1				

					Test Re	adings fo	or Specim	en No.	. 2		
No.	Def. Dial in.	Load Dial	Load Ibs.	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

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Ove	n dried Specimens			AST	M D 854	Met	hod B					
		S&ME	, Inc Greenv	ille 48 B	rookfield	Oaks	Dr., Suite F	Green	ville, SC 296	507		
Pro	ject #: 14	26-15	-009 (Phase 10)5)				Repor	t Date:	4	/30/19	
Proj	ject Name: I-8	35 Brid	ge Over Rocky	y Creek				Test D	Date(s):	4/19	- 4/26/1	9
Clie	nt Name: M	BI										
Clie	nt Address: Co	olumbi	a, SC									
Bor	ing #: R\	V-2		Log #	<u>+</u> :		39g		Sample I	Date:	3/13/	/19
Loc	ation: UI	D-1		Type:	:	Ur	ndisturbed		D	epth:	8 - 1	.0'
Sam	nple Description:	San	dy SILT [ML / /	4-7-5(9)]								
Mat	terial Excluded:	2.5%	6					(% Passing #	#4 Sieve	e: 97	7.5%
Bala	ince ID. 0.0	1 gram	ID#:	13942)	Cal. D	ate:	9/11/18	Cal.	Due:	9/1	11/19
Pycr	nometer ID No.		23169 Ca	al. Date:	3/10/1	19	Balance Ve	rification	Check N	/lass:	500 g	ram
	Pycnometer Vo	lume (V _p)	249.73	ml.			Mass De	etermination	:	500.00 g	grams
	Pycnometer N	lass (PN	A)	104.27	grams	-	If [ГРМ-М _р] is greater t	han .06 g	grams,	
	Ave. Pycnometer	Mass	(M _p)	104.27	grams		recal	ibrate the	e dry mass of	t the pyc	nometer.	
Met	the 2 ACTNA D OF	ea spe	ecimens	N		боак	ing time	A	ASTM CL	27:24 <u>+</u> • ::•:•!	<u>-</u> 4 nrs.	
Ta	DIE 2 ASTIM D 854	+	Specimen L		g.)	4		Ag	gregate no	tinitiali	y ariea	
		25	0-mi. beaker	500-ml.	Deaker							
	SP, SP-SIVI	_	$\frac{60 + 10}{45 + 10}$	100	<u>+</u> 10	-	Initial Dry	Mass of	Test			
	SP-SC, SIVI, SC	_	<u>45 + 10</u>	<u> </u>	- 10	-	Specimen -	not req	uired.		Ç	grams
	Silt of Clay		<u> </u>	<u> </u>	- 10	<u> </u>						
	Moswit	= Ma	ass of the Pycn	ometer, so	oil, and w	ater :	= 378.	23 ar	rams			
M	ass of Dry Soil (gr	ams)	Tare #	BB-2		T _t =	Test T	emperati	ure T _t		22.0 °	С
Α	Tare Weight			227.23	3	K =	Temperatu	Ire Coeffi	cient at T _t	C	.99957	
с	Dry Wt. + Tare Wt	t.		266.27	7	К =	Temperature	e Coeffici	ent at 23°C	C	.99933	
M,	Dry Weight		C-A	39.04	l p	w;t =	Density	y of Wate	er at T _t	C	.99777 g	j./ml.
	M _{pw;t} = M	ass of t	he Pycnometer	and water	at T _t	-	$M_{pw;t} = M$	_p + (V _p x	p _{w;t})		353.44 g	grams
	G _t = S	pecific	Gravity of Soil S	Solids at the	e T _t		$G_t = M_s / (M_r)$, _{bw;t} - (M _{ps} ,	_{w;t} -M _s))		2.740	
	G = Sp	ecific G	iravity of Soil Sc	lids at the	20°C		G =	K x G _t			2.739	
	Soils containing p	lus #4	material teste	d per		R =	% of Soil re	etained c	on the #4 si	eve	2.5%	
	A	5 ТМ С	127			P =	% of Soil	passing	the #4 siev	e	97.5%	
	6	Арра	rent Specific G	ravity of p	olus #4 m	nateria	l at the 23°C	c per AS	TM C127			_
	G ₊₄	A	Apparent Spec	ific Gravity	y of plus	#4 ma	aterial correc	cted to 2	20°C			
	G Tot	al Sam	nla Spacific	G	_		1				7 7 2 0	
	Utotal 7010	n Sunn Gra	vity	G _{total}	_		<u>R</u> +		P		2.735	
		0/0	Vity			100) x G ₊₄	100	хG			
Note	es / Deviations / Re	ference	s: ASTM D8	54: Specific	: Gravity c	of Soil S	Solids by Wat	er Pycnoi	meter			
				-								
	Benjamin Kov	aleski		(Art M	. Vgl	-	Proi	iect Ma	r. / Senior	Enar.	4/3	30/19

Benjamin Kovaleski Technician Name

Technical Responsibility

Project Mgr. / Senior Engr. 4/30/19 Position Date



pH / Resistivity / Chloride / Sulfate

AASHTO T 289 / AASHTO T 288 / EPA SW9056A

Proiect #:	1426-15-009 (Phase 105)
110,000.	1 120 13 003 (i Hase 103)

Project Name: I-85 Bridge Over Rocky Creek

Report Date: 4/8/2019

BORING NUMBER	DEPTH	рН	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 Technician Name

NICET Lab Level III / 118202 Certification Type / No.

4/8/2019 Date

Brian Voughen Signature

Brian Vaughan, P.E. Technical Responsibility

Group Leader Position

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/ft³)."

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/ft³. 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/ft³)."

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/ft³. 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.



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:

- $\label{eq:r} \begin{array}{l} r = A \text{verage resistivity of soil, ohm-cm} \\ A = \text{Distance between electrodes, cm} \\ E = \text{Measured Voltage, Volts} \end{array}$
- 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-	50,000 to 100,000
corrosive	

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**.



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 "asreceived" 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.



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.



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





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





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

Poring No.	Sample	Dopth (ft)	Dimen	sions, in.	Shape	Area	Unit Weight	Loading Rate	Maximum	Strength	Moisture
Bulling No.	No.	Deptin (it)	Length	Diameter	(See Key)	(in ²)	(lbs/ft ³)	(psi/sec)	Load (lbs)	(psi)	(%)
BR-1	NQ-1	29.6 - 30.6	4.47	1.99	А	3.11	166.0	75	76,507	24,600	0.2
BR-1	NQ-2	33.9 - 34.6	4.45	1.99	А	3.11	164.7	73	88,076	28,320	0.1
BR-1	NQ-3	39.8 - 40.6	4.46	1.98	А	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^{€1} may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08^{€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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{€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^{¢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^{€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^{€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

Poring No.	Sample	Dopth (ft)	Dimen	sions, in.	Shape	Area	Unit Weight	Loading Rate	Maximum	Strength	Moisture
Builing No.	No.	Deptin (it)	Length	Diameter	(See Key)	(in ²)	(lbs/ft ³)	(psi/sec)	Load (lbs)	(psi)	(%)
BR-2	NQ-1	38.7 - 39.3	4.45	1.98	А	3.08	164.5	71	48,407	15,717	0.1
BR-2	NQ-2	41.4 - 42.5	4.39	1.98	А	3.08	163.0	82	54,175	17,589	0.1
BR-2	NQ-3	44.8 - 45.5	4.40	1.98	А	3.08	171.4	43	18,168	5,899	0.1
BR-2	NQ-4	49.3 - 50.2	4.43	1.98	А	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^{€1} may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08^{€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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{€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^{¢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^{€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^{€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

Poring No.	Sample	Dopth (ft)	Dimen	isions, in.	Shape	Area	Unit Weight	Loading Rate	Maximum	Strength	Moisture
Boning No.	No.	Deptil (it)	Length	Diameter	(See Key)	(in ²)	(lbs/ft ³)	(psi/sec)	Load (lbs)	(psi)	(%)
BR-3	NQ-1	31.5 - 32.3	4.47	1.98	А	3.08	163.6	77	64,325	20,885	0.1
BR-3	NQ-2	35.8 - 36.9	4.47	1.99	А	3.11	162.8	73	48,574	15,619	0.1
BR-3	NQ-3	40.8 - 42.0	4.45	1.98	А	3.08	166.0	87	50,752	16,478	0.1
BR-3	NQ-4	46.6 - 47.7	4.21	1.98	С	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^{€1} may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-08^{€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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)
- B Test specimen measurements met the desired shape tolerances of ASTM D4543-08^{€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^{¢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^{€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^{€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.



			1413 Topsid	le Road, Louisvi	lle, TN 37777		
Project:	I-85 Bridge Over	Rocky Creek	Diameter, in.	:	1.99	Date:	4/4/2019
Project No.:	1426-15-009, Ph	ase 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 Co	ntent, %:	0.2		
Depth (ft):	29.6 - 30.6		Load Rate, p	si/sec:	75		
	-1	<u> </u>	1			<u> </u>	
Data	Strain	(10 ⁻⁰)	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axiai	radiai	(dl)	Stress (psi)	<u>x 10° (psi)</u>	Ratio	Failure
1	0	0	0	0	0.00	0.00	
2	-120	20	2,000	1 296	3.10	0.16	
3	-202	62	4,000	1,200	4.91	0.10	
5	-526	85	8,000	1,929	4.95	0.10	+
6	-520	108	10,000	3 215	4.09	0.10	
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
				ļ	<u></u>	<u> </u>	<u> </u>
Comments:	Loading rate was	s selected to tai	rget reaching fa	ailure between 2 an	d 15 minutes. of ASTM D4543 08 ^{€1} (ci	do straightness (and flatnass 8
	parallelism, and	end perpendicu	larity to axis)	a shape tolerances		de straightness, e	
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				Axial Strain			
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			1413 Topsid	e Road, Louisvi	lle, TN 37777		
Project:	I-85 Bridge Over	Rocky Creek	Diameter, in.	:	1.99	Date:	4/4/2019
Project No.:	1426-15-009, Ph	ase 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 Cor	ntent, %:	0.1		
Depth (ft):	33.9 - 34.6		Load Rate, p	si/sec:	73		
Data		6-			Occupit Mardulus	Deineerle	Domonto de
Data Doint	Strain	(10 ⁻⁰)		Compressive	Secant Modulus	Poisson's	Remarks
Point	axiai		(di)	Stress (psi)	<u>x 10° (psi)</u>	Ratio	Fallure
2	72	14	2 000	643	0.00	0.00	
3	-12	27	2,000	1 286	8.93	0.19	
4	-211	42	6,000	1,200	9.14	0.13	
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	1
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	Foilure
24			66,076	20,320			Fallule
Comments:	Loading rate was Test specimen n parallelism, and	s selected to tan neasurements r end perpendicu	rget reaching fa met the desired Ilarity to axis)	ailure between 2 an d shape tolerances	d 15 minutes. of ASTM D4543-08 ^{€1} (si	de straightness, e	end flatness &
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0	-3,600 -3,400 -3,200	-3,000 -2,800 -2,600	-2,400 -2,200 -2,000	, 200 00 1, 800 00 1, 800 00 1, 1, 800 00 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	10°) 10°)	-200 400 60 700 700 700	600 800 1,000 1,200
				 Axial Strain 			



			1413 Topsid	le Road, Louisvil	le, 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 Co	ntent, %:	0.1		
Depth (ft):	39.8 - 40.6		Load Rate, psi/sec:		70		
Data	Strain (10 ⁻⁶)		Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure
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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain





			1413 Topsic	de Road, Louisvil	lle, 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	Strain (10 ⁻⁶)		Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure
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^{€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.





			1413 Topsid	le Road, Louisvil	lle, 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 Co	ntent, %:	0.1		
Depth (ft):	38.7 - 39.3		Load Rate, p	si/sec:	71		
Data	Strain	(10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure
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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain





orject. 100 roject. 142 pring Id: BR- ample No: NQ- epth (ft): 41.4 Data	26-15-009, P -2 +-2 4 - 42.5 Strain axial 0 -154 -313 -453 -580 -703 -819 -936 1.040	hase 105	Length, in.: Unit Weight, Moisture Co Load Rate, p Load (Ib) 0 2,000 4,000	pcf: ntent, %: psi/sec: Compressive Stress (psi) 0 649	4.39 163.0 0.1 82 Secant Modulus x 10 ⁶ (psi)	Tested by: Reviewed by: Poisson's Ratio	BKP / TDV JBB
opect Not. 142 ring Id: BR- mple No: NQ- pth (ft): 41.4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 20 20	-2 -2 4 - 42.5 Strain axial 0 -154 -313 -453 -580 -703 -819 -936 1.042	1 (10 ⁻⁶) radial 0 13 25 38 51	Longur, m.: Unit Weight, Moisture Co Load Rate, p Load (Ib) 0 2,000 4,000	pcf: ntent, %: ssi/sec: Compressive Stress (psi) 0 649	163.0 0.1 82 Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	JBB Remarks
million Data NQ. point 1.4 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 comments: Loa Tes para	2-2 4 - 42.5 Strain axial 0 -154 -313 -453 -580 -703 -819 -936 4.040	1 (10 ⁻⁶) radial 0 13 25 38 51	Load (Ib) 0 2,000 4,000 4,000	Compressive Stress (psi)	0.1 82 Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks
mple No. Indextore Data 41.4 Point 1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 0 1 20 1 0 1 18 19 20 1 0 1 18 19 20 1	4 - 42.5 Strain axial 0 -154 -313 -453 -580 -703 -819 -936 4 040	(10⁻⁶) radial 0 13 25 38 51	Load Rate, p Load (lb) 0 2,000 4,000	Compressive Stress (psi)	82 Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks
Data	Strain axial 0 -154 -313 -453 -580 -703 -819 -936 4000	(10 ⁻⁶) radial 0 13 25 38 51	Load (lb) 0 2,000 4,000	Compressive Stress (psi)	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks
Data	Strain axial 0 -154 -313 -453 -580 -703 -819 -936 4.040	(10 ⁻⁶) radial 0 13 25 38 51	Load (lb) 0 2,000 4,000	Compressive Stress (psi) 0	Secant Modulus x 10 ⁶ (psi)	Poisson's Ratio	Remarks
Point 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	axial 0 -154 -313 -453 -580 -703 -819 -936 4.040	radial 0 13 25 38 51	(lb) 0 2,000 4,000	Stress (psi) 0	<u>x 10⁶ (psi)</u>	Ratio	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	0 -154 -313 -453 -580 -703 -819 -936 4.042	0 13 25 38 51	0 2,000 4,000	0			Failure
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 	-154 -313 -453 -580 -703 -819 -936 4.042	13 25 38 51	2,000 4,000	6/0	0.00	0.00	
3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	-313 -453 -580 -703 -819 -936	25 38 51	4,000	043	4.21	0.08	+
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 Tes para	-453 -580 -703 -819 -936	38 51	.,	1.299	4.15	0.08	+
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 	-580 -703 -819 -936	51	6.000	1,948	4.30	0.08	+
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 	-703 -819 -936	•	8,000	2,597	4.48	0.09	+
7 8 9 10 11 12 13 14 15 16 17 18 19 20	-819 -936	67	10,000	3.247	4.62	0.10	
8 9 10 11 12 13 14 15 16 17 18 19 20	-936	83	12,000	3,896	4.76	0.10	1
9 10 11 12 13 14 15 16 17 18 19 20 	1.040	102	14,000	4,545	4,86	0.11	1
10 11 12 13 14 15 16 17 18 19 20 	-1 042	122	16,000	5 195	4 99	0.12	1
11 12 13 14 15 16 17 18 19 20	-1,146	144	18,000	5.844	5.10	0.13	1
12 13 14 15 16 17 18 19 20 	-1 256	170	20,000	6 494	5.17	0.14	+
13 14 15 16 17 18 19 20 	-1 466	228	24,000	7 792	5.32	0.16	-
14 15 16 17 18 19 20 	-1 666	287	28,000	9 091	5 46	0.17	1
15 16 17 18 19 20 	-1 893	359	32,000	10 390	5.10	0.19	+
16 17 18 19 20 	-2 160	392	36,000	11 688	5 41	0.18	-
mments: Loa Tes	-2 436	002	40,000	12 987	5 33	0.00	lost radial dade
mments: Loa Tes	-2 705		40,000	14 286	5.28	0.00	
mments: Loa Tes	-2 944	-	48,000	15 584	5.20	0.00	+
mments: Loa Tes	-3 213	-	52 000	16,883	5.25	0.00	+
omments: Loa Tes para	0,210		54 175	17 589	0.20	0.00	Failure
mments: Loa Tes para			04,170	17,000			
omments: Loa Tes para	-						-
	ading rate wa st specimen i allelism, and	as selected to ta measurements I end perpendice	rget reaching f met the desire ularity to axis)	ailure between 2 and d shape tolerances d	d 15 minutes. of ASTM D4543-08 ^{€1} (si	de straightness, e	nd flatness &
18,000 16,000 14,000		1	S	tress vs. Strain			
ğ 12,000 -							•
S 10,000 -				◄			<u> </u>





	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	Strain	<u>(10⁻⁶)</u>	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure
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
				1			

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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain




roject:	I-85 Bridge Ove	r Rocky Creek	Diameter, in	.:	1.98	Date:	4/5/2019
roject No.:	1426-15-009, P	hase 105	Length, in.:		4.43	Tested by:	BKP / TDV
oring Id:	BR-2		Unit Weight	, pcf:	163.3	Reviewed by:	JBB
ample No:	NQ-4		Moisture Co	ontent, %:	0.1		
epth (ft):	49.3 - 50.2		Load Rate, p	osi/sec:	50		
Data	Strain	n (10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain





			1413 Topsid	le Road, Louisvil	le, TN 37777		
Project:	I-85 Bridge Over	Rocky Creek	Diameter, in		1.98	Date:	4/5/2019
Project No.:	1426-15-009, Ph	nase 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 Co	ntent, %:	0.1		
Depth (ft):	55.0 - 56.3		Load Rate, p	si/sec:	81		
Data	Strain	(10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure
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 7.82	0.10 0.09	
8	-581	54	14,000	4,545			
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^{ϵ 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.





1413 Topside Road, Louisville, TN 37777												
Project:	I-85 Bridge Over	1.98	Date:	4/4/2019								
Project No.:	1426-15-009, Ph	ase 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 Co	ntent. %:	0.1							
Depth (ft):	31.5 - 32.3		Load Rate, p	si/sec:	77							
			, p									
Data	Strain	(10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks					
Point	axial	radial	(lb)	Stress (psi)	$\times 10^6$ (pci)	Ratio	Failure					
1	0	0	0	0		0.00		-				
2	-137	17	2 000	649	4 74	0.00		-				
3	-261	33	2,000	1 200	4.08	0.12		-				
3	-201	40	4,000	1,233	4.30	0.13		-				
4	-370	49	8,000	1,940	5.15	0.13		-				
5	-504	07	8,000	2,397	5.15	0.13		_				
0	-622	65	10,000	3,247	5.22	0.14		4				
/	-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		1				
15	-2,084	414	36,000	11,688	5.61	0.20		1				
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		1				
19	-3,031	806	52,000	16,883	5.57	0.27		1				
20	-3,609	1,202	60,000	19,481	5.40	0.33		1				
21		,	64.325	20.885			Failure	-				
			- ,	- ,				-				
Comments:	Loading rate was Test specimen n parallelism, and	s selected to tai neasurements r end perpendicu	rget reaching fa net the desired llarity to axis)	ailure between 2 an d shape tolerances d	d 15 minutes. of ASTM D4543-08 ^{€1} (si	de straightness, e	end flatness &					
22.	000		S	tress vs. Strair	1			_				
20,	000							-				
18,	000							-				
	000							-				
<u>e</u> 14,	000							-				
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ŏ	-3,800 -3,600 -3,400	-3,200 -3,000 -2,800	-2,800 -2,400 -2,200	Strain (1, 200 Strai	•01 -1,000 -1,000 -1,000 -200 -200	200 400	800 1,000 1,200	1,400				
				Axial Strain								



	1413 Topside Road, Louisville, TN 37777 I-85 Bridge Over Rocky Creek Diameter, in.: 1.99 Date: 4/4/2019											
Project:	I-85 Bridge Over	Rocky Creek	Diameter, in.	:	1.99	Date:	4/4/2019					
Project No.:	1426-15-009, Ph	ase 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 Co	ntent, %:	0.1							
Depth (ft):	35.8 - 36.9		Load Rate, p	si/sec:	73							
Data	Strain	(10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks					
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure					
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^{€1} (side straightness, end flatness &

parallelism, and end perpendicularity to axis)

Stress vs. Strain





1413 Topside Road, Louisville, TN 37777 Project: I-85 Bridge Over Rocky Creek Diameter, in.: 1.98 Date: 4/4/2019											
Project:	I-85 Bridge Over	Rocky Creek	Diameter, in.		1.98	Date:	4/4/2019				
Project No.:	1426-15-009, Ph	nase 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 Co	ntent, %:	0.1						
Depth (ft):	40.8 - 42.0		Load Rate, psi/sec:		87						
			· •								
Data	Strain	(10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks				
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	Failure				
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				
í l			-								

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^{€1} (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain





			1413 Topsic	de Road, Louisvil	lle, TN 37777		
Project:	I-85 Bridge Ove	r Rocky Creek	ek Diameter, in.:		1.98	Date:	4/4/2019
Project No.:	1426-15-009, P	hase 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 Co	ontent, %:	0.5		
Depth (ft):	46.6 - 47.7		Load Rate, J	osi/sec:	43		
Data	Strain	ı (10 ⁻⁶)	Load	Compressive	Secant Modulus	Poisson's	Remarks
Point	axial	radial	(lb)	Stress (psi)	x 10 ⁶ (psi)	Ratio	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 1.07 1.04	0.07 0.07 0.08	
5	-1,211	89	4,000	1,299			
6	-1,560	127	5,000	1,623			
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	1		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^{€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.





	1413 Topside Road, Louisville, TN 37777											
Project: Project No.: Boring Id: Sample No.:	I-85 Bridge Over F 1426-15-009, Pha BR-1 NQ-1	Rocky Creek ase 105	Unit Moistur	Diameter (in) Length (in): t Weight (pcf) e Content (%)	1.99 Date: 3/26/2019 4.47 Tested by: VLI 166.0 Reviewed by: JBB 0.2							
Depth (ft):	29.6 - 30.6			. ,								
Deviation Fro	m Straightness (P	rocedure S1)				· - — ·						
Is the maximur	m gap ≤ 0.02 in.?	YES		Straightness T	blerance Met? YES							
					··-·							
End Flatness	and Parallelism R	eadings (Proc	cedure FP1)									
Position	End 1	End 1(90)	End 2	End 2(90)	End 1 Diameter 1	+ 0.0002						
- 7/8	0.0000	0.0004	-0.0011	0.0002	D 0.0030							
- 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	6 -0.0020							
- 3/8	0.0000	0.0004	0.0000	0.0000		0.75 1.00						
- 2/8	0.0000	0.0004	0.0000	0.0000								
- 1/8	0.0000	0.0003	0.0000	0.0000	Diameter (in)							
0	0.0000	0.0000	0.0000	0.0000								
1/8	0.0000	0.0000	0.0005	0.0000	0 0040 End 1 Diameter 2 y = -0.0003x +	+ 0.0002						
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	b -0.0020 b -0.0030							
6/8	0.0007	0.0000	0.0016	0.0000		0.75 1.00						
7/8	0.0007	0.0000	0.0016	0.0000		0.75 1.00						
	Flatness Tolerar	nce Met?		YES	b c c c c c c c c	0.75 1.00						
Parallelism is opposing end	met when the ang Is is ≤ 0.25°.	jular differenc	ce between bes	t fit lines on	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	+ 0.0000						
End 1	Slope of Post Eit		0.00044		Diameter (in)							
	Angle of Rest Fit	Line.	0.00044			······································						
End 2:	Slope of Best Fit		0.02321		Perpendicularity (Procedure P1) is met when the difference	a hetween						
Enu 2.	Angle of Best Fit		0.00155		max and min readings along each line divided by the diam	eter is						
	Max Angular Diff		0.00000		1 = 0.0043.							
	wax Angular Diffe		-0.06									
	Darrallaliam D	liamotor 2			Difference Divide by	Mooto						
End 1.	Slope of Bost Eit	line:	-0 00033		b/w max & min Diameter	Toleranco						
	Angle of Post Fit	Line.	-0.00032		D/W max & min Diameter							
End O.	Slope of Dest Fit	Line. Line:	-0.01817		End 1 Diam 2 0.0001 0.0004	IED VEC						
End 2:	Slope of Best Fit	Line:	-0.00004		End 1 Diam 2 0.0004 0.0002	TES						
	Angle of Best Fit	Line:	-0.00229		End 2 Diam 1 0.0027 0.0014	YES						
	Max Angular Diffe	erence:	-0.02		End 2 Diam 2 0.0002 0.0001	YES						
Parallelism To	olerance Met?		YES		Perpendicularity Tolerance Met?	YES						



	1413 Topside Road, Louisville, TN 37777											
Project:	I-85 Bridge Over R	Rocky Creek		Diameter (in):	: 1.99			Date:	3/26/2019			
Project No.:	1426-15-009, Pha	ase 105		Length (in):	4.45			Tested by:	VLI			
Boring Id:	BR-1		Uni	t Weight (pcf):	: 164.	7		Reviewed by:	JBB			
Sample No.:	NQ-2		Moistur	e Content (%):	: 0.1							
Depth (ft):	33.9 - 34.6											
Deviation Fro	m Straightness (P	rocedure S1)										
Is the maximur	m gap ≤ 0.02 in.?	YES		Straightness T	olerar	nce Me	et?		YES	_		
┣												
End Flatness	and Parallelism Ro	eadings (Prod	cedure FP1)		٦					1		
Position	End 1	End 1(90)	End 2	End 2(90)	-	_	0.0040 ⊤	End 1 Diameter 1	y = 0.000	1x - 0.0001		
- 7/8	-0.0002	0.0000	-0.0006	0.0009	-	ding	0.0030 + 0.0020 +					
- 0/8 5/9	-0.0002	0.0000	-0.0005	0.0007	-	Rea	0.0010 + 0.0000 +	• • • • • • • • • • • • • • • • • • •	• • • • •	• • • •		
- 3/6 0/k	-0.0002	0.0000	-0.0001	0.0005	-	ge ł (in)	-0.0010					
- 4/ð 2/0	-0.0001	0.0000	-0.0001	0.0003	-	Ga	-0.0030		1 1			
- 3/0	-0.0001	0.0000	0.0000	0.0000	-	Dial	-1.0	0 -0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00		
- 2/0	0.0000	0.0000	0.0000	0.0000	-			Diamete	er (in)			
- 1/0	0.0000	0.0000	0.0000	0.0000	-	L						
1/8	0.0000	0.0000	0.0000	0.0000	-				v = -0.000	0x - 0.0000		
2/2	0.0000	0.0000	0.0000	0.0000	-	5	0.0040 T	End 1 Diameter 2	y = -0.000			
2/0	0.0000	0.0000	0.0000	0.0000	-	din	0.0030 +					
3/0 4/8	0.0000	0.0000	0.0000	0.0000	-	Rea	0.0010 + 0.0000 + 0.0000	• • • • • • • •	• • • • •	• • • •		
5/8	0.0000	0.0000	0.0000	0.0000	-	lge (in)	-0.0010 +					
6/8	0.0000	0.0000	0.0000	0.0000	-	Ga	-0.0030					
7/8	0.0000	-0.0000	0.0000	0.0000	1	Dia	-1.0	0 -0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00		
110	0.0000	0.0001	0.0000	0.0000	1			Diamete	er (in)			
	Flatness Tolerar	nce Met?		YES	-	Dial Gage Reac (in)	0.0010 0.0000 -0.0010 -0.0020 -0.0030 -0.0040 -1.0	0 -0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00		
Parallelism is	met when the ang	ular difference	ce between bes	t fit lines on	Ţ	iage Reading (in)	0.0040 0.0030 0.0020 0.0010 -0.0010 -0.0010 -0.0030	End 2 Diameter 2	y = -0.0004	4x + 0.0002		
opposing end	ls is ≤ 0.25°.				i	al G	-0.0040					
	Parrallelism D	iameter 1			1	ä	-1.0	0 -0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00		
End 1:	Slope of Best Fit	Line:	0.00012					Diamete	er (in)			
	Angle of Best Fit	Line:	0.00704		i —			2				
End 2:	Slope of Best Fit	Line:	0.00023		Perp	pendic	ularity (Pr	ocedure P1) is met w	hen the differe	nce between		
	Angle of Best Fit	Line:	0.01326		max	and n	nin readin	gs along each line div	vided by the dia	ameter is		
	Max Angular Diffe	erence:	-0.01		≤ 0.0	043.						
	Parrallelism D	iameter 2			i			Difference	Divide bv	Meets		
End 1:	Slope of Best Fit	Line:	-0.00002		1			b/w max & min	Diameter	Tolerance		
	Angle of Best Fit	Line:	-0.00115		1	End	1 Diam 1	0.0002	0.0001	YES		
End 2:	Slope of Best Fit	Line:	-0.00041		1	End	1 Diam 2	0.0001	0.0001	YES		
	Angle of Best Fit	Line:	-0.02325		1	End	2 Diam 1	0.0006	0.0003	YES		
	Max Angular Diffe	erence:	0.02		ł	End	2 Diam 2	0.0009	0.0005	YES		
Parallelism To	blerance Met?		YES			Perp	endiculari	ty Tolerance Met?		YES		



			1413 Top	oside Road, L	_ouisvi	ille, ˈ	TN 37777			
Project:	I-85 Bridge Over	Rocky Creek		Diameter (in):	: 1.98			Date:	3/26/2019	
Project No.:	1426-15-009, Pl	hase 105		Length (in):	4.46			Tested by:	VLI	
Boring Id:	BR-1		Uni	it Weight (pcf):	: 163.7			Reviewed by:	JBB	
Sample No.:	NQ-3		Moistur	e Content (%):	: 0.1			-		
Depth (ft):	39.8 - 40.6									
Deviation From	m Straightness (I	Procedure S1)								
Is the maximun	n gap ≤ 0.02 in.?	YES		Straightness T	Foleranc	e Me	et?		YES	
End Flatness a	and Parallelism F	Readings (Pro	cedure FP1)							
Position	End 1	End 1(90)	End 2	End 2(90)			0.0040	End 1 Diameter 1	y = 0.000	3x - 0.0001
- 7/8	-0.0008	0.0002	0.0000	0.0002		bu	0.0040			
- 6/8	-0.0007	0.0001	0.0000	0.0001		eadi	0.0020			
- 5/8	-0.0004	0.0000	0.0000	0.0001		å E	0.0000		····	• • • • • • • • • • • • • • • • • • •
- 4/8	0.0000	0.0000	0.0000	0.0000		;jage	-0.0020			
- 3/8	0.0000	0.0000	0.0000	0.0000		ਡ	-0.0040	0.75 0.50 0.05		
- 2/8	0.0000	0.0000	0.0000	0.0000		۵	-1.00	-0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00
- 1/8	0.0000	0.0000	0.0000	0.0000				Diamete	er (in)	
0	0.0000	0.0000	0.0000	0.0000						
1/8	0.0000	0.0000	0.0000	0.0000				End 1 Diameter 2	y = -0.0001	1x + 0.0000
2/8	0.0000	0.0000	0.0000	0.0000		bu	0.0040			
3/8	0.0000	0.0000	0.0000	0.0000		adi	0.0020			
4/8	0.0000	0.0000	0.0000	0.0000		ž e	0.0000	*****	• • • • •	• • • •
5/8	0.0000	0.0000	0.0000	0.0000		i age	-0.0020			
6/8	0.0000	0.0000	0.0000	0.0000		9 9	-0.0040			0.75 4.00
7/8	0.0000	0.0000	0.0000	0.0000		ā	-1.00	-0.75 -0.50 -0.25 (0.00 0.25 0.50	0.75 1.00
	Flatness Tolera	ance Met?		YES	-	Dial Gage Readin (in)	0.0020 0.0010 0.0000 -0.0010 -0.0020 -0.0020 -0.0030 -0.0040 -1.00	-0.75 -0.50 -0.25 (0.00 0.25 0.50	• • • • • 0.75 1.00
Parallelism is opposing end: End 1	met when the an s is ≤ 0.25°. Parrallelism Slope of Best Fi	gular differen Diameter 1 t line:	ce between be	st fit lines on		Dial Gage Reading (in)	0.0040 0.0030 0.0020 0.0010 0.0010 -0.0020 -0.0020 -0.0030 -0.0040 -1.00	End 2 Diameter 2	y = -0.000	1x + 0.0000
	Angle of Best Fi	t Line:	0.00034		i					
End 2	Slope of Rest Fi	t Line:	0.01932		Perne	ndic	ularity (Pro	cedure P1) is met w	hen the differe	nce between
LIIU Z.	Andle of Rest Fi	t Line.	0.00000		max a	ind n	nin reading	s along each line di	vided by the dia	ameter is
	Max Angular Dif	ference:	0.00000 n n 2		≤ 0.00	43.	9		,,,	
	Max / Ingular Di		0.02							
	Parrallelism	Diameter 2						Difference	Divide by	Meets
End 1:	Slope of Best Fi	t Line:	-0.00006					b/w max & min	Diameter	Tolerance
	Angle of Best Fi	t Line:	-0.00327			End ²	1 Diam 1	0.0008	0.0004	YES
End 2	Slope of Best Fi	t Line:	-0.00007			End '	1 Diam 2	0.0002	0.0001	YES
	Angle of Rest Fi	t Line:	-0 00409			End '	2 Diam 1	0.0002	0 0000	YES
	May Angular Dif	ference:	0.00+09			End '	2 Diam 2	0.0000	0.0000	VES
	max Angular Dir		0.00		İ			0.0002	0.0001	. 25
Parallelism To	rallelism Tolerance Met? YES					Perp	endicularity	/ Tolerance Met?		YES



			1413 Top	oside Road, L	Louisville, TN 37777
Project:	I-85 Bridge Over	Rocky Creek		Diameter (in)): 1.98 Date: 3/26/2019
Project No.:	1426-15-009. Pl	hase 105		Length (in):	3.93 Tested by: VLI
Boring Id:	BR-1		Un	it Weight (pcf)): 170.4 Reviewed by: JBB
Sample No.:	NQ-4		Moistu	e Content (%)): 0.2
Depth (ft):	42.9 - 43.5			()	, ,
Deviation From	m Straightness (I	Procedure S1)			
Is the maximur	m gap ≤ 0.02 in.?	NO		Straightness T	Tolerance Met? NO
End Flatness	and Parallelism F	Readings (Pro	cedure FP1)		- 0.00778 0.0001
Position	End 1	End 1(90)	End 2	End 2(90)	= 0.0080 = End 1 Diameter 1 y = 0.0077x - 0.0001
- 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	- 0.0060 0.0080
- 3/8	-0.0022	-0.0003	-0.0001	0.0015	
- 2/8	-0.0011	0.0000	0.0000	0.0005	Diameter (in)
- 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	End 1 Diameter 2
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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
//8	0.0073	0.0029	0.0028	-0.0022	Diameter (in)
	Flatness Tolera	ance Met?		YES	- 0.0010 - 0.0020 - 0.0020 - 0.0020 - 0.0030 - 0.0040 - 0.0040 - 0.0020 - 0.00
Parallelism is	met when the an	gular differen	ce between be	st fit lines on	End 2 Diameter 2 y = -0.0030x + 0.0006 0.0030 0.0010 0.0000 0.0010 0.0010 0.0010 0.0020 0.0010 0.0010 0.0020 0.0010 0.0020 0.0010 0.0020 0.0010 0.0030
opposing end	s is ≤ 0.25°.				
	Parrallelism	Diameter 1			-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
End 1:	Slope of Best Fi	it Line:	0.00770		Diameter (in)
	Angle of Best Fi	it Line:	0.44101		
End 2:	Slope of Best Fi	it Line:	0.00249		Perpendicularity (Procedure P1) is met when the difference between
	Angle of Best Fi	it Line:	0.14258		Imax and min readings along each line divided by the diameter is
	Max Angular Dif	ference:	0.30		l≤0.0043.
	Parrallelism	Diameter 2			Difference Divide by Meets
End 1:	Slope of Best Fi	it Line:	0.00235		b/w max & min Diameter Tolerance
	Angle of Best Fi	it Line:	0.13440		End 1 Diam 1 0.0149 0.0075 NO
End 2:	Slope of Best Fi	it Line:	-0.00298		End 1 Diam 2 0.0044 0.0022 YES
	Angle of Best Fi	it Line:	-0.17091		End 2 Diam 1 0.0052 0.0026 YES
	Max Angular Dif	ference:	0.31		End 2 Diam 2 0.0060 0.0030 YES
Parallelism To	plerance Met?		<u>NO</u>		Perpendicularity Tolerance Met? <u>NO</u>



			1413 Тор	oside Road, L	Louisville, TN 37777
Project:	I-85 Bridge Ove	r Rocky Creek		Diameter (in):): 1.98 Date: 3/26/2019
Project No.:	1426-15-009, F	hase 105		Length (in):	4.45 Tested by: VLI
Boring Id:	BR-2		Un	it Weight (pcf):): 164.5 Reviewed by: JBB
Sample No.:	NQ-1		Moistu	e Content (%):	,): 0.1
Depth (ft):	38.7 - 39.3				
Deviation Fro	m Straightness	(Procedure S1)			
is the maximum	$fn gap \leq 0.02 \text{ in.}?$	TES		Straightness I	Tolerance Met?
End Elatnoss	and Parallolism	Boodings (Bro			
Position	End 1	End 1/90)	End 2	End 2(90)	$y = 0.0021 x \pm 0.0008$
- 7/8	-0.0009	0.0000	-0.0026	0.0000	End 1 Diameter 1 9 = 0.0021X + 0.0000
- 6/8	-0.0006	0.0000	-0.0020	0.0000	
- 5/8	-0.0000	0.0000	-0.0022	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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
- 1/8	0.0000	0.0000	0.0000	0.0000	Diameter (in)
0	0.0000	0.0000	0.0000	0.0000	1
1/8	0.0004	0.0000	0.0003	0.0001	End 1 Diameter 2
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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
drawn throug	h points and a v Flatness Toler	isual best fit lir ance Met?	ne is ≤ 0.001 in.	YES	
Parallelism is opposing end	met when the a s is ≤ 0.25°. Parrallelism	ngular differen	ce between be	st fit lines on	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Enu I.	Slope of Best F	Tit Line.	0.00215		
End 2	Slope of Rest F	it Line.	0.12310		Perpendicularity (Procedure P1) is met when the difference between
LIGZ.	Angle of Rest F	Tit Line:	0.19350		max and min readings along each line divided by the diameter is
	Max Angular Di	ifference:	-0.07		≤ 0.0043.
End 1:	Parrallelism	Diameter 2	0.00082		Difference Divide by Meets
	Angle of Best F	it Line:	0.04715		End 1 Diam 1 0.0041 0.0021 YES
End 2:	Slope of Best F	it Line:	0.00112		End 1 Diam 2 0.0018 0.0009 YES
	Angle of Best F	it Line:	0.06417		End 2 Diam 1 0.0064 0.0032 YES
	Max Angular Di	ifference:	-0.02		End 2 Diam 2 0.0021 0.0011 YES
Parallelism To	plerance Met?		<u>YES</u>		Perpendicularity Tolerance Met? YES



			1413 Тор	side Road, I	Louis	ville,	TN 3777	77			
Project: Project No.: Boring Id: Sample No.:	I-85 Bridge Over Rc 1426-15-009, Phas BR-2 NQ-2	ocky Creek se 105	Unit Moisture	Diameter (in) Length (in): t Weight (pcf) e Content (%)	: 1.98 4.39 : 163.0 : 0.1)		Date: Teste Revie	d by: \ wed by: J	3/26/2019 /LI JBB	
Depth (ft):	41.4 - 42.5										
Deviation Fro	m Straightness (Pro	ocedure S1)									
Is the maximur	m gap ≤ 0.02 in.?	YES		Straightness T	Toleran	ice Me	et?		_	YES	_
┣		·· <u> </u>					· — - — -				·
End Flatness	and Parallelism Rea	adings (Prod	cedure FP1)	F. 10(00)	7						
Position		⊏na 1(90)		End 2(90)	-	_	0.0040 -	End 1 Dia	meter 1	y = 0.0000	x + 0.0001
- 1/8 6/9	0.0001	-0.0023	-0.0025	0.0000	-	ding	0.0030 - 0.0020 -				
- 0/8	0.0001	-0.0010	-0.0018	0.0000	-	Rea	0.0010 - 0.0000 -	• • • •	· · · · ·		• • • • • •
- 5/6	0.0001	-0.0014	-0.0013	0.0000	-	lge (in)	-0.0010 - -0.0020 -				
- 4/0	0.0001	-0.0009	-0.0007	0.0000	-	l Ga	-0.0030				
- 2/8	0,0001	0.0000	0,0000	0.0000	1	Dia	-1.	00 -0.75 -0.5	0 -0.25 0.0	00 0.25 0.50	0.75 1.00
- 1/8	0.0001	0.0000	0.0000	0.0000	1				Diameter	(in)	
0	0.0000	0.0000	0.0000	0.0000	1	L					
1/8	0.0000	0.0002	0.0003	0.0000	1			End 1 Dia	meter 2	y = 0.0031	x + 0.0004
2/8	0.0000	0.0006	0.0008	0.0000	1	βL	0.0040				
3/8	0.0000	0.0013	0.0012	0.0000		adiı	0.0020				
4/8	0.0000	0.0018	0.0020	0.0001		e Re	0.0000				
5/8	0.0001	0.0026	0.0027	0.0002]	age (i)	-0.0020				
6/8	0.0002	0.0031	0.0032	0.0004		ial G	-0.0040	00 075 05	0.25 0.4		0.75 1.00
7/8	0.0002	0.0036	0.0037	0.0004		õ	-1.	00 -0.75 -0.5	J -U.25 U.(UU U.25 U.50	0.75 1.00
	Flatness Tolerand	ce Met?		YES	_	Dial Gage Rea (in)	0.0010 - 0.0000 - -0.0010 - -0.0020 - -0.0030 - -0.0040 - -1.	00 -0.75 -0.5) -0.25 0.0	00 0.25 0.50	0.75 1.00
Parallelism is	met when the angu	lar differend	e between bes	t fit lines on	7	ige Reading (in)	0.0040 0.0030 0.0020 0.0010 -0.0010 -0.0010 -0.0010	End 2 Dia	meter 2	y = 0.0002	2x + 0.0001
opposina end	ls is ≤ 0.25°.				i	l Ga	-0.0030 -0.0040				
	Parrallelism Dia	ameter 1			l	Dia	-1.	00 -0.75 -0.5	0 -0.25 0.0	00 0.25 0.50	0.75 1.00
End 1:	Slope of Best Fit L	ine:	0.00001		1				Diameter	(in)	
	Angle of Best Fit L	ine:	0.00049		;	har an an an					
End 2:	Slope of Best Fit L	ine:	0.00317		Perp	endic	ularity (P	rocedure P1)	is met wh	en the differer	nce between
	Angle of Best Fit L	ine:	0.18155		max	and n	nin readir	ngs along ead	h line divi	ded by the dia	ameter is
	Max Angular Differ	ence:	-0.18		≤ 0.0	043.					
					i						
	Parrallelism Dia	ameter 2						Diff	erence	Divide by	Meets
End 1:	Slope of Best Fit L	ine:	0.00309		1	_		b/w m	iax & min	Diameter	Tolerance
_	Angle of Best Fit L	ine:	0.17680		ł	End	1 Diam 1	0	0002	0.0001	YES
End 2:	Slope of Best Fit L	ine:	0.00019			End	1 Diam 2	0	0059	0.0030	YES
	Angle of Best Fit L	ine:	0.01080		1	End	2 Diam 1	0	0062	0.0031	YES
	Max Angular Differ	ence:	0.17		ł	End 2	2 Diam 2	0	0004	0.0002	YES
Parallelism To	allelism Tolerance Met? <u>YES</u>					Perp	endicular	rity Tolerance	Met?		YES



			1413 Top	oside Road, L	_ouisvil	le, ˈ	TN 377	77		
Project:	I-85 Bridge Ove	r Rocky Creek		Diameter (in)	: 1.98			Date:	3/26/2019	
Project No.:	1426-15-009, F	9, Phase 105 Length (in):				4.40 Tested by: VLI				
Boring Id:	BR-2		Un	: 171.4			Reviewed by	: JBB		
Sample No.:	NQ-3		Moistu	re Content (%)	: 0.1					
Depth (ft):	44.8 - 45.5									
Deviation From	m Straightness	(Procedure S1)								
Is the maximum	m dan < 0.02 in ?	YES		Straightness T	Tolerance	Me	t?		YES	
End Flatness	and Parallelism	Readings (Pro	cedure FP1)							
Position	End 1	End 1(90)	End 2	End 2(90)	1 🗆			End 1 Diameter 1	y = -0.000	2x - 0.0000
- 7/8	0.0001	-0.0028	0.0000	-0.0026		2	0.0040			
- 6/8	0.0000	-0.0021	0.0000	-0.0018	adir	au	0.0020			
- 5/8	0.0000	-0.0020	0.0000	-0.0011	Re		0.0000	• • • • • • • • • • • • • • • • • • •	• • • • • • •	
- 4/8	0.0000	-0.0013	0.0000	-0.0004	ade	Ē	-0.0020			
- 3/8	0.0000	-0.0008	0.0000	0.0000	9	ס פ	-0.0030			
- 2/8	0.0000	-0.0003	0.0000	0.0000	ä	ž	-1	.00 -0.75 -0.50 -0.25	0.00 0.25 0.50	0.75 1.00
- 1/8	0.0000	0.0000	0.0000	0.0000				Diam	eter (in)	
0	0.0000	0.0000	0.0000	0.0000	1					
1/8	0.0001	0.0002	-0.0001	0.0004				End 1 Diameter 2	y = 0.0033	3x + 0.0002
2/8	0.0001	0.0008	-0.0002	0.0008		ĥ	0.0040			
3/8	0.0001	0.0010	-0.0003	0.0012	adii	ga	0.0020			
4/8	0.0000	0.0018	-0.0009	0.0019	Re		0.0000			
5/8	-0.0002	0.0022	-0.0012	0.0026	ade		-0.0020	-		
6/8	-0.0004	0.0029	-0.0016	0.0033	9 8	9 8	-0.0040			
7/8	-0.0005	0.0033	-0.0017	0.0036	ä	5	-1	.00 -0.75 -0.50 -0.25	0.00 0.25 0.50	0.75 1.00
	Flatness Tolerance Met? YES					uai dage he (in)	0.0000 -0.0010 -0.0020 -0.0030 -0.0040 -1	00 -0.75 -0.50 -0.25	0.00 0.25 0.50	0.75 1.00
					Reading)	0.0040 0.0030 0.0020 0.0010 0.0010	End 2 Diameter 2	y = 0.003	1x + 0.0005
Parallelism is	met when the a	ngular differen	ce between be	st fit lines on		i.	-0.0020			
opposing end	s is ≤ 0.25°.				0	0 8	-0.0040			
	Parrallelism	Diameter 1				ž	-1	.00 -0.75 -0.50 -0.25	0.00 0.25 0.50	0.75 1.00
End 1:	Slope of Best F	it Line:	-0.00020					Diam	eter (in)	
	Angle of Best F	it Line:	-0.01146		i					
End 2:	Slope of Best F	it Line:	-0.00093		Perpen	ndic	ularity (F	rocedure P1) is met	when the differe	nce between
	Angle of Best F	it Line:	-0.05320		max an	nd n	nin readi	ngs along each line	divided by the di	ameter is
	Max Angular Di	ifference:	0.04		≤ 0.004	3.				
					i					
	Parrallelism	Diameter 2			1			Difference	Divide by	Meets
End 1:	Slope of Best F	it Line:	0.00325		I			b/w max & m	in Diameter	Tolerance
	Angle of Best F	it Line:	0.18646		; E	nd 1	1 Diam 1	0.0006	0.0003	YES
End 2:	Slope of Best F	it Line:	0.00307		Ε	nd 1	1 Diam 2	0.0061	0.0031	YES
	Angle of Best F	it Line:	0.17565		I E	nd 2	2 Diam 1	0.0017	0.0009	YES
	Max Angular Di	ifference:	0.01		; E	nd 2	2 Diam 2	0.0062	0.0031	YES
Parallelism Tolerance Met?		YES		P	erp	endicula	rity Tolerance Met?		YES	



			1413 Top	side Road, L	ouisville,	TN 37777			
Project: Project No.:	I-85 Bridge Over Rocky Creek Diameter (in): 1426-15-009, Phase 105 Length (in): BR-2				1.98 4.43		Date: 3 Tested by: \	3/26/2019 /LI	
Boring Id:	BR-2		Uni	t Weight (pcf):	163.3		Reviewed by:	JBB	
Sample No.:	NQ-4		Moistur	e Content (%):	0.1				
Depth (ft):	49.3 - 50.2								
Deviation From	m Straightness (P	rocedure S1)							
Is the maximur	m gap ≤ 0.02 in.?	YES		Straightness T	plerance Me	et?	_	YES	_
End Flatness	and Parallelism R	eadings (Pro	cedure FP1)						
Position	End 1	End 1(90)	End 2	End 2(90)		0.0040	End 1 Diameter 1	y = 0.0012	x + 0.0005
- 7/8	-0.0003	0.0000	-0.0001	0.0000	ling	0.0030			
- 6/8	-0.0001	0.0000	0.0000	0.0000	leac				
- 5/8	0.0000	0.0000	0.0000	0.0000	je F	-0.0010			
- 4/8	0.0000	0.0000	0.0000	0.0000	Gaç	-0.0020			
- 3/8	0.0000	0.0000	0.0000	0.0000	Dial	-0.0040 -1.00	-0.75 -0.50 -0.25 0.0	00 0.25 0.50	0.75 1.00
- 2/8	0.0000	0.0000	0.0000	0.0000			Diameter	(in)	
- 1/8	0.0000	0.0000	0.0000	0.0000			Diameter	()	
0	0.0000	0.0000	0.0000	0.0000					
1/8	0.0003	0.0003	0.0002	0.0000		0.0040	End 1 Diameter 2	y = 0.0009	x + 0.0005
2/8	0.0005	0.0007	0.0004	0.0000	ling				
3/8	0.0008	0.0007	0.0007	0.0000	ead				
4/8	0.0013	0.0009	0.0012	0.0000	je R	-0.0010		•	
5/8	0.0014	0.0012	0.0016	0.0000	Gag	-0.0020			
6/8	0.0018	0.0014	0.0019	0.0001	Dial	-0.0040 +	-0.75 -0.50 -0.25 0.0	00 0.25 0.50	0.75 1.00
7/8	0.0019	0.0016	0.0024	0.0002			Diamotor	(in)	
	Flatness Tolerance Met? YES					0.0020 0.0010 0.0000 -0.0010 -0.0020 -0.0030 -0.0040 -1.00	-0.75 -0.50 -0.25 0.0 Diameter	, , , , , , , , , , , , , , , , , , ,	0.75 1.00
Parallelism is opposing end	met when the ang ls is ≤ 0.25°. Parrallelism D	gular differen Diameter 1	ce between bes	st fit lines on	Dial Gage Reading (in)	0.0040 0.0030 0.0020 0.0010 0.0010 -0.0020 -0.0020 -0.0030 -0.0040 -1.00	End 2 Diameter 2	y = 0.0001	x + 0.0000
End 1:	Slope of Best Fit	Line:	0.00122				Diameter	(in)	
	Angle of Best Fit	Line:	0.06990		L	=			
End 2:	Slope of Best Fit	Line:	0.00128		Perpendic	ularity (Pro	cedure P1) is met wh	en the differer	nce between
	Angle of Best Fit	Line:	0.07334		max and n	nin reading	s along each line divi	aea by the dia	imeter is
	Max Angular Diffe	erence:	0.00		≥ 0.0043.				
					l I				
	Parrallelism D	Diameter 2					Difference	Divide by	Meets
End 1:	Slope of Best Fit	Line:	0.00094		_		b/w max & min	Diameter	Tolerance
	Angle of Best Fit	Line:	0.05402		End	1 Diam 1	0.0022	0.0011	YES
End 2:	Slope of Best Fit	Line:	0.00006		End	1 Diam 2	0.0016	0.0008	YES
	Angle of Best Fit	Line:	0.00327		End	2 Diam 1	0.0025	0.0013	YES
	Max Angular Diffe	erence:	0.05		End	2 Diam 2	0.0002	0.0001	YES
Parallelism Tolerance Met?		<u>YES</u>		Perp	endicularity	/ Tolerance Met?		<u>YES</u>	



			1413 Тор	side Road, L	_ouis∖	/ille,	TN 377	77			
Project:	I-85 Bridge Over R	Rocky Creek		Diameter (in):	1.98			Date:	3	3/26/2019	
Project No.:	1426-15-009, Pha	ase 105		Length (in):	4.44			Tested I	by: \	/LI	
Boring Id:	BR-2		Unit	t Weight (pcf):	: 166.4	1		Reviewe	ed by: 、	IBB	
Sample No.:	NQ-5		Moistur	e Content (%):	: 0.1						
Depth (ft):	55.0 - 56.3										
Deviation Fro	m Straightness (Pi	rocedure S1)					· — - —				
Is the maximur	m gap ≤ 0.02 in.?	NO		Straightness T	oleran	ce Me	et?			NO	
┣—											
End Flatness	and Parallelism Re	eadings (Proc	cedure FP1)								
Position	End 1	End 1(90)	End 2	End 2(90)			0.0040	End 1 Diame	ter 1	y = 0.0004	x + 0.0002
- 7/8	0.0000	0.0000	-0.0043	-0.0028		bu	0.0040				
- 6/8	0.0000	0.0000	-0.0034	-0.0023		eadi	0.0020	-			
- 5/8	0.0000	0.0000	-0.0026	-0.0015		ъ В К	0.0000 -0.0010		+ +		
- 4/8	0.0000	0.0000	-0.0020	-0.0009		Gag	-0.0020 -0.0030				
- 3/8	0.0000	0.0000	-0.0011	-0.0005		ial (-0.0040	00 0.75 0.50	0.25 0.		0.75 1.00
- 2/8	0.0000	0.0000	-0.0004	-0.0001		Δ	-1	.00 -0.75 -0.50	-0.23 0.0	JU U.20 U.5U	0.75 1.00
- 1/8	0.0000	0.0000	0.0000	0.0000					Diameter	(in)	
0	0.0000	0.0000	0.0000	0.0000		r					
1/8	0.0000	0.0000	0.0003	0.0000			0.0040	End 1 Diame	ter 2	y = 0.0003	x + 0.0002
2/8	0.0002	0.0002	0.0010	0.0004		buj	0.0040				
3/8	0.0004	0.0003	0.0019	0.0008		eadi	0.0020				^
4/8	0.0004	0.0003	0.0027	0.0015		e R	0.0000 -0.0010		+ +		
5/8	0.0005	0.0005	0.0034	0.0024		3ag	-0.0020 -0.0030	-			
6/8	0.0006	0.0005	0.0045	0.0030		ial (-0.0040	00 0 75 0 50	0.25 0.	0 0 25 0 50	0.75 1.00
7/8	0.0006	0.0005	0.0054	0.0034		ā	-1	.00 -0.75 -0.50	-0.25 0.0	JU 0.25 0.50	0.75 1.00
	Flatness Toleran	nce Met?		YES	_	Dial Gage Read (in)	0.0020 0.0000 -0.0020 -0.0040 -0.0060 -1	.00 -0.75 -0.50	-0.25 0.1	00 0.25 0.50	0.75 1.00
Parallelism is opposing end	met when the ang Is is ≤ 0.25°.	ular differenc	ce between bes	t fit lines on	٦ ¦	ial Gage Reading (in)	0.0040 0.0030 0.0020 0.0010 0.0010 -0.0020 -0.0030 -0.0040 -1	End 2 Diame	-0.25 0	y = 0.0031	x + 0.0002
	Parrallelism D	nameter 1			1		.1		Diameter	(in)	
End 1:	Slope of Best Fit	Line:	0.00039		¦	L			Jameter	(11)	
E. LO	Angle of Best Fit	Line:	0.02210		 	o n -l ! -	ularity (Presedure D4) !-	motivit	on the difference	
End 2:	Slope of Best Fit	Line:	0.00503		Imerp	endic and r	uiarity (F	rocedure P1) is	met wh	en the aitterer ded by the dia	ice between
	Angle of Best Fit	Line:	0.28844		1< 0 0	anu f 043	miread	ings along each		aeu by the dia	
	Max Angular Diffe	erence:	-0.27		<u> </u>	J-7J.					
	Parrolloliem D	iameter 2			i				ence	Divido by	Mooto
End 1	Slope of Boot Eit	line:	0 00033		i -			b/w mos	(& min	Divide by	Toleranco
End 1:		Line. Line:	0.00033		ļ	End	1 Diam 1	kem w\u			
End O.	Angle of Best Fit	Line. Line:	0.01883		i	End End		0.00		0.0003	IES VEC
End 2:	Slope of Best Fit	LINE:	0.00312		1	End	ו Diam 2	0.00	05	0.0003	YES
	Angle of Best Fit	Line:	0.17876			End	2 Diam 1	0.00	97	0.0049	NO
	Max Angular Diffe	erence:	-0.16			End	2 Diam 2	0.00	162	0.0031	YES
Parallelism Tolerance Met?			<u>NO</u>		:	Perp	endicula	rity Tolerance N	let?		NO



			1413 Тор	side Road, I	Louisville, TN 37777					
Project:	I-85 Bridge Over F	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		Uni	t Weight (pcf)): 163.6 Reviewed by: JBB					
Sample No.:	NQ-1		Moistur	e Content (%)): 0.1					
Depth (ft):	31.5 - 32.3									
Deviation Fro	m Straightness (P	rocedure S1)								
Is the maximu	m dap < 0.02 in ?	YES		Straightness T	Tolerance Met? YES					
End Flatness	and Parallelism R	eadings (Proc	cedure FP1)							
Position	End 1	End 1(90)	End 2	End 2(90)	End 1 Diameter 1 $y = 0.0019x + 0.0002$					
- 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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00					
- 1/8	-0.0001	0.0000	0.0000	0.0000	Diameter (in)					
0	0.0000	0.0000	0.0000	0.0000	1					
1/8	0.0002	0.0000	0.0000	0.0000	End 1 Diameter 2 $y = 0.0003x + 0.0001$					
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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00					
					Diameter (in)					
Flatness is m	et when the differe	ence at any po	bint between a	smooth curve	End 2 Diameter 1 y = 0					
drawn throug	n points and a vis	ual best fit lin	ie is ≤ 0.001 in.							
	Flatness Tolerar	nce Met?		YES	- (0.0020 - 0.0030					
					Diameter (in)					
					0.0000 0.0000					
					End 2 Diameter 2 $y = 0.0008x + 0.0002$					
Parallolism is	mot when the and	ular difforon	n hotwoon ho	st fit lings on						
	Inter when the any	gular unterend	se between bes	st nt nnes on	B -0.0020					
opposing end	IS IS ≥ 0.23 . Derrelleliem D	Sometor 1			-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00					
End 4			0.00100		Diameter (in)					
Ena 1:	Silupe of Best Fit	Line:	0.00192							
Erd O.	Angle of Best Fit	Line.	0.11017		Barpondicularity (Procedure P1) is mat when the difference between					
End 2:	Slope of Best Fit	Line:	0.00000		may and min readings along each line divided by the diameter is					
	Angle of Best Fit	Line:	0.00000		I < 0.0043.					
	wax Angular Diffe	erence:	0.11							
	Demelle Parts	lometer 0			Difference Divide has the state					
Ex 14		nameter 2	0 00000		Difference Divide by Meets					
End 1:	Slope of Best Fit	Line:	0.00030		b/w max & min Diameter Tolerance					
_	Angle of Best Fit	Line:	0.01735		End 1 Diam 1 0.0038 0.0019 YES					
End 2:	Slope of Best Fit	Line:	0.00081		End 1 Diam 2 0.0005 0.0003 YES					
	Angle of Best Fit	Line:	0.04666		End 2 Diam 1 0.0000 0.0000 YES					
	Max Angular Diffe	erence:	-0.03		End 2 Diam 2 0.0019 0.0010 YES					
			VEO		l I Domendiaulatity Televine Marco					
Parallelism Tolerance Met?		YES		Perpendicularity i olerance Met? <u>YES</u>						



			1413 Top	side Road, L	_ouisv	ille, ⁻	TN 3777	7		
Project: Project No :	I-85 Bridge Over Rocky Creek Diameter (in): 1426-15-009, Phase 105 Length (in):							Date: Tested by:	3/26/2019	
Boring Id:	BR-3	ase 105	Uni	t Weight (ncf)	• 162 8			Peviewed by:	IBB	
Sample No :			Moistur	Contont (%)	· 102.0			Reviewed by.	100	
Donth (ft):	25.9 26.0		WOIStur		. 0.1					
Depth (It).	55.8 - 50.9									
Deviation Fro	m Straightness (P	Procedure S1)								
Is the maximur	m gap ≤ 0.02 in.?	YES		Straightness T	oleranc	e Me	t?		YES	
End Flatness	and Parallelism R	eadings (Pro	cedure FP1)							
Position	End 1	End 1(90)	End 2	End 2(90)			0.0040	End 1 Diameter 1	y = 0.000	1x - 0.0000
- 7/8	-0.0001	0.0006	0.0000	0.0004		gu	0.0040 - 0.0030 -			
- 6/8	-0.0001	0.0000	0.0000	0.0000		adi	0.0020 - 0.0010 -			
- 5/8	-0.0001	0.0000	0.0000	0.0000		e Re	0.0000	• • • • • • • • • • • • • • • • • • •	• • • • •	• • • •
- 4/8	-0.0001	0.0000	0.0000	0.0000		(jr Ge	-0.0020 -			
- 3/8	0.0000	0.0000	0.0000	0.0000		Ű	-0.0030 -	1 1 1		
- 2/8	0.0000	0.0000	0.0000	0.0000	1	Dia	-1.	00 -0.75 -0.50 -0.25	0.00 0.25 0.50	0.75 1.00
- 1/8	0.0000	0.0000	0.0000	0.0000	1			Diame	er (in)	
0	0.0000	0.0000	0.0000	0.0000	┫└					
1/2	0.0000	0.0000	0.0000	0.0000	- 				v – -0 000'	1x + 0.0000
1/0	0.0000	0.0000	0.0000	0.0000	-	-	0.0040	End 1 Diameter 2	y = -0.000	
2/8	0.0000	0.0000	0.0000	0.0000	-	dinç	0.0030 - 0.0020 -			
3/8	0.0000	0.0000	0.0000	0.0000	-	eac	0.0010	<u> </u>		
4/8	0.0000	0.0000	0.0000	0.0000		ji B	-0.0010 -	• • • • •	• • • • •	· · · ·
5/8	0.0000	0.0000	0.0000	0.0000		Gag	-0.0020 -			
6/8	0.0000	0.0000	0.0000	-0.0002		ial o	-0.0040 +	0 0 75 0 50 0 25	0.00 0.25 0.50	0.75 1.00
7/8	0.0000	0.0000	0.0000	-0.0010		Δ	-1.		0.00 0.23 0.30	0.75 1.00
	Flatness Tolerance Met? YES					Dial Gage Readir (in)	0.0020 - 0.0010 - 0.0000 - -0.0020 - -0.0030 - -0.0040 - -1.	• • • • • • • • • • • • • • • • • • •	0.00 0.25 0.50	• • • • • • • • • • • • • • • • • • • •
Parallelism is opposing end	met when the ang Is is ≤ 0.25°. Parrallelism [gular differen Diameter 1	ce between bes	st fit lines on]	Dial Gage Reading (in)	0.0040 0.0020 0.0010 0.0000 -0.0010 -0.0020	End 2 Diameter 2	y = -0.000	0.75 1.00
End 1:	Slope of Best Fit	Line:	0.0006					Diame	er (in)	
	Angle of Best Fit	Line:	0.00360							
End 2	Slope of Best Fit	Line:	0 00000		Perne	ndic	ularitv (P	rocedure P1) is met w	hen the differe	nce between
	Angle of Rest Fit	Line [.]	0.00000		max	ind m	nin readir	igs along each line di	vided by the di	ameter is
	Max Angular Diff		0.00000 n n		≤ 0.00	43.		<u>.</u>		
	Max Angular Diff	erence.	0.00		1					
	Parrallelism I	Diameter 2			!			Difference	Divide by	Meets
End 1:	Slope of Best Fit	Line:	-0.00012		i			b/w max & mir	Diameter	Tolerance
	Angle of Best Fit	Line:	-0.00688			End 1	I Diam 1	0.0001	0.0001	YES
End 2:	Slope of Best Fit	Line:	-0.00031		1	End 1	Diam 2	0.0006	0.0003	YES
2113 2.	Angle of Rest Fit	Line:	-0 01801		:	End 2	Diam 1	0.0000	0 0000	YES
	Max Angular Diff	erence.	0.01001		1	End 2	Diam 2	0.0000	0.0007	YES
			0.01		ļ			0.0014	0.0007	123
Parallelism To	olerance Met?		<u>YES</u>			Perp	endicular	ity Tolerance Met?		<u>YES</u>



			1413 Тор	side Road, L	uisville, TN 37777	
Project: Project No.: Boring Id: Sample No.: Depth (ft):	I-85 Bridge Over 1426-15-009, P BR-3 NQ-3 40.8 - 42.0	r Rocky Creek hase 105	Uni Moistur	Diameter (in) Length (in): t Weight (pcf) e Content (%)	.98 Date: 3/26/201 .45 Tested by: VLI 66.0 Reviewed by: JBB .1 .1 .1	9
Deviation Fro	m Straightness (m gap ≤ 0.02 in.?	Procedure S1) YES		Straightness T	erance Met?	 s
End Flatness	and Parallelism	Readings (Proc	edure FP1)			
Position	End 1	End 1(90)	End 2	End 2(90)	End 1 Diameter 1	= 0.0007x - 0.0002
- 7/8	-0.0006	0.0005	0.0000	0.0003		
- 6/8	-0.0006	0.0004	0.0000	0.0002	0.0020 0.0010	
- 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		0.50, 0.75, 1.00
- 2/8	-0.0006	0.0000	0.0000	0.0000		0.50 0.75 1.00
- 1/8	-0.0005	0.0000	0.0000	0.0000	Diameter (in)	
0	0.0000	0.0000	0.0000	0.0000		
1/8	0.0000	0.0001	0.0000	0.0000	End 1 Diameter 2 y =	-0.0002x + 0.0002
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	0 -0.0030	
7/9	0.0004	0.0001	0.0002	0.0000	-1.00 -0.75 -0.50 -0.25 0.00 0.25	0.50 0.75 1.00
//0	0.0004	0.0001	0.0002	0.0000	Diameter (in)	
	Flatness Toler	ance Met?		YES	b c c c c c c c c	0.50 0.75 1.00
Parallelism is opposing end	met when the a ls is ≤ 0.25°. Parrallelism	ngular differend Diameter 1	ce between bes	t fit lines on	End 2 Diameter 2 y = 0.0040 End 2 Diameter 2 y = 0.0020 0.0010 0.0000 0.0000 0.0010 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.0000 0.0000	-0.0001x + 0.0000
End 1:	Slope of Best F	it Line:	0.00073		Diameter (in)	
	Angle of Best F	it Line:	0.04174			
End 2:	Slope of Best F	it Line:	0.00009		erpendicularity (Procedure P1) is met when the c	lifference between
	Angle of Best F	it Line:	0.00507		ax and min readings along each line divided by	the diameter is
	Max Angular Di	fference:	0.04		0.0043.	
End 1:	Parrallelism Slope of Best F Angle of Best F	Diameter 2 iit Line: iit Line:	-0.00017 -0.00999		Difference Divide b/w max & min Diam End 1 Diam 1 0.0010 0.00	e by Meets eter Tolerance 05 YES
End 2:	Slope of Best F	it Line:	-0.00009		End 1 Diam 2 0.0005 0.00	03 YES
	Angle of Best F Max Angular Di	it Line: fference:	-0.00540 0.00		End 2 Diam 1 0.0002 0.00 End 2 Diam 2 0.0003 0.00	01 YES 02 YES
Parallelism Tolerance Met?			<u>YES</u>		Perpendicularity Tolerance Met?	YES



			1413 Top	side Road, I	Louisville, TN 37777
Project:	I-85 Bridge Over	Rocky Creek		Diameter (in)): 1.98 Date: 3/26/2019
Project No.:	1426-15-009, Ph	ase 105		Length (in):	4.21 Tested by: VLI
Boring Id:	BR-3		Uni	t Weight (pcf)): 162.8 Reviewed by: JBB
Sample No.:	NQ-4		Moistur	e Content (%)): 0.5
Depth (ft):	46.6 - 47.7				
Deviation Fro	m Straightness (F	Procedure S1)			
Is the maximur	m gap ≤ 0.02 in.?	NO		Straightness 1	Tolerance Met? NO
End Flatness	and Parallelism R	Readings (Pro	cedure FP1)		
Position	End 1	End 1(90)	End 2	End 2(90)	End 1 Diameter 1 $y = 0.005x + 0.0001$
- 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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
- 1/8	0.0000	0.0000	0.0001	0.0000	Diameter (in)
0	0.0000	0.0000	0.0000	0.0000	
1/8	0.0006	0.0000	0.0005	0.0000	End 1 Diameter 2 v = -0.0052x - 0.0001
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	-1.00 -0.75 -0.50 -0.25 0.00 0.25 0.50 0.75 1.00
	Flatness Tolera	nce Met?		$- \frac{1000000}{0.0000} + \frac{100000}{0.0000} + \frac{100000}{0.0000} + \frac{100000}{0.0000} + \frac{100000}{0.0000} + \frac{1000000}{0.0000} + 1000000000000000000000000000000000000$	
Parallelism is opposing end	met when the an Is is ≤ 0.25°. Parrallelism I	gular differen Diameter 1	ce between bes	st fit lines on	End 2 Diameter 2 y = -0.0032x + 0.0003 0.0030 0.0010 0.00010 0.00000 0.00000 0.00010 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0
End 1:	Slope of Best Fit	Line:	0.00505		Diameter (in)
	Angle of Best Fit	Line:	0.28910		·
End 2:	Slope of Best Fit	Line:	0.00294		Perpendicularity (Procedure P1) is met when the difference between
-	Angle of Best Fit	Line:	0.16829		max and min readings along each line divided by the diameter is
	Max Angular Diff	erence:	0.12		l≤0.0043.
	-				
	Parrallelism I	Diameter 2			Difference Divide by Meets
End 1:	Slope of Best Fit	Line:	-0.00518		b/w max & min Diameter Tolerance
	Angle of Best Fit	Line:	-0.29679		End 1 Diam 1 0.0096 0.0048 NO
End 2:	Slope of Best Fit	Line:	-0.00324		End 1 Diam 2 0.0102 0.0052 NO
	Angle of Best Fit	Line:	-0.18547		End 2 Diam 1 0.0055 0.0028 YES
	Max Angular Diff	erence:	-0.11		End 2 Diam 2 0.0064 0.0032 YES
Parallelism Tolerance Met?			<u>YES</u>		Perpendicularity Tolerance Met? <u>NO</u>

















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