Geotechnical Base Line Report (GBLR)
I-77 Panthers Interchange
Rock Hill, York County, South Carolina
SCDOT Project ID P038652
S&ME Project No. 1461-19-069

PREPARED FOR:

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October 12, 2020

October 12, 2020

RS&H
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Attention: Mr. Andrew Smith, PE, SE – Office Leader

Reference: **Geotechnical Base Line Report (GBLR)**
I-77 Panthers Interchange
Rock Hill, York County, South Carolina
SCDOT Project ID P038652
S&ME Project No. 1461-19-069

Dear Mr. Smith:

The purpose of this geotechnical base line report (GBLR) is to provide the design/build team information that may be used in preliminary design and bidding for construction of the bridge and roadway embankments associated with the new Panthers Interchange along Interstate 77, in Rock Hill, York County, South Carolina. Our services were performed in general accordance with the Subcontract for Professional Services between RS&H and S&ME, Inc. dated December 9, 2019, including the associated scope of services for geotechnical investigations in general accordance with the SCDOT *Geotechnical Design Manual* (GDM), Version 2.0, 2019 version.

We look forward to continuing our geotechnical engineering services on this important project. If you or your design team has specific questions regarding any geotechnical aspects of this project, please call at any time.

Sincerely,

S&ME, Inc.

Robert C. Bruorton, P.E.
Senior Engineer/Project Manager

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER
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CERTIFICATE OF AUTHORIZATION

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1.0 Introduction

This report summarizes the preliminary results of the geotechnical investigation conducted to date for the proposed I-77 Panthers Interchange. The general configuration of the interchange is shown on the *Site Location Plan*, attached as Figure 1 in Appendix I. Our scope of work relevant to the roadway embankment and bridge portions of the project included:

- Visits to the site by geotechnical personnel,
- Coordinating clearing activities for drill rig access,
- Coordinating coring and drilling activities,
- Performing geotechnical and geophysical subsurface investigations,
- Conducting laboratory testing,
- Reviewing available geologic and geotechnical-related data,
- Conducting preliminary seismic analysis for the FEE and SEE conditions based on ADRS curves provided by SCDOT,
- Preparing this report conforming to Section 21 of the GDM.

Project design parameters and computations generally follow those described in the relevant sections of the South Carolina Department of Transportation (SCDOT) *Geotechnical Design Manual v2.0 (GDM)*, except where specifically described otherwise in the report text.

2.0 Project Description

Our understanding of the project is based on review of the following plans, provided by RS&H:

- Proposed Plans for South Carolina Department of Transportation – SCDOT Project ID P038652 – "York County I-77 Interchange at Exit 81 (Panthers Interchange)", prepared by Neel-Schaffer, dated 6-9-2020, and
- Proposed Plans for York County – Project ID P038652 – "I-77 Interchange near Exit 82 – Construct Overpass over I-77", prepared by RS&H, dated 6-15-2020.

The proposed construction for this project includes a new folded diamond interchange that is summarized as follows:

- Ramp 1 – An approximately 1,948 linear foot exit ramp from I-77 southbound to a signaled intersection with One Carolina Drive approximately 512 feet west of the overpass structure. The ramp will consist of two traffic lanes splitting to up to six lanes approaching the intersection. Longitudinally along this alignment, fills of up to roughly 21 feet and cuts of up to roughly 15 feet are planned. Transversely along this alignment, fills of up to roughly 20 feet and cuts of up to roughly 25 feet are planned.

- Ramp 2 – An approximately 2,870 linear foot entrance ramp from a signaled intersection with One Carolina Drive to I-77 northbound approximately 454 feet east of the overpass structure. The ramp extends south from the intersection and loops under the overpass to merge with I-77 north of the

overpass. The ramp consists of two traffic lanes near the intersection with One Carolina Drive merging to a single lane. Longitudinally along this alignment, fills of up to roughly 32 feet and cuts of up to roughly 2 feet are planned. Transversely along this alignment, fills of up to roughly 36 feet and cuts of up to roughly 17 feet are planned.

- Ramp 3 – An approximately 3,003 linear foot exit ramp from I-77 northbound to a signaled intersection with One Carolina Drive approximately 454 feet east of the overpass structure. The ramp consists of one traffic lane splitting to up to three lanes approaching the intersection. Longitudinally along this alignment, fills of up to roughly 43 feet and cuts of up to roughly 12 feet are planned. Transversely along this alignment, fills of up to roughly 42 feet and cuts of up to roughly 26 feet are planned. An MSE retaining wall is planned from roughly Station 562+00 to 565+00.

- Ramp 4 – An approximately 4,240 linear foot entrance ramp from a signaled intersection with One Carolina Drive to I-77 southbound, approximately 512 feet west of the overpass structure. The ramp extends north from the intersection and loops under the overpass to merge with I-77 south of the overpass. The ramp consists of two traffic lanes near the intersection with One Carolina Drive merging to a single lane. Longitudinally along this alignment, fills of up to roughly 20 feet and cuts of up to roughly 8 feet are planned. Transversely along this alignment, fills of up to roughly 22 feet and cuts of up to roughly 21 feet are planned.

- One Carolina Drive – East – Approximately 2,018 linear feet of new roadway, extending from the new bridge (overpass) east through the Ramp 2/Ramp 3 intersection and extending east to merge into existing Paragon Way. The alignment is depicted to have five traffic lanes near the overpass that merge down to two lanes at existing Paragon Way with appropriate shoulders and median. Longitudinally along this alignment, fills of up to roughly 36 feet and cuts of up to roughly 1 foot are planned. Transversely along this alignment, fills of up to roughly 37 feet and cuts of up to roughly 5 feet are planned. A roughly 275-foot long MSE abutment wall is planned at the bridge/overpass end slope. An additional MSE retaining walls is planned from roughly Station 42+00 to 46+00.

- One Carolina Drive – West – Approximately 1,184 linear feet of new roadway, extending from the new bridge (overpass) west through the Ramp 1/Ramp 4 intersection to stub into planned development west of the intersection. The roadway is depicted with eight traffic lanes near the overpass that merge down to six lanes at the tie-in to the planned development with appropriate shoulders and median. Longitudinally along this alignment, fills of up to roughly 38 feet and cuts of up to roughly 4 feet are planned. Transversely along this alignment, fills of up to roughly 37 feet and cuts of up to roughly 4 feet are planned. A roughly 275-foot long MSE abutment wall is planned at the bridge/overpass end slope.

- One Carolina Drive Bridge/Overpass – An approximately 285 linear foot long, 126-foot, 4-inch wide bridge (overpass) structure over Interstate 77 with center median, sidewalk, and shared use path. The bridge is planned to consist of three spans in a 71-foot, 3-inch/142-foot, 6-inch/71-foot, 3-inch configuration with 20-foot approach slabs. The bridge is planned to be constructed of thirteen rows of pre-cast/pre-stressed (PCPS) concrete beams supported on four PCPS or cast-in-place concrete bent caps on each at each of the four bents. Each bent (end and interior) is planned to be supported by six columns, each supported by a deep foundation system.

3.0 Existing Conditions

From our review of the *Rock Hill East* USGS historical topographic quadrangle, the site is generally situated along the eastern side slope of a ridge. An associated, unnamed tributary of Manchester Creek traverses the site by means of a piped culvert beneath I-77.

The site and planned developments consist of three general areas:

- Area 1 – One Carolina Drive (East), Ramp 2 and Ramp 3,
- Area 2 – Overpass Structure and Interstate 77 right-of-way; and,
- Area 3 – One Carolina Drive (West), Ramp 1 and Ramp 4.

3.1 Area 1 – One Carolina Drive (East)/Ramp 2 and Ramp 3

Parcels east of the I-77 alignment currently consist of a mix of industrial and undeveloped properties. The planned alignments cross areas observed to be undeveloped, moderate woodland and areas of open grasses associated with the existing industries. The eastern end of the alignment ties into Paragon Way roughly 2,130 to 2,400 linear feet south-southwest of its intersection with State Route 50 (Celriver Road). A portion of the new northbound exit ramp alignment (Ramp 3) is planned to traverse the existing stormwater management ponds for a large distribution center located at 996 Paragon Way.

From our review of York County GIS, the existing grades along the northbound exit ramp (Ramp 3) appear to slope in a northeasterly direction from about elevation 575 feet at I-77 down to roughly elevation 550 feet, then back up to about elevation 580 feet along the planned new roadway alignment. Existing grades along the northbound entrance ramp (Ramp 2) range from about elevation 580 feet to 560 feet within the ramp loop. Along the planned new roadway alignment of this ramp, existing grades appear to range from about elevation 575 feet to 580 feet. Existing grades along One Carolina Drive slope down from the existing I-77 right-of way then gradually up to the east to existing Paragon Way and appear to range from about elevation 575 feet to 580 feet.

3.2 Area 2 – Overpass Structure and I-77 Right-of-Way

The Interstate 77 portion of the site currently consists of four, 12-foot wide, asphalt-paved, northbound and four, 12-foot wide, asphalt-paved, southbound travel lanes with asphalt-paved shoulders and medians divided by a concrete barrier wall. The existing Interstate 77 right-of-way in the project corridor ranges from approximately 300 to 350 feet wide. An existing box culvert traverses beneath I-77 from northwest (roughly Station 561+21) to southeast (roughly Station 562+93.

From our review of York County GIS, the existing grades along I-77 slope in a southern direction, from about elevation 605 feet down to about elevation 530 feet. Along the northbound shoulder of the existing right-of-way, the existing ground surface generally slopes up away from I-77 within the southern quarter of the site, down away from I-77 within the south-central quarter of the site and is relatively even with I-77 within the northern half of the site. Along the southbound shoulder of the existing right-of-way, the existing ground surface generally slopes up, away from I-77.

3.3 Area 3 – One Carolina Drive (West)/Ramp 1 and Ramp 4

The western property portion of the site currently consists of a portion of a roughly 232-acre, undeveloped tract of land. This overall tract of land is located within the southwestern quadrant of the intersection of Interstate 77 and Eden Terrace; however, the western portion of this project is concentrated within the northeastern quadrant of the overall tract. The western portion of the alignment, west of the intersection associated with the southbound entrance/exit ramps, traverses an existing overhead electrical easement. This portion of the site is currently undeveloped and wooded. Surface elevations are up to 5 feet lower to roughly 60 feet higher than the I-77 right of way.

From our review of York County GIS, the existing grades along the southbound exit ramp (Ramp 4) appear to slope in a southern direction and range from about elevation 625 feet down to 595 feet, then transition back up to about elevation 625 feet at the planned new roadway alignment. Existing grades along the southbound entrance ramp range from about elevation 610 feet to 580 feet within the ramp loop. Along the planned new roadway alignment of this ramp, existing grades appear to range from about elevation 580 feet to 645 feet.

4.0 Subsurface Exploration Work

As requested, representatives of S&ME, Inc. were present at the above referenced site between January 6 and 17, 2020 and again between May 18 and 26, 2020, to conduct the following preliminary phase testing:

- Forty-five (45) Standard Penetration Test (SPT) borings,
- Three (3) bulk samples,
- Four (4) undisturbed samples, and
- One (1) MASW/MAM shear wave velocity test.

Boring designations reflect the purpose of the borings, as follows:

Table 4-1 – Boring Summary

Purpose	Boring No.
End Bent	EB-1 through EB-4
Interior Bent	IB-1 through IB-4
Embankment	EM-1 through EM-21
Retaining Wall	RW-1 through RW-14
Culvert	C-1 through C-2

Initial project information provided for the alignment showed a retaining wall in the vicinity of Station 49+00 to 51+00 along One Carolina Drive where borings RW-5 and RW-6 were performed, however, the provided plans show a retaining wall from Station 42+00 to 46+00.

Previous borings B-9 and B-10, performed for our *Report of Preliminary Geotechnical Exploration, Properties in Rock Hill, SC – Hutchison Parcel* (S&ME Project Number 1461-19-050, dated October 17, 2019) were located within the planned new roadway and are therefore included in this exploration.

The boring locations were initially established in the field by representatives of S&ME at the locations submitted to and approved by SCDOT using our hand-held sub-meter GPS unit. Borings were performed in reasonable proximity to marked location stakes unless they are offset because of slopes, ditches, overhead power or other obstructions. Where appropriate, offset distances and relative direction were noted on the field boring record. Subsequent to drilling and abandonment, boring coordinates and elevations were surveyed by Glenn and Associates, under subcontract to S&ME. Boring positions were located in the field at reported coordinates by hand-held GPS unit, then the actual boring location determined by visual observation and probing with a small-diameter steel probe rod. The coordinates and elevations of the borings tabulated in this report and indicated on the boring records may be considered accurate to the degree of surveying accuracy used by the surveyor. Station and offset were interpreted from the digital files provided by RS&H. Boring locations are attached in tabular format as Table 1 in Appendix II and are presented in graphical format on the *Boring Location Plans*, Figures 2 through 8 in Appendix I.

The following sections summarize the general outline of each test. The field testing data are organized into appendices of this report as follows:

- Appendix III – Soil and Rock Core Boring Records
- Appendix IV – Rock Core Box Photographs
- Appendix V – SPT Hammer Energy Reports
- Appendix VI – MASW/MAM Seismic Data

4.1 Encroachment Permit

S&ME applied for encroachment along the SCDOT right-of-way on December 13, 2019 and received the approved encroachment permit No. 230664 on January 3, 2020.

4.2 Traffic Control

Traffic control for the project was provided by Area Wide Protective (AWP) for borings within the existing travel lanes and along the existing shoulders. Traffic control within the existing SCDOT right-of-way along Interstate 77 was performed in accordance with SCDOT requirements for Lane Closure, Daytime, Multiline Components, Interstate Routes – SCDOT Standard Drawing 610-105-01 and Right Shoulder Closure (Case I/Case II) Interstate Routes) – SCDOT Standard Drawing 610-305-00. Traffic control within the travel lanes of existing Paragon Way was performed in accordance with SCDOT requirements for Flagging Operations, Two-Lane, Two-Way Roadway without Intersections – SCDOT Standard Drawing 610-005-10.

4.3 Site Clearing

Clearing was performed by Carolina BrushCutters under subcontract to S&ME. Carolina BrushCutters used a skid steer-mounted forestry grinder on January 3 through 7, 2020 and again on May 18, 2020 to create drill rig access pathways to several of the boring locations located in overgrown fields and wooded areas. Trails of approximately

12 to 15 feet wide were cleared with trees chipped in-place. No attempt was made to stack or remove downed trees from the site. Care was taken to limit site disturbance during this process.

4.4 Standard Penetration Test (SPT) Borings

Forty-five (45) soil test borings with SPT sampling were performed for this project between the dates of January 6 and 20, 2020 and again between May 18 and 26, 2020, using three drill rigs, as follows:

Table 4-2 –Drilling Equipment Summary

Rig Make/Model	Driller	Carrier Type	Average SPT Energy Transfer Ratio (ETR), %
CME-55	Independence Drilling, Inc.	Truck	75.9
CME-550	Metro Drill, Inc.	ATV	85.5
CME-550	S&ME, Inc.	ATV	85.9

Borings were performed using hollow-stem auger drilling techniques. The borings were extended to termination or drill bit refusal depths ranging from 9.2 to 70.3 feet below the existing ground surface, followed by wireline rock coring, where applicable.

Soil sampling and penetration testing were performed in general accordance with ASTM D1586 *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*. SPT was performed in each boring continuously in the upper 10 feet, followed by approximate 5-foot centers, thereafter. The split-barrel sampler was opened at the drill site and sloughed material was identified and separated from the recovered sample. The recovered sample was visually described and classified by S&ME's rig geologist or engineer. A selected portion of the sample was placed in a glass jar with a moisture-proof lid or sealed plastic bags. Where materials changed over the sample drive length, a sample of each material was retained. The sample jars/bags were labeled, placed in cardboard boxes, and transported to the S&ME Columbia Office at the end of each work day.

Water level measurements were attempted immediately after completion of drilling and, were repeated after a period of 24 hours in select borings. After ground water measurements were complete, borings conducted within the existing SCDOT right-of-way were backfilled with Portland cement/bentonite grout, and the surface pavements were patched with commercially available bagged asphalt cold patch materials. Borings conducted outside of the existing SCDOT right-of-way were backfilled with auger cuttings and a plastic hole plug was placed within the borehole.

SPT hammer energy measurements with a Pile Driving Analyzer (PDA) were performed by S&ME at off-site locations for the drill rigs used on the project in general accordance with ASTM D4633 *Standard Test Method for Energy Measurement for Dynamic Penetrometers*. The SPT Energy test results are provided in Appendix V. The N-values indicated on the logs are field values and were not corrected for overburden stress, rod length, borehole diameter or hammer efficiency. Hammer energy ratios are provided on the individual soil test boring records in Appendix II.

4.5 Wireline Rock Coring

At the bridge (EB and IB) boring locations, wireline rock coring was performed to termination depths of 55.4 to 70.3 feet below the existing ground surface to explore the refusal materials in general accordance with ASTM D2113 *Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration*. Rock coring was performed using an NQ-size core barrel and wireline retrieval system. The recovered rock cores were visually logged by the S&ME rig geologist or engineer. The rock core samples were placed in wooden/cardboard core boxes and the boxes were labeled. Photographs were taken of each completed core box prior to core being removed for laboratory testing. Completed core boxes were transported to the S&ME Columbia Office at the end of each work day. The rock cores were preserved, handled and transported in general accordance with ASTM D5079.

4.6 Bulk Samples

Three (3) bulk samples were obtained from the site at selected borings. The representative bulk samples of near-surface soils were obtained by randomly taking shovel loads of auger cutting spoils from borings until a sample of 75 to 100 pounds was obtained. The samples were placed in plastic buckets/bags and marked with appropriate descriptive information.

4.7 Undisturbed Samples (Shelby Tubes)

Undisturbed samples (Shelby tubes) were obtained in companion off-set borings adjacent to selected boring locations. Four (4) relatively undisturbed (UD) samples, or Shelby Tubes, were performed on January 21, 2020, in general accordance with ASTM D1587 *Standard Practice for Thin-Walled Tube Sampling of Fine Grained Soils for Geotechnical Purposes*. Shelby tube sample depths were selected by S&ME upon review of the SPT logs and assigned accordingly.

Shelby Tubes provide sufficiently intact samples for quantitative laboratory testing. Samples were obtained by pushing a 3-inch outer diameter, 16-guage, steel tube into the soil at the desired sampling intervals in hollow stem augered boreholes adjacent to the original SPT location. The tube, together with the encased soil, was carefully removed from the ground and length of the recovered soil measured. The ends of the tube were sealed with microcrystalline wax and labeled with applicable project information before being transported to our laboratory. Shelby tube samples were transported and stored in general accordance with ASTM D4220 for Group C samples.

4.8 Shear Wave Velocity Test by MASW/MAM Method

On December 31, 2019, we completed a seismic surface wave survey at the site. Analysis of surface waves (Raleigh waves) can be used to determine shear wave velocities. Surface waves propagate to depths that are inversely proportional to their frequencies (i.e. dispersion) and are recorded at the ground surface along a spread of low-frequency geophones. Measurements are then transformed from time domain into frequency domain from which the phase characteristics of the surface waves can be calculated. A dispersion curve (i.e. phase velocity curve) is developed allowing the phase velocity (Cf) of particular frequency waves to be calculated. The dispersion curve is then transformed into a one-dimensional (1D) shear wave velocity profile through an inversion and iterative process.

We performed a combination of Multi-Channel Analysis of Surface Waves (MASW) and Microtremor Array Measurements (MAM) surveys at the requested location as presented in Appendix XI. Performing both surveys generally provides greater penetration depth using low frequency surface waves (MAM) without sacrificing resolution at shallower depths by using higher frequency surface waves (MASW). The MASW survey consisted of recording different frequency surface waves generated from an active energy source (sledgehammer striking a metal plate) traveling across a linear array using a Geometrics ES3000 seismograph equipped with sixteen (16) 4.5 Hz vertical geophones. Measurements for the MASW survey were collected with geophones at set spacings of both 5 feet and 10 feet. The MAM survey consisted of recording different frequency surface waves generated from a passive energy source (e.g. background noise, vehicles, etc.) traveling across a non-linear array using a Geometrics ES3000 seismograph equipped with eleven (11) 4.5 Hz vertical geophones. Measurements for the MAM survey were conducted along an "L-shaped" array using geophones at a set spacing of 30 feet. Data analysis was conducted using the OYO Corporation's SeisImager/SW™ software (Pickwin™ and WaveEq™).

Geophysical Methodology Limitations

Regardless of the thoroughness of a geophysical study, there is always a possibility that actual conditions may not match the interpretations. The results should be considered accurate only to the degree implied by the methods used and the method's limitations and data coverage. Accordingly, the possibility exists that not all features at a project site will be located due to either subsurface soil conditions or the occurrence of features outside the lateral limits and below the depth of penetration of the methods used.

The geophysical methods used for this survey also has inherent limitations. Site activity (e.g. generators, heavy equipment, traffic, etc.) can cause noise/interference in the seismic data sets. Depth restrictions are also associated with the MASW/MAM methods and energy source. Depth of penetration using surface wave methods is mainly controlled by the shear properties of the subsurface materials and frequency range of site surface waves (generated active or ambient passive). Generally, penetration depth is greater for stiffer profiles as the signal does not attenuate as rapidly. However, because very small strain is required to determine shear properties, sometimes velocities of very stiff materials are difficult to obtain using traditional active or ambient sources.

5.0 Classification of Recovered Soil and Rock Samples

Recovered split spoon and bulk 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, provisional field classifications were revised as necessary to provide a soil description that generally follows the terminology given by ASTM D2487 *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)* and AASHTO M145 *Recommended Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes*.

Recovered rock core samples were reviewed and classified in general accordance with the SCDOT GDM Chapter 6, Section 6.3. Upon return to our laboratory, the rock core samples were reviewed and classified by a Professional Geologist (PG). Recovered cores examined in the laboratory were assigned descriptive terms using tables 6-16 through 6-22 of the GDM where applicable to the rock type. Rock lithologic descriptions, and applicable descriptive information are included on the Soil Test Boring Records in Appendix III. Discontinuities in the

recovered cores were evaluated using the terminology in GDM Table 6-24. After logging, selected sections of rock core were removed and prepared for laboratory compressive strength testing.

After laboratory testing was completed, the Rock Mass Rating (RMR) was computed in general accordance with the GDM and Section 10 of the 2012 AASHTO LRFD *Bridge Design Specifications*. Additionally, the Geological Strength Index (GSI) was determined in general accordance with the 2014 AASHTO LRFD *Bridge Design Specifications*. A summary of the Rock Core Testing is provided in Appendix IX.

Interpreted subsurface conditions encountered by the SPT borings are shown on the soil test boring records in Appendix III. Soil test boring records were compiled in gINT using standard SCDOT template. These records represent our interpretation of the subsurface conditions based on the test data. Stratification lines on the boring records represent approximate boundaries between soil types; however, the actual transition may be gradual and the thicknesses of the strata will vary across the site. The soil samples will be retained at our laboratory for a period of seven years, or until completion of substructure installation, whichever is earlier.

6.0 Laboratory Physical Tests

Index property testing consisting of Atterberg limits, particle-size distribution, percent finer #200 sieve, and natural moisture content tests were performed on split-spoon, bulk and undisturbed soil samples to assist in classifying the soils. Additionally, organic content and corrosion series (pH, chloride, sulfate, and resistivity) testing were performed on selected split-spoon samples. Furthermore, standard Proctor moisture-density and California Bearing Ratio testing were performed on bulk samples. Finally, one-dimensional consolidation and consolidated undrained triaxial shear testing were performed on undisturbed samples. Uniaxial compressive strength testing was performed on selected rock core specimen.

Table 6-1 – Laboratory Testing Table

Test Type	Quantity
Atterberg limits	54
Particle-size distribution	5
Percent-finer 200 sieve	49
Natural moisture content	55
Organic content	4
Corrosion Series	2
Standard Proctor moisture-density	3
California Bearing Ratio	3
One-dimensional consolidation	2
Consolidated undrained triaxial shear	2
Compressive strength of rock cores	17

Tables summarizing the laboratory test results are provided after this report as follows:

- Table 2: Split Spoon Samples – Laboratory Classification Testing Summary
- Table 3: Corrosion Series Testing Summary
- Table 4: Undisturbed Samples – Laboratory Classification & Shear Strength Testing Summary
- Table 5: Bulk Samples – Laboratory Classification & Proctor Testing Summary
- Table 6: Bulk Samples – Laboratory Proctor and CBR Testing Summary
- Table 7: Undisturbed Samples – Laboratory Classification & Consolidation Testing Summary
- Table 8: Rock Core Samples – Laboratory Testing Summary

Testing was performed in general accordance with ASTM, AASHTO, or SC state test procedures as follows:

- Atterberg limits – ASTM D4318 / AASHTO T89/90
- Particle-size distribution – ASTM D422 / AASHTO T88
- Percent-finer 200 sieve – ASTM D1140 / AASHTO T11
- Natural moisture content – ASTM D2216 / AASHTO T265
- Organic content – ASTM D2974 / AASHTO T267
- Corrosion Series:
  - pH – ASTM G51 / AASHTO T289
  - Chloride – AASHTO T291
  - Sulfate – ASTM C1580 / AASHTO T290
  - Resistivity – AASHTO T288
- Standard Proctor moisture-density – ASTM D698 / AASHTO T99
- California Bearing Ratio – ASTM D1883
- One-dimensional consolidation – ASTM D2435
- Consolidated undrained triaxial shear – ASTM D4767
- Compressive strength of rock cores – ASTM D7012 (Methods C&D)

The individual laboratory test data sheets are organized into appendices of this report as summarized below:

- Appendix VIII – Laboratory Test Data Sheets – Split Spoon Samples
- Appendix IX – Laboratory Test Data Sheets – Rock Core Samples
- Appendix X – Laboratory Test Data Sheets – Bulk Samples
- Appendix XI – Laboratory Test Data Sheets – Undisturbed Samples
- Appendix XII – Laboratory Test Data Sheets – Corrosion Series

7.0 Subsurface Conditions

Assessment of the geotechnical conditions included review of available topographic, geologic and soils maps for relevant information.

7.1 Area Geology

The site is located within the Charlotte Belt of the Piedmont Physiographic Province of South Carolina. The Piedmont Province generally consists of well-rounded hills and ridges, which are dissected by a well-developed system of draws and streams. The Piedmont Province is predominantly underlain by metamorphic rock (formed

by heat, pressure and/or chemical action) and igneous rock (formed directly from molten material), which were initially formed during the Precambrian and Paleozoic eras. The volcanic and sedimentary rocks deposited in the Piedmont Province during the Precambrian eras were the host for the metamorphism and were changed to gneiss and schist. The more recent Paleozoic era had periods of igneous emplacement, with at least several episodes of regional metamorphism resulting in the majority of the rock types seen today.

The topography and relief of the Piedmont Province have developed from differential weathering of the igneous and metamorphic rock. Because of the continued chemical and physical weathering, the rocks in the Piedmont Province are now generally covered with a mantle of soil that has weathered in place from the parent bedrock. These soils have variable thicknesses and are referred to as residuum or residual soils. The residuum is typically finer grained and has higher clay content near the surface because of the advanced weathering. Similarly, the soils typically become coarser grained with increasing depth because of decreased weathering. As the degree of weathering decreases, the residual soils generally retain the overall appearance, texture, gradation and foliations of the parent rock.

The boundary between soil and rock in the Piedmont is not sharply defined. A transitional zone termed "Partially Weathered Rock" is normally found overlying the parent bedrock. Partially Weathered Rock (PWR) is defined for engineering purposes as residual material with Standard Penetration Resistances (N-values) exceeding 100 blows per foot. The transition between hard/dense residual soils and PWR occurs at irregular depths due to variations in degree of weathering.

Water is typically present in the residual soils and within fractures in the PWR or underlying bedrock in the Piedmont. On upland ridges in the Piedmont, water may or may not be present in the residual soils above the PWR and bedrock. Alluvial soils, which have been transported and deposited by water, are typically found in floodplains and are generally saturated to within a few feet of the ground surface. Fluctuations in water levels are typical in residual soils and PWR in the Piedmont, depending on variations in precipitation, evaporation and surface water runoff. Seasonal high-water levels are expected to occur during or just after the typically wetter months of the year (November through April).

The existing right-of-way of I-77, including the extent of the existing culvert that traverses the existing roadway, include areas of previously placed fill. It has been our experience that previously placed fill soils can change abruptly in composition or consistency over short horizontal distances. Previously placed fills often may contain hidden zones of detrimental materials and unsuitable soils or may contain voids.

7.2 Soil and Rock Stratification

The generalized subsurface conditions at the site are described below. Interpreted subsurface cross-sectional profiles are attached as Figures 9 through 13 in Appendix I. The discussed subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring/sounding records included in Appendix II should be reviewed for specific information at each boring/sounding location. The depth and thickness of the subsurface strata indicated on the boring/sounding records was estimated based on the drill cuttings and the samples recovered or correlations between tip stress and sleeve friction of the cone. The transition between materials may be more gradual than indicated on the boring/sounding records. Information on actual subsurface conditions exists only at the specific boring/sounding

locations and is relevant to the time the exploration was performed. Variations may occur and should be expected at locations remote from the boring/sounding. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates. Soil test boring and sounding records are attached in Appendix II.

7.2.1 Northbound Exit Ramp (Ramp 3)

Borings associated with the northbound exit ramp include EM-1 through EM-3 and RW-1 through RW-4. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 2 inches of topsoil.

Beneath the surface materials, Borings EM-1, EM-2 and RW-4 encountered embankment fill associated with the shoulders of Interstate 77 to depths of roughly 1½ to 2½ feet below the existing ground surface. This embankment fill consisted of low to high plasticity clays with little sands (CL and CH) and low to medium plasticity silts with nil to some fine to medium sands (ML). Recovered samples were dry to moist to the touch and were red and brown in color. SPT N-values ranged from 11 to 21 blows per foot (bpf), indicating stiff to very stiff consistencies.

Borings RW-1 and RW-2 encountered previous fill soils associated with the adjacent industrial development and stormwater ponds to depths of roughly 2 feet below the existing ground surface. This previous fill consisted of low plasticity clays with some fine to medium sands (CL). Recovered samples were moist to wet to the touch and were brown in color. SPT N-values on the order of 8 bpf, indicating a firm consistency.

Beneath the previous fill soils in Borings RW-1, RW-2 and RW-4 and at the ground surface in RW-3, alluvial deposits were encountered to depths of roughly 6 to 8 feet below the existing ground surface. This alluvium consisted of high plasticity clays (CH), some with trace organics. Recovered samples were moist to wet to the touch and were gray and brown in color. SPT N-values ranged from 6 to 15 bpf, indicating firm to stiff consistencies.

Beneath the fills and alluvial deposits, the borings in this portion of the site typically encountered Piedmont residuum consisting of low to high plasticity silts with few to some fine to coarse sands (ML and MH), fine to coarse sands with little to some low to high plasticity silts (SM) and high plasticity clays with nil to trace coarse sands (CH). Recovered samples of the residual soils were dry to wet to the touch and were red, brown, yellow and gray in color. SPT N-values ranged from 5 to 64 bpf, indicating firm to hard consistencies in the silty/clayey soils and loose to very dense relative densities in the sandy soils.

Partially weathered rock (PWR) was encountered beneath the Piedmont residuum in Borings EM-3, RW-3 and RW-4 at depths of roughly 6 feet, 18½ feet and 6 feet, respectively, below the existing ground surface. The PWR consisted of fine to coarse sand with some low plasticity silts (SM). Recovered samples were moist to the touch and brown in color.

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project and was encountered at depths of roughly 6.8 feet in Boring EM-3, roughly 23.2 feet in Boring RW-1, roughly 18.4 feet in Boring RW-2, roughly 20.6 feet in Boring RW-3 and roughly 23.6 feet in Boring RW-4.

Ground water was not encountered at time of boring in the borings performed within this portion of the project. Select borings were left open overnight for delayed ground water measurements, with no ground water encountered after 24 hours either.

7.2.2 Northbound Entrance Ramp (Ramp 2)

Boring associated with the northbound entrance ramp include EM-4 through EM-8 and C-1. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 3 inches of topsoil.

Beneath the surface materials, Borings EM-4, EM-5 and EM-6 encountered embankment fill associated with the shoulders of Interstate 77 to depths of roughly 2 to 3 feet below the existing ground surface. This embankment fill consisted of high plasticity silts and clays with little to some fine sands (MH and CH). Recovered samples were moist to the touch and were red in color. SPT N-values ranged from 7 to 9 bpf, indicating a firm consistency.

Boring EM-8 encountered previous fill soils associated with the adjacent industrial development and stormwater ponds to depths of roughly 2 feet below the existing ground surface. This previous fill consisted of high plasticity clays (CH). Recovered samples were moist to the touch and were red and brown in color. SPT N-values on the order of 16 bpf, indicating a very stiff consistency.

Boring C-1 encountered alluvial deposits to a depth of roughly 2 feet below the existing ground surface. This alluvium consisted of high plasticity clays (CH) some with trace organics. Recovered samples were wet to the touch and were gray and brown in color. SPT N-values on the order of 4 bpf, indicating a soft consistency.

Beneath the fills and alluvial deposits, the borings in this portion of the site typically encountered Piedmont residuum consisting of low plasticity silts with little to some fine to coarse sands (ML), high plasticity clays with trace to some fine to medium sands (CH), high plasticity silts with trace fine sands (MH) and fine to coarse sands with little to some low to medium plasticity fines (SM). Recovered samples of the residual soils were moist to wet to the touch and were red, brown and gray in color. SPT N-values ranged from 4 to 71 bpf, indicating soft to very stiff consistencies in the silty/clayey soils and loose to very dense relative densities in the sandy soils.

Partially weathered rock (PWR) was encountered beneath the Piedmont residuum in Borings EM-8 and C-1 at depths of roughly 6 feet and 4 feet, respectively, below the existing ground surface. The PWR consisted of fine to coarse sand with some low plasticity silts (SM). Recovered samples were dry to the touch and brown and gray in color.

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project and was encountered at a depth of roughly 21 feet in Boring C-1.

Ground water was encountered in Borings EM-7 and C-1 at time of boring at depths of roughly 4½ and 6 feet, respectively, below the existing ground surface. Select borings were left open overnight for delayed ground water measurements, with ground water encountered after 24 hours at these same borings at depths of roughly 5 and 12 feet, respectively below the existing ground surface.

7.2.3 One Carolina Drive

Boring associated with the Paragon Way include EM-17 through EM-21, RW-5 and RW-6, C-2 and previous borings B-9 and B-10. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 4 inches of topsoil and 15 inches of asphalt pavement.

Beneath the surface materials, Boring EM-20 encountered embankment fill associated with the shoulders of Interstate 77 to a depth of roughly 8 feet below the existing ground surface. This embankment fill consisted of high plasticity silts with little fine sands and trace gravels (MH). Recovered samples were moist to the touch and were red in color. SPT N-values ranged from 6 to 8 bpf, indicating a firm consistency.

Borings EM-17 and C-2 encountered alluvial deposits to depths of roughly 8½ and 3 feet, respectively, below the existing ground surface. This alluvium consisted of medium to high plasticity clays (CH) with little to some fine sands, some with trace roots. Recovered samples were moist to the touch and were red, gray and brown in color. SPT N-values ranged from 4 to 8 bpf, indicating soft to firm consistencies.

Beneath the fills and alluvial deposits, the borings in this portion of the site typically encountered Piedmont residuum consisting of fine to coarse sands with little to some low plasticity silts and high plasticity clays (SM and SC), low to high plasticity clays with nil to some fine to coarse sands, some with trace organics (CL and CH) and low to high plasticity silts with little to some fine to coarse sands (ML and MH). Recovered samples of the residual soils were dry to wet to the touch and were red, brown, yellow and gray in color. SPT N-values ranged from 3 to 80 bpf, indicating soft to hard consistencies in the silty/clayey soils and loose to very dense relative densities in the sandy soils.

Partially weathered rock (PWR) was encountered beneath the Piedmont residuum in Borings EM-18 and C-2 at depths of roughly 8 feet and 14 feet, respectively, below the existing ground surface. The PWR consisted of fine to coarse sand with some low plasticity silts (SM). Recovered samples were moist to the touch and brown and red in color.

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project and was encountered at a depth of roughly 11 feet in Boring EM-20, roughly 14½ feet in Boring C-2 and roughly 18 feet in Boring B-9.

Ground water was encountered in Borings EM-17 and C-2 at time of boring at depths of roughly 1 and 3½ feet, respectively, below the existing ground surface. Select borings were left open overnight for delayed ground water measurements, with ground water encountered after 24 hours at these same borings at depths of roughly 2 feet below the existing ground surface.

7.2.4 One Carolina Drive Overpass Bridge

Borings associated with the overpass bridge include IB-1 though IB-4, EB-1 through EB-4 and RW-7 through RW-14. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 9 inches of topsoil, up to 13 inches of asphalt pavement and up to 11 inches of graded aggregate base course materials. A summary of the stratification across the bridge alignment is provided below.

Table 7-1 – Soil Stratification Table

Geologic Formation	Elevation of Top of Layer (ft MSL)	Depth to Top of Layer (ft)	USCS Soil Type	SPT N-values (bpf)
Alluvium	574.3 – 595.8	0 - 8.3	CH	2 - 13
Embankment Fill	575.7 – 585.9	0	ML, CL, MH, CH	5 - 15
Residuum	569.1 – 593.8	2 - 13.5	SC-SM, SM, SC, ML, CL, CH	4 - 68
PWR	550.5 – 571.3	6.5 - 33.5	SM, SC, CL	100
Bedrock - Metagabbro	545.9 – 562.1	20.5 - 38.1	---	---

Beneath the surface materials, Borings IB-1 through IB-4, EB-2 and RW-7 through RW-9 encountered embankment fill associated with the shoulders of Interstate 77 to depths of roughly 2 to 13½ feet below the existing ground surface. This embankment fill consisted of low to high plasticity silts and clays with trace to some fine to medium sands, some with trace gravels (ML, CL, MH and CH). Recovered samples were dry to wet to the touch and were red, brown, yellow and gray in color. SPT N-values ranged from weight of hammer (W-O-H) to 20 bpf, indicating very soft to very stiff consistencies.

Boring RW-10 encountered previous fill soils associated with the adjacent industrial development to a depth of roughly 6 feet below the existing ground surface. This previous fill consisted of low plasticity clays with little fine to medium sands and trace wood debris (CL). Recovered samples were moist to wet to the touch and were red in color. SPT N-values ranged from 5 to 17 bpf, indicating stiff to very stiff consistencies.

Borings IB-4, EB-1, EB-3, EB-4, RW-8 and RW-13 encountered alluvial deposits to depths of roughly 2 to 8 feet below the existing ground surface. This alluvium consisted of fine to coarse sands with little high plasticity clays and trace wood debris (SC) and medium to high plasticity clays with trace to some fine sands some with trace organics (CH). Recovered samples were moist to wet to the touch and were red, gray, yellow and brown in color. SPT N-values ranged from weight of hammer (W-O-H) to 13 bpf, indicating very soft to stiff consistencies in the clayey soils and a loose relative density in the sandy soils.

Beneath the fills and alluvial deposits and from the ground surface, the borings in this portion of the site typically encountered Piedmont residuum consisting of fine to coarse sands with little to some non-plastic to high plasticity silts and clays (SM, SM-SC and SC) and low to high plasticity silts and clays with trace to some fine to coarse sands (ML, CL and CH). Recovered samples of the residual soils were dry to wet to the touch and were red, brown, yellow and gray in color. SPT N-values ranged from 3 to 89 bpf, indicating soft to hard consistencies in the silty/clayey soils and loose to very dense relative densities in the sandy soils.

Partially weathered rock (PWR) was encountered beneath the Piedmont residuum in Borings IB-1, IB-3, IB-4, EB-1 through EB-4, RW-7, RW-8, RW-10 and RW-12 at depths of roughly 5 to 34½ below the existing ground surface. The PWR consisted of low plasticity clays with little to some fine to coarse sands (CL) and fine to coarse sands with little to some non-plastic to medium plasticity fines (SM and SC). Recovered samples were dry to wet to the touch and brown, yellow, gray and red in color.

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project and was encountered at depths ranging from roughly 6 to 38 feet in Borings IB-1 through IB-4, EB-1 through EB-4, RW-7, RW-8, RW-10 and RW-12.

Upon encountering auger refusal in Borings IB-1 through IB-4 and EB-1 through EB-4, the borings were advanced into the refusal materials by rock coring techniques. Devonian-aged to Silurian-aged crystalline metagabbro was recovered. For purpose of assigning empirical properties to the recovered cores, the recovered rock was subdivided into separate runs ranging from roughly 1 to 5 feet in length. In most cases, run length was determined by the length of the core barrel. Rock was gauged to be fractured to continuous based on recovery ranging from 30 to 100 percent obtained in the runs.

Recovered core examined in the laboratory were assigned descriptive terms using Tables 6-15 through 6-32 of the SCDOT Geotechnical Design Manual (GDM) where applicable to the rock type. Recovered samples were assessed as completely weathered to fresh according to Table 6-19. Samples consisted of "weak" to "extremely strong" rock as determined by hammer blows as described in Table 6-20. Rock quality as assessed using the Rock Quality Designation (RQD) value ranged from "very poor" to "excellent" according to Table 6-21 based on RQD values of 0 to 100 percent, and "low" to "very hard" using the terms in Table 6-22.

Recovered core contained discontinuities which were evaluated as "joints" during examination in the laboratory. Discontinuity spacing was "very close" to "close" using the terminology of Table 6-24. Discontinuities were considered "very narrow" to "moderately wide" with "planar" to "irregular" features. The surface roughness was judged as "slightly rough" to "rough". Filling appears to range from "surface stained" to "filled" with iron oxide and calcite. The depths and description of the discontinuities are provided on the boring records in Appendix III.

Selected recovered samples of intact rock core representative of the metagabbro were cut to length and the ends machined flat. Specimens were compressed in a loading frame and axial load continuously applied until peak load and failure were obtained. Samples were soaked prior to testing. Peak compressive strengths ranged from 2,162 to 45,581 psi. Uniaxial compressive strengths are tabulated in Table 8 – *Rock Core Samples – Laboratory Testing Summary,* in Appendix II.

The rock mass rating (RMR), a representation of how the mass of rock will behave as opposed to the compressive strength samples, was determined in general accordance with GDM Table 6-30 and equation 6-10 to range from 4 to 79.

The geological strength index (GSI), a representation of the strength of the jointed rock mass, was determined in general accordance with Figure 10.4.6.4-1 of the AASHTO LRFD *Bridge Design Specifications*, seventh edition and GDM Figure 6-13 to range from 35 to 95.

Ground water was encountered in Borings IB-1 through IB-4, EB-1 through EB-4, and RW-7 through RW-12 at time of boring at depths ranging from roughly 1 to 22 feet below the existing ground surface. Select borings were left open overnight for delayed ground water measurements, with ground water encountered after 24 hours at these same borings at depths ranging from roughly 1 to 15½ feet below the existing ground surface.

7.2.5 Southbound Exit Ramp (Ramp 1)

Borings associated with the southbound exit ramp include EM-9 through EM-12. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 2 inches of topsoil.

Beneath the surface materials, the borings in this portion of the site typically encountered Piedmont residuum consisting of low to high plasticity silts with few to some fine to coarse sands (ML and MH), medium to high plasticity clays with little fine to coarse sands (CH) some with trace roots and fine to coarse sands with little low to medium plasticity clays (SC). Recovered samples of the residual soils were moist to wet to the touch and were red, yellow and gray in color. SPT N-values ranged from 2 to 38 bpf, indicating soft to very stiff consistencies in the silty/clayey soils and medium dense relative densities in the sandy soils.

Partially weathered rock (PWR) was encountered beneath the Piedmont residuum in Boring EM-12 at a depth of roughly 8½ feet below the existing ground surface. The PWR consisted of fine to coarse sand with little low plasticity silts (SM). Recovered samples were moist to the touch and gray in color.

Auger refusal is defined as material that could not be penetrated with the drill rig equipment used on the project and was encountered at a depth of roughly 9 feet in Boring EM-12.

Ground water was not encountered at time of boring in the borings performed within this portion of the project. Select borings were left open overnight for delayed ground water measurements, with no ground water encountered after 24 hours either.

7.2.6 Southbound Entrance Ramp (Ramp 4)

Borings associated with the southbound entrance ramp include EM-13 through EM-16. Surface materials encountered at the existing ground surface in these borings consisted of up to roughly 4 inches of topsoil.

Beneath the surface materials, Borings EM-13, EM-15 and EM-16 encountered embankment fill associated with the shoulders of Interstate 77 to depths of roughly 2 feet below the existing ground surface. This embankment fill consisted of medium to high plasticity clays with little fine to coarse sands (CH) and fine to coarse sands with some medium plasticity silts (SM). Recovered samples were moist to the touch and were red and brown in color. SPT N-values ranged from 5 to 12 bpf, indicating firm to stiff consistencies in the clayey soils and a loose relative density in the sandy soils.

Boring EM-13 encountered alluvial deposits beneath the embankment fills to a depth of roughly 6 feet below the existing ground surface. This alluvium consisted of high plasticity clays with trace fine to medium sands (CH). Recovered samples were moist to the touch and were gray in color. SPT N-values ranged from 4 to 5 bpf, indicating soft to firm consistencies.

Beneath the surface materials, fills and alluvium, the borings in this portion of the site typically encountered Piedmont residuum consisting of fine to coarse sands with little low to high plasticity silts and clays (SM and SC) and low to medium plasticity silts with some fine to coarse sands (ML). Recovered samples of the residual soils were moist to the touch and were red, yellow, brown and gray in color. SPT N-values ranged from 6 to 28 bpf, indicating loose to medium dense relative densities in the sandy soils and a very stiff consistency in the silty soils.

7.3 Shear Wave Velocity Measurement

Shear-wave velocity measurements were made using MASW/MAM methods at SW-1, performed east of the planned One Carolina Drive Overpass Bridge. The shear wave velocity profile depicted resolves into vertical intervals of roughly 4 to 16 feet. Velocity measurements were obtained to a depth of about 70 feet below existing ground surface.

A best-fit profile determined from the scatter of the data may be expressed as a shear wave velocity ranging from 600 feet per second (fps) near the surface, increasing to about 1,200 fps then decreasing to about 750 fps and increasing again to about 1,700 fps through the residual soils. Velocities interpreted from the data then increase dramatically to over 3,000 fps at the interface with the PWR and again to over 4,200 fps at the interface with the underlying bedrock.

The calculated weighted average site stiffness to the B-C boundary for this site ($V^*_{s,H}$) using the Shear Wave Velocity Profile from the ground surface to a depth of 45 feet is 1,109 fps.

8.0 Seismic Design

8.1 Acceleration Design Response Spectrum (ADRS)

The results of the MASW/MAM testing were provided to the SCDOT Design/Build RPG for the purposes of establishing seismic design parameters for the project. The 3-Point Acceleration Design Response Spectrum (ADRS) provided by the SCDOT is included in Appendix VII. The overpass bridge was provided to have a bridge Operational Classification (OC) of "II" (OC II). The bridge embankment, defined as the portion of the approach embankment including the front slope plus 3.25 times the backwall height measured from the end of the approach slab, would extend approximately 32½ feet beyond the end of approach slab, or roughly 52½ feet beyond the end bents on each abutment. Roadway embankments beyond the bridge embankment do not require seismic hazard analyses.

The SCDOT Geotechnical Design Section provided pseudo spectral accelerations (PSA) for the Safety Evaluation Earthquake (SEE) (3% probability of exceedance in 75 years) and the Functional Evaluation Earthquake (FEE) (15% probability of exceedance in 75 years). These values were provided for the geologically realistic condition, 5% critical damping, and the peak ground acceleration (PGA) at the B-C boundary. The 3-point method was utilized to generate the ADRS curves provided in Appendix VII. The design parameters derived from these curves are detailed in the table below.

Table 8-1 – Seismic Design Parameters

Seismic Design Parameter	Acceleration (g)
PGA_{-FEE}	0.04
SDS_{-FEE}	0.08
$SD1_{-FEE}$	0.01
PGA_{-SEE}	0.06

Seismic Design Parameter	Acceleration (g)
$SDS\text{-}_{SEE}$	0.15
$SD1\text{-}_{SEE}$	0.02

Seismic Design Category (SDC) designation of a structure from A to D determines the level of analysis and detailing required. SDC is determined by the bridge operational classification (OC) and the design spectral response acceleration for the SEE event at the one-second period. The long period acceleration $SD1\text{-}_{SEE}$ is < 0.30 g. Per Table 3.5 of the SCDOT *Seismic Design Specifications for Highway Bridges (2008)*, Seismic Design Category (SDC) based on these parameters for an OC Level II structure is A.

8.2 Preliminary Seismic Evaluation

In order to evaluate the need for ground improvement, the potential for soil liquefaction and soil strength loss (SSL) were examined for sand-like cyclic liquefaction potential and clay-like cyclic softening utilizing screening procedures outlined in GDM Chapter 13. This methodology was used to perform calculations to determine lateral displacement and one-dimensional reconsolidation settlement of liquefied soils due to seismic loads. From our preliminary evaluation, the hazard associated with SSL is very low for both the FEE and SEE events within the bridge limits of the project.

9.0 Design and Construction Considerations

Chapter 21 of the SCDOT GDM provides that the GBLR should provide limited (preliminary) geotechnical information on a D/B project, thus permitting the contractor to bid on the project with a certain degree of knowledge and acceptable risk. The preliminary design and construction considerations submitted herein are based, in part, upon data obtained from our preliminary field exploration and laboratory testing program. Subsurface conditions across the site will vary, as will grading and construction details. Additional geotechnical exploration and analysis will be required to provide detailed analysis and recommendations for the project.

9.1 Drilled Deep Foundations

Drilled shaft foundations are possible for support of the bridge interior and end bents. We anticipate that drilled shafts for the bridge could range from 36 to 60 inches in diameter. Due to the subsurface conditions encountered, we anticipate that the drilled shafts will be socketed into the underlying bedrock to provide the required axial and lateral resistance.

The bedrock elevation is somewhat variable across the bridge alignment, varying up to roughly 15 feet in elevation from east to west along the northern side of the bridge, up to roughly 9 feet in elevation from east to west along the southern side, roughly 5 feet from north to south on the east side and roughly 7 to 16 feet from north to south on the west side. The upper roughly 10 to 20 feet of bedrock was low in quality and possibly discontinuous. The initial core runs in several borings exhibited RQD of less than 40, and in some cases RQD equal zero. Therefore, difficult drilling and deeper penetration into the bedrock will likely be required to achieve proper bearing and lateral stability for the bridge foundations. Individual shafts may encounter ledges, boulders

or seams of relatively hard rock within the partially weathered rock zone overlying competent bedrock, which may require special measures to permit advancement to the required bearing.

Due to the ground water conditions encountered in our borings, we anticipate drilled shafts will be installed using the wet method of construction with casing described in Standard Specification Section 712.4.5. Steel casing should be advanced and seated into the top of rock to provide an effective seal. If an effective seal is established, the drilled shaft contractor may be able to effectively dewater the hole and maintain the stable bottom until concrete is placed. However if the casing penetrates to less competent material and an effective seal is not obtained, or if the competent material does not extend over the entire base of the drilled shaft, it is likely that the water head in the deeper shafts will cause severe softening and necessitate either additional depth of drilling to reach a stable bottom. In this case, wet construction installation methods using a drilling slurry as described in SCDOT Standard Specification Section 712.4.5 may be required to stabilize the hole and allow placement of concrete.

The overburden soil materials consisting of existing fill, alluvial soils, and Piedmont residual soils can typically be excavated with a conventional earth auger. PWR or low quality rock will necessitate use of a rock auger advanced by a large foundation drilling rig. Contractor should be required to provide augering equipment with adequate torque and power to install drilled shafts through very dense PWR and low quality rock using augers with hardened tungsten carbide bits. The speed of excavation depends upon the type of material being penetrated, size of foundation element and size of the drilling rig. The explored soil profile shows zones of PWR, ranging from nil to roughly 25 feet in thickness. The rate of penetration through these materials could be very slow and could require rotary percussion drills or core barrels to penetrate to relatively continuous bedrock encountered in the borings. Specialized drilling equipment may be required due to the observed rock strengths, depending on required penetration depths. This may include, but not be limited to rock augers, core barrels, or rotary percussion drilling equipment.

Laboratory uniaxial strength test results performed on selected cores from end and interior bent borings indicate compressive strengths as summarized in the table below:

Table 9-1 – Rock Core Compressive Strength Summary

Boring No.	Core Run	Core Interval (ft)	Sample No.	Sample Depth (ft)	Compressive Strength (psi)
EB-1	RC-3	40.5-45.5	RS-1	42.6-43.0	2,162
	RC-6	55.5-60.5	RS-2	57.5-57.9	22,416
EB-2	RC-1	25-30	RS-3	25.3-25.7	34,032
	RC-5	45-50	RS-4	46.7-47.1	39,834
EB-3	RC-6	55.3-60.3	RS-14	55.0-55.35	41,162
	RC-7	60.3-65.3	RS-15	62.6-62.95	21,672
EB-4	RC-5	40.5-45.5	RS-16	44.0-44.4	23,952
	RC-8	55.5-60.5	RS-17	55.5-55.9	45,581
IB-1	RC-4	45.5-50.5	RS-5	45.7-46.2	35,620

Boring No.	Core Run	Core Interval (ft)	Sample No.	Sample Depth (ft)	Compressive Strength (psi)
	RC-7	60.5-65.5	RS-6	65.0-65.5	32,845
IB-2B	RC-4	43.0-48.0	RS-7	43.3-43.8	35,638
	RC-6	53.0-58.0	RS-8	57.5-57.9	28,662
IB-3	RC-4	50.1-55.1	RS-9	53.7-54.1	21,042
	RC-6	60.1-65.1	RS-10	60.5-60.9	40,273
IB-4A	RC-3	24.6-25.4	RS-11	24.7-25.1	33,534
	RC-5	30.4-35.4	RS-12	34.8-35.2	36,589
	RC-9	50.4-55.4	RS-13	54.3-54.7	25,959

Compressive strengths obtained in the laboratory represent very strong, dense metamorphic rock which will pose substantial resistance to heavy duty drilling equipment. Diamond core barrels will be required to advance through hard rocks and contractor should be prepared to expend substantial time to advance the sockets in these materials.

Ground water control is important during construction of drilled shafts. Due to the observed ground water along the bridge alignment, ranging from roughly 5 to 20 feet below the existing ground surface, it may be necessary to use telescoping casing installation methods to achieve the planned casing tip elevations.

9.2 Driven Deep Foundations

Driven steel H-pile foundations are possible for support of the bridge interior and end bents. Piles are anticipated to bear on dense partially weathered rock or on material causing refusal to the borings. Driven steel H-piles are advantageous due primarily to their relative cost and ease for pile splicing and cutting. Piles are commonly paid for on an "in-place" basis and no charge is made for the length of steel cut off. The principal disadvantage associated with steel H-piles are their relatively small tip areas, which can result in very small end bearing resistance in residual soils since formation of a soil plug cannot be counted on in all cases to help with end bearing capacity development, hence piles will need to extend to sufficient depth to bear in PWR or rock. Nominal pile resistance will be essentially the allowable stress of the steel pile cross sectional area.

The contractor should take care not to overdrive or overstress the piles during driving. Steel pile compressive stresses during driving should not exceed 0.9 times the yield strength of the steel section during driving. Because the PWR and meta-gabbro bedrock is anticipated to be very hard, we recommend that the piles be equipped with driving points or shoes to protect the pile from damage during driving. Due to the relatively shallow depth of PWR on the east side of the bridge, pre-drilling and/or penetration aids may be needed to facilitate pile installation.

Axial resistance will likely govern the geotechnical foundation design and be developed in end bearing on the underlying bedrock. Development of lateral resistance of the drilled shafts should be achievable in the Piedmont residuum and underlying PWR. Preliminary SSL analyses do not show potential for loss of lateral resistance or downdrag in the residual soils.

9.3 Roadway Embankments

Fill embankments of up to 42 feet in height and cut slopes approaching 26 feet in height will be required to achieve planned grades along the planned alignments. Fill slope areas should be prepared, and fill materials placed, in accordance with the SCDOT *Standard Specifications for Highway Construction*.

9.3.1 Undercutting/Surface Stabilization

The majority of the split-spoon samples obtained just below the ground surface were classified as either A-7-6 or A-7-5 using the AASHTO classification system. Due to the silty and clayey nature of the near-surface soils across the majority of the site, unstable subgrades may be encountered where final grade will be at or near the existing ground surface elevation, particularly where ground water depths are shallow. Undercutting or stabilization may be required as part of finish grading of these areas, particularly in shallow cuts west of the overpass on One Carolina Drive or on Ramp 1 or Ramp 4.

9.3.2 Imported Fill/Borrow

As the site is located in Rock Hill, York County, South Carolina, Group A would apply to borrow soils allowed for use as fill. AASHTO classification A-7 soils, similar to those encountered across the site, are not allowed within the top 5 feet of embankment per the SCDOT *Standard Specifications*.

9.3.3 Slope Stability

Although planned slopes are typically shown at 2H:1V to 3H:1V on the conceptual plans, global stability of both cut and fill slopes will need to be evaluated as part of design development by the successful team due to the height of the slopes. Per SCDOT GDM 2.0, roadway embankments constructed within the limits of the bridge embankment must be designed and evaluated under both service and extreme event limit states, while the remaining roadway embankments will only require service limit state evaluation.

9.3.4 Compression and Settlement

Performance specifications of the GDM restrict the permissible long-term differential movement of the finished roadway following asphalt placement near approach slabs, inlets, curbs or similar structures along the alignment. Since portions of the alignment will have fill heights in excess of 45 feet, long term differential settlements resulting from even minor volume changes in the fill (measured in percent of fill height) could be substantial and must be taken account of in design.

Immediate settlements include self-weight compression of the fill mass during and immediately following fill placement. Typically in the Piedmont, these settlements are built out during placement of successive lifts and do not contribute substantially to post construction settlement. However, depending on sequence of construction of end bent piles, MSE walls or other ERS structures self-weight compression may be applicable to downdrag calculations or to wall settlements. Contractor design submittals will need to address how initial compression of soils placed around structures will be accommodated.

Compression/consolidation of underlying residuum or alluvium will occur due to vertical stress imposed by the fill height in specific areas. In some areas the bearing soils will be completely submerged when the load is applied, and substantial time will be required for the applied loads to expel the water and consolidate the soils. Due to the height of the fill soils to be placed, the magnitude and length of primary consolidation of very soft clayey soils encountered in several of the borings may be on the order of 1 month and may require either extended wait periods or surcharging pending construction schedule.

Two consolidation tests were performed for the project, on previous fill consisting of high plasticity clay (CH) and residual silts (ML). The preconsolidation stresses of these soils ranged from roughly 3 to 5 ksf. Fills ranging from 25 to 42 feet indicated on the conceptual plans will impose vertical loading on the existing soil profile in excess of the preconsolidation stress indicated on the consolidation tests. This would result in fill-induced settlements in the soil profile largely following the virgin compression curve after placing the fill. With primary consolidation on the virgin segment of the consolidation curve, settlements of the higher embankments east of the overpass could be 8 inches or more at the end of primary consolidation. A reasonable expectation would be that primary consolidation would occur during fill placement and within 30 days of topping out the fill. It is important to note that other areas with similar soil conditions may be encountered along the alignments, as soil conditions can vary between our widely spaced boring locations. Additional consolidation testing should be performed to better understand the potential fill-induced settlements and potential for delays in construction timeframe due to surcharge wait-time.

9.4 Earth Retaining Structures

As discussed, MSE retaining walls are planned at the following locations:

- Ramp 3 from roughly Station 562+00 to 565+00,
- One Carolina Drive from roughly Station 42+00 to 46+00
- Bridge/Overpass at both east and west abutments, OC II, SDC A.

Per the SCDOT GDM, earth retaining structures must be designed and evaluated for internal and external stability. Abutment walls at the end bents of the overpass must be designed for internal stability and external stability, including bearing capacity, overturning, sliding and global stability, under service and extreme event limit states. Retaining structures on Ramp 3 and along the One Carolina Drive are outside of the bridge embankment and will require evaluation of internal and external stability under the service limit state only. MSE walls at the bridge abutments will have end bent deep foundations within the reinforced zone, therefore, construction sequencing and protection of the reinforcement around the piles should be considered. Deep foundations installed prior to MSE wall fill placement may be subjected to downdrag forces caused by immediate and consolidation settlements.

Final design of retaining walls and ERS, if utilized, should consider possible presence of existing fill, very loose to loose/very soft to soft alluvium and residual soils.

9.5 Culverts

Culvert extensions are planned beneath Ramp 2 (Boring B-1) and beneath Paragon Way west of the bridge/overpass (Boring C-2). Near-surface soils encountered in the borings in these areas consisted of soft

alluvial high plasticity clays and firm alluvial high plasticity clays, respectively. Additionally, stabilized ground water was encountered at roughly 12 and 2 feet, respectively, below the existing ground surface at these locations. Prior to installation of these culvert extensions, high plasticity clayey soils similar to those encountered in the borings will likely require undercutting or stabilization. Local dewatering may be required during construction of the culvert west of the bridge/overpass.

9.6 Vibration Monitoring Assessment

Properties east of the I-77 alignment include various existing light industrial/commercial structures. There are also various existing structures along the northeastern side of the SCDOT right-of-way of I-77 (Area 2) along Corporate Boulevard. However, due to the proximity of these structures to the planned bridge and embankment construction limits, it does not appear that vibration monitoring will be required. The planned bridge construction appears to be at least 350 feet away from the closest structure, while the planned retaining wall and roadway embankment construction appears to be at least 30 feet and 45 feet, respectively, away from the closest structure.

9.7 Corrosion Potential Results

Corrosion series testing was performed to determine the potential for material deterioration of the proposed foundations. Two composite samples were taken from selected recovered samples of Borings EB-2 and IB-4 to perform pH, resistivity, sulfate, and chloride geochemical tests. These borings are representative of end and interior bents on either side of I-77. The samples were selected based on their proximity to the estimated soil/pile/ground water interface elevation.

Table 9-2 – Summary of Corrosion Series Testing

Sample	Depth (feet)	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)	pH
EB-2 (SS-3)	4-6	5,025	66.8	76.2	7.3
IB-4 (SS-5)	8-10	4,824	3.0	28.4	6.7

The complete laboratory testing results of the corrosion series testing are provided in Appendix XII and are summarized in Table 3 on Appendix II.

Section 7.19 of the GDM provides guidance on determining corrosion potential or aggressiveness. The following soil conditions from GDM Table 7-34 suggest aggressive conditions:

- pH less than 5.5;
- Sulfate concentrations greater than 1,000 ppm (mg/kg);
- Resistivity less than 2,000 ohm-cm;

Therefore, the site appears to be non-aggressive for foundations. However, interpretation of the data and corrosion protection of structural components shall be reviewed and provided by the structural engineer during the design phase of the project.

10.0 Closing

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

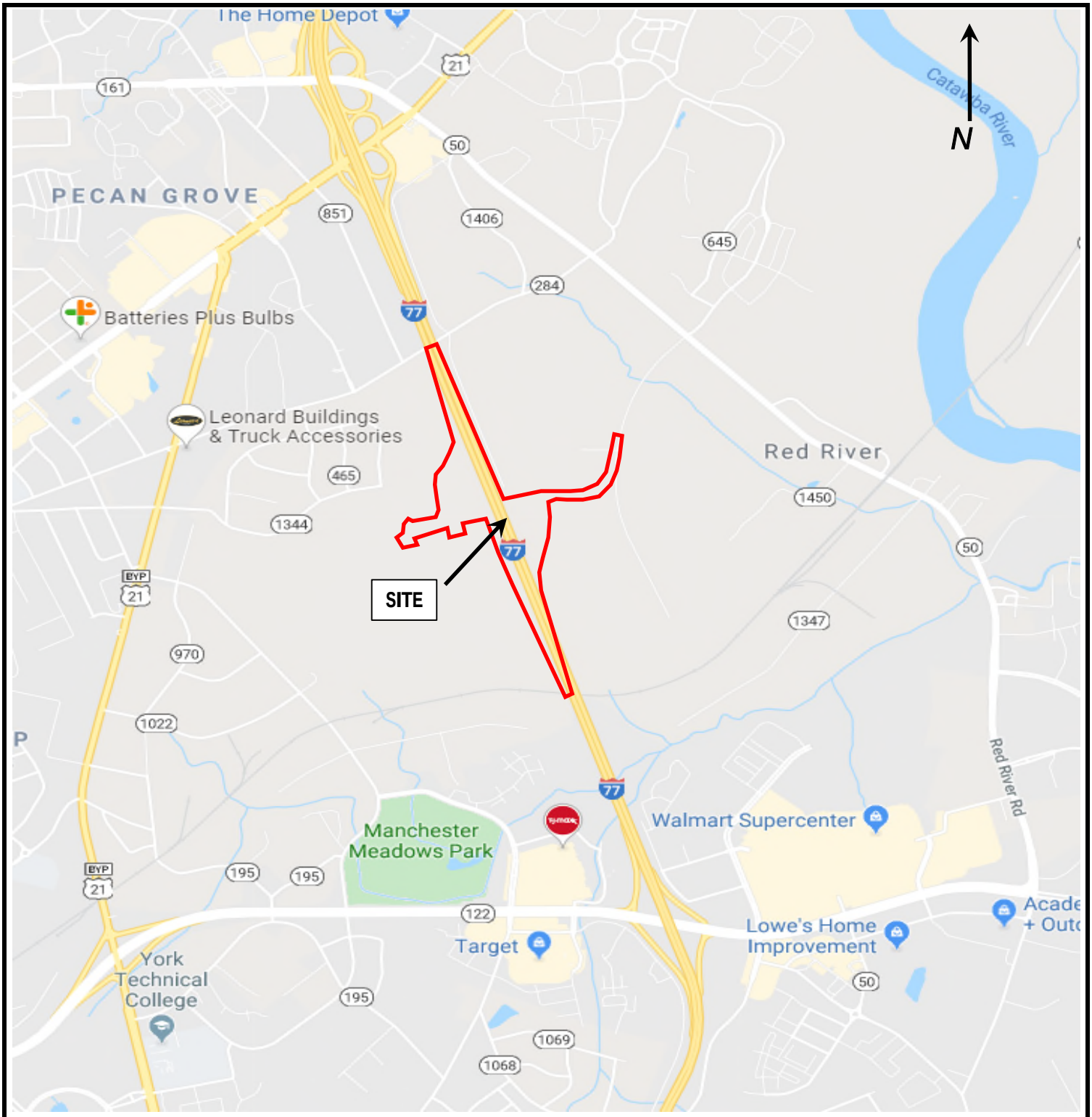
Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendices

Appendix I – Figures



SOURCE: Google Maps

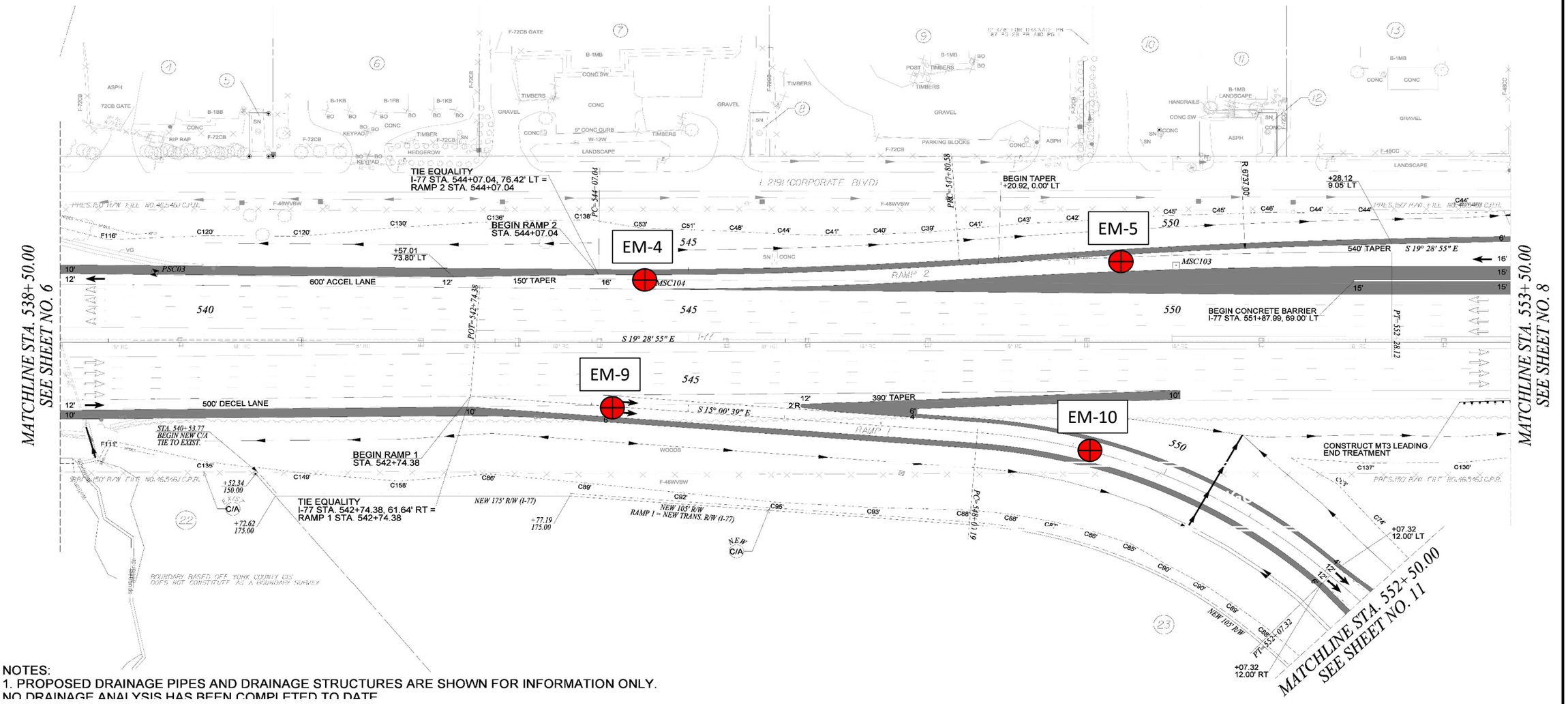
SITE LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

FIGURE NO.

1

SCALE:	NTS	CHECKED BY:	MFC
DATE:	8/11/2020	DRAWN BY:	RCB

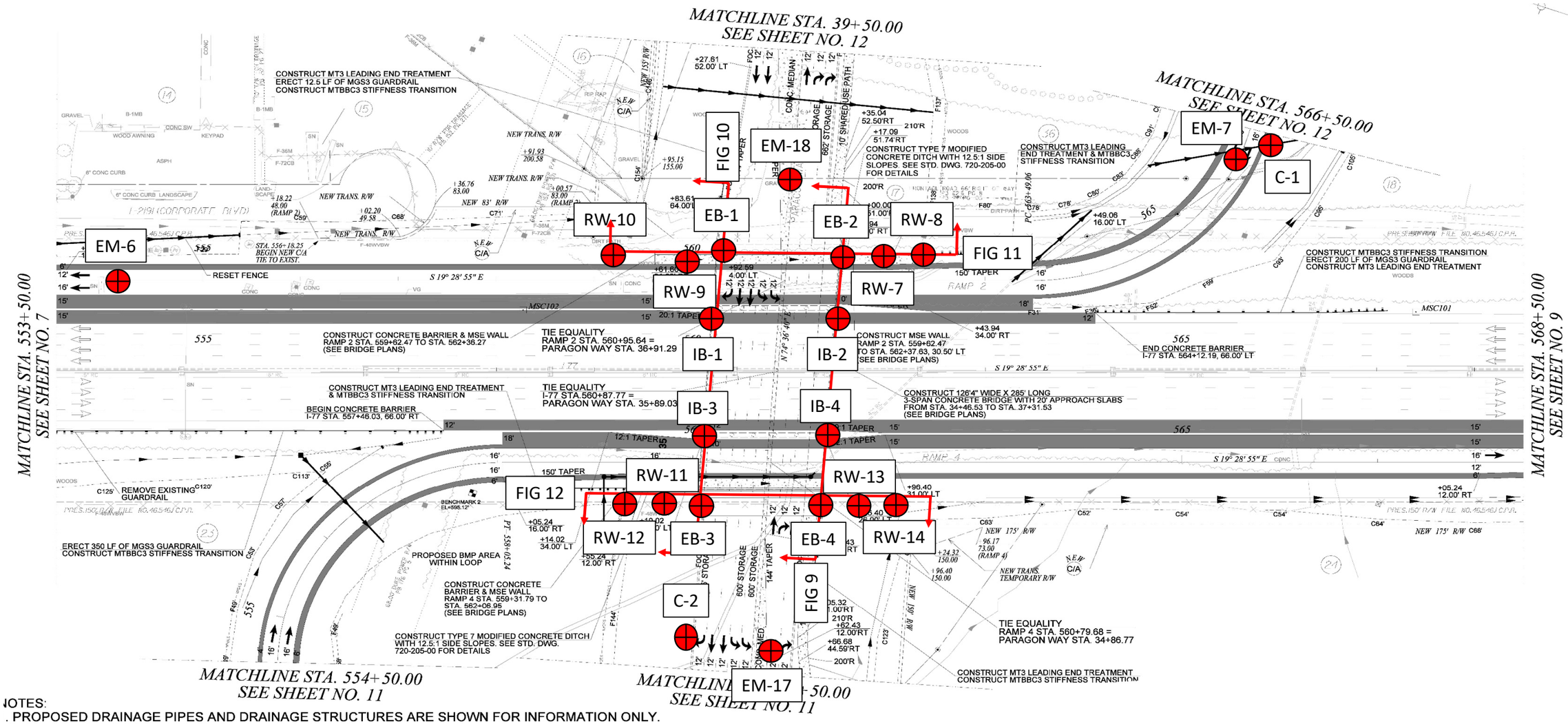


NOTES:
1. PROPOSED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY. NO DRAINAGE ANALYSIS HAS BEEN COMPLETED TO DATE.

SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange		FIGURE NO.
LOCATION:	I-77 between Eden Terrace and RR Overpasses		2
CITY, STATE:	Rock Hill, South Carolina		
JOB NO.:	1461-19-069		
SCALE: NTS		CHECKED BY: MFC	
DATE: 10/12/2020		DRAWN BY: RCB	



NOTES:

1. PROPOSED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY.
2. DRAINAGE ANALYSIS HAS BEEN COMPLETED TO DATE.

N

SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

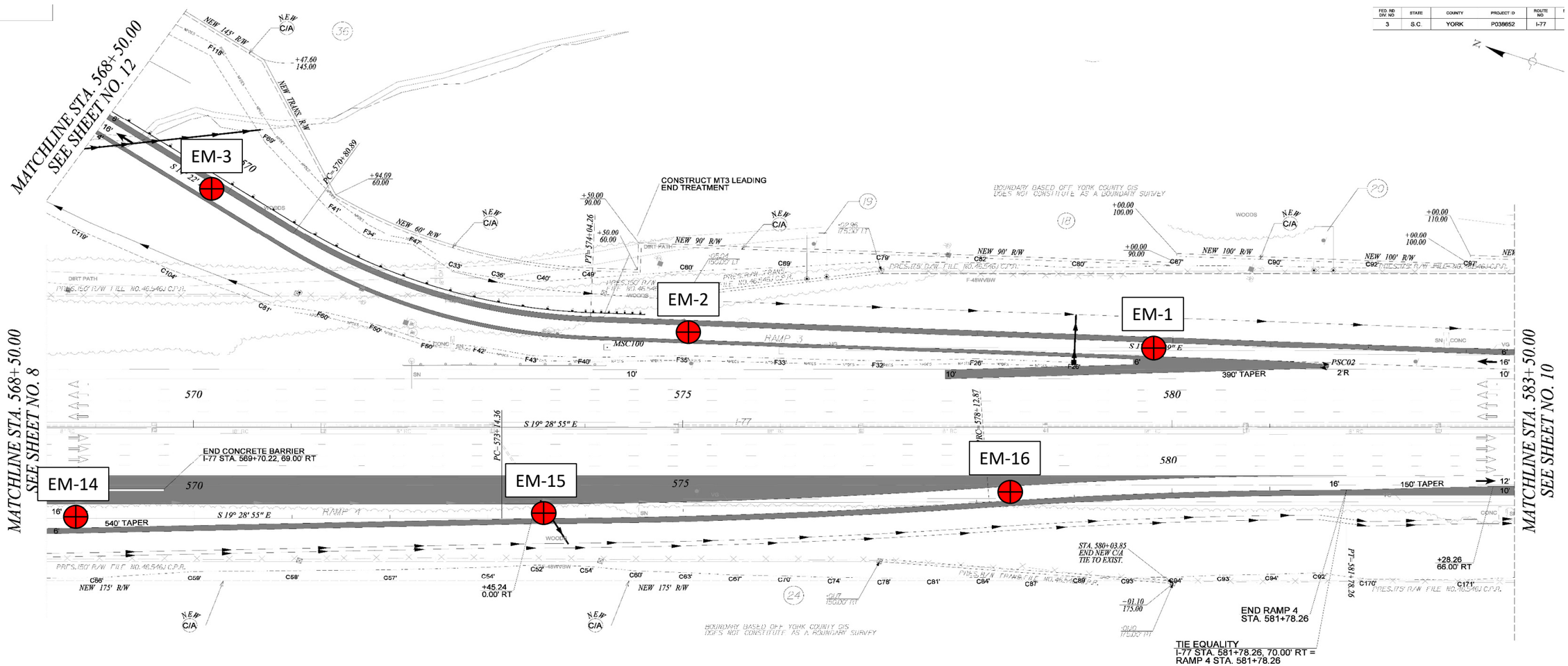
BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

FIGURE NO. 3

SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB

FED. RD. DIV. NO.	STATE	COUNTY	PROJECT ID	ROUTE NO.
3	S.C.	YORK	P038652	I-77



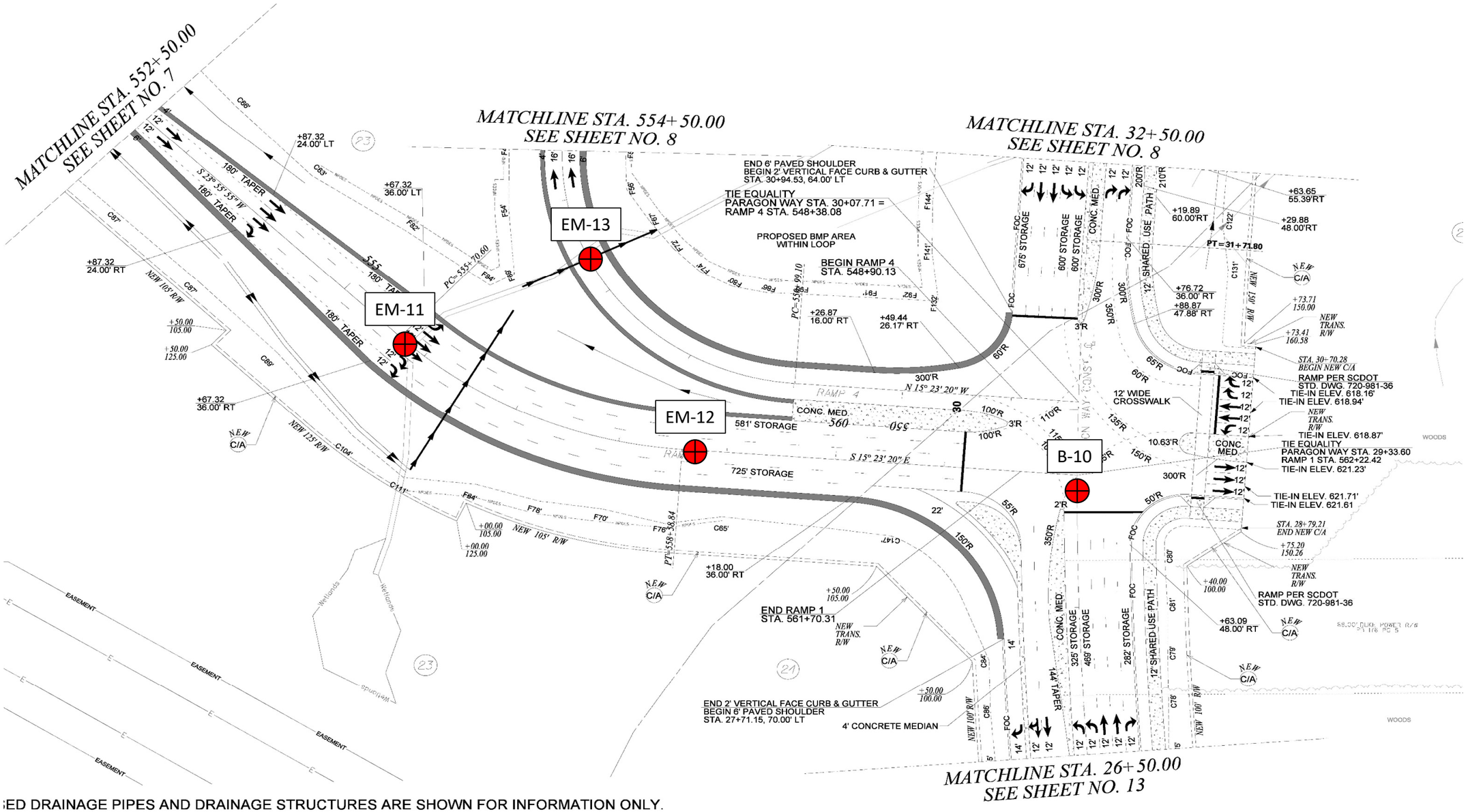
SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

FIGURE NO. 4

SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB



ED DRAINAGE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY.
AGE ANALYSIS HAS BEEN COMPLETED TO DATE

SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN

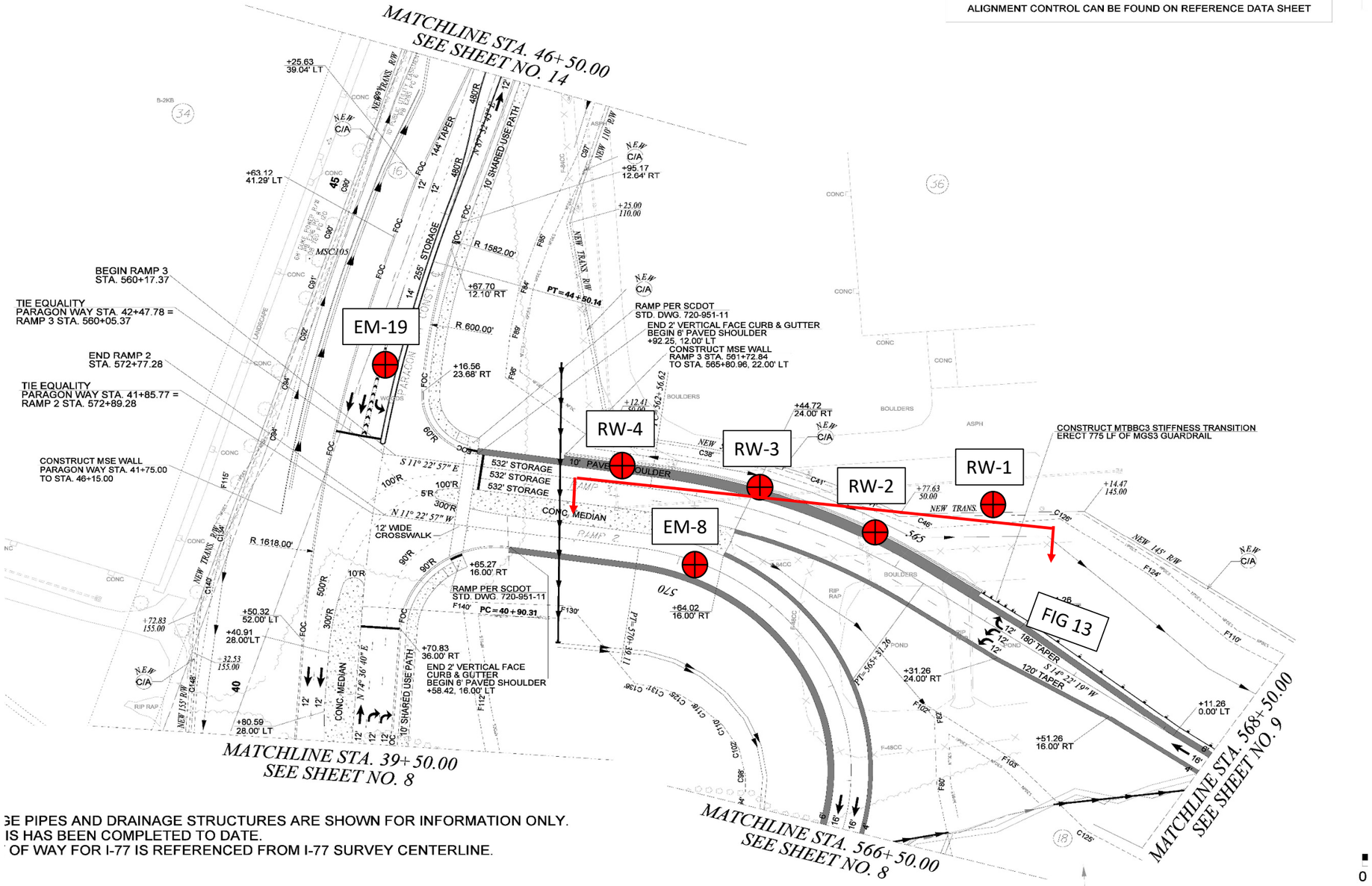
JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB

FIGURE NO.

5

ALIGNMENT CONTROL CAN BE FOUND ON REFERENCE DATA SHEET



GE PIPES AND DRAINAGE STRUCTURES ARE SHOWN FOR INFORMATION ONLY.
IS HAS BEEN COMPLETED TO DATE.
OF WAY FOR I-77 IS REFERENCED FROM I-77 SURVEY CENTERLINE.

N

SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

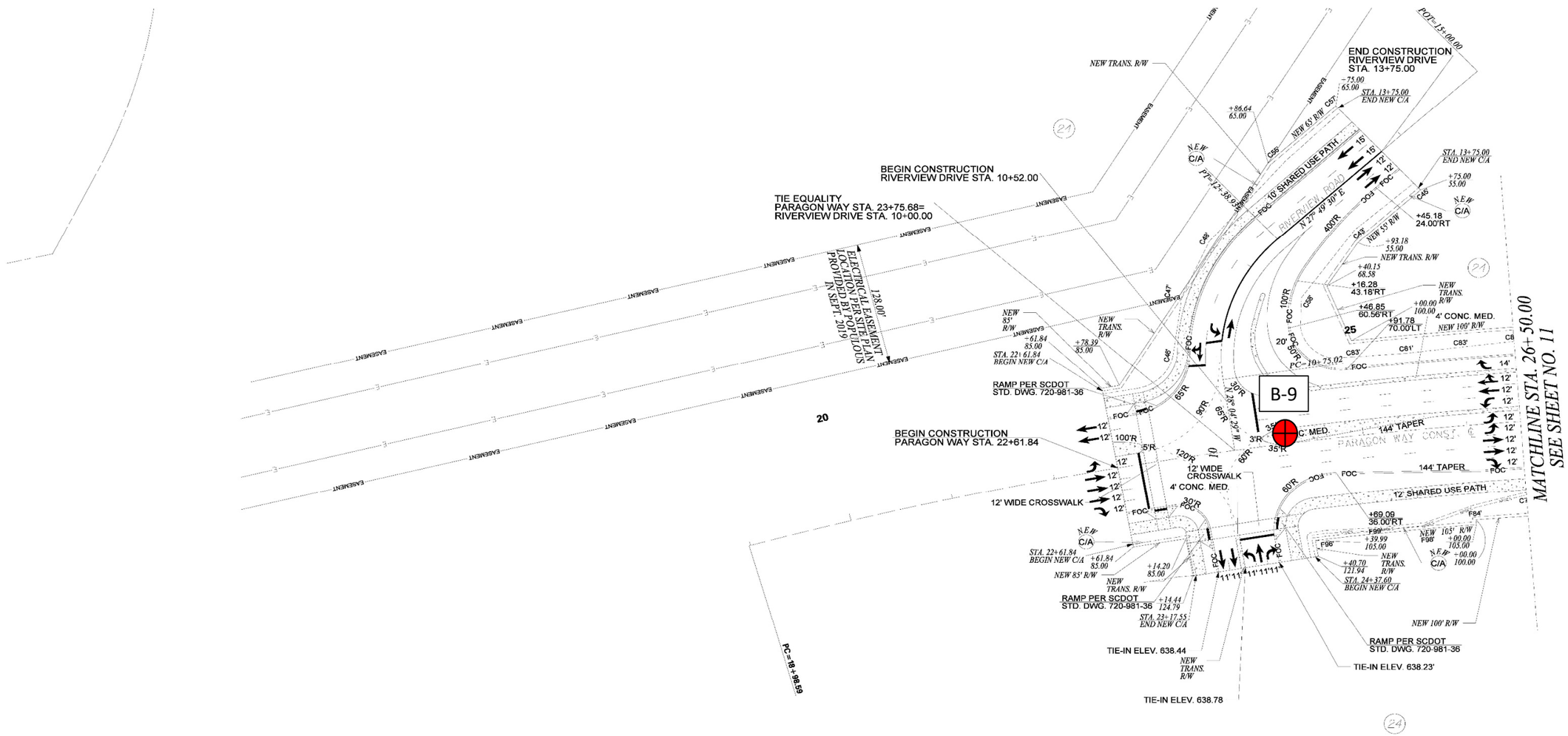
BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB

FIGURE NO.

6



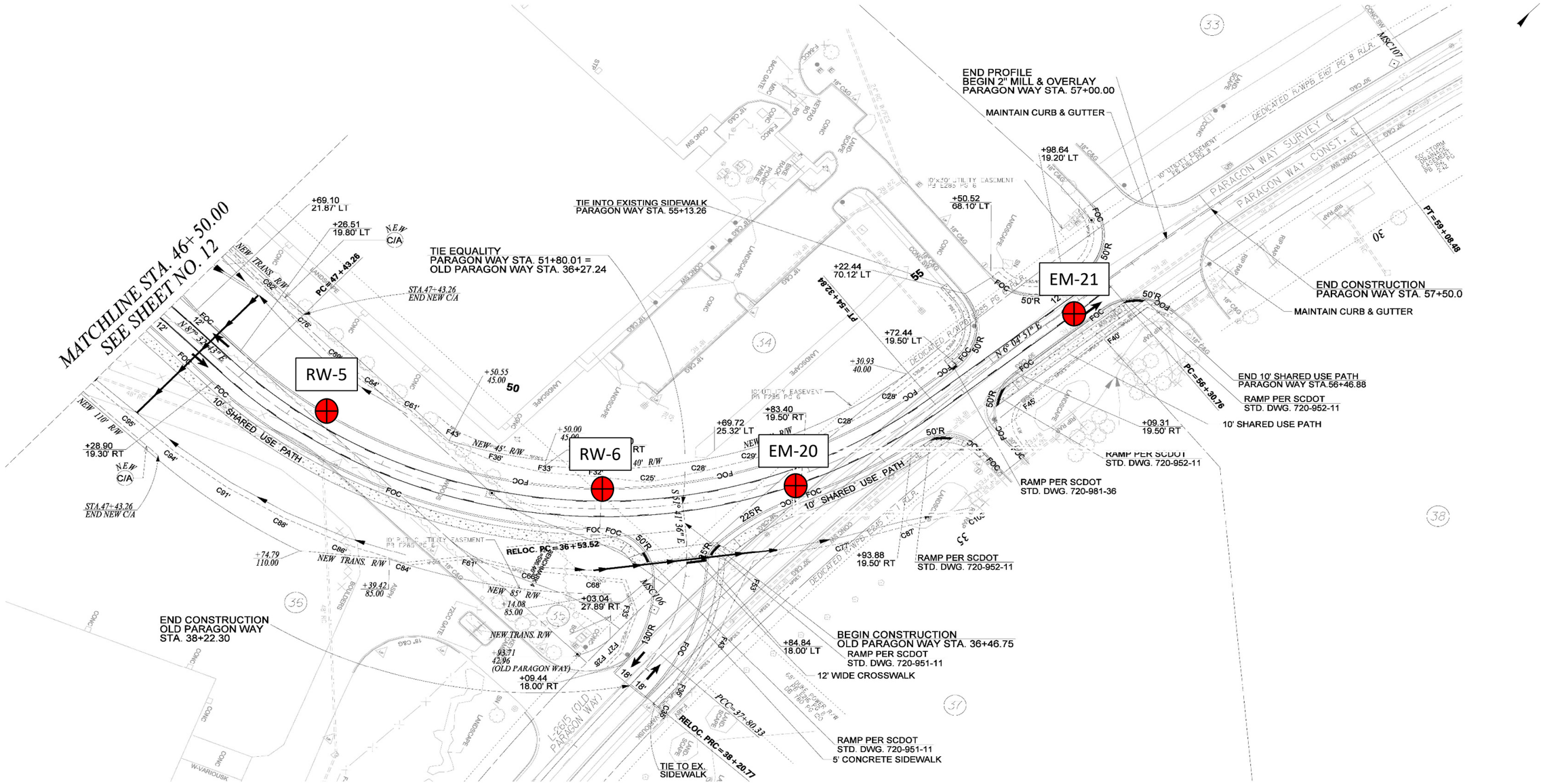
SOURCE: York County I-77 Interchange at Exit 81 (Panthers Interchange), prepared by Neel-Schaffer, dated 6-9-2020

BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069

FIGURE NO. 7

SCALE:	NTS	CHECKED BY:	MFC
DATE:	10/12/2020	DRAWN BY:	RCB

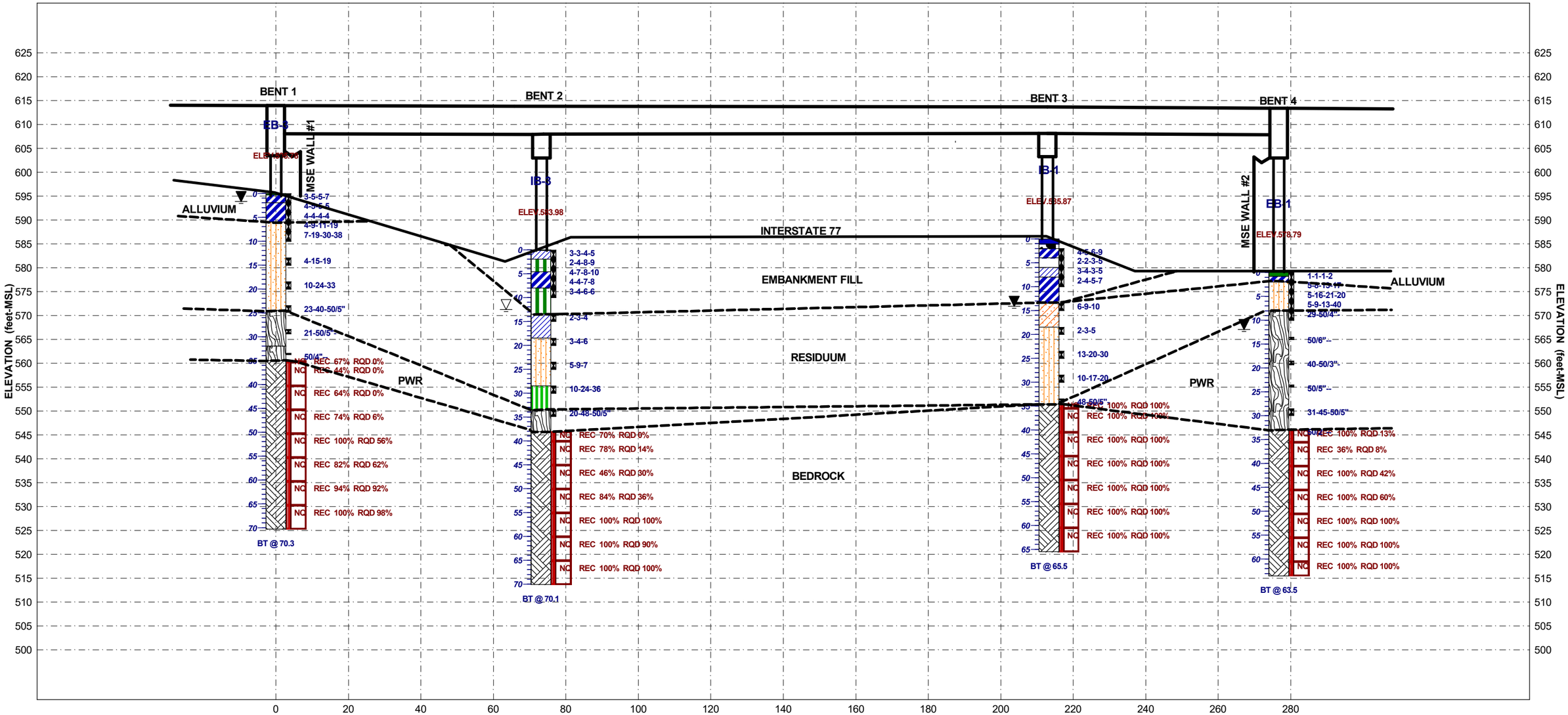


BORING LOCATION PLAN

JOB NAME:	I-77 Panthers Interchange
LOCATION:	I-77 between Eden Terrace and RR Overpasses
CITY, STATE:	Rock Hill, South Carolina
JOB NO.:	1461-19-069
SCALE: NTS	CHECKED BY: MFC
DATE: 10/12/2020	DRAWN BY: RCB

FIGURE NO.

8



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation at GS

Water Level at Time of Boring
Water Level after 24 Hours
Hole Caved
Water Loss/Inflow

11-16-10 Standard Penetration Test (blows per foot).
12in Undisturbed Sample Recovery in Inches
NX Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation
BT Boring Termination Depth
XXX Boring Refusal

LEGEND OF MATERIAL GRAPHICS FOR SOIL TEST BORINGS

- GW, Well-graded Gravel
- SM, Silty Sand
- SC, Clayey Sand
- ML, Low Plasticity Silt
- MH, High Plasticity Silt
- CL, Low Plasticity Clay
- CH, High Plasticity Clay
- PWR, Partially Weathered Rock
- Bedrock

The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgment. The actual subsurface conditions will vary between boring locations.

SUBSURFACE PROFILE
BRIDGE OVERPASS - NORTH

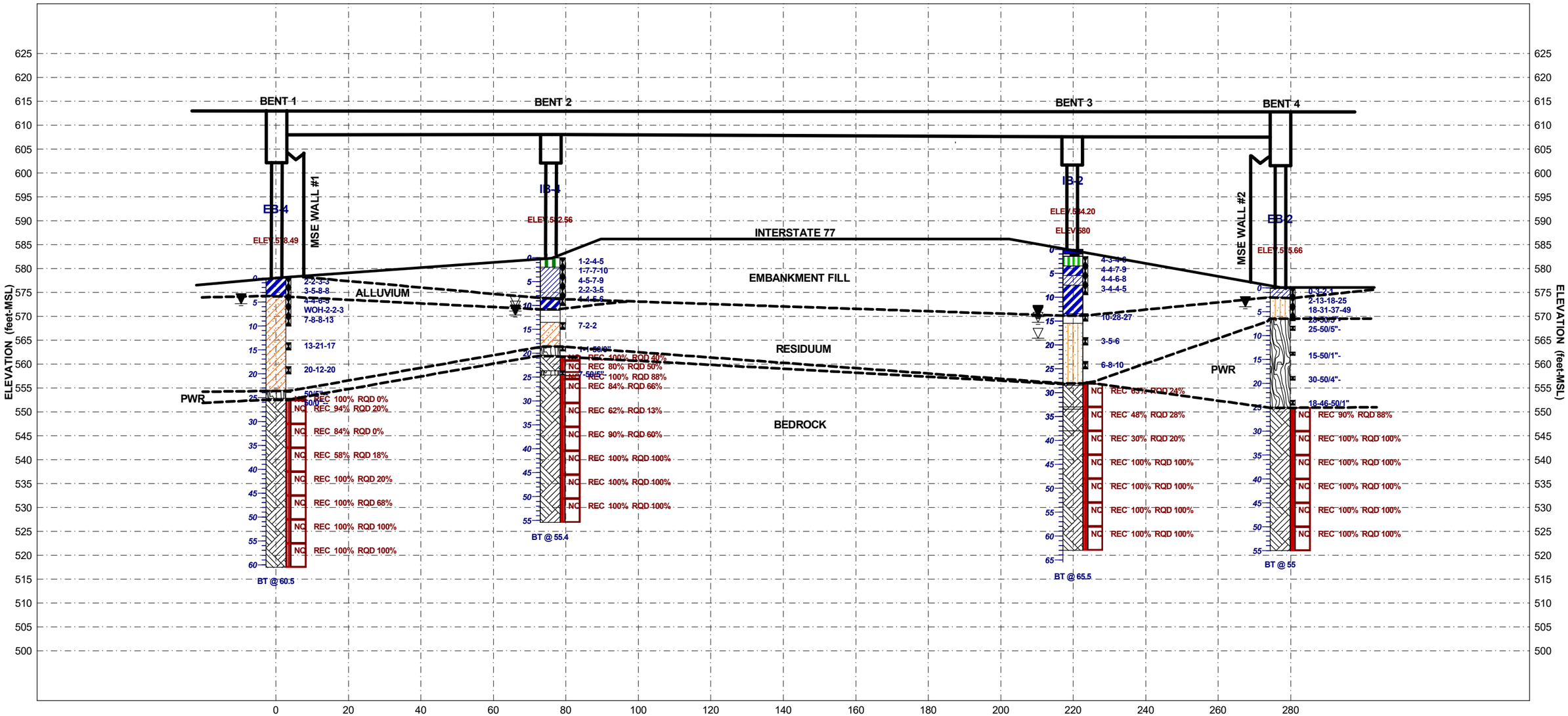
PROJECT: I-77 Interchange near Exit 80

LOCATION: Rock Hill, York Co, SC

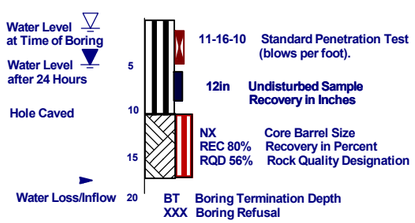
FIGURE: 9

JOB NO: 1461-19-069

DATE: 10/12/20



SOIL TEST BORINGS
B-3 Boring Number
123.0 Elevation at GS



LEGEND OF MATERIAL GRAPHICS FOR SOIL TEST BORINGS

- GW, Well-graded Gravel
- SM, Silty Sand
- SC, Clayey Sand
- ML, Low Plasticity Silt
- MH, High Plasticity Silt
- CL, Low Plasticity Clay
- CH, High Plasticity Clay
- PWR, Partially Weathered Rock
- Bedrock

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SUBSURFACE PROFILE
BRIDGE OVERPASS - SOUTH

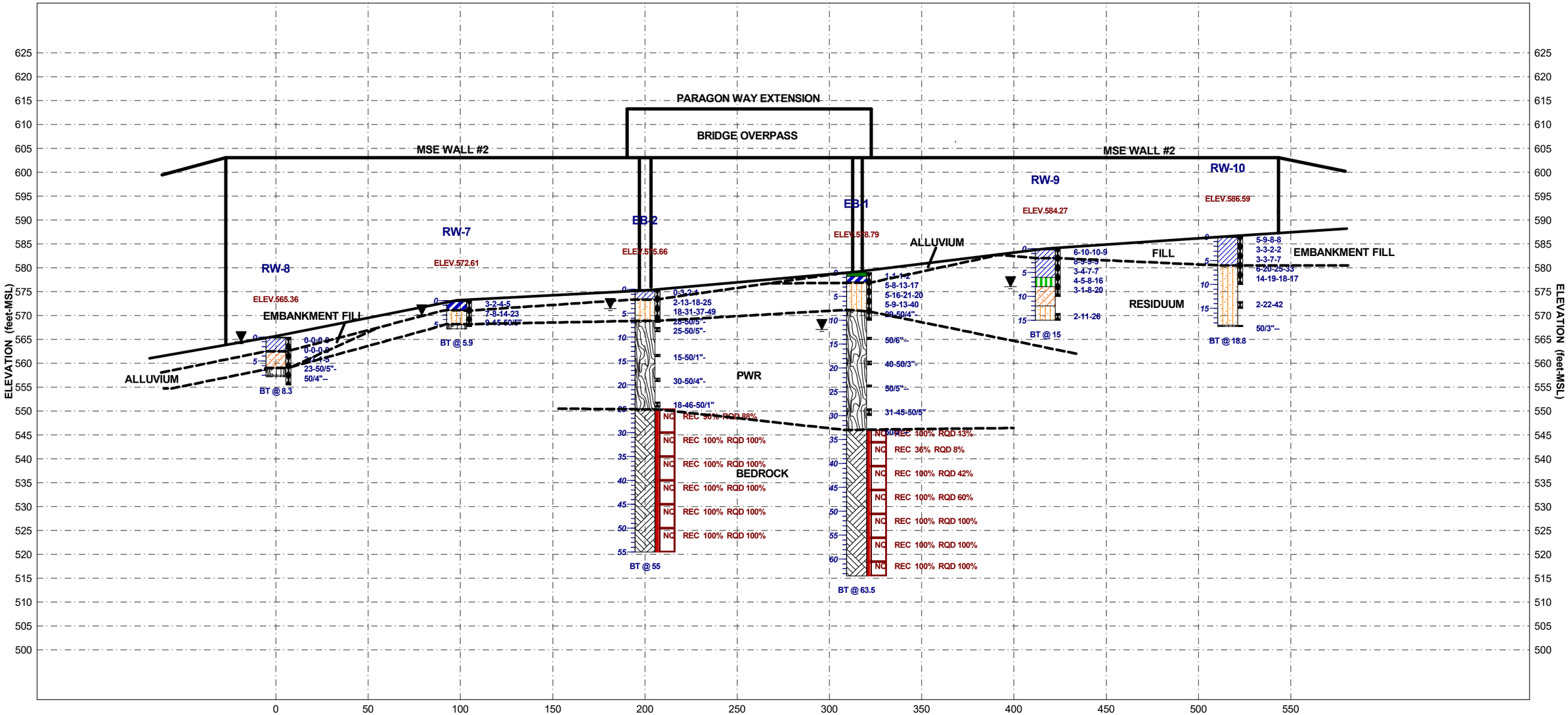
PROJECT: I-77 Interchange near Exit 80

LOCATION: Rock Hill, York Co, SC

FIGURE: 10

JOB NO: 1461-19-069

DATE: 10/12/20



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation at GS

Water Level at Time of Boring
Water Level after 24 Hours
Hole Caved
Water Loss/Inflow

11-16-10 Standard Penetration Test (blows per foot).

12in Undisturbed Sample Recovery in Inches

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

BT Boring Termination Depth
XXX Boring Refusal

LEGEND OF MATERIAL GRAPHICS FOR SOIL TEST BORINGS

- SM, Silty Sand
- SC, Clayey Sand
- ML, Low Plasticity Silt
- CL, Low Plasticity Clay
- CH, High Plasticity Clay
- PWR, Partially Weathered Rock
- Bedrock

The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgment. The actual subsurface conditions will vary between boring locations.

SUBSURFACE PROFILE
BRIDGE OVERPASS - EAST

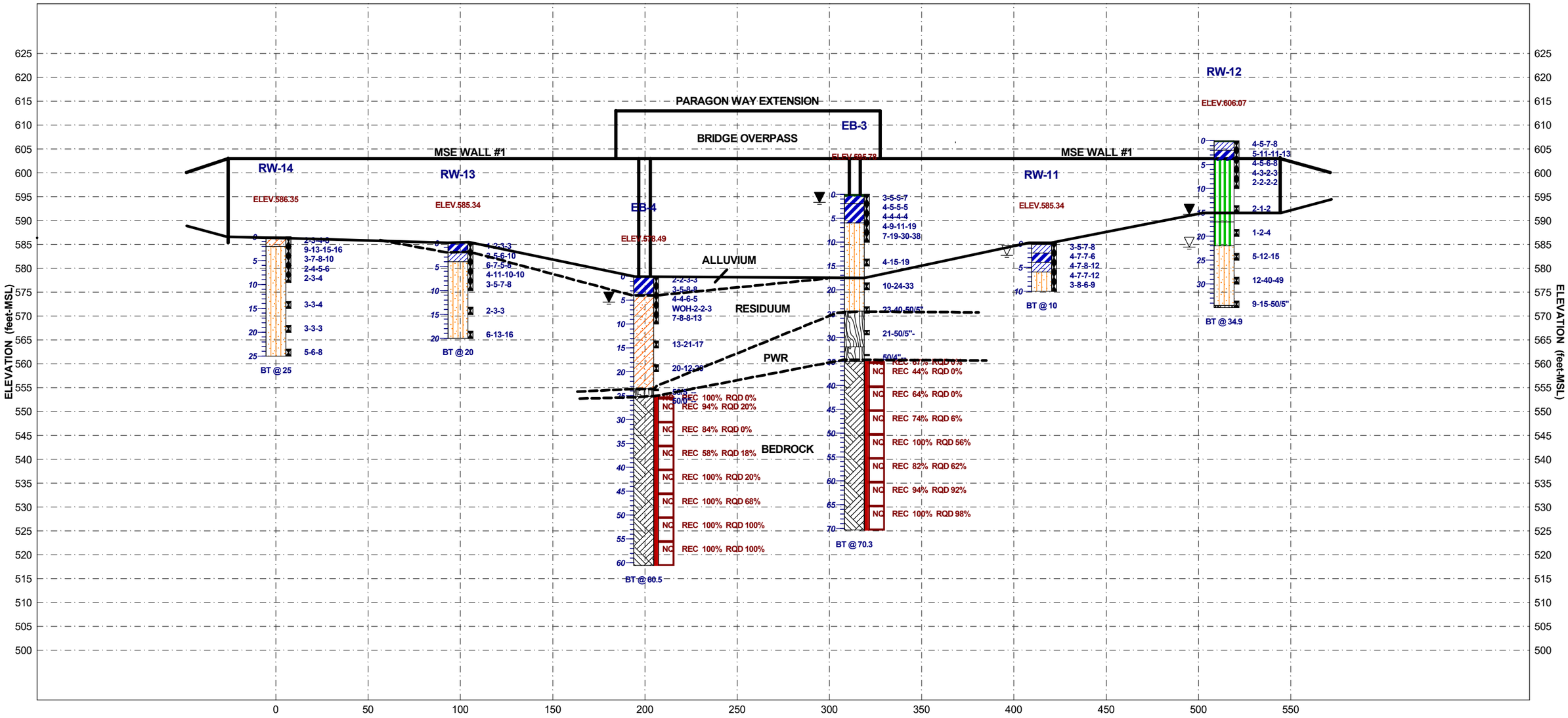
PROJECT: I-77 Interchange near Exit 80

LOCATION: Rock Hill, York Co, SC

FIGURE: 11

JOB NO: 1461-19-069

DATE: 10/12/20



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation at GS

Water Level at Time of Boring

Water Level after 24 Hours

Hole Caved

Water Loss/Inflow

11-16-10 Standard Penetration Test (blows per foot).

12in Undisturbed Sample Recovery in Inches

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

BT Boring Termination Depth
XXX Boring Refusal

LEGEND OF MATERIAL GRAPHICS FOR SOIL TEST BORINGS

- SM, Silty Sand
- SC, Clayey Sand
- ML, Low Plasticity Silt
- CL, Low Plasticity Clay
- CH, High Plasticity Clay
- PWR, Partially Weathered Rock
- Bedrock

The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgment. The actual subsurface conditions will vary between boring locations.

SUBSURFACE PROFILE
BRIDGE OVERPASS - WEST

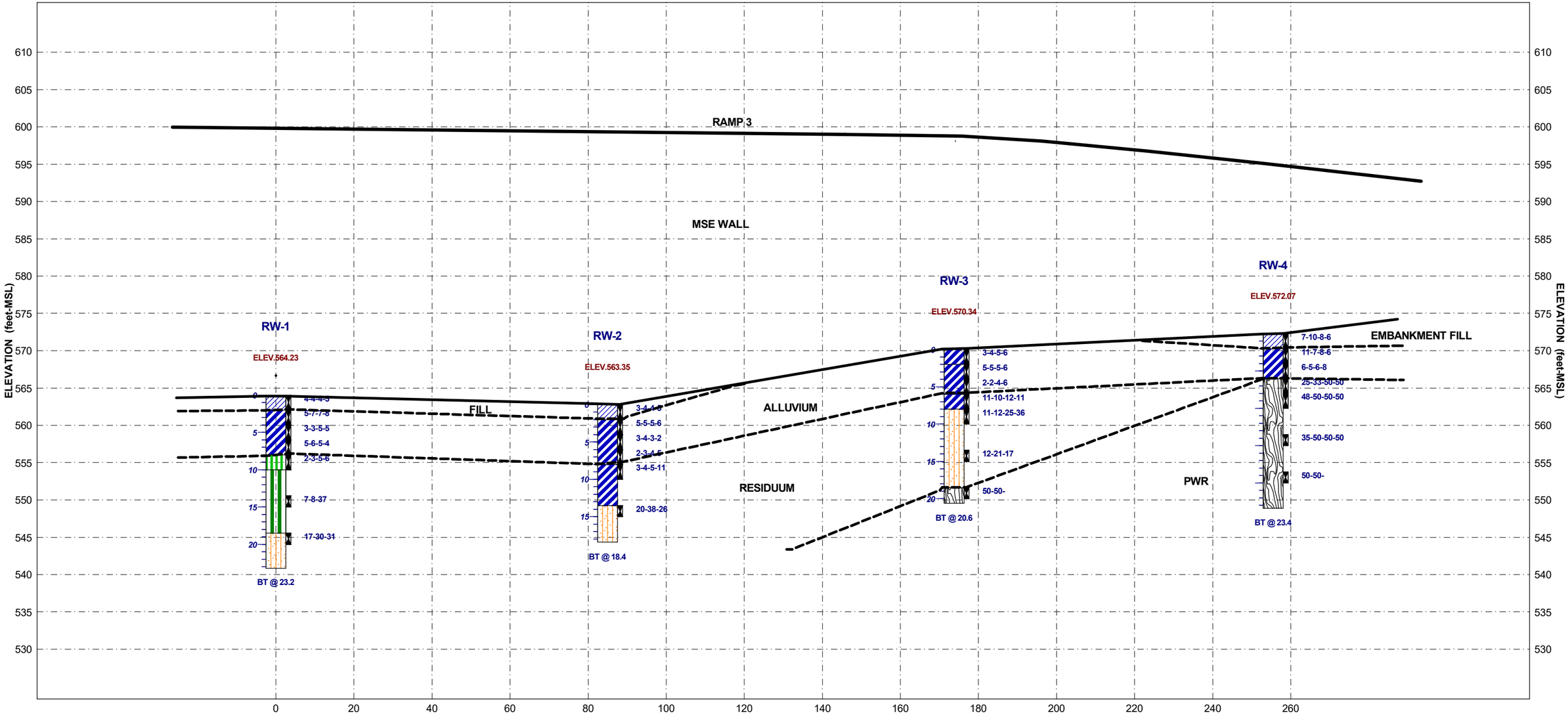
PROJECT: I-77 Interchange near Exit 80

LOCATION: Rock Hill, York Co, SC

FIGURE: 12

JOB NO: 1461-19-069

DATE: 10/12/20



SOIL TEST BORINGS

B-3 Boring Number
123.0 Elevation at GS

Water Level at Time of Boring
Water Level after 24 Hours
Hole Caved
Water Loss/Inflow

11-16-10 Standard Penetration Test (blows per foot).
12in Undisturbed Sample Recovery in Inches
NX Core Barrel Size
REC 80% Recovery in Percent
RQD 56% Rock Quality Designation
BT Boring Termination Depth
XXX Boring Refusal

LEGEND OF MATERIAL GRAPHICS FOR SOIL TEST BORINGS

- SM, Silty Sand
- CL, Low Plasticity Clay
- ML, Low Plasticity Silt
- CH, High Plasticity Clay
- MH, High Plasticity Silt
- PWR, Partially Weathered Rock

The depicted stratigraphy is shown for illustrative purposes only and is not warranted. Separations between different strata may be gradual and likely vary considerably from those shown. Profiles between nearby borings have been estimated using reasonable engineering care and judgment. The actual subsurface conditions will vary between boring locations.

SUBSURFACE PROFILE
RAMP 3

PROJECT: I-77 Interchange near Exit 80

LOCATION: Rock Hill, York Co, SC

FIGURE: 13

JOB NO: 1461-19-069

DATE: 10/12/20

Appendix II – Tables

Table 1: Test Location Summary

Test ID	Test/SampleType(s)				SC State Plane Northing (ft.)	SC State Plane Easting (ft.)	Latitude (degrees)	Longitude (degrees)	Elevation (ft-msl)	Alignment	Station	Offset (ft)
	SPT	RC	Bulk	UD								
EB-1	X	X			1137186.1	2006041.6	34.9587	-80.9798	578.79	Paragon	37+16.14	68.2 LT
EB-2	X	X			1137083.8	2006071.4	34.9584	-80.9797	575.66	Paragon	37+17.75	38.4 RT
EB-3	X	X			1137113.2	2005754.8	34.9585	-80.9808	595.78	Paragon	34+20.27	74.0 LT
EB-4	X	X			1136993.3	2005796.2	34.9582	-80.9806	578.49	Paragon	34+28.41	52.6 RT
IB-1	X	X			1137171.7	2005972.3	34.9587	-80.9801	585.87	Paragon	36+45.52	72.7 LT
IB-2	X				1137071.5	2006007.8	34.9584	-80.9799	584.20	Paragon	36+53.17	33.3 RT
IB-2A	X		X									
IB-2B	X	X										
IB-3	X	X	X		1137125.9	2005838.5	34.9585	-80.9805	583.98	Paragon	35+04.31	64.1 LT
IB-4	X				1137041.3	2005864.2	34.9583	-80.9804	582.56	Paragon	35+06.63	24.4 RT
IB-4A	X	X										
EM-1	X				1135299.7	2006648.0	34.9535	-80.9778	549.01	Ramp 3	580+08.81	1.4 RT
EM-2	X				1135781.9	2006479.5	34.9548	-80.9784	559.64	Ramp 3	574+99.20	35.1 RT
EM-3	X				1136264.7	2006499.5	34.9562	-80.9783	551.91	Ramp 3	570+15.26	3.4 LT
EM-4	X				1138643.5	2005469.7	34.9627	-80.9817	603.60	Ramp 2	544+64.12	2.4 LT
EM-5	X				1138221.6	2005615.0	34.9615	-80.9812	599.67	Ramp 2	549+09.87	19.7 RT
EM-6	X				1137762.0	2005812.6	34.9603	-80.9806	593.86	Ramp 2	554+10.13	5.8 LT
EM-7	X				1136741.2	2006311.5	34.9575	-80.9789	560.88	Ramp 2	566+04.26	18.1 LT
EM-8	X				1136871.8	2006548.4	34.9578	-80.9781	570.93	Ramp 2	569+10.42	4.1 LT
EM-9	X				1138639.9	2005301.1	34.9627	-80.9823	606.31	Ramp 1	544+12.4	9.2 RT
EM-10	X				1138108.3	2005430.8	34.9612	-80.9819	630.13	Ramp 1	549+61.5	0.1 RT
EM-11	X		X		1137545.1	2005202.7	34.9597	-80.9826	596.38	Ramp 1	555+75.1	17.6 RT
EM-12	X				1137161.1	2005225.8	34.9586	-80.9825	623.95	Ramp 1	559+58.8	10.8 RT
EM-13	X				1137394.7	2005381.1	34.9593	-80.9820	586.90	Ramp 4	553+44.62	16.2 RT
EM-14	X				1136320.8	2006121.6	34.9563	-80.9796	570.50	Ramp 4	568+70.51	20.5 LT
EM-15	X				1135854.5	2006299.1	34.9550	-80.9790	563.69	Ramp 4	573+69.56	32.1 LT
EM-16	X				1135388.7	2006457.8	34.9538	-80.9784	551.65	Ramp 4	578+62.23	4.7 LT
EM-17	X				1137023.6	2005729.2	34.9583	-80.9809	592.50	Paragon	33+71.77	5.6 RT
EM-18	X				1137150.6	2006187.7	34.9586	-80.9793	577.36	Paragon	38+47.60	4.8 RT
EM-19	X				1137279.7	2006655.5	34.9590	-80.9778	581.55	Paragon	43+31.73	14.0 LT
EM-20	X				1137588.2	2007515.0	34.9598	-80.9749	580.96	Paragon	53+02.35	17.7 RT
EM-21	X				1137852.3	2007559.9	34.9605	-80.9748	578.11	Paragon	55+66.53	16.3 RT
RW-1	X				1136705.0	2006675.7	34.9574	-80.9777	564.23	Ramp 3	565+44.97	64.8 LT
RW-2	X				1136773.4	2006641.8	34.9576	-80.9778	563.35	Ramp 3	564+88.25	16.5 LT
RW-3	X				1136864.2	2006657.7	34.9578	-80.9778	570.34	Ramp 3	563+99.06	22.5 LT
RW-4	X				1136943.8	2006646.8	34.9580	-80.9778	572.07	Ramp 3	563+21.43	13.7 LT
RW-5	X				1137321.8	2007153.5	34.9591	-80.9761	579.04	Paragon	48+34.79	22.0 LT
RW-6	X				1137418.3	2007354.0	34.9593	-80.9754	583.04	Paragon	50+68.62	16.5 LT

Table 1: Test Location Summary

Test ID	Test/SampleType(s)				SC State Plane Northing (ft.)	SC State Plane Easting (ft.)	Latitude (degrees)	Longitude (degrees)	Elevation (ft-msl)	Alignment	Station	Offset (ft)
	SPT	RC	Bulk	UD								
RW-7	X				1136985.1	2006108.4	34.9582	-80.9796	572.61	Ramp 2	562+41.20	25.6 LT
RW-8	X				1136890.6	2006142.9	34.9579	-80.9795	565.36	Ramp 2	563+41.78	26.6 LT
RW-9	X				1137263.2	2005989.2	34.9589	-80.9800	584.27	Ramp 2	559+39.25	5.9 LT
RW-10	X			X	1137414.4	2005946.2	34.9593	-80.9801	586.59	Ramp 2	557+82.35	15.9 LT
RW-11	X				1137205.4	2005730.1	34.9588	-80.9809	585.34	Ramp 4	559+05.99	53.6 RT
RW-12	X			X	1137291.5	2005688.4	34.9590	-80.9810	606.07	Ramp 4	558+10.92	64.1 RT
RW-13	X				1136898.7	2005834.7	34.9579	-80.9805	585.34	Ramp 4	562+29.94	57.3 RT
RW-14	X				1136814.5	2005867.4	34.9577	-80.9804	586.35	Ramp 4	563+20.29	54.5 RT
C-1	X				1136689.5	2006364.6	34.9573	-80.9787	559.89	Ramp 2	566+56.16	33.5 RT
C-2	X				1137098.9	2005713.6	34.9585	-80.9809	579.76	Paragon	33+76.74	71.2 LT

Table 2: Split Spoon Samples – Laboratory Classification Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits			Percent Finer #10 (%)	Percent Finer #40 (%)	Percent Finer #200 (%)	Organic Content (%)	Soil Classification	
				LL	PL	PI					AASHTO	USCS
IB-1	SS-1	2-4	33.4	67	26	41	TNP	TNP	83.2	TNP	A-7-6	CH
	SS-3	6-8	21.1	30	18	12	TNP	TNP	58.8	TNP	A-6	CL
	SS-4	8-10	29.1	59	24	35	TNP	TNP	65.5	TNP	A-7-6	CH
	SS-5	13.5-15	20.6	29	23	6	TNP	TNP	38.4	TNP	A-4	SC-SM
	SS-6	18.5-20	26.6	32	26	6	TNP	TNP	38.7	TNP	A-4	SM
	SS-7	23.5-25	11.8	25	22	3	TNP	TNP	30.1	TNP	A-2-4	SM
	SS-8	28.5-30	14.9	28	25	3	TNP	TNP	33.6	TNP	A-2-4	SM
	SS-9	33.5-34.2	12.3	20	19	1	TNP	TNP	23.3	TNP	A-2-4	SM
IB-3	SS-1	0-2	21.1	47	25	22	TNP	TNP	62.3	TNP	A-7-6	CL
	SS-2	2-4	27.3	54	34	20	TNP	TNP	65.9	TNP	A-7-5	MH
	SS-3	4-6	27.8	69	29	40	TNP	TNP	85.8	TNP	A-7-6	CH
	SS-4	6-8	24.6	53	25	28	TNP	TNP	70.9	TNP	A-7-6	CH
	SS-5	8-10	38.5	66	37	29	TNP	TNP	70.7	TNP	A-7-5	MH
	SS-6	13.5-15	52.6	46	26	20	TNP	TNP	52.4	TNP	A-7-6	CL
	SS-7	18.5-20	27.8	41	29	12	TNP	TNP	28.3	TNP	A-2-7	SM
	SS-8	23.5-25	23.5	36	28	8	TNP	TNP	31.1	TNP	A-2-4	SM
	SS-9	28.5-30	TNP	34	29	5	TNP	TNP	63.2	TNP	A-4	ML
EM-1	SS-1	0-2	25.1	51	23	28	TNP	TNP	70.7	TNP	A-7-6	CH
EM-2	SS-1	0-2	28.3	49	39	10	TNP	TNP	50.2	TNP	A-5	ML
EM-4	SS-1	0-2	54.1	54	38	16	TNP	TNP	71.2	TNP	A-7-5	MH
EM-5	SS-1	0-2	27.6	57	36	21	TNP	TNP	80.2	TNP	A-7-5	MH
EM-6	SS-1	0-2	22.1	50	24	26	TNP	TNP	60.8	TNP	A-7-6	CH
EM-9	SS-1	0-2	30.2	48	29	19	TNP	TNP	64.0	TNP	A-7-6	ML
EM-10	SS-1	0-2	24.3	57	23	34	TNP	TNP	78.8	TNP	A-7-6	CH
EM-11	SS-1	0-2	32.7	63	28	35	TNP	TNP	83.0	TNP	A-7-6	CH
	SS-2	2-4	34.2	TNP	TNP	TNP	TNP	TNP	TNP	5.8	--	--
EM-12	SS-1	0-2	28.5	64	27	37	TNP	TNP	81.7	TNP	A-7-6	CH
EM-13	SS-1	0-2	33.0	60	25	35	TNP	TNP	80.9	TNP	A-7-6	CH
EM-14	SS-1	0-2	23.0	40	34	6	TNP	TNP	35.0	TNP	A-2-4	SM
EM-15	SS-1	0-2	28.7	52	25	27	TNP	TNP	70.1	TNP	A-7-6	CH
EM-16	SS-1	0-2	26.6	55	37	18	TNP	TNP	32.1	TNP	A-2-7	SM
EM-17	SS-1	0-2	31.9	61	25	36	TNP	TNP	82.2	TNP	A-7-6	CH
	SS-2	2-4	30.0	TNP	TNP	TNP	TNP	TNP	TNP	3.5	--	--
EM-20	SS-1	1.3-3.3	34.7	63	42	21	TNP	TNP	82.8	TNP	A-7-5	MH
EM-21	SS-1	1.3-3.3	18.7	39	23	16	TNP	TNP	31.9	TNP	A-2-6	SC
RW-7	SS-1	0-2	37.7	53	29	24	TNP	TNP	80.9	TNP	A-7-6	CH
	SS-2	2-4	24.2	32	26	6	TNP	TNP	39.3	TNP	A-4	SM
RW-8	SS-2	2-4	31.7	TNP	TNP	TNP	TNP	TNP	TNP	3.3	--	--
	SS-3	4-6	19.5	31	17	14	TNP	TNP	23.5	TNP	--	SC
RW-9	SS-2	2-4	18.1	36	18	18	TNP	TNP	66.6	TNP	A-6	CL
	SS-4	6-8	30.5	41	32	9	TNP	TNP	61.0	TNP	A-5	ML
	SS-5	8-10	22.9	31	21	10	TNP	TNP	84.4	TNP	A-4	SC
RW-10	SS-1	0-2	17.9	TNP	TNP	TNP	TNP	TNP	TNP	4.2	--	--
	SS-2	2-4	24.1	33	19	14	TNP	TNP	50.9	TNP	A-6	CL
	SS-3	4-6	30.0	47	20	27	TNP	TNP	65.1	TNP	A-7-6	CL

Table 2: Split Spoon Samples – Laboratory Classification Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits			Percent Finer #10 (%)	Percent Finer #40 (%)	Percent Finer #200 (%)	Organic Content (%)	Soil Classification	
				LL	PL	PI					AASHTO	USCS
RW-11	SS-2	2-4	39.3	59	30	29	TNP	TNP	70.1	TNP	A-7-5	CH
	SS-3	4-6	27.4	39	21	18	TNP	TNP	66.5	TNP	A-6	CL
RW-12	SS-2	2-4	35.4	71	33	38	TNP	TNP	88.9	TNP	A-7-5	CH
	SS-4	6-8	44.7	49	30	19	TNP	TNP	80.6	TNP	A-7-5	ML
	SS-8	23.5-25	19.5	--	NP	NP	TNP	TNP	33.4	TNP	A-2-4	SM
RW-13	SS-1	0-2	33.1	68	32	36	TNP	TNP	80.8	TNP	A-7-5	CH
RW-13	SS-4	6-8	14.0	35	27	8	TNP	TNP	39.9	TNP	A-4	SM
RW-14	SS-3	4-6	23.2	42	30	12	TNP	TNP	49.8	TNP	A-7-5	SM

NP = Nonplastic
TNP = Test Not Performed
[1] Classification estimated based on test results and ASTM D2488 Visual Manual Procedure

Table 3: Corrosion Series Testing Summary

Boring Number	Sample Depth (ft)	Sample No(s).	As-Rec'd Resistivity (Ohm-cm)	Min-Resistivity (Ohm-cm)	Sulfates		Chlorides		pH
					(mg/kg)	(wt%)	(mg/kg)	(wt%)	
EB-2	4.0-6.0	SS-3	12,730	5,025	66.8	0.0067	76.2	0.0076	7.3
IB-4	8.0-10.0	SS-5	5,360	4,824	3.0	0.0003	28.4	0.0028	6.7

Table 4: Undisturbed Samples - Laboratory Classification & Shear Strength Testing Summary

Boring Number	Sample Number	Sample Depth (ft)	Sample Type	Test Type	Atterberg Limits		Percent Finer #200 (%)	USCS	AASHTO	Specific Gravity	Test Specimen Number	Initial Dry Unit Weight (pcf)	Initial Moisture Content (%)	Shear Strength Parameters			
														Total		Effective	
					LL	PI								c (ksf)	ϕ (degrees)	c' (ksf)	ϕ' (degrees)
RW-10	UD-2	10-11.2	Shelby Tube	CU Triaxial (ASTM D4767)	--	NP	30.2	SM	A-2-4	2.768	1	111.1	15.8	0.17	25	0.000	45
											2	120.4	15.2				
											3	120.1	15.2				
RW-12	UD-4	19-21	Shelby Tube	CU Triaxial (ASTM D4767)	TNP	TNP	TNP	ML	--	2.786	1	93.9	30.3	0.389	18	0.069	38
											2	98.3	27.2				
											3	98.5	27.0				

TNP= Test Not Performed

Table 5: Bulk Samples – Laboratory Classification & Proctor Testing Summary										
Boring Number	Sample Number	Sample Depth (ft)	Natural Moisture (%)	Atterberg Limits		Percent Finer #200 (%)	Soil Classification		Max. Dry Density (pcf)	Optimum Moisture (%)
				LL	PI		AASHTO	USCS		
IB-2A	BS-1	0-5	33.4	57	30	71.6	A-7-6	CH	102.9	20.8
IB-3	BS-2	0-5	27.0	61	29	69.7	A-7-5	MH	103.9	19.4
EM-11	BS-3	0-5	34.0	58	27	77.8	A-7-5	MH	92.7	29.6

TNP= Test Not Performed

Table 6: Bulk Samples – Laboratory Proctor and CBR Testing Summary						
Boring Number	**Sample Number**	**Sample Depth (ft)**	**Max. Dry Density (pcf)**	**Optimum Moisture (%)**	**% Compaction**	**Corrected CBR Value at 0.1 in.**
IB-2A	BS-1	0-5	102.9	20.8	91.6	1.7
					97.9	2.8
IB-3	BS-2	0-5	103.9	19.4	92.8	0.9
					99.5	1.2
EM-11	BS-3	0-5	92.7	29.6	91.7	3.7
					98.9	9.9

Table 7: Undisturbed Samples - Laboratory Classification & Consolidation Testing Summary												
Boring Number	Sample Number	Sample Depth (ft)	Atterberg Limits		Percent Finer #200 (%)	USCS	AASHTO	Specific Gravity	Initial Void Ratio (%)	Final Void Ratio (%)	Initial Dry Unit Weight (pcf)	Initial Moisture Content (%)
			LL	PI								
RW-10	UD-1	4-6	79	48	83.5	CH	A-7-5	2.784	0.979	0.796	87.8	35.1

Table 8: Rock Core Samples – Laboratory Testing Summary

Boring Number	Total Boring Depth (ft)	Core Run	Core Interval	Recovery (%)	RQD	No. of Sample Tested	Approx. Depth (ft)	Compressive Strength (psi)	RMR	GSI
EB-1	63.5	RC-1	32.9-35.5	100	14	---	---	---	---	50
		RC-2	35.5-40.5	36	8	---	---	---	---	65
		RC-3	40.5-45.5	100	42	RS-1	42.6-43.0	2,162	4	70
		RC-4	45.5-50.5	100	60	---	---	---	---	60
		RC-5	50.5-55.5	100	100	---	---	---	---	85
		RC-6	55.5-60.5	100	100	RS-2	57.5-57.9	22,416	66	90
		RC-7	60.5-63.5	100	100	---	---	---	---	95
EB-2	55.0	RC-1	25-30	90	88	RS-3	25.3-25.7	34,032	66	85
		RC-2	30-35	100	100	---	---	---	---	90
		RC-3	35-40	100	100	---	---	---	---	90
		RC-4	40-45	100	100	---	---	---	---	90
		RC-5	45-50	100	100	RS-4	46.7-47.1	39,834	74	90
		RC-6	50-55	100	100	---	---	---	---	90
EB-3	70.3	RC-1	35.0-35.3	67	0	---	---	---	---	40
		RC-2	35.3-40.3	44	0	---	---	---	---	40
		RC-3	40.3-45.3	64	0	---	---	---	---	40
		RC-4	45.3-50.3	74	6	---	---	---	---	45
		RC-5	50.3-55.3	100	56	---	---	---	---	60
		RC-6	55.3-60.3	83	62	RS-14	55.0-55.35	41,162	47	60
		RC-7	60.3-65.3	94	92	RS-15	62.6-62.95	21,672	61	80
		RC-8	65.3-70.3	100	98	---	---	---	---	90
EB-4	60.5	RC-1	25.2-25.5	100	0	---	---	---	---	45
		RC-2	25.5-30.5	94	20	---	---	---	---	45
		RC-3	30.5-35.5	84	0	---	---	---	---	50
		RC-4	35.5-40.5	58	18	---	---	---	---	40
		RC-5	40.5-45.5	100	20	RS-16	44.0-44.4	23,952	9	35
		RC-6	45.5-50.5	100	68	---	---	---	---	70
		RC-7	50.5-55.5	100	100	---	---	---	---	90
		RC-8	55.5-60.5	100	100	RS-17	55.5-55.9	45,581	74	90
IB-1	65.5	RC-1	34.6-35.5	100	100	---	---	---	---	90
		RC-2	35.5-40.5	100	100	---	---	---	---	85
		RC-3	40.5-45.5	100	100	---	---	---	---	90
		RC-4	45.5-50.5	100	100	RS-5	45.7-46.2	35,620	69	95
		RC-5	50.5-55.5	100	100	---	---	---	---	85
		RC-6	55.5-60.5	100	100	---	---	---	---	85
		RC-7	60.5-65.5	100	100	RS-6	65.0-65.5	32,845	69	85
		RC-1	28.1-33.0	63	25	---	---	---	---	55
		RC-2	33.0-38.0	48	28	---	---	---	---	75

Table 8: Rock Core Samples – Laboratory Testing Summary

Boring Number	Total Boring Depth (ft)	Core Run	Core Interval	Recovery (%)	RQD	No. of Sample Tested	Approx. Depth (ft)	Compressive Strength (psi)	RMR	GSI
IB-2B	63	RC-3	38.0-43.0	30	20	---	---	---	---	95
		RC-4	43.0-48.0	100	100	RS-7	43.3-43.8	35,638	64	90
		RC-5	48.0-53.0	100	96	---	---	---	---	95
		RC-6	53.0-58.0	100	100	RS-8	57.5-57.9	28,662	76	95
		RC-7	58.0-63.0	100	100	---	---	---	---	95
IB-3	70.1	RC-1	38.1-40.1	70	0	---	---	---	---	65
		RC-2	40.1-45.1	78	14	---	---	---	---	65
		RC-3	45.1-50.1	46	30	---	---	---	---	70
		RC-4	50.1-55.1	84	36	RS-9	53.7-54.1	21,042	14	70
		RC-5	55.1-60.1	100	100	---	---	---	---	95
		RC-6	60.1-65.1	100	90	RS-10	60.5-60.9	40,273	79	90
		RC-7	65.1-70.1	100	100	---	---	---	---	95
IB-4A	55.4	RC-1	20.5-21.1	100	14	---	---	---	---	75
		RC-2	21.1-23.0	80	50	---	---	---	---	70
		RC-3	24.6-25.4	100	88	RS-11	24.7-25.1	33,534	37	75
		RC-4	25.4-30.4	84	66	---	---	---	---	80
		RC-5	30.4-35.4	62	13	RS-12	34.8-35.2	36,589	12	40
		RC-6	35.4-40.4	90	60	---	---	---	---	70
		RC-7	40.4-45.4	100	100	---	---	---	---	90
		RC-8	45.4-50.4	100	100	---	---	---	---	95
		RC-9	50.4-55.4	100	100	RS-13	54.3-54.7	25,959	79	95

Appendix III – Boring Logs

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	37+16.14	**Offset:**	68.2 LT	**Alignment:**	Paragon
Elev.:	578.8 ft	**Latitude:**	34.9587	**Longitude:**	-80.9798	**Date Started:**	1/9/2020
Total Depth:	63.5 ft	**Soil Depth:**	32.9 ft	**Core Depth:**	30.6 ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 10.8 ft	**24HR**	11.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.8	**SURFACE MATERIALS - TOPSOIL** - 9 inches.		0.0						
		ALLUVIUM - SANDY FAT CLAY (CH) - very soft, moist, dark brown, mostly medium to high plasticity fines, some fine to medium sands. [7.5YR 3/2]			SS-1	1	1	1	2	2
	2.0	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - medium dense, moist, brown, mostly fine sands, some low plasticity fines. [7.5YR 4/4]		2.0	SS-2	5	8	13	17	21
		@ 4 feet - dense, some non-plastic to low plasticity fines. [7.5YR 4/2]		4.0	SS-3	5	16	21	20	37
573.8										
		@ 6 feet - medium dense, very dark greenish gray, little non-plastic to low plasticity fines. [GLEY 1 3/10Y]		6.0	SS-4	5	9	13	40	22
	8.0	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, dry, dark brown, mostly fine sands, little non-plastic to low plasticity fines. [7.5YR 3/4]		8.0	SS-5	2950/4"				100
568.8										
		@ 13.5 feet - mostly coarse sands.		13.5	SS-6	50/6"				100
563.8										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	37+16.14	**Offset:**	68.2 LT	**Alignment:**	Paragon
Elev.:	578.8 ft	**Latitude:**	34.9587	**Longitude:**	-80.9798	**Date Started:**	1/9/2020
Total Depth:	63.5 ft	**Soil Depth:**	32.9 ft	**Core Depth:**	30.6 ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 10.8 ft	**24HR**	11.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
		@ 18.5 feet - absent coarse sands, few rock fragments.		18.5	SS-7	4050/3"	100
558.8							
		@ 23.5 feet - dark gray, absent rock fragments. [GLEY 1 4/N]		23.5	SS-8	50/5"	100
553.8							
		@ 28.5 feet - wet, greenish black, mostly medium to coarse sands, little low plasticity fines, few rock fragments. [GLEY 1 2.5/10Y]		28.5	SS-9	31 45 50/5"	100
548.8							
	32.9	**<u>METAMORPHOSED IGNEOUS ROCK</u> - METAGABBRO** - fine grained, gray, moderately weathered, medium strong to		32.7 32.9	SS-10	50/2"	

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	37+16.14	**Offset:**	68.2 LT	**Alignment:**	Paragon
Elev.:	578.8 ft	**Latitude:**	34.9587	**Longitude:**	-80.9798	**Date Started:**	1/9/2020
Total Depth:	63.5 ft	**Soil Depth:**	32.9 ft	**Core Depth:**	30.6 ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 10.8 ft	**24HR**	11.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		strong. [GLEY 1 6/N]			RC-1			
543.8		@ 32.9 feet - highly fractured zone.						
		RC-1: REC = 100%, RQD = 14%, GSI = 50.		35.5				
		33.4 to 33.7 feet - highly fractured with 30-60 degree dips.						
		34.0 to 34.4 feet - highly fractured with 30-60 degree dips.						
		@ 35.5 feet - greenish black, completely to highly weathered, extremely weak. [GLEY 1 2.5/10GY]			RC-2			
		RC-2: REC = 36%, RQD = 8%, GSI = 65.						
		@ 36.9 feet - gray, moderately weathered, medium strong to strong. [GLEY 1 6/N]						
538.8				40.5				
		RC-3: REC = 100%, RQD = 42%, GSI = 70, RMR = 4.			RC-3			
		43.5 to 44.9 feet - near vertical veins with open vugs containing calcite mineralization.						
533.8				45.5				
		@ 45.5 feet - highly fractured with 45 degree to near vertical dips.						
		RC-4: REC = 100%, RQD = 60%, GSI = 60.			RC-4			
		@ 46.8 feet - slightly weathered to fresh, strong to very strong.						
		- fractures with 0-60 degree dips, narrow, no infill, planar, close, slightly rough.						
528.8				50.5				
		RC-5: REC = 100%, RQD = 100%, GSI =						

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	37+16.14	**Offset:**	68.2 LT	**Alignment:**	Paragon
Elev.:	578.8 ft	**Latitude:**	34.9587	**Longitude:**	-80.9798	**Date Started:**	1/9/2020
Total Depth:	63.5 ft	**Soil Depth:**	32.9 ft	**Core Depth:**	30.6 ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 10.8 ft	**24HR**	11.9 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		85.			RC-5			
523.8		RC-6: REC = 100%, RQD = 100%, GSI = 90, RMR = 66.		55.5	RC-6			
518.8		RC-7: REC = 100%, RQD = 100%, GSI = 95.		60.5	RC-7			
	63.5	Boring terminated at 63.5 feet.						
513.8								

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	EB-2
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	37+17.75	**Offset:**	38.4 RT	**Alignment:**	Paragon
Elev.:	575.7 ft	**Latitude:**	34.9584	**Longitude:**	-80.9797	**Date Started:**	1/7/2020
Total Depth:	55 ft	**Soil Depth:**	25 ft	**Core Depth:**	55 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		EMBANKMENT FILL - SANDY LEAN CLAY (CL) - firm, wet, weak red, mostly low to medium plasticity fines, some fine to medium sands. [10R 5/2]			SS-1	0	3	2	1	5
	2.0	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - dense to very dense, moist, reddish gray, subangular, mostly fine to medium sands, some low plasticity fines. [10R 6/1]		2.0	SS-2	2	13	18	25	31
		▼		4.0						
570.7					SS-3	18	31	37	49	68
				6.0						
	6.5	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, dry, weak red, subangular, mostly fine to medium sands, little low plasticity fines. [10R 5/2]			SS-4	2850/5"				100
				8.0	SS-5	2550/5"				100
565.7										
				13.5	SS-6	1550/1"				100
560.7										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	37+17.75	**Offset:**	38.4 RT	**Alignment:**	Paragon
Elev.:	575.7 ft	**Latitude:**	34.9584	**Longitude:**	-80.9797	**Date Started:**	1/7/2020
Total Depth:	55 ft	**Soil Depth:**	25 ft	**Core Depth:**	55 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
				18.5	SS-7	3050/4"	100	
555.7				23.5	SS-8	18 46 50/1"	100	
550.7	25.0	**METAMORPHOSED IGNEOUS ROCK - METAGABBRO** - medium grained, subrounded, crystalline, gray, slightly weathered, strong to very strong. [GLEY 1 6/N] RC-1: REC = 90% , RQD = 88%, GSI = 85, RMR = 66.		25.0	RC-1			
545.7		@ 29.9 feet - fractures and veins with 60-80 degree dips, very narrow, infilled with calcite, planar, very close, slightly rough. RC-2: REC = 100% , RQD = 100%, GSI = 90. @ 31 feet - end veins and fractures. @ 33.1 - fresh.		30.0	RC-2			

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	37+17.75	**Offset:**	38.4 RT	**Alignment:**	Paragon
Elev.:	575.7 ft	**Latitude:**	34.9584	**Longitude:**	-80.9797	**Date Started:**	1/7/2020
Total Depth:	55 ft	**Soil Depth:**	25 ft	**Core Depth:**	55 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
540.7		RC-3: 100% REC , 100% RQD , GSI = 90.		35.0	RC-3			
535.7		RC-4: REC = 100% , RQD = 100%, GSI = 90.		40.0	RC-4			
530.7		RC-5: REC = 100% , RQD = 100%, GSI = 90, RMR = 74.		45.0	RC-5			
525.7		RC-6: REC = 100% , RQD = 100%, GSI = 90.		50.0				

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	37+17.75	**Offset:**	38.4 RT	**Alignment:**	Paragon
Elev.:	575.7 ft	**Latitude:**	34.9584	**Longitude:**	-80.9797	**Date Started:**	1/7/2020
Total Depth:	55 ft	**Soil Depth:**	25 ft	**Core Depth:**	55 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
					RC-6			
520.7	55.0	Boring terminated at 55.0 feet.						
515.7								
510.7								

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	34+20.27	**Offset:**	74.0 LT	**Alignment:**	Paragon
Elev.:	595.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9808	**Date Started:**	1/14/2020
Total Depth:	70.3 ft	**Soil Depth:**	35 ft	**Core Depth:**	70.3 ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	1.7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0	SS-1	3	5	5	7	10
		ALLUVIUM - FAT CLAY (CH) - stiff, moist, very dark gray, mostly high plasticity fines, few fine sands. [GLEY 3/1]								
	2.0	**PIEDMONT RESIDUUM - FAT CLAY (CH)** - stiff to firm, moist, dark reddish gray, mostly high plasticity fines, few fine sands. [5YR 4/2]		2.0	SS-2	4	5	5	5	10
				4.0	SS-3	4	4	4	4	8
590.8	6.0	**SILTY SAND (SM)** - medium dense, moist, weak red, mostly fine sands, little low plasticity fines, trace mica. [10R 5/2]		6.0	SS-4	4	9	11	19	20
		@ 8 feet - dense.		8.0	SS-5	7	19	30	38	49
585.8				13.5	SS-6	4	15	19		34
580.8										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	34+20.27	**Offset:**	74.0 LT	**Alignment:**	Paragon
Elev.:	595.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9808	**Date Started:**	1/14/2020
Total Depth:	70.3 ft	**Soil Depth:**	35 ft	**Core Depth:**	70.3 ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	1.7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
		@ 18.5 feet - very dense.		18.5	SS-7	10 24 33	57
575.8				23.5	SS-8	23 40 50/5"	100
	24.5	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, dark bluish gray, mostly fine to coarse sands, little low plasticity fines. [GLEY 4/10B]		28.5	SS-9	2150/5"	100
570.8							
565.8							
	32.0	**LEAN CLAY WITH SAND (CL)** - hard, moist, dark bluish gray, mostly high plasticity fines, little fine to coarse sands. [GLEY 4/5PB]		33.5	SS-10	50/4"	100

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	34+20.27	**Offset:**	74.0 LT	**Alignment:**	Paragon
Elev.:	595.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9808	**Date Started:**	1/14/2020
Total Depth:	70.3 ft	**Soil Depth:**	35 ft	**Core Depth:**	70.3 ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	1.7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
560.8	35.0	**<u>METAMORPHOSED IGNEOUS ROCK</u> - METAGABBRO** - medium grained, very dark bluish gray, moderately weathered, medium strong to strong rock. [GLEY 3/5PB]	35.0			
		RC-1: REC = 67% , RQD = 0%, GSI = 40.	35.3	RC-1		
		@ 35 feet - highly fractured zone.				
		RC-2: REC = 44% , RQD = 0%, GSI = 40.		RC-2		
555.8			40.3			
		RC-3: REC = 64% , RQD = 0%, GSI = 40.				
		@ 40.6 feet - completely weathered.		RC-3		
550.8			45.3			
		RC-4: REC = 74% , RQD = 6%, GSI = 45.				
		@ 46.8 feet - moderately weathered.		RC-4		
545.8			50.3			
		RC-5: REC = 100% , RQD = 56%, GSI = 60.				

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	34+20.27	**Offset:**	74.0 LT	**Alignment:**	Paragon
Elev.:	595.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9808	**Date Started:**	1/14/2020
Total Depth:	70.3 ft	**Soil Depth:**	35 ft	**Core Depth:**	70.3 ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	1.7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 50.3 - fractures with 10-40 degree dips, narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.						
		@ 50.7 feet - highly fractured zone.						
		@ 51.1 feet - fractures with 10-40 degree dips, narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.			RC-5			
		@ 53.6 feet - slightly weathered.						
		@ 54.4 feet - fractures with 5-60 degree dips.						
540.8				55.3				
		RC-6: REC = 82% , RQD = 62%, GSI = 60, RMR = 47.						
		@ 56.7 feet - fresh.						
		@ 57.7 - fractures with 5-80 degree dips, no infill, rough.			RC-6			
535.8				60.3				
		RC-7: REC = 94% , RQD = 92%, GSI = 80, RMR = 61.						
					RC-7			
530.8				65.3				
		RC-8: REC = 100% , RQD = 98%, GSI = 90.						
		@ 51.1 feet - fractures with 0-65 degree dips, very narrow, partially infilled with Iron			RC-8			

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	34+20.27	**Offset:**	74.0 LT	**Alignment:**	Paragon
Elev.:	595.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9808	**Date Started:**	1/14/2020
Total Depth:	70.3 ft	**Soil Depth:**	35 ft	**Core Depth:**	70.3 ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	T. Brown	**Groundwater:**	**TOB** N/A	**24HR**	1.7 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		Oxides, planar, close, slightly rough to rough.						
525.8	70.3	Boring terminated at 70.3 feet.						
520.8								
515.8								

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	34+28.41	**Offset:**	52.6 RT	**Alignment:**	Paragon
Elev.:	578.5 ft	**Latitude:**	34.9582	**Longitude:**	-80.9806	**Date Started:**	1/15/2020
Total Depth:	60.5 ft	**Soil Depth:**	25.2 ft	**Core Depth:**	60.5 ft	**Date Completed:**	1/15/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** N/A	**24HR**	5.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ALLUVIUM - FAT CLAY (CH)** - firm, moist, gray, mostly high plasticity fines, trace fine sands. [5YR 5/1]		0.0	SS-1	2	2	3	3	5
		@ 2 feet - stiff, light gray and yellow, mostly medium to high plasticity fines, trace fine to coarse sands. [5YR 5/1] [5YR 6/6]		2.0	SS-2	3	5	8	8	13
	3.8	**PIEDMONT RESIDUUM - CLAYEY SAND (SC)** - loose, moist, light reddish brown, mostly fine sands, little low to medium plasticity fines, relict rock structure. [5YR 6/4]		4.0	SS-3	4	4	6	5	10
573.5		@ 6 feet - very loose, trace roots.		6.0	SS-4	WOH	2	2	3	4
		@ 8 feet - medium dense, absent trace roots.		8.0	SS-5	7	8	8	13	16
568.5										
		@ 13.5 feet - dense, dark reddish gray, subangular, mostly fine to medium sands. [5YR 4/2]		13.5	SS-6	13	21	17		38
563.5										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	EB-4
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AKS	**Boring Location:**	34+28.41	**Offset:**	52.6 RT	**Alignment:**	Paragon
Elev.:	578.5 ft	**Latitude:**	34.9582	**Longitude:**	-80.9806	**Date Started:**	1/15/2020
Total Depth:	60.5 ft	**Soil Depth:**	25.2 ft	**Core Depth:**	60.5 ft	**Date Completed:**	1/15/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** N/A	**24HR**	5.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				18.5	SS-7	20	12	20		32
558.5										
	23.5	**PARTIALLY WEATHERED ROCK- SILTY SAND (SM)** - very dense, moist, yellow, subangular, mostly fine to coarse sands, some low to medium plasticity fines, relict rock structure. [10YR7/6]		23.5	SS-8	50/5"				100
553.5	25.2	**METAMORPHOSED IGNEOUS ROCK - METAGABBRO** - medium grained, subrounded, crystalline, gray, moderately weathered, medium strong. [GLEY 1 6/N]		25.2	SS-9	50/0"				100
		RC-1: REC = 100% , RQD = 0%, GSI = 45.		25.2	RC-1					
		RC-2: REC = 94% , RQD = 20%, GSI = 45.		25.5						
					RC-2					
		@ 29.3 feet - highly weathered.								
548.5		- highly fractured zone.		30.5						
		RC-3: REC = 84% , RQD = 0%, GSI = 20.			RC-3					

SPT N VALUE ●

PL ✕ MC ○ LL ✕

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	34+28.41	**Offset:**	52.6 RT	**Alignment:**	Paragon
Elev.:	578.5 ft	**Latitude:**	34.9582	**Longitude:**	-80.9806	**Date Started:**	1/15/2020
Total Depth:	60.5 ft	**Soil Depth:**	25.2 ft	**Core Depth:**	60.5 ft	**Date Completed:**	1/15/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** N/A	**24HR**	5.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
543.5		RC-4: REC = 58% , RQD = 18%, GSI = 40.		35.5	RC-4			
538.5		RC-5: REC = 100% , RQD = 20%, GSI = 35, RMR = 9.		40.5	RC-5			
		@ 43.5 feet - slightly weathered. - fractures with 10-50 degree dips, narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.						
533.5		RC-6: REC = 100% , RQD = 68%, GSI = 70.		45.5	RC-6			
		@ 47.2 feet - coarse grained, moderately weathered. @ 48.3 feet - medium grained, slightly weathered. @ 49.5 feet - fresh.						
528.5		@ 50.2 feet - end of fractures. RC-7: REC = 100% , RQD = 100%, GSI =		50.5				

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EB-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	34+28.41	**Offset:**	52.6 RT	**Alignment:**	Paragon
Elev.:	578.5 ft	**Latitude:**	34.9582	**Longitude:**	-80.9806	**Date Started:**	1/15/2020
Total Depth:	60.5 ft	**Soil Depth:**	25.2 ft	**Core Depth:**	60.5 ft	**Date Completed:**	1/15/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB**	N/A	**24HR** 5.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		90.						
					RC-7			
523.5				55.5				
		RC-8: REC = 100% , RQD = 100%, GSI = 90, RMR = 74.						
					RC-8			
518.5								
	60.5	Boring terminated at 60.5 feet.						
513.5								

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+45.52	**Offset:**	72.7 LT	**Alignment:**	Paragon
Elev.:	585.9 ft	**Latitude:**	34.9587	**Longitude:**	-80.9801	**Date Started:**	1/6/2020
Total Depth:	65.5 ft	**Soil Depth:**	34.6 ft	**Core Depth:**	30.9 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	Mud Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	J. Little	**Groundwater:**	**TOB** 20.7 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS - ASPHALT** - 13 inches.								
	1.1	**GRADED AGGREGATE BASE** - 11 inches.								
	2.0	**EMBANKMENT FILL - FAT CLAY WITH SAND (CH)** - stiff, moist, very dark gray, mostly high plasticity fines, little fine to medium sands. [5YR 3/1] [NMC=33.4%. LL=67, PL=26, PI=41. %FINES=83.2%.]		2.0	SS-1	4	5	6	9	11
	4.0	NO RECOVERY - SS-2 possible cobble blocking sampler.		4.0	SS-2	2	2	3	5	5
580.9	6.0	**SANDY LEAN CLAY (CL)** - firm, moist, reddish gray, mostly low plasticity fines, some fine to medium sands, trace fine gravel. [5YR 5/2] [NMC=21.1%. LL=30, PL=18, PI=12. %FINES=58.8%.]		6.0	SS-3	3	4	3	5	7
	8.0	**SANDY FAT CLAY (CH)** - firm, moist, reddish gray, mostly high plasticity fines, some fine to medium sands, trace fine gravel. [5YR 5/2] [NMC=29.1%. LL=59, PL=24, PI=35. %FINES=65.5%.]		8.0	SS-4	2	4	5	7	9
575.9										
	13.5	**PIEDMONT RESIDUUM - SILTY CLAYEY SAND (SC-SM)** - medium dense, moist, light reddish brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [5YR 6/4] [NMC=20.6%. LL=29, PL=21, PI=6. %FINES=38.4%]		13.5	SS-5	6	9	10		19
570.9										

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

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+45.52	**Offset:**	72.7 LT	**Alignment:**	Paragon
Elev.:	585.9 ft	**Latitude:**	34.9587	**Longitude:**	-80.9801	**Date Started:**	1/6/2020
Total Depth:	65.5 ft	**Soil Depth:**	34.6 ft	**Core Depth:**	30.9 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	Mud Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	J. Little	**Groundwater:**	**TOB** 20.7 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	18.5			18.5						
		SILTY SAND (SM) - loose, dry to moist, dark gray, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [5YR 4/1] [NMC=26.6%. LL=32, PL=26, PI=6. %FINES=38.7%]			SS-6	2	3	5		8
565.9		▽								
		@ 23.5 feet - dense. [NMC=11.8%. LL=25, PL=22, PI=3. %FINES=30.1%]		23.5	SS-7	13	20	30		50
560.9										
		@ 28.5 feet - [NMC=14.9%. LL=28, PL=25, PI=3. %FINES=33.6%]		28.5	SS-8	10	17	20		37
555.9										
	33.5	**PARTIALLY WEATHERED ROCK (PWR)** -		33.5	SS-9	4850/5"				100

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+45.52	**Offset:**	72.7 LT	**Alignment:**	Paragon
Elev.:	585.9 ft	**Latitude:**	34.9587	**Longitude:**	-80.9801	**Date Started:**	1/6/2020
Total Depth:	65.5 ft	**Soil Depth:**	34.6 ft	**Core Depth:**	30.9 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	Mud Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	J. Little	**Groundwater:**	**TOB** 20.7 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
550.9	34.6	**SILTY SAND (SM)** - very dense, dry, dark gray, subangular, mostly fine to medium sands, little low plasticity fines [5YR 4/1] [NMC=12.3%. LL=20, PL=19, PI=1. %FINES=23.3%]		34.6				
					RC-1			
		METAMORPHOSED IGNEOUS ROCK - METAGABBRO - medium grained, subrounded, crystalline, gray, slightly weathered, strong. [GLEY 1 6/N]		35.5				
		RC-1: Rec = 100%, RQD = 100%, GSI= 90.						
		RC-2: Rec = 100%, RQD = 100%, GSI= 85.						
		@ 37.8 feet - fractures with 20-60 degree dips, very narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.			RC-2			
545.9				40.5				
		RC-3: Rec = 100%, RQD = 100%, GSI= 90.						
					RC-3			
540.9		@ 44.6 feet - fresh.		45.5				
		RC-4: Rec = 100%, RQD = 100%, GSI= 95, RMR = 69.						
		@ 47.8 feet - fractures with 10-70 degree dips, partially infilled with calcite, stepped and planar.			RC-4			
535.9				50.5				
		RC-5: Rec = 100%, RQD = 100%, GSI= 85.						

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+45.52	**Offset:**	72.7 LT	**Alignment:**	Paragon
Elev.:	585.9 ft	**Latitude:**	34.9587	**Longitude:**	-80.9801	**Date Started:**	1/6/2020
Total Depth:	65.5 ft	**Soil Depth:**	34.6 ft	**Core Depth:**	30.9 ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	Mud Rotary	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	J. Little	**Groundwater:**	**TOB** 20.7 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 51.6 feet - veins with 50-70 degree dips, medium wide, infilled with calcite, planar, very close.						
		@ 52.6 - end veins.			RC-5			
530.9		RC-6: Rec = 100%, RQD = 100%, GSI= 85.		55.5				
		@ 58 feet - fractures and veins with 60-70 degree dips, narrow, infilled with calcite, planar, very close, slightly rough.			RC-6			
525.9		RC-7: Rec = 100%, RQD = 100%, GSI= 85, RMR = 69.		60.5				
		@ 60.5 feet - coarse grained.			RC-7			
		@ 64.3 feet - medium grained.						
520.9	65.5	Boring Terminated at 65.5 feet.						

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	15.5 ft	**Soil Depth:**	15.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 14.0 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS - ASPHALT** - 12 inches.								
	1.0	**GRADED AGGREGATE BASE** - 6 inches.								
	1.5	**EMBANKMENT FILL - SILT (ML)** - firm, moist, reddish yellow, mostly low to medium plasticity fines, trace fine sands, trace mica. [5YR 6/6]		1.5	SS-1	4	3	4	6	7
	3.5	**FAT CLAY (CH)** - stiff, moist, reddish gray, mostly high plasticity fines. [5YR 5/2]		3.5	SS-2	4	4	7	9	11
579.2	5.5	**LEAN CLAY (CL)** - stiff, moist, reddish yellow, mostly low plasticity fines, trace fine sands. [5YR 6/6]		5.5	SS-3	4	4	6	8	10
	7.5	**FAT CLAY (CH)** - firm, moist, reddish gray, mostly high plasticity fines. [5YR 5/2]		7.5	SS-4	3	4	4	5	8
574.2	13.5	**PIEDMONT RESIDUUM - LEAN CLAY (CL)** - hard, moist, gray, mostly low plasiticity fines, trace fine sands, relict rock structure. [5YR 5/1]		13.5	SS-5	10	28	27		55
569.2	15.5	@ 14 feet - spoon possibly encountered side of boulder at the bottom of embankment fill, possibly resulting in high blow counts. Due to bent spoon, sample could not be retrieved from SS-6.								
		Auger Refusal at 15.5 feet. Offset 5 ft south.								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	15.5 ft	**Soil Depth:**	15.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 14.0 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		See log for IB-2A.						
564.2								
559.2								
554.2								

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	38 ft	**Soil Depth:**	38 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 15.3 ft	**24HR**	13.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%)
	0.0	**SURFACE MATERIALS - ASPHALT** - 12 inches.						
	1.0	**GRADED AGGREGATE BASE** - 6 inches.						
	1.5	see log for soil boring IB-2.						
579.2								
574.2								
569.2	15.5	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - medium dense, moist, reddish brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock						

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	38 ft	**Soil Depth:**	38 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 15.3 ft	**24HR**	13.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		structure. [5YR 5/3]								
				18.5						
					SS-1	3	5	6		11
564.2										
				23.5						
					SS-2	6	8	10		18
559.2										
		@ 27 feet - wet cuttings.								
	28.5	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, reddish brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [5YR 5/3]		28.5	SS-3	50/5"				100
554.2										
	33.5	**PIEDMONT RESIDUUM - SILTY SAND**		33.5						

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

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	38 ft	**Soil Depth:**	38 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 15.3 ft	**24HR**	13.8 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
549.2		**(SM)** - very dense, moist, reddish brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [5YR 5/3]			SS-4	8	26	41		67	
	38.0										
		Auger refusal at 38.0 feet. Could not set casing due to possible boulder at bottom of embankment. Offset 5 ft south. See log for IB-2B.									
544.2											
539.2											
534.2											

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2B		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	63 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	34.9 ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 18.6 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	0.0	**SURFACE MATERIALS - ASPHALT** - 12 inches.						
	1.0	**GRADED AGGREGATE BASE** - 6 inches.						
	1.5	see logs for soil borings IB-2 and IB-2A.						
579.2								
574.2								
569.2								

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2B		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	63 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	34.9 ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 18.6 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
564.2								
559.2								
	28.1	Auger Refusal at 28.1 feet.		28.1				
		METAMORPHOSED IGNEOUS ROCK - METAGABBRO - medium grained, subrounded, crystalline gray, moderately weathered, strong. [GLEY 1 6/N]						
554.2		RC-1: Rec = 63%, RQD = 25%, GSI = 55.			RC-1			
		Sample disturbed from 28.1 feet to 33 feet.						
	33.0			33.0				
		RC-2: Rec = 48%, RQD = 28%, GSI = 55. @ 33 feet - slightly weathered.						

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2B		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	63 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	34.9 ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 18.6 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
549.2		@ 35.1 feet - fractures with 10-70 degree dips, very narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.			RC-2			
		RC-3: Rec = 30%, RQD = 20%, GSI = 60.		38.0				
544.2					RC-3			
		RC-4: Rec = 100%, RQD = 100%, GSI = 90, RMR = 64.		43.0				
		@ 43.5 feet - fresh.						
539.2					RC-4			
		RC-5: Rec = 100%, RQD = 96%, GSI = 95.		48.0				
534.2					RC-5			

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-2B		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	36+53.17	**Offset:**	33.3 RT	**Alignment:**	Paragon
Elev.:	584.2 ft	**Latitude:**	34.9584	**Longitude:**	-80.9799	**Date Started:**	1/8/2020
Total Depth:	63 ft	**Soil Depth:**	28.1 ft	**Core Depth:**	34.9 ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 18.6 ft	**24HR**	14.1 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
				53.0				
		RC-6: Rec = 100%, RQD = 100%, GSI = 95, RMR = 79.						
529.2					RC-6			
				58.0				
		RC-7: Rec = 100%, RQD = 100%, GSI = 95.						
524.2					RC-7			
	63.0							
		Boring Terminated at 63 feet.						
519.2								

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+04.31	**Offset:**	64.1 LT	**Alignment:**	Paragon
Elev.:	584.0 ft	**Latitude:**	34.9585	**Longitude:**	-80.9805	**Date Started:**	1/17/2020
Total Depth:	70.1 ft	**Soil Depth:**	38.1 ft	**Core Depth:**	70.1 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 12.5 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		EMBANKMENT FILL - SANDY LEAN CLAY (CL) - firm, moist, reddish yellow, mostly low plasticity fines, some fine to medium sands. [5YR 6/6] [NMC=21.1%. LL=47, PL=25, PI=22. %FINES=62.3%]			SS-1	3	3	4	5	7
	2.0			2.0						
		SANDY ELASTIC SILT (MH) - stiff, moist, reddish yellow, mostly high plasticity fines, some fine sands. [5YR 6/6] [NMC=27.3%. LL=54, PL=34, PI=20. %FINES=65.9%]			SS-2	2	4	8	9	12
	4.6			4.0						
579.0		**FAT CLAY WITH SAND (CH)** - stiff, moist, red, mostly high plasticity fines, little fine to medium sands. [10R 5/6] [NMC=27.8%. LL=69, PL=29, PI=40. %FINES=85.8%]			SS-3	4	7	8	10	15
		@ 6 feet - stiff, reddish brown. [5YR 5/3] [NMC=24.6%. LL=53, PL=25, PI=28. %FINES=70.9%]		6.0						
					SS-4	4	4	7	8	11
	8.0			8.0						
		ELASTIC SILT WITH SAND (MH) - stiff, moist, reddish brown, mostly high plasticity fines, little fine to medium sands. [5YR 5/3] [NMC=38.5%. LL=66, PL=37, PI=29. %FINES=70.7%]			SS-5	3	4	6	6	10
574.0										
	13.5			13.5						
		PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL) - firm, wet, light reddish brown, mostly low plasticity fines, some fine to coarse sands, relict rock structure. [5YR 6/3] [NMC=52.6%. LL=46, PL=26, PI=20. %FINES=52.4%]			SS-6	2	3	4		7
569.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	IB-3
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AKS	**Boring Location:**	35+04.31	**Offset:**	64.1 LT	**Alignment:**	Paragon
Elev.:	584.0 ft	**Latitude:**	34.9585	**Longitude:**	-80.9805	**Date Started:**	1/17/2020
Total Depth:	70.1 ft	**Soil Depth:**	38.1 ft	**Core Depth:**	70.1 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 12.5 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	18.5			18.5						
		SILTY SAND (SM) - loose, moist, reddish yellow, subangular, mostly fine to coarse sands, some low plasticity fines, relict rock structure. [5YR 6/6] [NMC=27.8%. LL=41, PL=29, PI=12. %FINES=28.3%]			SS-7	3	4	6		10
564.0										
				23.5						
		@ 23.5 feet - medium dense. [NMC=23.5%. LL=36, PL=28, PI=18. %FINES=31.1%]			SS-8	5	9	7		16
559.0										
	28.5			28.5						
		SANDY SILT (ML) - very hard, moist, reddish brown, mostly low plasticity fines, some fine to coarse sands. [5YR 6/6] [LL=34, PL=29, PI=5. %FINES=63.2%]			SS-9	10	24	36		60
554.0										
	33.5			33.5						
		PARTIALLY WEATHERED ROCK - SILTY								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+04.31	**Offset:**	64.1 LT	**Alignment:**	Paragon
Elev.:	584.0 ft	**Latitude:**	34.9585	**Longitude:**	-80.9805	**Date Started:**	1/17/2020
Total Depth:	70.1 ft	**Soil Depth:**	38.1 ft	**Core Depth:**	70.1 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 12.5 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
549.0		**SAND (SM)** - very dense, dry to moist, gray, subangular, mostly fine to medium sands, some low plasticity fines. [5YR 6/1]			SS-10	20 48 50/5"	100	
	38.1			38.1				
		METAMORPHOSED IGNEOUS ROCK - METAGABBRO - medium grained, subrounded, crystalline, light gray, highly weathered, medium strong. [GLEY 1 7/N]			RC-1			
544.0		RC-1: 70% REC, 0% RQD, GSI = 60.		40.1				
		@ 38.7 feet - moderately weathered.						
		- fractures with 20-80 degree dips, narrow, partially infilled with iron oxides, planar, slightly rough.						
		RC-2: 78% REC, 14% RQD, GSI = 50.			RC-2			
		@ 41.1 feet - highly fractured zone, residual soil, greenish gray. [GLEY 1 6/5GY]						
		@ 41.8 feet - moderately weathered, light gray. [GLEY 1 7/N]						
		- fractures with 30-50 degree dips, narrow, partially infilled with Iron Oxides, planar, very close, slightly rough.						
539.0		RC-3: 46% REC, 30% RQD, GSI = 35.		45.1				
		@ 45.1 feet - completely weathered, dark greenish gray. [GLEY 1 4/10Y]			RC-3			
		@ 47.1 feet - slightly weathered, light gray. [GLEY 1 7/N]						
534.0		RC-4: 84% REC, 36% RQD, GSI = 60, RMR = 14.		50.1				

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+04.31	**Offset:**	64.1 LT	**Alignment:**	Paragon
Elev.:	584.0 ft	**Latitude:**	34.9585	**Longitude:**	-80.9805	**Date Started:**	1/17/2020
Total Depth:	70.1 ft	**Soil Depth:**	38.1 ft	**Core Depth:**	70.1 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 12.5 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		@ 51.4 feet - highly weathered, dark greenish gray. [GLEY 1 4/10Y]			RC-4			
		@ 52.5 feet - slightly weathered, light gray. [GLEY 1 7/N]						
		@ 53.1 feet - highly fractured zone.						
529.0		RC-5: 100% REC, 100% RQD, GSI = 95.		55.1				
		@ 55.1 feet - coarse grained, fresh, very strong.			RC-5			
		@ 57 feet - fractures with 50-60 degree dips, very narrow, partially infilled with Iron Oxides and Calcite, planar and wavy, very close, slightly rough.						
524.0		RC-6: 100% REC, 90% RQD, GSI = 90, RMR = 79.		60.1				
					RC-6			
519.0		RC-7: 100% REC, 100% RQD, GSI = 95.		65.1				
					RC-7			

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+04.31	**Offset:**	64.1 LT	**Alignment:**	Paragon
Elev.:	584.0 ft	**Latitude:**	34.9585	**Longitude:**	-80.9805	**Date Started:**	1/17/2020
Total Depth:	70.1 ft	**Soil Depth:**	38.1 ft	**Core Depth:**	70.1 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 12.5 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
514.0	70.1	Boring terminated at 70.1 feet.						
509.0								
504.0								

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+06.63	**Offset:**	24.4 RT	**Alignment:**	Paragon
Elev.:	582.6 ft	**Latitude:**	34.9583	**Longitude:**	-80.9804	**Date Started:**	1/16/2020
Total Depth:	11 ft	**Soil Depth:**	11 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	F. Johnson	**Groundwater:**	**TOB** 10.2 ft	**24HR**	FIAD

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.1	**SURFACE MATERIALS - TOPSOIL** - 1 inch.		0.0						
		EMBANKMENT FILL - ELASTIC SILT (MH) - firm, moist, yellowish red, mostly high plasticity fines, trace fine to medium sands, trace gravel. [5YR 5/6]			SS-1	1	2	4	5	6
	2.0	**LEAN CLAY (CL)** - stiff, moist, yellowish red, mostly low plasticity fines, trace fine sands. [5YR 5/6]		2.0	SS-2	1	7	7	10	14
				4.0	SS-3	4	5	7	9	12
577.6		@ 6 feet - firm.		6.0	SS-4	2	2	3	5	5
	8.3	**ALLUVIUM - FAT CLAY (CH)** - stiff, moist, reddish brown, mostly medium plasticity fines, trace fine sands, trace organics, organic odor. [5YR 5/3]		8.0	SS-5	1	4	5	6	9
572.6		▽								
	11.0	Auger encountered possible boulder. Offset ~5 feet south to IB-4A to begin sampling at 13.5 feet.								
567.6										

SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-4A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+06.63	**Offset:**	24.4 RT	**Alignment:**	Paragon
Elev.:	582.6 ft	**Latitude:**	34.9583	**Longitude:**	-80.9804	**Date Started:**	1/16/2020
Total Depth:	55.4 ft	**Soil Depth:**	24.6 ft	**Core Depth:**	55.4 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** 11.2 ft	**24HR**	12 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	0.0	See log for IB-4.									
577.6											
572.6											
	13.5	**PIEDMONT RESIDUUM - CLAYEY SAND (SC)** - very loose, moist, light bluish gray and light reddish brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [GLEY 1 7/10G] [5YR 6/4]		13.5	SS-1	7	2	2		4	●
567.6											

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-4A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+06.63	**Offset:**	24.4 RT	**Alignment:**	Paragon
Elev.:	582.6 ft	**Latitude:**	34.9583	**Longitude:**	-80.9804	**Date Started:**	1/16/2020
Total Depth:	55.4 ft	**Soil Depth:**	24.6 ft	**Core Depth:**	55.4 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** 11.2 ft	**24HR**	12 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	18.5			18.5				
		PARTIALLY WEATHERED ROCK - CLAYEY SAND (SC) - very loose, wet, reddish yellow, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [5YR 6/6]			SS-2	1 1 50/0"	100	
562.6	20.5			20.5				
		METAMORPHOSED IGNEOUS ROCK - METAGABBRO - medium grained, subrounded, crystalline, light greenish gray, moderately weathered, strong. [GLEY 1 7/10GY]			RC-1			
		RC-1: Rec = 100%, RQD = 14%, GSI = 75.		21.5				
		@ 20.8 feet - fractures with 10-40 degree dips, narrow, partially infilled with iron oxides, planar, very close, slightly rough.			RC-2			
	23.7	RC-2: Rec = 80%, RQD = 50%, GSI = 70.		23.7				
		@ 22.9 feet - highly fractured zone.			SS-3	7 50/5"	100	
	24.6	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, wet, gray, mostly fine to coarse sands, little low plasticity fines, few gravel-sized rock fragments. [GLEY 1 6/N]		24.6	RC-3			
557.6				25.4				
		@ 24.6 feet - fractures with 10-40 degree dips, narrow, partially infilled with iron oxides, planar, very close, slightly rough.			RC-4			
		RC-3: Rec = 100%, RQD = 88%, GSI = 75, RMR = 37.						
		RC-4: Rec = 84%, RQD = 66%, GSI = 75.						
		@ 25.4 feet - highly fractured zone.						
		@ 25.6 feet - fractures with 10-40 degree dips, narrow, partially infilled with iron oxides, planar, very close, slightly rough.						
552.6		@ 29 feet - highly weathered.		30.4				
		- highly fractured zone.						
		RC-5: Rec = 62%, RQD = 13%, GSI = 50, RMR = 12.			RC-5			
		@ 30.4 feet - moderately weathered.						
		@ 32 feet - residual soil.						
		@ 32.4 feet - slightly weathered.						

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-4A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+06.63	**Offset:**	24.4 RT	**Alignment:**	Paragon
Elev.:	582.6 ft	**Latitude:**	34.9583	**Longitude:**	-80.9804	**Date Started:**	1/16/2020
Total Depth:	55.4 ft	**Soil Depth:**	24.6 ft	**Core Depth:**	55.4 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** 11.2 ft	**24HR**	12 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
547.6								
		RC-6: Rec = 90%, RQD = 60%, GSI = 70.		35.4				
		@ 35.4 feet - no infill.			RC-6			
		@ 38 feet - fresh.						
		- end fractures.						
542.6				40.4				
		RC-7: Rec = 100%, RQD = 100%, GSI = 90.			RC-7			
537.6				45.4				
		RC-8: Rec = 100%, RQD = 100%, GSI = 95.			RC-8			
532.6				50.4				
		RC-9: Rec = 100%, RQD = 100%, GSI = 95,						

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	IB-4A		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	35+06.63	**Offset:**	24.4 RT	**Alignment:**	Paragon
Elev.:	582.6 ft	**Latitude:**	34.9583	**Longitude:**	-80.9804	**Date Started:**	1/16/2020
Total Depth:	55.4 ft	**Soil Depth:**	24.6 ft	**Core Depth:**	55.4 ft	**Date Completed:**	1/17/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	NQ2	**Driller:**	J. Little	**Groundwater:**	**TOB** 11.2 ft	**24HR**	12 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	● SPT N VALUE ● PL MC LL ▲ FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		RMR = 79.			RC-9			
527.6	55.4	Boring Terminated at 55.4 feet.						
522.6								
517.6								

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	580+08.81	**Offset:**	1.4 RT	**Alignment:**	Ramp 3
Elev.:	549.0 ft	**Latitude:**	34.9535	**Longitude:**	-80.9778	**Date Started:**	1/6/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/6/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	FIAD

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0	SS-1	3	5	16	18	21
	1.5	**EMBANKMENT FILL - FAT CLAY WITH SAND (CH)** - very stiff, moist, red, mostly medium to high plasticity fines, little fine sands. [10R 4/6] [NMC=25.1%. LL=51, PL=23, PI=28. %FINES=70.7%]		2.0	SS-2	2	3	4	5	7
		PIEDMONT RESIDUUM- SANDY SILT (ML) - firm, moist, weak red, mostly low to medium plasticity fines, some fine sands. [10R 5/2]		4.0	SS-3	3	2	4	4	6
544.0	6.0	**ELASTIC SILT (MH)** - firm, moist, reddish gray, mostly medium to high plasticity fines, few fine to medium sands. [10R 6/1]		6.0	SS-4	3	5	7	5	12
		@ 8 feet - stiff.		8.0	SS-5	3	4	4	7	8
539.0	10.0	Boring terminated at 10.0 feet.								
534.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	574+99.20	**Offset:**	35.1 RT	**Alignment:**	Ramp 3
Elev.:	559.6 ft	**Latitude:**	34.9548	**Longitude:**	-80.9784	**Date Started:**	1/6/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/6/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	FIAD

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		EMBANKMENT FILL- SANDY SILT (ML) - very stiff, dry to moist, red, mostly low to medium plasticity fines, some fine sands. [10R 4/6] [NMC=28.3%. LL=49, PL=39, PI=10. %FINES=50.2%]			SS-1	3	5	12	7	17
	2.5	**PIEDMONT RESIDUUM - SANDY SILT (ML)** - firm, moist, weak red, mostly low to medium plasticity fines, little fine sands. [10R 5/2]		2.0	SS-2	3	4	4	7	8
				4.0	SS-3	2	3	3	5	6
554.6	6.0	**SILTY SAND (SM)**- loose, moist, weak red, subangular, mostly fine to coarse sands, little medium to high plasticity fines. [10R 5/4]		6.0	SS-4	2	3	4	5	7
				8.0	SS-5	3	4	5	6	9
549.6	10.0	Boring terminated at 10.0 feet.								
544.6										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	570+15.26	**Offset:**	3.4 LT	**Alignment:**	Ramp 3
Elev.:	551.9 ft	**Latitude:**	34.9562	**Longitude:**	-80.9783	**Date Started:**	5/26/2020
Total Depth:	6.8 ft	**Soil Depth:**	20 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/26/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - firm, moist, dark reddish brown, mostly high plasticity fines. [2.5YR 3/4]		0.0	SS-1	4	2	3	4	5
	2.0	**SANDY ELASTIC SILT (MH)** - very stiff, moist, dark reddish brown, mostly high plasticity fines, some fine to coarse grained sand. [2.5YR 3/4]		2.0	SS-2	7	7	15		22
546.9	4.0	**SILT SAND (SM)** - dense, moist, brown, mostly fine to coarse grained sand, some low plasticity fines. [7.5YR 4/4]		4.0	SS-3	8	16	26	16	42
	6.0	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - moist, brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 4/4]		6.0	SS-4	2450/2"				100
	6.8	Auger Refusal at 6.8 feet.								
541.9										
536.9										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	544+64.12	**Offset:**	2.4 LT	**Alignment:**	Ramp 2
Elev.:	603.6 ft	**Latitude:**	34.9627	**Longitude:**	-80.9817	**Date Started:**	1/6/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/6/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0						
		EMBANKMENT FILL- ELASTIC SILT WITH SAND (MH) - firm, moist, red, mostly high plasticity fines, little fine sands. [10R 4/6] [NMC=54.1%. LL=54, PL=38, PI=16. %FINES=71.2%]			SS-1	2	3	5	5	8
	2.0			2.0						
		PIEDMONT RESIDUUM - FAT CLAY (CH) - stiff, moist, red, mostly medium to high plasticity fines, trace fine sands. [10R 4/6]			SS-2	2	4	8	6	12
	4.0			4.0						
598.6		**ELASTIC SILT (MH)** - firm, wet, weak red, mostly high plasticity fines, trace fine sands. [10R 5/2]			SS-3	3	3	4	5	7
				6.0						
					SS-4	3	3	3	4	6
				8.0						
					SS-5	2	3	2	4	5
593.6	10.0	Boring terminated at 10.0 feet.								
588.6										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

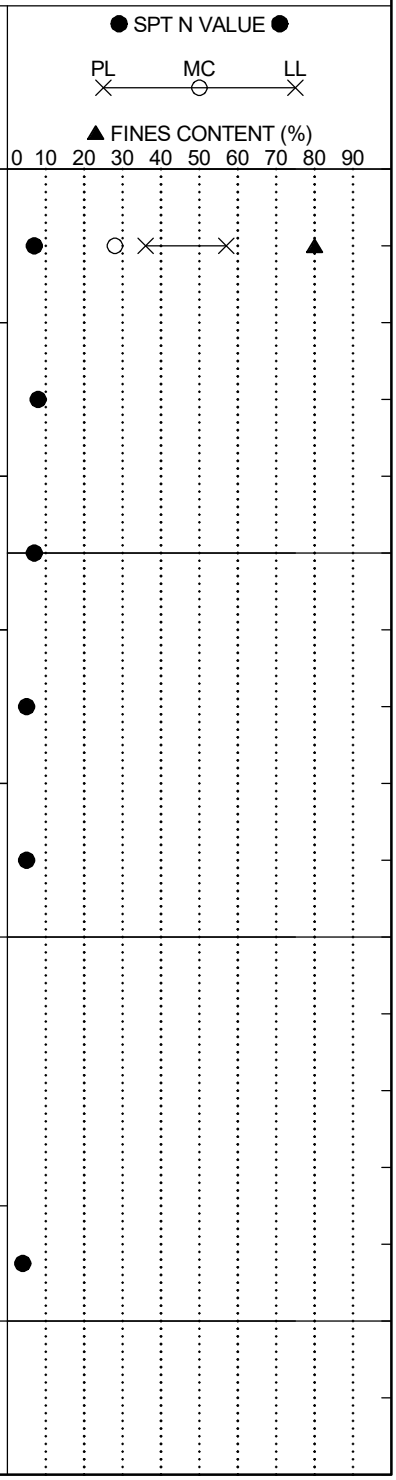
LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-5		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	549+09.87	**Offset:**	19.7 RT	**Alignment:**	Ramp 2
Elev.:	599.7 ft	**Latitude:**	34.9615	**Longitude:**	-80.9812	**Date Started:**	1/6/2020
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/6/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0	SS-1	2	3	4	6	7
		EMBANKMENT FILL - ELASTIC SILT WITH SAND (MH) - firm, moist, red, mostly medium to high plasticity fines, little fine sands. [10R 4/6] [NMC=27.6%. LL=57, PL=36, PI=21. %FINES=80.2%]								
	2.0			2.0	SS-2	3	4	4	6	8
		PIEDMONT RESIDUUM - ELASTIC SILT (MH) - firm, moist, weak red, mostly high plasticity fines, trace fine sands. [10R 5/2]								
	4.0			4.0	SS-3	3	4	3	7	7
594.7		**SANDY SILT (ML)** - firm, moist to wet, weak red, mostly low to medium plasticity fines, little fine to medium sands. [10R 5/2]								
				6.0	SS-4	3	2	3	5	5
				8.0	SS-5	2	2	3	3	5
589.7										
				13.5	SS-6	2	2	2		4
		@ 13.5 feet - soft.								
584.7	15.0	Boring terminated at 15.0 feet.								



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	EM-6
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	554+10.13	**Offset:**	5.8 LT	**Alignment:**	Ramp 2
Elev.:	593.9 ft	**Latitude:**	34.9603	**Longitude:**	-80.9806	**Date Started:**	1/6/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/6/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2.5 inches.		0.0	SS-1	2	3	4	5	7
		EMBANKMENT FILL - SANDY FAT CLAY (CH) - firm, moist, dark red, mostly high plasticity fines, some fine sands. [10R 3/6] [NMC=22.1%. LL=50, PL=24, PI=26. %FINES=60.8%]		2.0						
	3.0	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - loose, moist, weak red, subangular, mostly fine to medium sands, little medium plasticity fines. [10R 5/2]			SS-2	3	4	5	6	9
		@ 4 feet - medium dense.		4.0						
588.9					SS-3	3	4	7	9	11
				6.0						
					SS-4	4	7	8	10	15
				8.0						
					SS-5	6	7	8	12	15
583.9	10.0	Boring terminated at 10.0 feet.								
578.9										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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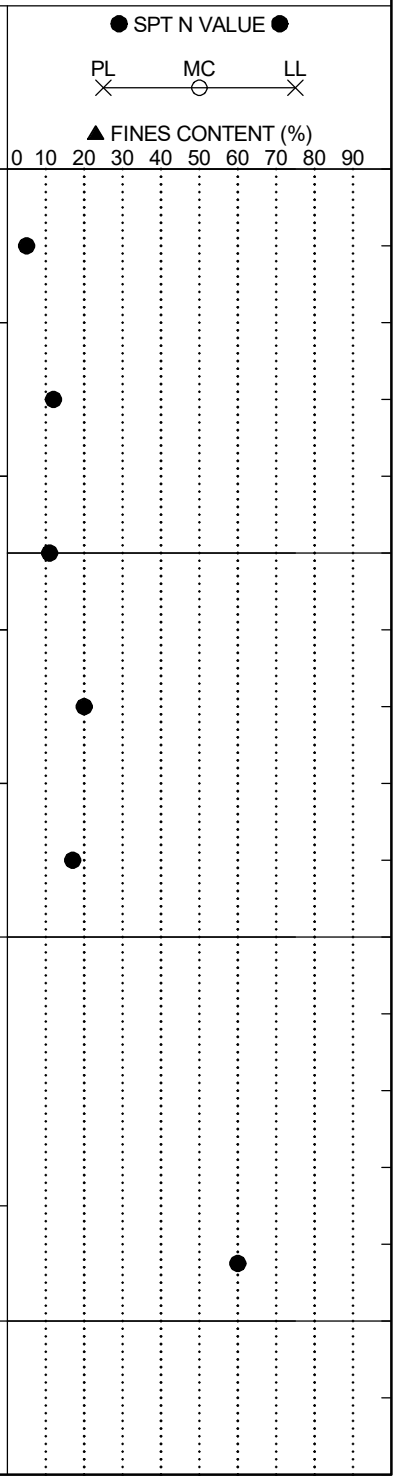
SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-7		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	566+04.26	**Offset:**	18.1 LT	**Alignment:**	Ramp 2
Elev.:	560.9 ft	**Latitude:**	34.9575	**Longitude:**	-80.9789	**Date Started:**	5/26/2020
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/26/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 4.5 ft	**24HR**	5.2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - firm, moist, brown, mostly high plasticity fines. [7.5YR 4/4]		0.0	SS-1W	O.H	2	3	2	5
	2.0	**SILT SAND (SM)** - medium dense, wet to moist, brown, mostly fine to coarse grained sand, some low plasticity fines. [7.5YR 4/4]		2.0	SS-2	4	4	8	7	12
555.9		▽ ▼		4.0	SS-3	4	5	6	5	11
	6.0	**SANDY SILT (ML)** - very stiff, wet, brown, mostly low plasticity fines, some fine to coarse grained sand. [7.5YR 4/4]		6.0	SS-4	8	10	10	13	20
	8.0	**FAT CLAY (CH)** - very stiff, moist, brown, mostly high plasticity fines. [7.5YR 4/4]		8.0	SS-5	5	5	12	13	17
	9.0	**SANDY SILT (ML)** - very stiff, moist, brown, mostly low plasticity fines, some fine to coarse grained sand. [7.5YR 4/4]								
550.9	10.0	**SILT SAND (SM)** - very dense, moist, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		13.5	SS-6	10	14	46		60
545.9	15.0	Boring terminated at 15.0 feet.								



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-8		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	569+10.42	**Offset:**	4.1 LT	**Alignment:**	Ramp 2
Elev.:	570.9 ft	**Latitude:**	34.9578	**Longitude:**	-80.9781	**Date Started:**	5/26/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/26/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**FILL - FAT CLAY (CH)** - very stiff, moist, dark reddish brown, mostly high plasticity fines. [2.5YR 3/4]		0.0	SS-1	3	7	9	10	16
	2.0	**RESIDUUM - SANDY FAT CLAY (CH)** - very stiff, moist, dark grayish brown, mostly high plasticity fines, some medium sand, trace organics. [10YR 4/2]		2.0	SS-2	9	9	9	8	18
	4.0	**SILTY SAND (SM)** - medium dense, moist, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		4.0	SS-3	5	5	8	15	13
565.9	6.0	**PARTIALLY WEATHERED ROCK (PWR)** - dry, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		6.0	SS-4	1650/4"				100
	8.0	**SILTY SAND (SM)** - medium dense, dry, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		8.0	SS-5	18	30	41	42	71
560.9	10.0	Boring terminated at 10.0 feet.								
555.9										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-9		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	544+12.4	**Offset:**	9.2 RT	**Alignment:**	Ramp 1
Elev.:	606.3 ft	**Latitude:**	34.9627	**Longitude:**	-80.9823	**Date Started:**	1/16/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0	SS-1	3	4	5	7	9
		PIEDMONT RESIDUUM - SANDY SILT (ML) - stiff, moist, weak red, mostly low plasticity fines, some fine to coarse sands. [10R 5/2] [NMC=30.2%. LL=48, PL=29, PI=19. %FINES=64.0%]								
	2.0			2.0	SS-2	6	5	7	7	12
		ELASTIC SILT (MH) - stiff, moist to wet, yellowish red, mostly high plasticity fines, few fine sands. [5YR 5/6]								
		@ 4 feet - very soft.		4.0						
601.3					SS-3	2	1	1	2	2
	6.0	**SANDY SILT (ML)** - soft, wet, yellowish red, mostly low to medium plasticity fines, little fine to coarse sands. [5YR 5/6]		6.0	SS-4	0	2	2	3	4
		@ 8 feet - firm.		8.0	SS-5	1	2	3	4	5
596.3	10.0	Boring terminated at 10.0 feet.								
591.3										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-10		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	549+61.5	**Offset:**	0.1 RT	**Alignment:**	Ramp 1
Elev.:	630.1 ft	**Latitude:**	34.9612	**Longitude:**	-80.9819	**Date Started:**	1/16/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		PIEDMONT RESIDUUM - FAT CLAY WITH SAND (CH) - firm, moist, red, mostly high plasticity fines, little fine to coarse sands. [10R 4/6] [NMC=24.3%. LL=57, PL=23, PI=34. %FINES=78.8%]			SS-1	4	3	4	6	7
		@ 2 feet - very stiff.		2.0						
					SS-2	4	11	12	14	23
	4.0			4.0						
625.1		**ELASTIC SILT (MH)** - very stiff, moist, yellowish red, mostly medium plasticity fines, few fine sands. [5YR 5/6]			SS-3	6	8	12	12	20
				6.0						
					SS-4	7	8	9	9	17
	8.0			8.0						
		SILT WITH SAND (ML) - stiff, moist, reddish yellow, mostly medium plasticity fines, little fine to coarse sands. [5YR 7/6]			SS-5	4	4	6	7	10
620.1	10.0	Boring terminated at 10.0 feet.								
615.1										

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

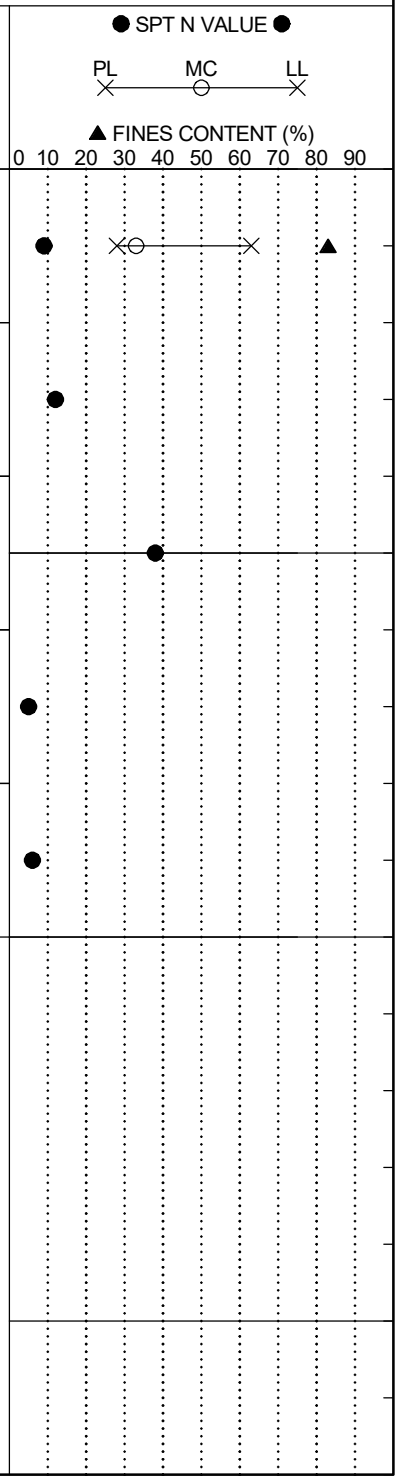
LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-11		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	555+75.1	**Offset:**	17.6 RT	**Alignment:**	Ramp 1
Elev.:	596.4 ft	**Latitude:**	34.9597	**Longitude:**	-80.9826	**Date Started:**	1/10/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		PIEDMONT RESIDUUM - FAT CLAY WITH SAND (CH) - stiff, moist, red, mostly medium plasticity fines, little fine sands, trace rootlets. [10R 4/6] [NMC=32.7%. LL=63, PL=28, PI=35. %FINES=83.0%. %ORG=5.8%]			SS-1	4	5	4	5	9
				2.0						
					SS-2	4	6	6	7	12
	4.0			4.0						
591.4		**FAT CLAY (CH)** - hard, moist, reddish brown, mostly high plasticity fines. [2.5YR 5/4]			SS-3	17	30	8	4	38
		@ 6 feet - firm		6.0						
					SS-4	2	2	3	4	5
	8.0			8.0						
		ELASTIC SILT (MH) - firm, moist, bluish gray, mostly medium plasticity fines, few fine to medium sands. [GLEY 5/5PB]			SS-5	3	3	3	7	6
586.4	10.0	Boring terminated at 10.0 feet.								
581.4										



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	EM-12
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	559+58.8	**Offset:**	10.8 RT	**Alignment:**	Ramp 1
Elev.:	624.0 ft	**Latitude:**	34.9586	**Longitude:**	-80.9825	**Date Started:**	1/10/2020
Total Depth:	9.2 ft	**Soil Depth:**	9.2 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0	SS-1	3	3	6	8	9
		PIEDMONT RESIDUUM - FAT CLAY WITH SAND (CH) - stiff, moist, red, mostly high plasticity fines, little fine to medium sands. [10R 4/6] [NMC=28.5%. LL=64, PL=27, PI=37. %FINES=81.7%]		2.0	SS-2	6	10	11	14	21
		@ 2 feet - very stiff.		4.0	SS-3	4	6	10	13	16
619.0				6.0	SS-4	7	10	14	15	24
	7.0	**CLAYEY SAND (SC)** - medium dense, moist, dark red, subangular, mostly fine to coarse sands, little low to medium plasticity fines. [2.5YR 3/6]		8.0	SS-5	3150/3"				100
	8.5									
	9.2	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, dark bluish gray, subangular, mostly fine to coarse sands, little low plasticity fines. [GLEY 4/5PB]								
614.0		Auger Refusal at 9.2 feet.								
609.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

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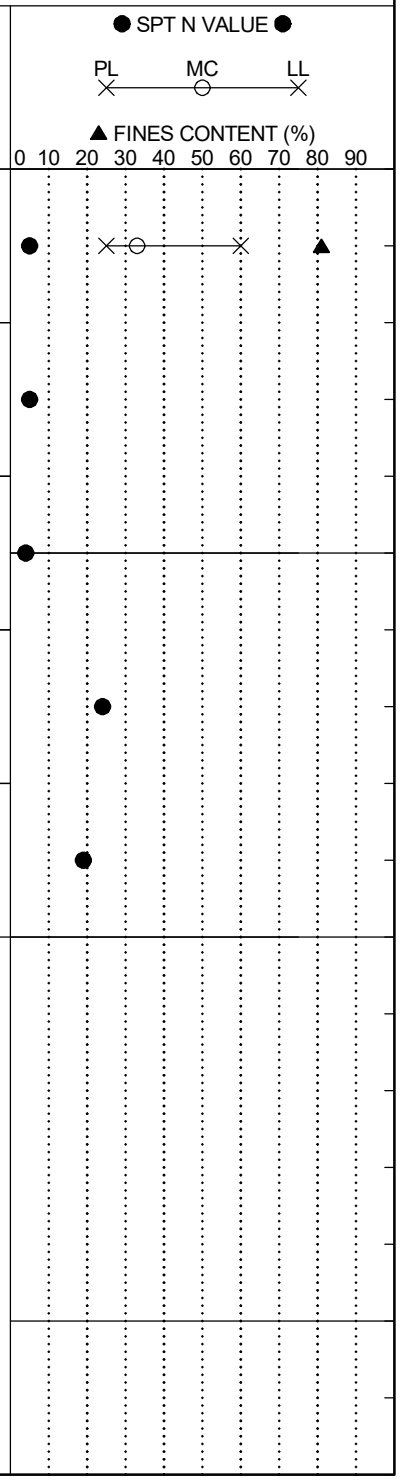
LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	EM-13
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	553+44.62	**Offset:**	16.2 RT	**Alignment:**	Ramp 4
Elev.:	586.9 ft	**Latitude:**	34.9593	**Longitude:**	-80.982	**Date Started:**	1/10/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/10/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 9 ft	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 4 inches.		0.0						
		EMBANKMENT FILL - FAT CLAY WITH SAND (CH) - firm, moist, red, mostly medium plasticity fines, little fine to medium sands, trace rootlets. [10R 4/6] [NMC=33.0%. LL=60, PL=25, PI=35. %FINES=80.9%]			SS-1	3	2	3	2	5
	2.0			2.0						
		ALLUVIUM - FAT CLAY (CH) - firm, moist, reddish gray, mostly high plasticity fines, trace fine to medium sands. [10R 6/1]			SS-2	2	3	2	3	5
		@ 4 feet - soft.		4.0						
581.9					SS-3	2	2	2	3	4
	6.0			6.0						
		PIEDMONT RESIDUUM - SILTY SAND (SM) - medium dense, moist, reddish brown, subangular, mostly fine to coarse sands, little low to medium plasticity fines. [2.5YR 5/4]			SS-4	6	12	12	15	24
	8.0			8.0						
		CLAYEY SAND (SC) - medium dense, moist, reddish gray, subangular, mostly fine to coarse sands, little medium to high plasticity fines. [10R 6/1]			SS-5	4	11	9	10	19
576.9	10.0	Boring terminated at 10.0 feet.								
571.9										



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-14		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	568+70.51	**Offset:**	20.5 LT	**Alignment:**	Ramp 4
Elev.:	570.5 ft	**Latitude:**	34.9563	**Longitude:**	-80.9796	**Date Started:**	1/16/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0						
		PIEDMONT RESIDUUM - SILTY SAND (SM) - medium dense, moist, very dark gray, subangular, mostly fine to coarse sands, little medium plasticity fines. [GLEY 3/N] [NMC=23.0%. LL=40, PL=34, PI=6. %FINES=35.0%]			SS-1	4	6	9	9	15
				2.0	SS-2	3	6	10	11	16
				4.0	SS-3	3	10	11	15	21
565.5										
				6.0	SS-4	10	13	15	19	28
				8.0	SS-5	8	9	15	19	24
560.5	10.0	Boring terminated at 10.0 feet.								
555.5										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-15		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	573+69.56	**Offset:**	32.1 LT	**Alignment:**	Ramp 4
Elev.:	563.7 ft	**Latitude:**	34.955	**Longitude:**	-80.979	**Date Started:**	1/16/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		EMBANKMENT FILL - FAT CLAY WITH SAND (CH) - stiff, moist, red, mostly high plasticity fines, little fine to coarse sands. [10R 4/6] [NMC=28.7%. LL=52, PL=25, PI=27. %FINES=70.1%]			SS-1	6	5	7	10	12
	2.0			2.0						
		PIEDMONT RESIDUUM - SANDY SILT (ML) - very stiff, moist, yellowish red, mostly medium plasticity fines, some fine sands. [5YR 5/6]			SS-2	6	10	10	14	20
				4.0						
558.7					SS-3	8	11	12	16	23
	6.0			6.0						
		SILTY SAND (SM) - loose, weak red, subangular, mostly fine to coarse sands, little low plasticity fines. [10R 5/2]			SS-4	2	2	4	11	6
		@ 8 feet - medium dense.		8.0						
					SS-5	7	8	10	13	18
553.7	10.0	Boring terminated at 10.0 feet.								
548.7										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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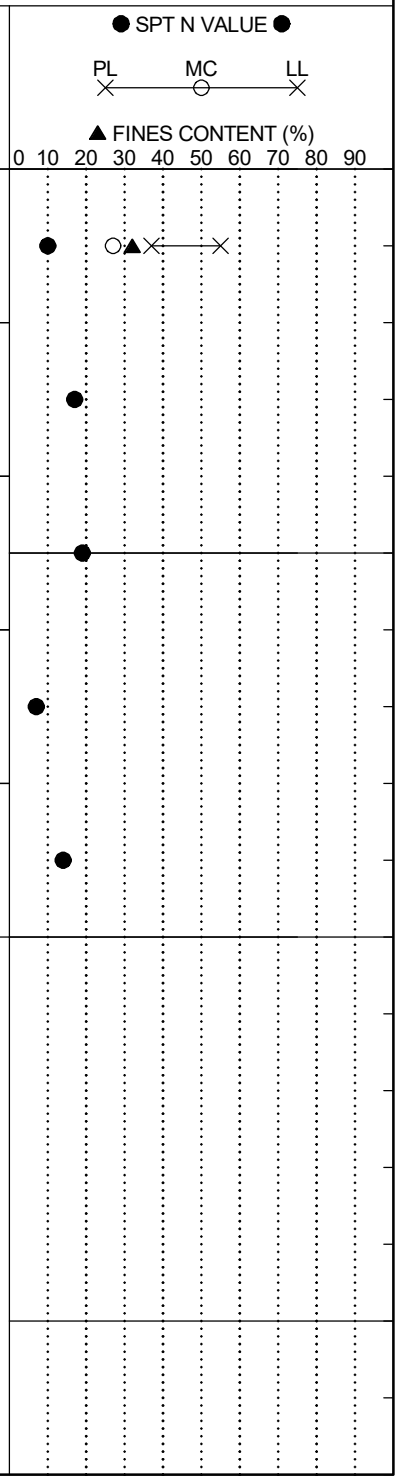
SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-16		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	578+62.23	**Offset:**	4.7 LT	**Alignment:**	Ramp 4
Elev.:	551.7 ft	**Latitude:**	34.9538	**Longitude:**	-80.9784	**Date Started:**	1/16/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/16/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0						
		EMBANKMENT FILL - SILTY SAND (SM) - loose, moist, reddish brown, subangular, mostly fine to coarse sands, some medium plasticity fines. [5YR 5/3] [NMC=26.6%. LL=55, PL=37, PI=18. %FINES=32.1%]			SS-1	3	5	5	8	10
	2.0			2.0						
		PIEDMONT RESIDUUM - SANDY SILT (ML) - very stiff, moist, light bluish gray, mostly low plasticity fines, some fine to coarse sands. [GLEY 7/10B]			SS-2	4	8	9	8	17
				4.0						
546.7					SS-3	7	9	10	14	19
	6.0			6.0						
		SILTY SAND (SM) - loose, moist, dark bluish gray, subangular, mostly fine to coarse sands, little medium plasticity fines. [GLEY 4/5B]			SS-4	2	3	4	7	7
		@ 8 feet - medium dense.		8.0						
					SS-5	4	6	8	9	14
541.7	10.0	Boring terminated at 10.0 feet.								
536.7										



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-17		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	33+71.77	**Offset:**	5.6 RT	**Alignment:**	Paragon
Elev.:	592.5 ft	**Latitude:**	34.9583	**Longitude:**	-80.9809	**Date Started:**	1/14/2020
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** 1.3 ft	**24HR**	2.2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ALLUVIUM - FAT CLAY WITH SAND (CH)** - firm, moist, red, mostly medium to high plasticity fines, little fine sands, trace roots. ▽[2.5YR 4/6] [NMC=31.9%. LL=61, PL=25, PI=36. %FINES=82.2%]		0.0	SS-1	2	2	3	2	5
	2.0	**SANDY FAT CLAY (CH)** - soft, moist, light reddish brown, mostly medium to high plasticity fines, some fine sands. [2.5YR 6/4]		2.0	SS-2	1	2	2	4	4
		@ 4 feet - trace roots. [%ORG=3.5%]		4.0	SS-3	1	2	2	2	4
587.5				6.0	SS-4	WOH	1	3	1	4
	8.5			8.0	SS-5	WOH	2	8	11	10
		PIEDMONT RESIDUUM - SILTY SAND (SM) - loose, moist, greenish gray, mostly fine sands, some low plasticity fines, relict rock structure. [GLEY 2 6/5GY]								
582.5				13.5	SS-6	4	8	11		19
		@ 13.5 feet - medium dense.								
577.5	15.0	Boring terminated at 15.0 feet.								

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

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-18		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	38+47.60	**Offset:**	4.8 RT	**Alignment:**	Paragon
Elev.:	577.4 ft	**Latitude:**	34.9586	**Longitude:**	-80.9793	**Date Started:**	5/21/2020
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - firm, moist, dark grayish brown, mostly high plasticity fines, trace organics. [10YR 4/2]		0.0	SS-1	2	3	5	6	8
	2.0	**SILTY SAND (SM)** - dense, moist, brown, mostly fine to coarse grained sand, some low plasticity fines. [7.5YR 4/4]		2.0	SS-2	10	23	23	27	46
		@ 4 feet - medium dense.		4.0	SS-3	2	8	16	28	24
572.4		@ 6 feet - dense.		6.0	SS-4	11	21	29	32	50
	8.0	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - moist, brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 4/4]		8.0	SS-5	24	50/4"			100
567.4				13.5	SS-6	9	20	50/2"		100
562.4	15.0	Boring terminated at 15.0 feet.								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-19		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	43+31.73	**Offset:**	14.0 LT	**Alignment:**	Paragon
Elev.:	581.6 ft	**Latitude:**	34.959	**Longitude:**	-80.9778	**Date Started:**	5/21/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - soft, wet, brown, mostly high plasticity fines. [7.5YR 4/4]		0.0	SS-1	W.O.H.	1	3	4	4
	2.0	**SANDY FAT CLAY (CH)** - hard, wet, brown, mostly high plasticity fines, some amounts of fine to coarse grained sand. [7.5YR 4/4]		2.0	SS-2	8	17	23	24	40
	4.0	**SILT SAND (SM)** - dense, moist, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		4.0	SS-3	6	17	24	38	48
576.6		@ 6 feet - very dense.		6.0	SS-4	19	39	41	46	80
		@ 8 feet - dense.		8.0	SS-5	8	19	27	33	46
571.6	10.0	Boring terminated at 10.0 feet.								
566.6										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-20		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	53+02.35	**Offset:**	17.7 RT	**Alignment:**	Paragon
Elev.:	581.0 ft	**Latitude:**	34.9598	**Longitude:**	-80.9749	**Date Started:**	1/7/2020
Total Depth:	11.3 ft	**Soil Depth:**	11.3 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	FIAD

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 15 inches of PAVEMENT.								
	1.3	**EMBANKMENT FILL - ELASTIC SILT WITH SAND (MH)** - firm, moist, red, mostly high plasticity fines, little fine sands, trace gravel. [10R 4/6] [NMC=34.7%. LL=63, PL=42, PI=21. %FINES=82.8%]		1.3	SS-1	2	3	4	5	7
				3.3	SS-2	2	3	5	6	8
576.0				5.3	SS-3	3	2	4	4	6
				7.3	SS-4	3	3	4	4	7
	8.3	**RESIDUUM - SILTY SAND (SM)** - loose, moist, weak red, mostly fine to medium sands, little low plasticity fines. [10R 5/2]		9.3	SS-5	2	3	3	4	6
571.0										
	11.3	Auger Refusal at 11.3 feet.								
566.0										

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

LEGEND

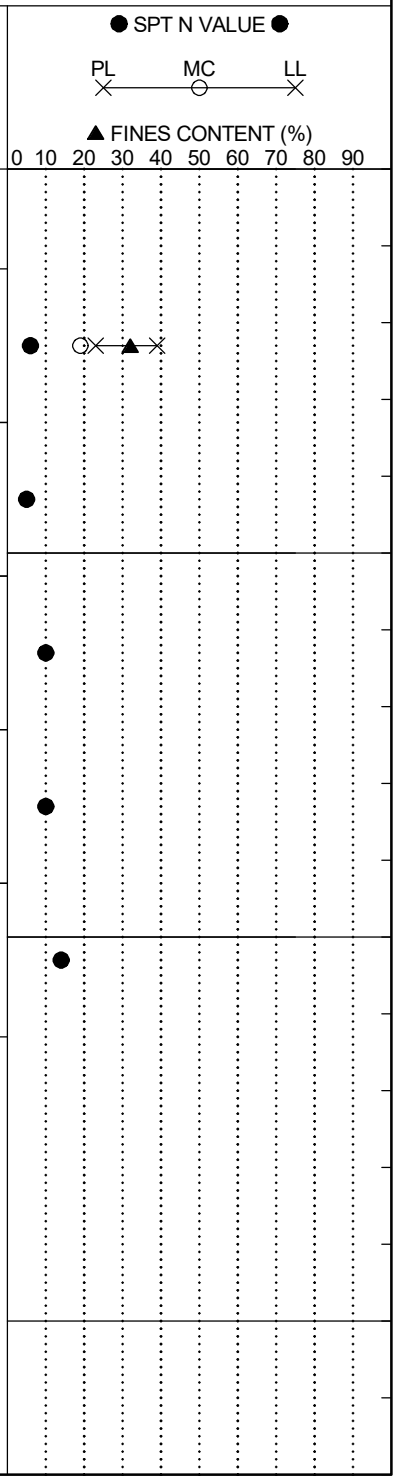
SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	EM-21		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	55+66.53	**Offset:**	16.3 RT	**Alignment:**	Paragon
Elev.:	578.1 ft	**Latitude:**	34.9605	**Longitude:**	-80.9748	**Date Started:**	1/7/2020
Total Depth:	11.3 ft	**Soil Depth:**	11.3 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-55	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	80.3%
Core Size:	N/A	**Driller:**	H. Lewis	**Groundwater:**	**TOB** Dry	**24HR**	FIAD

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**SURFACE MATERIALS** - 15 inches of PAVEMENT.								
	1.3	**EMBANKMENT FILL - CLAYEY SAND (SC)** - loose, moist, dusky red, subangular, mostly fine to medium sands, some medium to high plasticity fines. [10R 3/4] [NMC=18.7%. LL=39, PL=23, PI=16. %FINES=31.9%]		1.3	SS-1	3	3	3	5	6
				3.3	SS-2	2	2	3	1	5
573.1	5.3	**PIEDMONT RESIDUUM - ELASTIC SILT (MH)** - stiff, moist, red, mostly medium plasticity fines, trace fine to medium sands. [5YR 5/6]		5.3	SS-3	4	4	6	8	10
	7.3	**SANDY SILT (ML)** - stiff, moist, red, mostly low to medium plasticity fines, some fine to medium sands. [10R 5/6]		7.3	SS-4	3	4	6	8	10
				9.3	SS-5	3	6	8	10	14
568.1	11.3	Auger Refusal at 11.3 feet.								
563.1										



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	565+44.97	**Offset:**	64.8 LT	**Alignment:**	Ramp 3
Elev.:	564.2 ft	**Latitude:**	34.9574	**Longitude:**	-80.9777	**Date Started:**	5/18/2020
Total Depth:	23.2 ft	**Soil Depth:**	23.2 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**FILL - SANDY LEAN CLAY (CL)** - firm, moist, brown, mostly low plasticity fines, some fine to medium sand. [7.5YR 4/4]		0.0	SS-1	4	4	4	5	8
	2.0	**ALLUVIUM - FAT CLAY (CH)** - stiff, moist to wet, dark grayish brown, mostly high plasticity fines. [10YR 4/2]		2.0	SS-2	5	7	7	8	14
		@ 4 feet - firm.		4.0	SS-3	3	3	5	5	8
559.2		@ 6 feet - stiff.		6.0	SS-4	5	6	5	4	11
	8.0	**RESIDUUM - SANDY SILT (ML)** - firm, moist to wet, yellowish red, mostly medium plasticity fines, little fine to coarse sands. [5YR 5/6]		8.0	SS-5	2	3	5	6	8
554.2	10.0	**ELASTIC SILT (MH)** - hard, wet, dark grayish brown, mostly high plasticity fines, some fine to coarse grained sands. [10YR 4/2]		13.5	SS-6	7	8	37		45
549.2										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	565+44.97	**Offset:**	64.8 LT	**Alignment:**	Ramp 3
Elev.:	564.2 ft	**Latitude:**	34.9574	**Longitude:**	-80.9777	**Date Started:**	5/18/2020
Total Depth:	23.2 ft	**Soil Depth:**	23.2 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	18.5			18.5						
544.2		**SILTY SAND (SM)** - very dense, dry, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]			SS-7	17	30	31		61
	23.2	Auger Refusal @ 23.2 feet.								
539.2										
534.2										

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

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	564+88.25	**Offset:**	16.5 LT	**Alignment:**	Ramp 3
Elev.:	563.4 ft	**Latitude:**	34.9576	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	18.4 ft	**Soil Depth:**	18.4 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**FILL - SANDY LEAN CLAY (CL)** - firm, moist, brown, mostly low plasticity fines, some fine to medium sands. [7.5YR 4/4]		0.0	SS-1	3	4	4	5	8
	2.0	**ALLUVIUM - FAT CLAY (CH)** - stiff, moist to wet, brown, mostly high plasticity fines, trace organics. [7.5YR 4/4]		2.0	SS-2	5	5	5	6	10
		@ 4 feet - firm.		4.0	SS-3	3	4	3	2	7
558.4				6.0	SS-4	2	3	4	5	7
	8.0	**RESIDUUM - FAT CLAY (CH)** - stiff, moist, brown, mostly high plasticity fines, trace organics. [7.5YR 4/4]		8.0	SS-5	3	4	5	11	9
553.4										
	13.5	**SILT SAND (SM)** - very dense, moist, dark grayish brown, mostly fine to coarse grained sand, some low plasticity fines. [10YR 4/2]		13.5	SS-6	20	38	26		64
548.4										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	564+88.25	**Offset:**	16.5 LT	**Alignment:**	Ramp 3
Elev.:	563.4 ft	**Latitude:**	34.9576	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	18.4 ft	**Soil Depth:**	18.4 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	18.4	Auger Refusal @ 18.4 feet.						
543.4								
538.4								
533.4								

LEGEND

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

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SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	563+99.06	**Offset:**	22.5 LT	**Alignment:**	Ramp 3
Elev.:	570.3 ft	**Latitude:**	34.9578	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	20.6 ft	**Soil Depth:**	20.6 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ALLUVIUM - FAT CLAY (CH)** - stiff, moist, brown, mostly high plasticity fines, trace fine to coarse sands, trace organics. [7.5YR 4/4]		0.0	SS-1	3	4	5	6	9
				2.0	SS-2	5	5	5	6	10
		@ 4 feet - firm.		4.0	SS-3	2	2	4	6	6
565.3	6.0	**RESIDUUM - FAT CLAY (CH)** - very stiff, moist, dark reddish brown, mostly high plasticity fines, trace coarse sands. [2.5YR 3/4]		6.0	SS-4	11	10	12	11	22
	8.0	**SILTY SAND (SM)** - dense, moist, brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 4/4]		8.0	SS-5	11	12	25	36	37
560.3				13.5	SS-6	12	21	17		38
555.3										

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

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-3		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	563+99.06	**Offset:**	22.5 LT	**Alignment:**	Ramp 3
Elev.:	570.3 ft	**Latitude:**	34.9578	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	20.6 ft	**Soil Depth:**	20.6 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
	18.5	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - very dense, moist, brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 4/4]		18.5	SS-7	50/2"	100
550.3	20.6	Auger Refusal @ 20.6 feet.					
545.3							
540.3							

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

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	563+21.43	**Offset:**	13.7 LT	**Alignment:**	Ramp 3
Elev.:	572.1 ft	**Latitude:**	34.958	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	23.4 ft	**Soil Depth:**	23.4 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**EMBANKMENT FILL - SANDY LEAN CLAY (CL)** - very stiff, moist, brown, mostly low plasticity fines, some fine to medium sands, some stone. [7.5YR 4/4]		0.0	SS-1	7	10	8	6	18
	2.0	**ALLUVIUM - FAT CLAY (CH)** - stiff, moist, dark brown, mostly high plasticity fines, trace organics. [7.5YR 3/3]		2.0	SS-2	11	7	8	6	15
				4.0	SS-3	6	5	6	8	11
567.1	6.0	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - very dense, moist, dark brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 3/3]		6.0	SS-4	25	33	50/4"		100
				8.0	SS-5	4850/3"				100
562.1				13.5	SS-6	3550/4"				100
557.1										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-4		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	563+21.43	**Offset:**	13.7 LT	**Alignment:**	Ramp 3
Elev.:	572.1 ft	**Latitude:**	34.958	**Longitude:**	-80.9778	**Date Started:**	5/18/2020
Total Depth:	23.4 ft	**Soil Depth:**	23.4 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/18/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value
				18.5			
					SS-7	50/2"	100
552.1							
	23.4	Auger Refusal @ 23.4 feet.					
547.1							
542.1							

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-5		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	48+34.79	**Offset:**	22.0 LT	**Alignment:**	Paragon
Elev.:	579.0 ft	**Latitude:**	34.9591	**Longitude:**	-80.9761	**Date Started:**	5/21/2020
Total Depth:	30 ft	**Soil Depth:**	30 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - soft, wet, brown, mostly high plasticity fines. [7.5YR 4/4]		0.0	SS-1	1	2	1	3	3
		@ 2 feet - firm.		2.0	SS-2	3	3	4	7	7
	4.0	**SANDY ELASTIC SILT (MH)** - stiff, moist, dark grayish brown, mostly high plasticity fines, some medium sand. [10YR 4/2]		4.0	SS-3	4	5	6	8	11
574.0	6.0	**SANDY SILT (ML)** - very stiff, moist, dark reddish brown, mostly low plasticity fines, some fine to coarse sands. [2.5YR 3/4]		6.0	SS-4	9	9	10	18	19
	8.0	**FAT CLAY (CH)** - very stiff, moist, dark grayish brown, mostly high plasticity fines. [10YR 4/2]		8.0	SS-5	14	7	11	8	18
569.0	13.5	**SILTY SAND (SM)** - medium dense, moist, dark grayish brown, mostly fine to coarse sand, some low plasticity fines. [10YR 4/2]		13.5	SS-6	6	8	7		15
564.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-5		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	48+34.79	**Offset:**	22.0 LT	**Alignment:**	Paragon
Elev.:	579.0 ft	**Latitude:**	34.9591	**Longitude:**	-80.9761	**Date Started:**	5/21/2020
Total Depth:	30 ft	**Soil Depth:**	30 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				18.5						
		@ 18.5 feet - dense.			SS-7	8	14	21		49
559.0										
	23.5			23.5						
		SANDY ELASTIC SILT (MH) - hard, moist, dark grayish brown, mostly high plasticity fines, some medium sand, trace rock fragments. [10YR 4/2]			SS-8	3	11	38		45
554.0										
	28.5			28.5						
		SILT SAND (SM) - very dense, moist, dark grayish brown, mostly fine to coarse sand, some low plasticity fines. [10YR 4/2]			SS-9	30	15	45		60
549.0	30.0									
		Boring terminated at 30.0 feet.								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-6		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	50+68.62	**Offset:**	16.5 LT	**Alignment:**	Paragon
Elev.:	583.0 ft	**Latitude:**	34.9593	**Longitude:**	-80.9754	**Date Started:**	5/21/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**RESIDUUM - FAT CLAY (CH)** - firm, wet, brown, mostly high plasticity fines. [7.5YR 4/4]		0.0	SS-1	0	3	3	4	6
				2.0	SS-2	3	3	4	5	7
	4.0	**SANDY ELASTIC SILT (MH)** - firm, moist, brown, mostly high plasticity fines, some medium sands. [7.5YR 4/4]		4.0	SS-3	3	3	4	5	7
578.0	6.0	**SANDY SILT (ML)** - very stiff, moist, brown, mostly low plasticity fines, some fine to coarse sands. [7.5YR 4/4]		6.0	SS-4	11	12	16	19	28
				8.0	SS-5	9	8	8	12	16
573.0	10.0	Boring terminated at 10.0 feet.								
568.0										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-7		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	562+41.20	**Offset:**	25.6 LT	**Alignment:**	Ramp 2
Elev.:	572.6 ft	**Latitude:**	34.9582	**Longitude:**	-80.9796	**Date Started:**	1/8/2020
Total Depth:	5.9 ft	**Soil Depth:**	5.9 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/8/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	3.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0								
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.	0.0						
		EMBANKMENT FILL - FAT CLAY WITH SAND (CH) - firm, moist, red, mostly high plasticity fines, little fine to medium sands. [10R 4/6] [NMC=37.7%. LL=53, PL=29, PI=24. %FINES=80.9%]		SS-1	3	2	4	5	6
	2.0		2.0						
		PIEDMONT RESIDUUM - SILTY SAND (SM) - medium dense, moist, weak red, subangular, mostly fine to coarse grained sands, some medium plasicity fines. [10R 5/2] [NMC=24.2%. LL=32, PL=26, PI=6. %FINES=39.3%]		SS-2	7	8	14	23	22
			4.0						
				SS-3	9	15	50/5"		100
567.6	5.0								
	5.9	**PARTIALLY WEATHERED ROCK - SANDY LEAN CLAY (CL)** - very hard, moist, weak red, mostly low plasticity fines, some fine to coarse sands. [10R 5/2]							
		Auger Refusal at 5.9 feet.							
562.6									
557.6									

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-8		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	563+41.78	**Offset:**	26.6 LT	**Alignment:**	Ramp 2
Elev.:	565.4 ft	**Latitude:**	34.9579	**Longitude:**	-80.9795	**Date Started:**	1/7/2020
Total Depth:	8.3 ft	**Soil Depth:**	8.3 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/7/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 1.0 ft	**24HR**	1.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		EMBANKMENT FILL - LEAN CLAY WITH SAND (CL) - very soft, wet, dusky red, mostly low to medium plasticity fines, little fine sands, trace organics (root mat). [10R 3/3]			SS-1	0	0	0	0	0
	3.0			2.0						
		ALLUVIUM - CLAYEY SAND (SC) - very loose, wet, reddish gray, subangular, mostly fine to coarse sands, little high plasticity fines, trace wood pieces. [10R 6/1] [NMC=19.5%. LL=31, PL=7, PI=14. %FINES=23.5%. %ORG=3.3%]			SS-2	0	0	0	0	0
				4.0						
560.4					SS-3	3	3	1	5	4
				6.0						
	6.5	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, reddish gray, mostly fine to coarse sands, little low plasticity fines. [10R 6/1]			SS-4	2350/5"				100
	8.0			8.0						
	8.3	**SANDY LEAN CLAY (CL)** - very hard, wet, reddish gray, mostly low to medium plasticity fines, some fine to coarse sands. [10R 6/1]			SS-5	50/4"				100
		Auger Refusal at 8.3 feet.								
555.4										
550.4										

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

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-9		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	559+39.25	**Offset:**	5.9 LT	**Alignment:**	Ramp 2
Elev.:	584.3 ft	**Latitude:**	34.9589	**Longitude:**	-80.98	**Date Started:**	1/9/2020
Total Depth:	15 ft	**Soil Depth:**	15 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	8.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.		0.0						
		EMBANKMENT FILL - SANDY LEAN CLAY (CL) - very stiff, dry, red, mostly low plasticity fines, little fine to coarse sands. [10R 4/6]			SS-1	6	10	10	9	20
	2.0	**PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL)** - very stiff, moist, weak red, mostly low to medium plasticity fines, some fine to coarse sands. [10R 5/2] [NMC=18.1%. LL=36, PL=18, PI=18. %FINES=57.5%]		2.0	SS-2	8	9	9	9	18
		@ 4 feet - stiff, reddish black, little fine to medium sands. [10R 2.5/1]		4.0	SS-3	3	4	7	7	11
579.3	6.0	**SANDY SILT (ML)** - stiff, moist, yellowish red, mostly low to medium fines, some fine to coarse sands. [5YR 5/6] [NMC=30.5%. LL=41, PL=32, PI=9. %FINES=53.3%]		6.0	SS-4	4	5	8	16	13
	8.0 ▼	**CLAYEY SAND (SC)** - loose, moist, weak red, subangular, mostly fine sands, some high plasticity fines. [10R 5/2] [NMC=22.9%. LL=31, PL=21, PI=10. %FINES=47.2%]		8.0	SS-5	3	1	8	20	9
574.3	12.0	**SILTY SAND (SM)** - dense, moist, yellowish red, subangular, mostly fine to coarse sands, little low plasticity fines. [5YR 5/6]		13.5	SS-6	2	11	26		37
569.3	15.0	Boring terminated at 15.0 feet.								

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

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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	RW-10
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	557+82.35	**Offset:**	15.9 LT	**Alignment:**	Ramp 2
Elev.:	586.6 ft	**Latitude:**	34.9593	**Longitude:**	-80.9801	**Date Started:**	1/9/2020
Total Depth:	18.8 ft	**Soil Depth:**	18.8 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	13.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		FILL - SANDY LEAN CLAY (CL) - very stiff, moist, red, mostly low plasticity fines, little fine to medium sands, trace wood pieces. [10R 4/6] [%ORG=4.2%]			SS-1	5	9	8	8	17
		@ 2 feet - firm.		2.0	SS-2	3	3	2	2	5
		@ 4 feet - stiff, moist to wet, [NMC=30.0%. LL=47, PL=20, PI=27. %FINES=62.1%]		4.0	SS-3	3	3	7	7	10
581.6	6.0	**PIEDMONT RESIDUUM - SILTY SAND (SM)** - dense, moist, weak red, subangular, mostly fine sands, little low plasticity fines. [10R 5/2]		6.0	SS-4	6	20	25	33	45
				8.0	SS-5	14	19	18	17	37
576.6										
		@ 13.5 feet - very dense.		13.5	SS-6	2	22	42		62
571.6										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-10		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	557+82.35	**Offset:**	15.9 LT	**Alignment:**	Ramp 2
Elev.:	586.6 ft	**Latitude:**	34.9593	**Longitude:**	-80.9801	**Date Started:**	1/9/2020
Total Depth:	18.8 ft	**Soil Depth:**	18.8 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/9/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** Dry	**24HR**	13.0 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	18.5			18.5						
	18.8	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, bluish gray, subangular, mostly fine to coarse sands, little low plasticity fines. [GLEY 5/5PB]			SS-7	50/3"				100
566.6		Auger Refusal at 18.8 feet.								
561.6										
556.6										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-11		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	559+05.99	**Offset:**	53.6 RT	**Alignment:**	Ramp 4
Elev.:	585.3 ft	**Latitude:**	34.9588	**Longitude:**	-80.9809	**Date Started:**	1/14/2020
Total Depth:	10 ft	**Soil Depth:**	10 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 2.5 ft	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0						
		PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL) - stiff, moist, dark red, mostly high plasticity fines, some fine to coarse sands. [2.5YR 3/6]			SS-1	3	5	7	8	12
	2.0			2.0						
		FAT CLAY WITH SAND (CH) - stiff, moist, dark red, mostly high plasticity fines, little coarse sands. [2.5YR 3/6] [NMC=39.2%. LL=59, PL= 30, PI=29. %FINES=78.4%]			SS-2	4	7	7	6	14
	4.0			4.0						
580.3		**SANDY LEAN CLAY (CL)** - stiff, wet, dark red, mostly low plasticity fines, some fine to coarse sands. [2.5YR 3/6] [NMC=27.4%. LL=39, PL=21, PI=18. %FINES=56.9%]			SS-3	4	7	8	12	15
	6.0			6.0						
		SILTY SAND (SM) - medium dense, moist, weak red, subangular, mostly fine to coarse sands, little low plasticity fines. [10R 5/2]			SS-4	4	7	7	12	14
				8.0						
					SS-5	3	8	6	9	14
575.3	10.0	Boring terminated at 10.0 feet.								
570.3										

SPT N VALUE ●

PL MC LL

▲ FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

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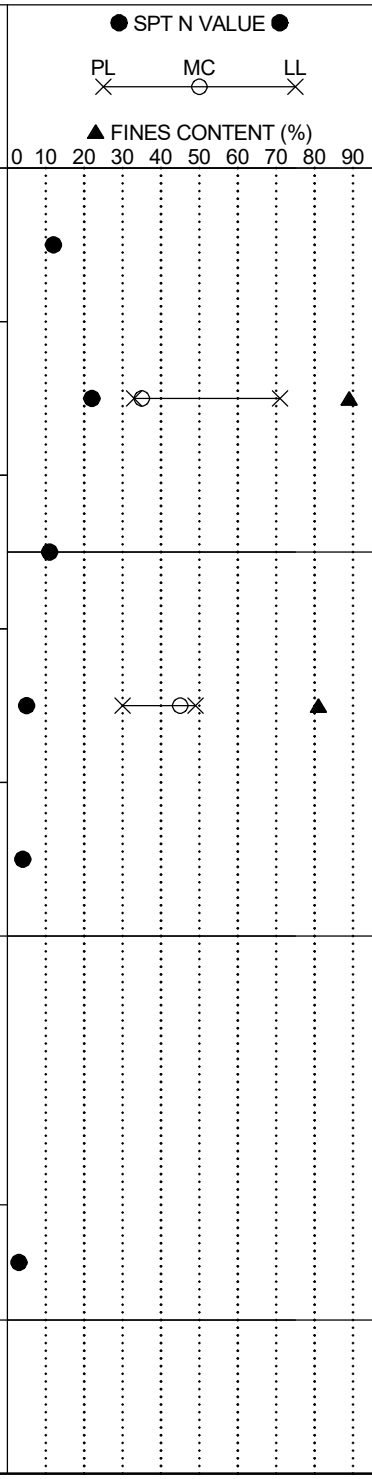
SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-12		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	558+10.92	**Offset:**	64.1 RT	**Alignment:**	Ramp 4
Elev.:	606.1 ft	**Latitude:**	34.959	**Longitude:**	-80.981	**Date Started:**	1/14/2020
Total Depth:	34.9 ft	**Soil Depth:**	34.9 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 22.3 ft	**24HR**	15.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0									
	0.2	**SURFACE MATERIALS - TOPSOIL** - 2 inches.		0.0	SS-1	4	5	7	8	12
		PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL) - stiff, moist, yellowish red, mostly low plasticity fines, little fine sands. [5YR 5/6]								
	2.0	**FAT CLAY (CH)** - stiff, moist, strong brown, mostly high plasticity fines, few fine sands. [7.5YR 5/8] [NMC=35.4%. LL=71, PL=33, PI=38. %FINES=88.9%]		2.0	SS-2	5	11	11	13	22
	4.0			4.0	SS-3	4	5	6	8	11
601.1		**SILT WITH SAND (ML)** - stiff, moist, dark brown, mostly low plasticity fines, little fine sands. [7.5YR 3/3] [NMC=44.7%. LL=49, PL=30, PI=19. %FINES=80.6%]								
		@ 6 feet - firm.		6.0	SS-4	4	3	2	3	5
		@ 8 feet - soft.		8.0	SS-5	2	2	2	2	4
596.1										
				13.5	SS-6	2	1	2		3
591.1										
	17.0									



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LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-12		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	558+10.92	**Offset:**	64.1 RT	**Alignment:**	Ramp 4
Elev.:	606.1 ft	**Latitude:**	34.959	**Longitude:**	-80.981	**Date Started:**	1/14/2020
Total Depth:	34.9 ft	**Soil Depth:**	34.9 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 22.3 ft	**24HR**	15.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
		SANDY SILT (ML) - firm, wet, weak red, mostly medium plasticity fines, some fine to coarse sands. [10R 5/2]		18.5	SS-7	1	2	4		6	
586.1											
	22.0	▽**SILTY SAND (SM)** - medium dense, moist, weak red, subangular, mostly fine to coarse sands, little non-plasticity fines. [10R 5/2] [NMC=19.5%. LL=NP, PL=NP, PI=NP. %FINES=33.4%]		23.5	SS-8	5	12	15		27	
581.1		@ 28.5 feet - very dense.		28.5	SS-9	12	40	49		89	
576.1				33.5							

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652			**County:**	York	**Boring No.:**	RW-12
Site Description:	I-77 Panthers Interchange					**Route:**	I-77
Eng./Geo.:	AMR	**Boring Location:**	558+10.92	**Offset:**	64.1 RT	**Alignment:**	Ramp 4
Elev.:	606.1 ft	**Latitude:**	34.959	**Longitude:**	-80.981	**Date Started:**	1/14/2020
Total Depth:	34.9 ft	**Soil Depth:**	34.9 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 22.3 ft	**24HR**	15.4 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
	34.5				SS-10	9 15 50/5"	100	
571.1	34.9	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, weak red, subangular, mostly fine to coarse sands, little low plasticity fines. [10R 5/2]						
		Auger Refusal at 34.9 feet.						
566.1								
561.1								
556.1								

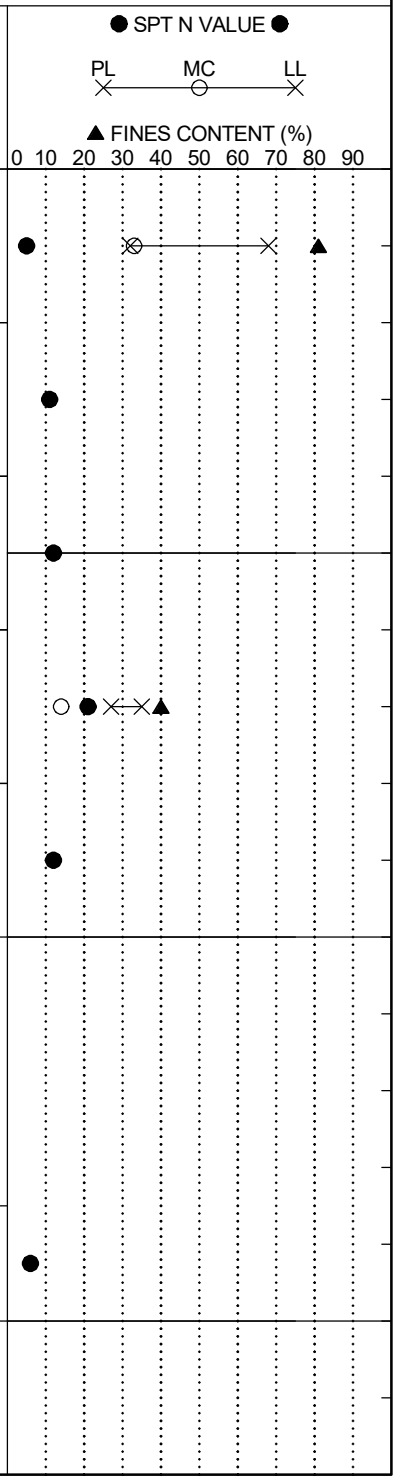
LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-13		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	562+29.94	**Offset:**	57.3 RT	**Alignment:**	Ramp 4
Elev.:	585.3 ft	**Latitude:**	34.9579	**Longitude:**	-80.9805	**Date Started:**	1/14/2020
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ALLUVIUM - FAT CLAY WITH SAND (CH)** - firm, moist, red, mostly high plasticity fines, little fine sands. [2.5YR 4/6] [NMC=33.1%. LL=68, PL=32, PI=36. %FINES=80.8%]		0.0	SS-1	1	2	3	3	5
	2.0	**PIEDMONT RESIDUUM - SANDY LEAN CLAY (CL)** - stiff, moist, yellow, mostly low plasticity fines, some fine sands, relict rock structure. [10YR 7/8]		2.0	SS-2	3	5	6	10	11
	4.0	**SILTY SAND (SM)** - medium dense, dry to moist, yellow, mostly fine sands, some low plasticity fines, relict rock structure. [10YR 7/8]		4.0	SS-3	6	7	5	8	12
580.3		@ 6 feet - [NMC=14.0%. LL=35, PL=27, PI=8. %FINES=39.9%]		6.0	SS-4	4	11	10	10	21
		@ 8 feet - moist, yellowish brown, subangular, mostly fine to medium sands. [10YR 5/6]		8.0	SS-5	3	5	7	8	12
575.3										
		@ 13.5 feet - loose.		13.5	SS-6	2	3	3		6
570.3										



LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-13		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	562+29.94	**Offset:**	57.3 RT	**Alignment:**	Ramp 4
Elev.:	585.3 ft	**Latitude:**	34.9579	**Longitude:**	-80.9805	**Date Started:**	1/14/2020
Total Depth:	20 ft	**Soil Depth:**	20 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
		@ 18.5 feet - medium dense.		18.5	SS-7	6	13	16		29
565.3	20.0	Boring terminated at 20.0 feet.								

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

560.3

555.3

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-14		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	563+20.29	**Offset:**	54.5 RT	**Alignment:**	Ramp 4
Elev.:	586.4 ft	**Latitude:**	34.9577	**Longitude:**	-80.9804	**Date Started:**	1/14/2020
Total Depth:	25 ft	**Soil Depth:**	25 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**PIEDMONT RESIDUUM - CLAYEY SAND (SC)** - loose, moist, strong brown, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [7.5YR 5/8]		0.0	SS-1	2	3	4	8	7
	2.0	**SILTY SAND (SM)** - medium dense, moist, reddish yellow, subangular, mostly fine to medium sands, some low plasticity fines, relict rock structure. [7.5YR 8/6]		2.0	SS-2	9	13	15	16	28
		@ 4 feet - [NMC=23.2%. LL=42, PL=30, PI=12. %FINES=49.8%]		4.0	SS-3	3	7	8	10	15
581.4		@ 6 feet - loose.		6.0	SS-4	2	4	5	6	9
				8.0	SS-5	2	3	4		7
576.4										
		@ 13.5 feet - pink. [7.5YR 7/3]		13.5	SS-6	3	3	4		7
571.4										

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

LEGEND

Continued Next Page

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	RW-14		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AKS	**Boring Location:**	563+20.29	**Offset:**	54.5 RT	**Alignment:**	Ramp 4
Elev.:	586.4 ft	**Latitude:**	34.9577	**Longitude:**	-80.9804	**Date Started:**	1/14/2020
Total Depth:	25 ft	**Soil Depth:**	25 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	J. Little	**Groundwater:**	**TOB** Dry	**24HR**	Dry

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
				18.5						
					SS-7	3	3	3		6
566.4										
				23.5						
		@ 23.5 feet - medium dense, yellowish brown. [10YR 5/4]			SS-8	5	6	8		14
561.4	25.0	Boring terminated at 25.0 feet.								
556.4										

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	C-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	566+56.16	**Offset:**	33.5 RT	**Alignment:**	Ramp 2
Elev.:	559.9 ft	**Latitude:**	34.9573	**Longitude:**	-80.9787	**Date Started:**	5/21/2020
Total Depth:	21 ft	**Soil Depth:**	21 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 6.1 ft	**24HR**	12.2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0	**ALLUVIUM - FAT CLAY (CH)** - soft, wet, dark grayish brown, mostly high plasticity fines, trace organics. [10YR 4/2]		0.0	SS-1	W.O.H	2	2		4
	2.0	**RESIDUUM - SANDY SILT (ML)** - very stiff, moist, brown, mostly low plasticity fines, some fine to coarse grained sand. [7.5YR 4/4]		2.0	SS-2	8	8	13	15	21
	4.0	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - very dense, moist, dark brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 3/3]		4.0	SS-3	17	16	31	50/5"	100
554.9				6.0	SS-4	20	50/2"			100
	8.0	**SILTY SAND (SM)** - dense, moist, very dark brown, mostly fine to coarse grained sand, some low plasticity fines. [7.5YR 2.5/2]		8.0	SS-5	36	35	13	16	48
549.9	10.0	**PARTIALLY WEATHERED ROCK (PWR) - SILTY SAND (SM)** - very dense, moist, dark brown, mostly fine to coarse sand, some low plasticity fines. [7.5YR 3/3]		13.5	SS-6	50/5"				100
544.9										

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

Continued Next Page

LEGEND

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

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	C-1		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	JCP	**Boring Location:**	566+56.16	**Offset:**	33.5 RT	**Alignment:**	Ramp 2
Elev.:	559.9 ft	**Latitude:**	34.9573	**Longitude:**	-80.9787	**Date Started:**	5/21/2020
Total Depth:	21 ft	**Soil Depth:**	21 ft	**Core Depth:**	N/A ft	**Date Completed:**	5/21/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 6.1 ft	**24HR**	12.2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	1st 6" / 2nd 6" / 3rd 6" / 4th 6"	N Value	SPT N VALUE / PL MC LL / FINES CONTENT (%) 0 10 20 30 40 50 60 70 80 90
				18.5				
					SS-7	50/2"	100	
539.9								
	21.0	Auger Refusal @ 21.0 feet.						
534.9								
529.9								

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

SCDOT Soil Test Log

Project ID:	P038652	**County:**	York	**Boring No.:**	C-2		
Site Description:	I-77 Panthers Interchange			**Route:**	I-77		
Eng./Geo.:	AMR	**Boring Location:**	33+76.74	**Offset:**	71.2 LT	**Alignment:**	Paragon
Elev.:	579.8 ft	**Latitude:**	34.9585	**Longitude:**	-80.9809	**Date Started:**	1/14/2020
Total Depth:	14.5 ft	**Soil Depth:**	14.5 ft	**Core Depth:**	N/A ft	**Date Completed:**	1/14/2020
Bore Hole Diameter (in):	5	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME-550X	**Drill Method:**	H.S.A.	**Hammer Type:**	Automatic	**Energy Ratio:**	85.9%
Core Size:	N/A	**Driller:**	T. Brown	**Groundwater:**	**TOB** 3.5 ft	**24HR**	2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	4th 6"	N Value
	0.0								
	0.3	**SURFACE MATERIALS - TOPSOIL** - 3 inches.	0.0						
		ALLUVIUM - FAT CLAY WITH SAND (CH) - firm, moist, very dark bluish gray, mostly high plasticity fines, little fine sands. [GLEY 3/5B]		SS-1	3	4	4	5	8
	3.0		2.0	SS-2	4	4	4	6	8
	4.0	**PIEDMONT RESIDUUM - ELASTIC SILT WITH SAND (MH)** - firm, wet, weak red, mostly medium plasticity fines, little fine sands. [10R 5/2]	4.0						
574.8		**CLAYEY SAND (SC)** - medium dense, moist, weak red, subangular, mostly fine sands, little high plasticity fines. [10R 5/2]		SS-3	5	6	6	5	12
			6.0	SS-4	3	7	10	12	17
	8.0		8.0						
		SILTY SAND (SM) - medium dense, moist, weak red, subangular, mostly fine to coarse sands, little low plasticity fines. [10R 5/2]		SS-5	5	8	11	16	19
569.8									
			13.5						
	14.0			SS-6	4	50/3"			100
	14.5	**PARTIALLY WEATHERED ROCK - SILTY SAND (SM)** - very dense, moist, weak red, subangular, mostly fine to coarse sands, little low plasticity fines. [10R 5/2]							
564.8		Auger Refusal at 14.5 feet.							

SPT N VALUE

PL MC LL

FINES CONTENT (%)

0 10 20 30 40 50 60 70 80 90

LEGEND

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

SC_DOT 1461-19-069 BORING LOGS.GPJ SCDOT DATA TEMPLATE_01_30_2015.GDT 10/12/20

PROJECT: **Properties in Rock Hill, SC - Hutchison Parcel**
Rock Hill, South Carolina
S&ME Project No. 1461-19-050

BORING LOG B-9

DATE DRILLED: **9/27/19**	ELEVATION: **641.5 ft**
DRILL RIG: **CME 750**	BORING DEPTH: **17.7 ft**
DRILLER: **S. Gowan**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **JPL**
SAMPLING METHOD: **Split spoon**	NORTHING: **1136717** EASTING: **2004834**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, Easting & Elevation obtained from as-drilled survey performed by Glenn Associates, Inc.

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS	N VALUE
	SURFACE MATERIAL - 2 inches of TOPSOIL.									
	PIEDMONT - LEAN CLAY (CL) - mostly medium plasticity fines, trace fine sands, dry to moist, red with yellow specks, very stiff.			SS-1		6	10	14		24
	- - - @ 3.5 feet - few fine sands, mottled red, yellow and white.			SS-2		8	13	17		30
5			636.5							
				SS-3		7	11	13		24
	- - - @ 8.5 feet - trace fine.			SS-4		6	9	11		20
10			631.5							
	CLAYEY SAND (SC) - mostly fine to coarse sands, some low plasticity fines, little fine to coarse gabbro rock fragments, dry, mottled red, light brown and white, medium dense.	HC		SS-5		6	10	8		18
15			626.5							
	Boring terminated at 17.7 ft due to auger refusal									

10 20 30 60 80

S&ME BORING LOG 1461-19-050 HUTCHINSON BORING LOG.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 10/17/19

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

PROJECT: **Properties in Rock Hill, SC - Hutchison Parcel**
Rock Hill, South Carolina
S&ME Project No. 1461-19-050

BORING LOG B-10

DATE DRILLED: **9/20/19**	ELEVATION: **628.8 ft**
DRILL RIG: **Diedrich D-50**	BORING DEPTH: **35.0 ft**
DRILLER: **J. Millwood**	WATER LEVEL: **Not Encountered**
HAMMER TYPE: **Auto**	LOGGED BY: **JPL**
SAMPLING METHOD: **Split spoon**	NORTHING: **1136885** / EASTING: **2005270**
DRILLING METHOD: **3¼" H.S.A.**	

NOTES: Northing, Easting & Elevation obtained from as-drilled survey performed by Glenn Associates, Inc.

DEPTH (feet)	MATERIAL DESCRIPTION	ELEVATION (feet-MSL)	SAMPLE NO.	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
	SURFACE MATERIAL - 4 inches of TOPSOIL.						
	PIEDMONT - LEAN CLAY (CL) - mostly medium plasticity fines, trace fine sands, trace fine roots, dry to moist, dark red, stiff.		SS-1	6	7	8	15
	- - - @ 3.5 feet - red, very stiff.		SS-2	6	10	13	23
5		623.8					
			SS-3	6	12	13	25
	- - - @ 8.5 feet - few fine sands, absent roots, dry, speckled red and light red.		SS-4	5	7	9	16
10		618.8					
	LEAN CLAY WITH SAND (CL) - mostly low plasticity fines, little fine sands, dry, red, firm.		SS-5	3	3	3	6
15		613.8					
	SILT WITH SAND (ML) - mostly medium plasticity fines, little fine sands, dry, mottled yellow and red, stiff.		SS-6	3	5	5	10
20		608.8					

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS
10 20 30 60 80

S&ME BORING LOG 1461-19-050 HUTCHINSON BORING LOG.GPJ S&ME COLUMBIA GINT DATA TEMPLATE.GDT 10/17/19

NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

PROJECT: **Properties in Rock Hill, SC - Hutchison Parcel**
Rock Hill, South Carolina
S&ME Project No. 1461-19-050

BORING LOG B-10

DATE DRILLED: **9/20/19** | ELEVATION: **628.8 ft**

DRILL RIG: **Diedrich D-50** | BORING DEPTH: **35.0 ft**

DRILLER: **J. Millwood** | WATER LEVEL: **Not Encountered**

HAMMER TYPE: **Auto** | LOGGED BY: **JPL**

NOTES: Northing, Easting & Elevation obtained from as-drilled survey performed by Glenn Associates, Inc.

SAMPLING METHOD: **Split spoon** | NORTHING: **1136885** | EASTING: **2005270**

DRILLING METHOD: **3¼" H.S.A.**

DEPTH (feet)	MATERIAL DESCRIPTION	WATER LEVEL	ELEVATION (feet-MSL)	SAMPLE NO.	SAMPLE TYPE	BLOW COUNT / CORE DATA 1st 6in / RUN #	2nd 6in / REC	3rd 6in / RQD	N VALUE
25	**LEAN CLAY WITH SAND (CL)** - mostly medium plasticity fines, few fine sands, dry, mottled light brown, white, gray and black, stiff, relict rock structure.	HC	603.8	SS-7		3	3	6	9
	- - - @ 28.5 feet - dry to moist, mottled light brown and gray.		598.8	SS-8		3	4	6	10
35	- - - @ 33.5 feet - moist, mottled light brown, light greenish-gray, white and black.		593.8	SS-9		3	5	5	10
	Boring terminated at 35 ft								

STANDARD PENETRATION TEST DATA (blows/ft) / REMARKS
10 20 30 60 80

S&ME BORING LOG 1461-19-050 HUTCHINSON BORING LOG.GPJ SME COLUMBIA GINT DATA TEMPLATE.GDT 10/17/19

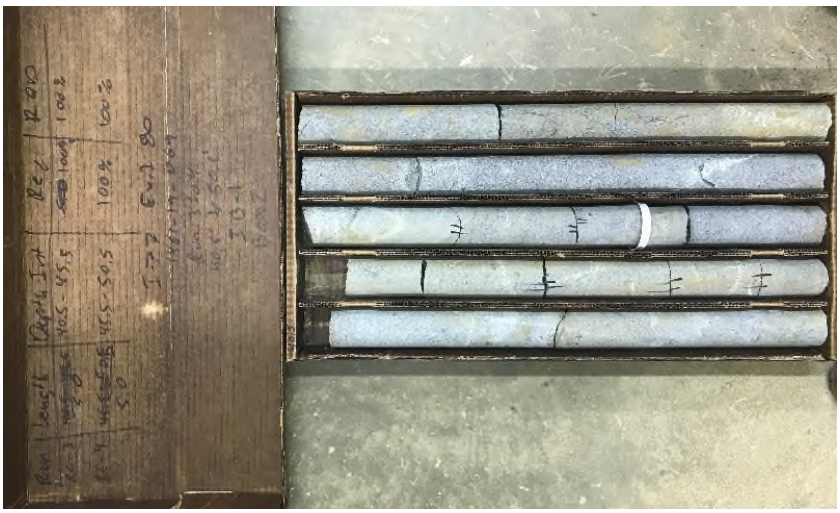
NOTES:

1. ***THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.***
2. ***BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.***
3. ***STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.***
4. ***WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.***

Appendix IV – Rock Core Photographs

Boring IB-1, Box 1 & 2

1	**Remarks:**	**Boring IB-1, Box 1**



2	**Remarks:**	**Boring IB-1, Box 2**

Boring IB-1, Box 3 & 4

3	**Remarks:**	**Boring IB-1, Box 3**

4	**Remarks:**	**Boring IB-1, Box 4**

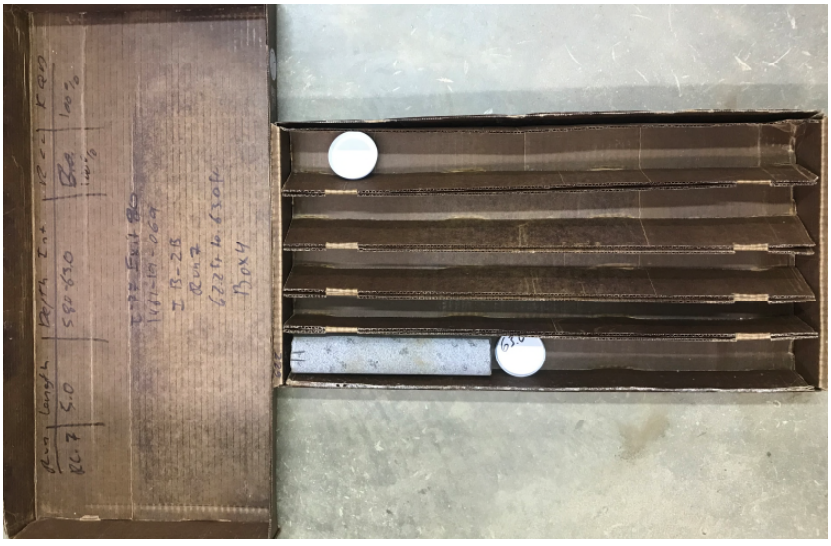
Boring IB-2B, Box 1 & 2

1	**Remarks:**	**Boring IB-2B, Box 1**

2	**Remarks:**	**Boring IB-2B, Box 2**

Boring IB-2B, Box 3 & 4

3	**Remarks:**	**Boring IB-2B, Box 3**



4	**Remarks:**	**Boring IB-2B, Box 4**

Boring IB-3, Box 1 & 2

1	**Remarks:**	**Boring IB-3, Box 1**

2	**Remarks:**	**Boring IB-3, Box 2**

Boring IB-3, Box 3 & 4

3	**Remarks:**	**Boring IB-3, Box 3**

4	**Remarks:**	**Boring IB-3, Box 4**

Boring IB-4A, Box 1 & 2

1	**Remarks:**	**Boring IB-4A, Box 1**

2	**Remarks:**	**Boring IB-4A, Box 2**

Boring IB-4A, Box 3 & 4

3	**Remarks:**	**Boring IB-4A, Box 3**

4	**Remarks:**	**Boring IB-4A, Box 4**

Boring EB-1, Box 1 & 2

1	**Remarks:**	**Boring EB-1, Box 1**

2	**Remarks:**	**Boring EB-1, Box 2**

Boring EB-1, Box 3

3	**Remarks:**	**Boring EB-1, Box 3**

Boring EB-2, Box 1 & 2

1	**Remarks:**	**Boring EB-2, Box 1**

2	**Remarks:**	**Boring EB-2, Box 2**

Boring EB-2, Box 3 & 4

3	**Remarks:**	**Boring EB-2, Box 3**

4	**Remarks:**	**Boring EB-2, Box 4**

Boring EB-3, Box 1 & 2

1	**Remarks:**	**Boring EB-3, Box 1**

2	**Remarks:**	**Boring EB-3, Box 2**

Boring EB-3, Box 3 & 4

3	**Remarks:**	**Boring EB-3, Box 3**

4	**Remarks:**	**Boring EB-3, Box 4**

Boring EB-4, Box 1 & 2

1	**Remarks:**	**Boring EB-4, Box 1**

2	**Remarks:**	**Boring EB-4, Box 2**

Boring EB-4, Box 3 & 4

3	**Remarks:**	**Boring EB-4, Box 3**

4	**Remarks:**	**Boring EB-4, Box 4**

Appendix V – SPT Hammer Energy Reports

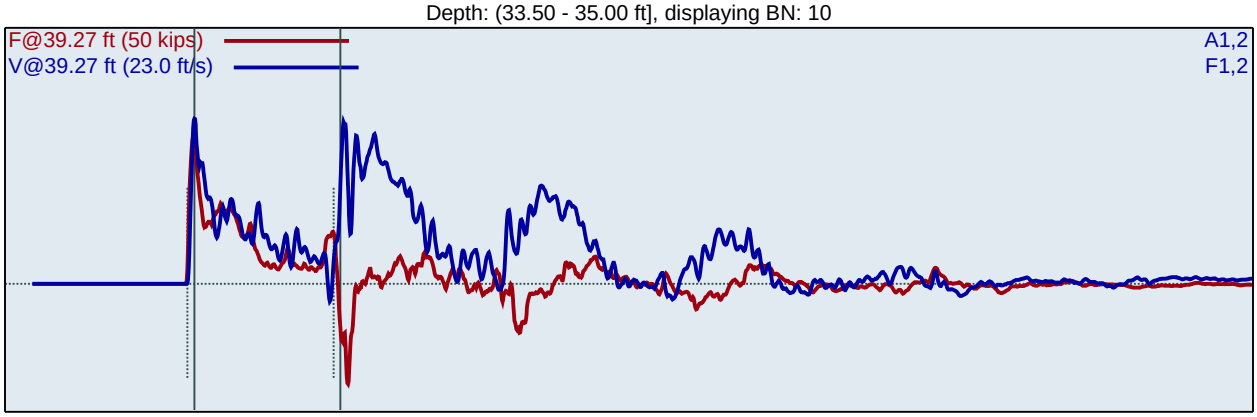
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in^2
LE: 39.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 10



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	33.58	6	1.9	30	14.7	1.05	1.00	24.6	271	77.4
2	33.67	6	42.4	30	14.8	1.00	1.00	24.5	273	78.1
3	33.75	6	42.5	30	14.7	1.05	1.00	24.5	269	76.9
4	33.83	6	42.3	30	14.8	1.28	1.00	24.6	270	77.1
5	33.92	6	42.5	30	14.8	1.36	1.00	24.4	271	77.3
6	34.00	6	42.4	30	14.7	1.23	1.00	24.8	271	77.5
7	34.10	5	42.4	30	14.7	1.26	1.20	24.5	272	77.6
8	34.20	5	42.5	30	14.6	1.20	1.20	24.5	270	77.3
9	34.30	5	42.4	30	14.9	1.20	1.20	24.3	273	77.9
10	34.40	5	42.5	30	14.8	1.20	1.20	24.5	271	77.4
11	34.50	5	42.4	30	14.9	1.20	1.20	24.6	271	77.3
12	34.56	8	42.5	30	14.9	0.91	0.75	24.5	270	77.2
13	34.63	8	42.3	29	15.0	0.87	0.75	24.0	275	78.6
14	34.69	8	42.5	30	14.9	0.80	0.75	24.3	268	76.5
15	34.75	8	42.3	30	15.1	0.81	0.75	24.5	274	78.2
16	34.81	8	42.5	30	15.0	0.75	0.75	24.5	267	76.3
17	34.88	8	42.4	30	15.2	0.75	0.75	24.4	271	77.4
18	34.94	8	42.4	30	15.2	0.76	0.75	24.5	272	77.6
19	35.00	8	42.5	30	15.3	0.75	0.75	24.4	272	77.8
		Average	42.4	30	15.0	0.96	0.92	24.4	271	77.5
		Std Dev	0.1	0	0.2	0.21	0.22	0.1	2	0.6
		Maximum	42.5	30	15.3	1.26	1.20	24.6	275	78.6
		Minimum	42.3	29	14.6	0.75	0.75	24.0	267	76.3

N-value: 13

Sample Interval Time: 25.42 seconds.

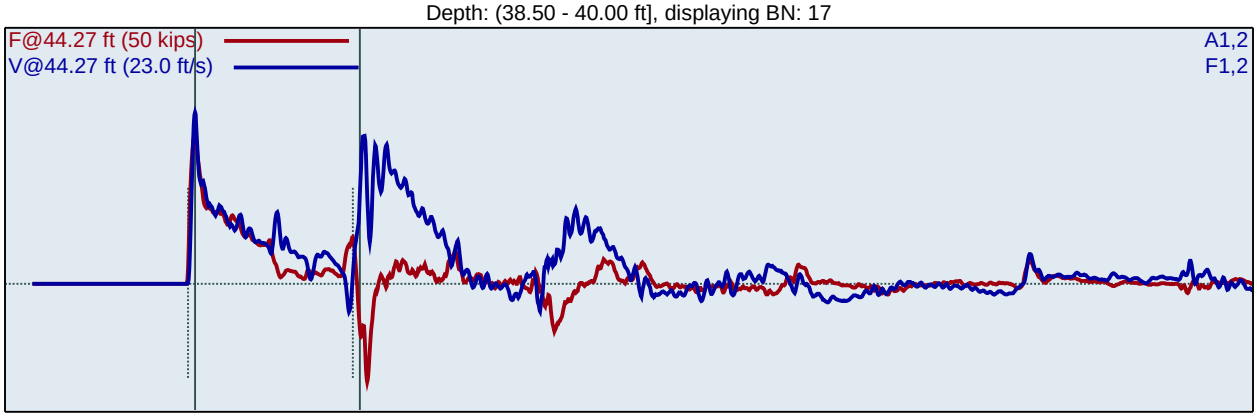
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in^2
LE: 44.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft], displaying BN: 17



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP	BC	BPM	FMX	VMX	DMX	DFN	CSX	EFV	ETR
	ft	/6"	bpm	kips	ft/s	in	in	ksi	ft-lb	%
1	38.56	8	1.9	30	15.1	1.44	0.75	24.9	267	76.2
2	38.63	8	38.3	30	15.1	0.75	0.75	24.5	268	76.7
3	38.69	8	38.3	30	15.3	0.75	0.75	24.4	270	77.2
4	38.75	8	38.4	30	15.2	0.75	0.75	24.3	267	76.3
5	38.81	8	38.3	30	15.1	0.75	0.75	24.3	268	76.6
6	38.88	8	38.3	30	15.3	0.77	0.75	24.3	268	76.7
7	38.94	8	38.4	30	15.3	0.82	0.75	24.2	269	76.8
8	39.00	8	38.3	30	15.3	0.76	0.75	24.3	268	76.6
9	39.05	10	38.3	29	15.4	0.64	0.60	24.1	271	77.5
10	39.10	10	38.4	29	15.3	0.60	0.60	24.2	266	76.1
11	39.15	10	38.3	29	15.4	0.62	0.60	24.1	268	76.6
12	39.20	10	38.3	30	15.4	0.61	0.60	24.2	268	76.5
13	39.25	10	38.4	30	15.3	0.61	0.60	24.3	266	75.9
14	39.30	10	38.3	29	15.5	0.64	0.60	24.0	268	76.5
15	39.35	10	38.4	30	15.3	0.65	0.60	24.3	267	76.4
16	39.40	10	38.4	30	15.2	0.65	0.60	24.4	267	76.3
17	39.45	10	38.3	30	15.4	0.68	0.60	24.3	269	76.8
18	39.50	10	38.4	30	15.5	0.67	0.60	24.2	268	76.5
19	39.56	9	38.3	30	15.3	0.68	0.67	24.5	269	76.7
20	39.61	9	38.3	30	15.4	0.70	0.67	24.3	266	76.1
21	39.67	9	38.3	30	15.4	0.74	0.67	24.2	268	76.6
22	39.72	9	38.4	30	15.7	0.73	0.67	24.2	268	76.5
23	39.78	9	38.3	29	15.9	0.75	0.67	24.1	273	78.1
24	39.83	9	38.3	29	15.6	0.73	0.67	24.2	274	78.2
25	39.89	9	38.4	29	15.6	0.69	0.67	24.1	271	77.6
26	39.94	9	38.3	30	15.6	0.69	0.67	24.3	271	77.5
27	40.00	9	38.4	29	16.1	0.68	0.67	23.6	271	77.3

Average	38.3	30	15.5	0.67	0.63	24.2	269	76.8
Std Dev	0.0	0	0.2	0.04	0.03	0.2	2	0.6
Maximum	38.4	30	16.1	0.75	0.67	24.5	274	78.2
Minimum	38.3	29	15.2	0.60	0.60	23.6	266	75.9

N-value: 19

Sample Interval Time: 40.63 seconds.

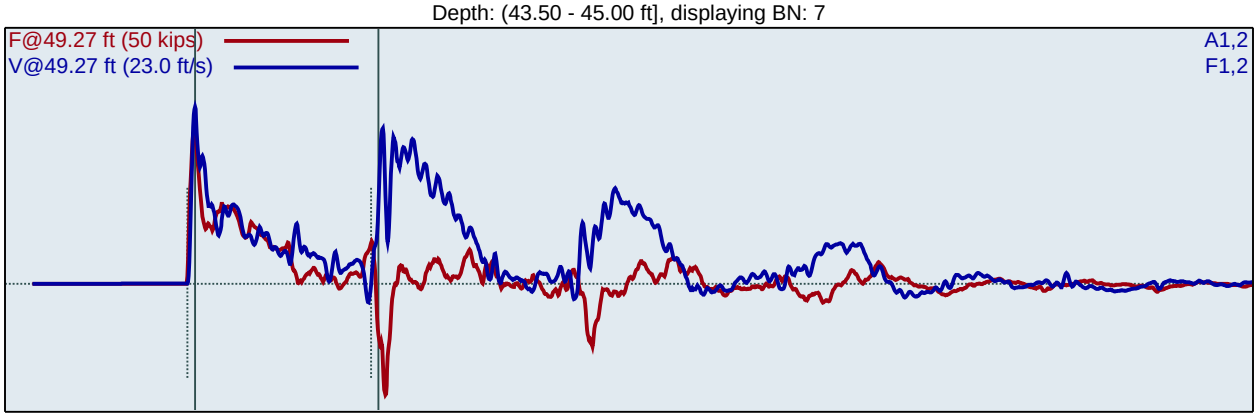
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in^2
LE: 49.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (43.50 - 45.00 ft], displaying BN: 7



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	43.67	3	1.9	30	15.7	2.08	2.00	24.6	288	82.3
2	43.83	3	46.3	30	15.9	2.00	2.00	24.6	286	81.6
3	44.00	3	46.1	30	15.8	2.00	2.00	24.7	289	82.5
4	44.08	6	46.3	30	15.8	1.33	1.00	24.6	287	81.9
5	44.17	6	46.0	30	15.8	1.14	1.00	24.9	287	82.0
6	44.25	6	46.2	30	15.9	1.06	1.00	24.5	288	82.2
7	44.33	6	46.2	30	15.9	1.02	1.00	24.6	289	82.4
8	44.42	6	46.2	30	15.8	1.00	1.00	24.4	289	82.6
9	44.50	6	46.2	30	16.0	1.00	1.00	24.5	290	82.7
10	44.56	9	46.2	30	16.1	0.92	0.67	24.5	291	83.1
11	44.61	9	46.3	30	16.0	0.88	0.67	24.4	288	82.1
12	44.67	9	46.2	30	16.2	0.86	0.67	24.2	290	82.8
13	44.72	9	46.3	30	16.0	0.81	0.67	24.2	287	82.0
14	44.78	9	46.1	30	16.1	0.71	0.67	24.3	288	82.4
15	44.83	9	46.1	30	16.3	0.70	0.67	24.5	290	82.9
16	44.89	9	46.3	30	16.3	0.69	0.67	24.2	289	82.6
17	44.94	9	46.1	30	16.4	0.69	0.67	24.3	289	82.6
18	45.00	9	46.2	29	16.3	0.69	0.67	23.9	290	82.8
		Average	46.2	30	16.0	0.90	0.80	24.4	289	82.5
		Std Dev	0.1	0	0.2	0.19	0.16	0.2	1	0.3
		Maximum	46.3	30	16.4	1.33	1.00	24.9	291	83.1
		Minimum	46.0	29	15.8	0.69	0.67	23.9	287	81.9

N-value: 15

Sample Interval Time: 22.04 seconds.

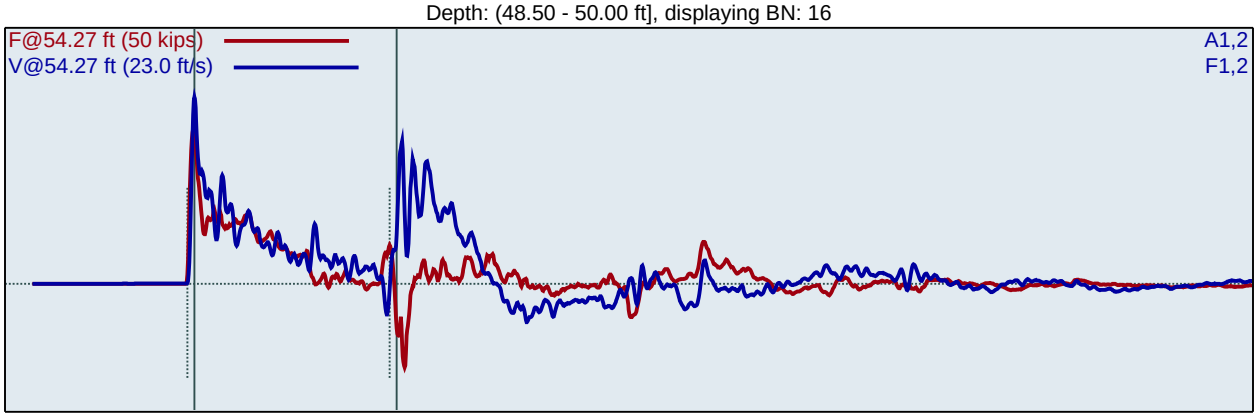
CME-55 Truck (SN331845)
D. Schoen
AE Drill Yard - Test Boring

33.5 to 35 ft
Test date: 2/13/2019

AR: 1.22 in^2
LE: 54.27 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (48.50 - 50.00 ft], displaying BN: 16



F1 : [71 AW-1] 212.41 PDICAL (1) FF1
F2 : [71 AW-2] 215.56 PDICAL (1) FF1

A1 (PR): [K1533] 374 mv/6.4v/5000g (1) VF1
A2 (PR): [K4664] 365 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	48.60	5	1.9	30	16.3	1.65	1.20	24.6	293	83.8
2	48.70	5	46.2	30	16.6	1.39	1.20	24.8	292	83.5
3	48.80	5	46.0	31	16.6	1.20	1.20	25.5	295	84.3
4	48.90	5	46.2	30	16.6	1.20	1.20	24.6	294	84.0
5	49.00	5	46.1	30	16.4	1.20	1.20	24.8	295	84.3
6	49.05	11	46.2	31	16.8	0.85	0.55	25.3	290	82.9
7	49.09	11	46.2	31	16.9	0.75	0.55	25.4	292	83.5
8	49.14	11	46.2	30	16.6	0.67	0.55	24.8	291	83.1
9	49.18	11	46.2	30	16.6	0.62	0.55	25.0	293	83.6
10	49.23	11	46.2	30	16.5	0.62	0.55	24.8	295	84.3
11	49.27	11	46.2	30	16.3	0.58	0.55	24.7	294	84.0
12	49.32	11	46.1	30	16.6	0.56	0.55	24.9	290	82.9
13	49.36	11	46.3	30	16.4	0.58	0.55	24.8	293	83.7
14	49.41	11	46.1	30	16.3	0.57	0.55	24.5	293	83.6
15	49.45	11	46.2	30	16.5	0.55	0.55	24.9	292	83.4
16	49.50	11	46.2	30	16.7	0.55	0.55	24.8	289	82.6
17	49.53	20	46.2	30	16.3	0.50	0.30	24.8	287	82.0
18	49.55	20	46.1	30	16.6	0.50	0.30	24.6	290	82.8
19	49.58	20	46.1	30	16.3	0.49	0.30	24.8	290	82.8
20	49.60	20	46.2	30	16.3	0.49	0.30	24.2	289	82.5
21	49.63	20	46.2	30	16.6	0.46	0.30	24.5	286	81.6
22	49.65	20	46.2	30	16.5	0.48	0.30	24.3	289	82.4
23	49.68	20	46.0	30	16.5	0.46	0.30	25.0	288	82.2
24	49.70	20	46.3	30	16.6	0.45	0.30	24.6	286	81.8
25	49.73	20	46.1	30	16.3	0.44	0.30	24.4	287	82.1
26	49.75	20	46.2	30	16.7	0.43	0.30	24.9	286	81.8
27	49.78	20	46.2	31	16.8	0.43	0.30	25.1	286	81.8

28	49.80	20	46.1	30	16.5	0.43	0.30	24.5	286	81.6
29	49.83	20	46.3	30	16.4	0.44	0.30	24.5	286	81.6
30	49.85	20	46.0	31	16.8	0.45	0.30	25.4	290	82.8
31	49.88	20	46.3	30	16.8	0.44	0.30	24.6	285	81.3
32	49.90	20	46.1	30	16.7	0.46	0.30	24.4	288	82.2
33	49.93	20	46.2	30	16.6	0.47	0.30	24.4	286	81.8
34	49.95	20	46.1	31	17.0	0.47	0.30	25.1	287	82.1
35	49.98	20	46.0	30	16.4	0.47	0.30	24.3	284	81.3
36	50.00	20	46.4	30	16.7	0.50	0.30	24.4	289	82.6
		Average	46.2	30	16.6	0.52	0.39	24.7	289	82.6
		Std Dev	0.1	0	0.2	0.10	0.12	0.3	3	0.8
		Maximum	46.4	31	17.0	0.85	0.55	25.4	295	84.3
		Minimum	46.0	30	16.3	0.43	0.30	24.2	284	81.3
					N-value: 31					

Sample Interval Time: 45.42 seconds.

Summary of SPT Test Results

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

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average DFN in	Average CSX ksi	Average EFV ft-lb	Average ETR %
39.27	33.50	35.00	**6-5-8**	**13**	**17**	42.4	30	15.0	0.96	0.92	24.4	271	77.5
44.27	38.50	40.00	**8-10-9**	**19**	**25**	38.3	30	15.5	0.67	0.63	24.2	269	76.8
49.27	43.50	45.00	**3-6-9**	**15**	**20**	46.2	30	16.0	0.90	0.80	24.4	289	82.5
54.27	48.50	50.00	**5-11-20**	**31**	**41**	46.2	30	16.6	0.52	0.39	24.7	289	82.6
			Overall Average Values:			43.6	30	15.9	0.70	0.62	24.5	281	80.3
			Standard Deviation:			3.3	0	0.6	0.22	0.25	0.3	10	2.8
			Overall Maximum Value:			46.4	31	17.0	1.33	1.20	25.4	295	84.3
			Overall Minimum Value:			38.3	29	14.6	0.43	0.30	23.6	266	75.9

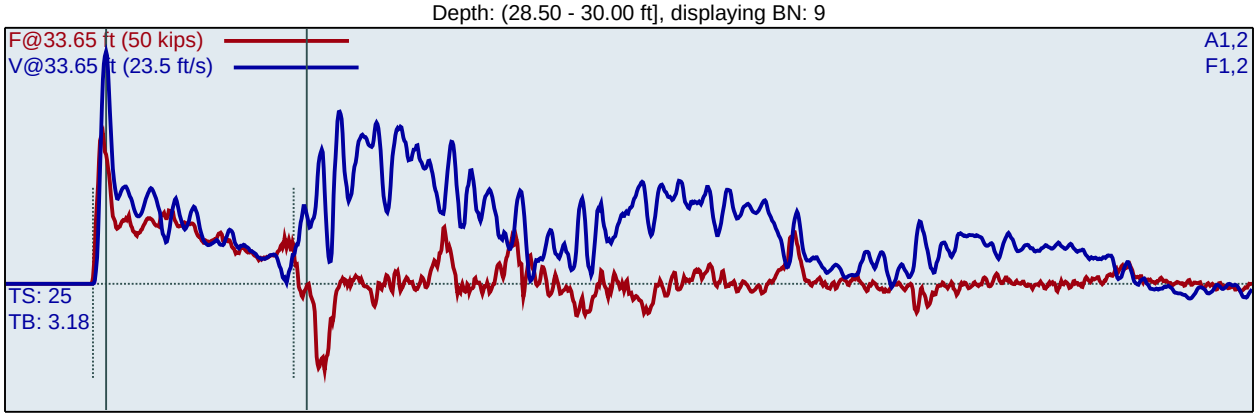
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in^2
LE: 33.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (28.50 - 30.00 ft], displaying BN: 9



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	28.67	3	1.9	29	20.9	2.72	2.00	24.3	303	86.7
2	28.83	3	21.3	29	21.1	2.54	2.00	24.4	303	86.5
3	29.00	3	21.1	29	21.3	2.44	2.00	24.4	304	87.0
4	29.17	3	21.1	29	21.2	2.18	2.00	24.3	303	86.5
5	29.33	3	21.0	29	21.2	2.04	2.00	24.0	304	86.8
6	29.50	3	21.0	30	21.5	2.01	2.00	24.9	304	86.8
7	29.60	5	21.1	29	21.5	1.57	1.20	24.7	301	86.1
8	29.70	5	21.0	29	21.4	1.45	1.20	24.4	299	85.4
9	29.80	5	21.1	29	21.3	1.41	1.20	24.7	302	86.2
10	29.90	5	21.1	30	21.8	1.40	1.20	25.0	304	86.9
11	30.00	5	21.1	29	21.4	1.32	1.20	24.3	302	86.2
		Average	21.1	29	21.4	1.67	1.50	24.5	302	86.4
		Std Dev	0.0	0	0.2	0.32	0.39	0.3	2	0.5
		Maximum	21.1	30	21.8	2.18	2.00	25.0	304	86.9
		Minimum	21.0	29	21.2	1.32	1.20	24.0	299	85.4

N-value: 8

Sample Interval Time: 28.39 seconds.

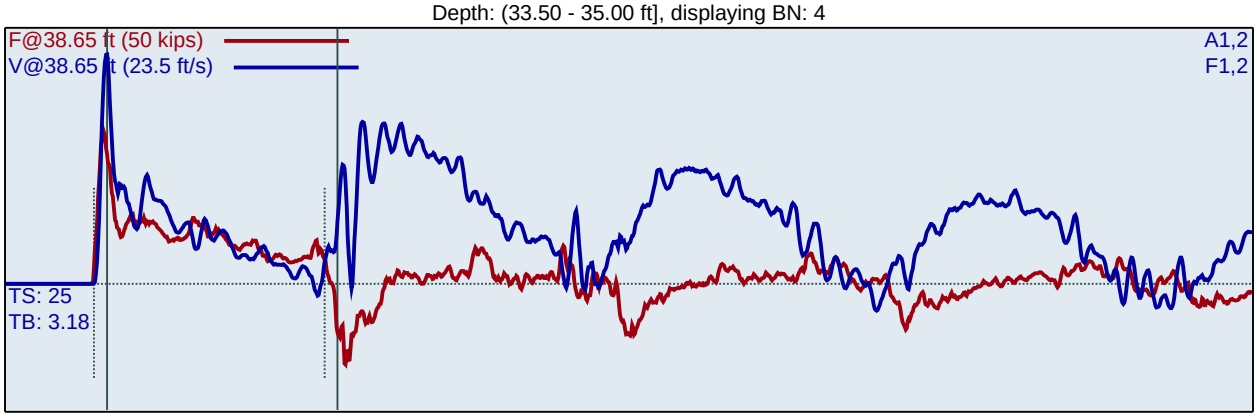
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in^2
LE: 38.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 4



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP	BC	BPM	FMX	VMX	DMX	DFN	CSX	EFV	ETR
	ft	/6"	bpm	kips	ft/s	in	in	ksi	ft-lb	%
1	33.67	3	1.9	30	21.4	2.19	1.99	24.9	281	80.1
2	33.83	3	21.4	30	21.1	2.25	2.00	25.2	286	81.7
3	34.00	3	21.2	29	20.7	2.00	2.00	24.3	310	88.5
4	34.10	5	21.1	30	21.1	1.67	1.20	24.9	295	84.3
5	34.20	5	21.2	30	21.2	1.35	1.19	24.8	283	81.0
6	34.30	5	21.2	30	21.0	1.19	1.19	24.9	287	81.9
7	34.40	5	21.2	30	21.1	1.22	1.20	25.0	298	85.2
8	34.50	5	21.2	30	21.2	1.23	1.20	25.0	301	86.1
9	34.58	6	21.2	30	21.0	1.07	1.00	24.8	296	84.6
10	34.67	6	21.1	30	21.2	1.07	1.00	24.8	299	85.4
11	34.75	6	21.2	30	21.5	1.09	1.00	25.2	303	86.6
12	34.83	6	21.2	30	21.5	1.07	1.00	25.0	300	85.8
13	34.92	6	21.2	29	21.2	1.09	1.00	24.7	299	85.4
14	35.00	6	21.2	29	21.3	1.08	1.00	24.4	291	83.1
		Average	21.2	30	21.2	1.19	1.09	24.9	296	84.5
		Std Dev	0.0	0	0.2	0.17	0.10	0.2	6	1.7
		Maximum	21.2	30	21.5	1.67	1.20	25.2	303	86.6
		Minimum	21.1	29	21.0	1.07	1.00	24.4	283	81.0

N-value: 11

Sample Interval Time: 36.73 seconds.

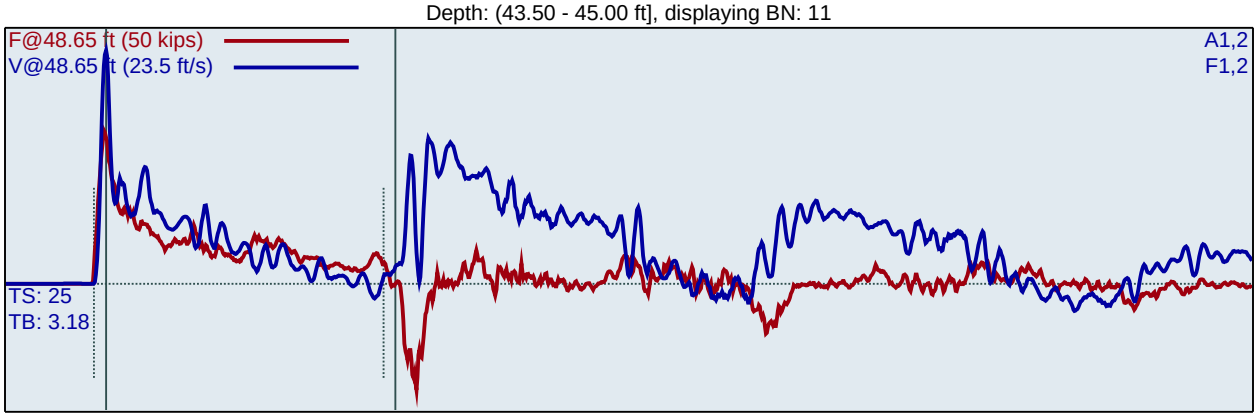
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in^2
LE: 48.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (43.50 - 45.00 ft], displaying BN: 11



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	43.63	4	1.9	29	20.4	1.72	1.50	24.4	267	76.1
2	43.75	4	21.3	29	21.2	1.56	1.50	24.4	298	85.1
3	43.88	4	21.2	29	21.6	1.57	1.50	24.7	298	85.1
4	44.00	4	21.1	28	22.9	1.57	1.50	23.9	291	83.0
5	44.13	4	21.1	30	21.7	1.57	1.50	25.1	286	81.8
6	44.25	4	21.2	30	21.3	1.58	1.50	25.3	298	85.2
7	44.38	4	21.2	30	21.4	1.56	1.50	25.2	303	86.6
8	44.50	4	21.2	29	22.0	1.51	1.50	24.8	309	88.2
9	44.60	5	21.1	30	21.1	1.20	1.20	24.9	292	83.5
10	44.70	5	21.2	30	21.4	1.20	1.20	25.5	294	83.9
11	44.80	5	21.2	30	21.5	1.20	1.20	25.2	296	84.5
12	44.90	5	21.2	30	21.6	1.20	1.20	25.2	294	83.9
13	45.00	5	21.2	30	21.9	1.22	1.20	24.9	303	86.6
		Average	21.2	30	21.5	1.36	1.33	25.1	297	84.9
		Std Dev	0.0	0	0.3	0.18	0.15	0.2	6	1.8
		Maximum	21.2	30	22.0	1.58	1.50	25.5	309	88.2
		Minimum	21.1	29	21.1	1.20	1.20	24.8	286	81.8

N-value: 9

Sample Interval Time: 33.94 seconds.

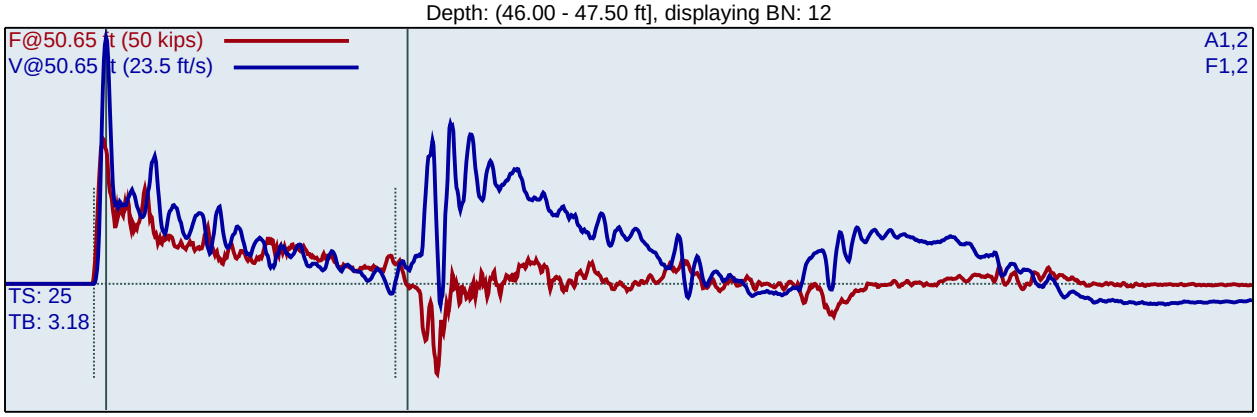
METRO CME-550 (SN191273)
AMR
TEST HOLE

28.5 - 47.5
Test date: 1/23/2020

AR: 1.19 in^2
LE: 50.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (46.00 - 47.50 ft], displaying BN: 12



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	DFN in	CSX ksi	EFV ft-lb	ETR %
1	46.13	4	1.9	29	21.4	1.69	1.49	24.6	267	76.4
2	46.25	4	21.5	30	21.9	1.72	1.50	25.0	289	82.4
3	46.38	4	21.2	29	21.9	1.58	1.50	24.7	290	82.9
4	46.50	4	21.1	30	22.4	1.69	1.50	25.1	313	89.6
5	46.60	5	21.1	29	22.2	1.48	1.20	24.6	312	89.1
6	46.70	5	21.2	29	22.6	1.33	1.20	24.6	305	87.1
7	46.80	5	21.2	29	22.5	1.25	1.20	24.4	300	85.7
8	46.90	5	21.2	28	22.6	1.20	1.20	23.9	293	83.8
9	47.00	5	21.2	28	22.8	1.20	1.20	23.4	296	84.7
10	47.07	7	21.2	28	22.4	0.88	0.85	23.6	288	82.1
11	47.14	7	21.2	28	22.7	0.90	0.85	23.4	293	83.7
12	47.21	7	21.2	28	22.7	0.93	0.86	23.8	303	86.5
13	47.29	7	21.2	29	22.5	0.91	0.86	24.0	304	87.0
14	47.36	7	21.2	29	22.6	0.93	0.86	24.1	308	87.9
15	47.43	7	21.2	28	22.3	0.93	0.86	23.9	309	88.2
16	47.50	7	21.2	28	22.3	0.92	0.86	23.8	309	88.4
		Average	21.2	29	22.5	1.07	1.00	24.0	302	86.2
		Std Dev	0.0	0	0.2	0.20	0.17	0.4	7	2.1
		Maximum	21.2	29	22.8	1.48	1.20	24.6	312	89.1
		Minimum	21.1	28	22.2	0.88	0.85	23.4	288	82.1

N-value: 12

Sample Interval Time: 42.35 seconds.

Summary of SPT Test Results

Project: METRO CME-550 (SN191273), Test Date: 1/23/2020

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
DFN: Final Displacement
CSX: Compression Stress Maximum
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average DFN in	Average CSX ksi	Average EFV ft-lb	Average ETR %
33.65	28.50	30.00	**3-3-5**	**8**	**11**	21.1	29	21.4	1.67	1.50	24.5	302	86.4
38.65	33.50	35.00	**3-5-6**	**11**	**15**	21.2	30	21.2	1.19	1.09	24.9	296	84.5
48.65	43.50	45.00	**4-4-5**	**9**	**12**	21.2	30	21.5	1.36	1.33	25.1	297	84.9
50.65	46.00	47.50	**4-5-7**	**12**	**17**	21.2	29	22.5	1.07	1.00	24.0	302	86.2
			Overall Average Values:			21.2	29	21.7	1.29	1.20	24.6	299	85.5
			Standard Deviation:			0.1	1	0.6	0.31	0.29	0.5	7	1.9
			Overall Maximum Value:			21.2	30	22.8	2.18	2.00	25.5	312	89.1
			Overall Minimum Value:			21.0	28	21.0	0.88	0.85	23.4	283	81.0

Report of SPT Energy Measurements
S&ME CME-550X ATV (Serial No. 290593)
Charlotte, North Carolina
S&ME Project No. 6235-17-020

PREPARED FOR:

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

PREPARED BY:

S&ME, Inc.
9751 Southern Pine Boulevard
Charlotte, North Carolina 28273

June 3, 2019

June 3, 2019

North Carolina Department of Transportation
Geotechnical Engineering Unit
1589 Mail Service Center
Raleigh, North Carolina 27699

Attention: Dr. Shunyi (Chris) Chen, Ph.D., P.E.

Cc: Ms. Cheryl A. Youngblood, L.G.

Reference: **Report of SPT Energy Measurements**
S&ME CME-550X ATV (Serial No. 290593)
Charlotte, North Carolina
S&ME Project No. 6235-17-020
NC PE Firm License No. F-0176

Dear Dr. Chen:

We have completed the Standard Penetration Test (SPT) energy measurements on the automatic hammer used with our CME-550X ATV-mounted drill rig (Serial No. 290593). This service was performed by Mr. Joseph Williamson, P.E. of our firm on May 1, 2019, in general accordance with ASTM D4633 and the most recent revision of the North Carolina Department of Transportation (NCDOT) Geotechnical Engineering Unit's requirements. Review of the data quality and analyses was performed by Mr. Gregory Canivan, P.E. of our firm. Copies of the Certificates of Proficiency issued by Pile Dynamics based on the Dynamic Measurement and Analysis Proficiency Test for Mr. Williamson and Mr. Canivan are included in the Appendix. The testing procedures, equipment used during testing, and detailed results are presented in this report.

1.0 Dynamic Testing Methodology

Testing was performed using a model PAX (Serial No. 3733L) Pile Driving Analyzer™ (PDA) manufactured by Pile Dynamics, Inc. The PDA was used to record and interpret data from two piezoresistive accelerometers (Serial Nos. K10181 and K10182) bolted to a 2.0-foot long AWJ drill rod (Serial No. 203) internally instrumented with two strain transducers. Calibration sheets for the accelerometers and the instrumented rod are included in the Appendix. The instrumented AWJ drill rod has a cross-sectional area of 1.19 square inches and an outside diameter of approximately 1.75 inches. Therefore, we calculate the inside diameter to be approximately 1.25 inches at the gauge location. The accelerometers and strain gauges, which are diametrically opposed near the middle of the instrumented rod, monitor acceleration and strain for each hammer blow. The analyzer converts the data to velocities and forces and computes the maximum transferred hammer energies with the "EFV" method described in ASTM D4633. Preliminary results are recorded and displayed in real time for each blow.

2.0 Testing and Observations

S&ME personnel were on site May 1, 2019, to observe and perform high-strain dynamic testing during SPT sampling on the CME-550X ATV-mounted drill rig operated by Fred Johnson of S&ME. The measurements were taken during drilling and sampling of a soil test boring at S&ME's office in Charlotte, North Carolina. SPT energy measurements were recorded during four sampling intervals at depths of approximately 28.5, 33.5, 38.5, and 43.5, ft below the ground surface. The 43.5-ft sample interval did not meet the NCDOT blow count requirements and was not included in the data analysis. The information presented in the tables below summarizes the equipment and tooling used during the SPT energy measurements.

Table 2-1: Drill Rig Information

Manufacturer	CME
Model	550X
Serial Number	290593
Operator	F. Johnson
Carrier	ATV

Table 2-2: Hammer Information

Model / Type	CME / Auto
Serial Number	290593
Anvil Height (inches)	12
Anvil Diameter (inches)	2.5
Typical Drop Height (inches)	30
Typical Ram Weight (pounds)	140
Ram Serial Number	N/A

Table 2-3: Drilling and Instrumented Rod Information

Drill Rod Type	AWJ
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.19
Typical Lengths (feet)	5
Instrumented Rod Type	AWJ (Serial No. 203)
OD (inches)	1.75
ID (inches)	1.25
Cross-Sectional Area (in^2)	1.19
Total Instrumented Rod Length (feet)	2.0
Length Below Gages (feet)	0.8
Split-Spoon Length (feet)	2.85

3.0 Dynamic Testing Results

The total rod length from the instrumentation to the tip of the split-spoon sampler was determined by adding 3.65 ft to the drill rod length at each sample depth. The SPT Energy Measurement Data Summary tables in the Appendix present the test data from every hammer blow at each sampling interval, along with representative force and velocity traces for each test interval. Per ASTM D4633, only the blows from the final foot of each sample interval (i.e. the blows that determine the N-value) are considered when computing the average measurement values of each test interval.

The reported blow counts obtained by the drill rig personnel, a summary of the test data, and average computed hammer energy and transfer ratio values are provided in Table 3-1. Based on the test data, the automatic hammer on the CME-550X operated at an average rate of about 53 blows per minute (bpm) during dynamic testing. The measured average transferred hammer energy (EFV) of the three sample intervals tested ranged from 295 to 305 ft-lbs, which corresponds to Energy Transfer Ratio (ETR) values of 84.2 to 87.0%, respectively. Plots and tables of the following are also included in the Appendix and present the test data with depth for each test interval:

- Penetration vs. BLC[1]
- Penetration vs. FMX[2]
- Penetration vs. EFV[3]
- Penetration vs. CSX[4]
- Penetration vs. VMX[5]
- Penetration vs. ETR[6]
- ETR vs. Rod Length
- Average ETR vs. Rod Length

Table 3-1: Summary of Dynamic Testing Results

Data Set ID	Sample Depth (ft)	Drill Rod Length (ft)	Instrumentation to Sampler Tip Length (ft)	Blows per 6" Increment / N-value	Soil Sample Description (Piedmont Residual)	Avg. BPM	Avg. EFV (ft-lbs)	Avg. ETR (%)
1	28.5 – 30.0	30.0	33.65	3-4-5 / 9	SANDY SILT	53.8	295	84.2
2	33.5 – 35.0	35.0	38.65	3-6-10 / 16	SANDY SILT	53.7	305	87.0
3	38.5 – 40.0	40.0	43.65	9-13-24 / 37	SILTY SAND	53.2	300	85.9
					Overall Average	**53.4**	**301**	**85.9**

The overall average transferred hammer energy for the automatic hammer on the CME-550X ATV-mounted drill rig was 301 foot-pounds, with an average ETR of 85.9%.

[1] BLC - Blow Count per 6-in. increment
[2] FMX - Maximum Compressive Force
[3] EFV – Maximum Transferred Energy
[4] CSX – Maximum Compressive Stress
[5] VMX – Maximum Velocity
[6] ETR – Energy Transfer Ratio – Ratio of Calculated Energy to Theoretical Energy of 140 lb hammer falling 30 inches

4.0 Limitations of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions contained in this report were based on the applicable standards of our profession in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

5.0 Closing

S&ME appreciates the opportunity to provide this report to the North Carolina Department of Transportation, Geotechnical Engineering Unit. Please let us know if you have any questions concerning this report.

Sincerely,

S&ME, Inc.

Joseph R. Williamson, P.E.
Project Engineer
N.C. Registration No. 042168

DocuSigned by:
Gregory J. Canivan
8C4BAC9729DB487...

Gregory J. Canivan, P.E.
Technical Principal
N.C. Registration No. 028593

NORTH CAROLINA PROFESSIONAL SEAL 028593 ENGINEER GREGORY J. CANIVAN

Appendices:

- Appendix I - Certificates of Proficiency
- Appendix II - Instrumented Rod and Accelerometer Calibration Sheets
- Appendix III - CME-550X ATV (SN 290593) SPT Energy Measurements Summary Plots and Tables
- Appendix IV - SPT Energy Evaluation Form (Field Log)

Appendices

Appendix I

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

This documents that

Pile Dynamics, Inc.

Joseph Williamson
S&ME

has on October 31, 2017 achieved the rank of

INTERMEDIATE

on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended*** **that Individuals at the Intermediate level seek Advanced, Master or Expert levels through additional study within four years of the date of this document.**

The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate. This certificate can be verified at www.PDAproficiencytest.com.

Steven A. Hall, Executive Director
Pile Driving Contractors Association

Garland Likins, Senior Partner
Pile Dynamics, Inc.

No. 2426

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

Pile Dynamics, Inc.

This documents that

Greg Canivan
S&ME Inc.

has on October 8, 2014 achieved the rank of

MASTER

on the **Dynamic Measurement and Analysis Proficiency Test.**

The individual identified on this document demonstrated to the degree granted above an understanding of theory, data quality evaluation, interpretation and signal matching for high strain dynamic testing of deep foundations. ***It is recommended*** **that individuals at the Master level seek to attain Expert level through additional study within five years of the date of this document**

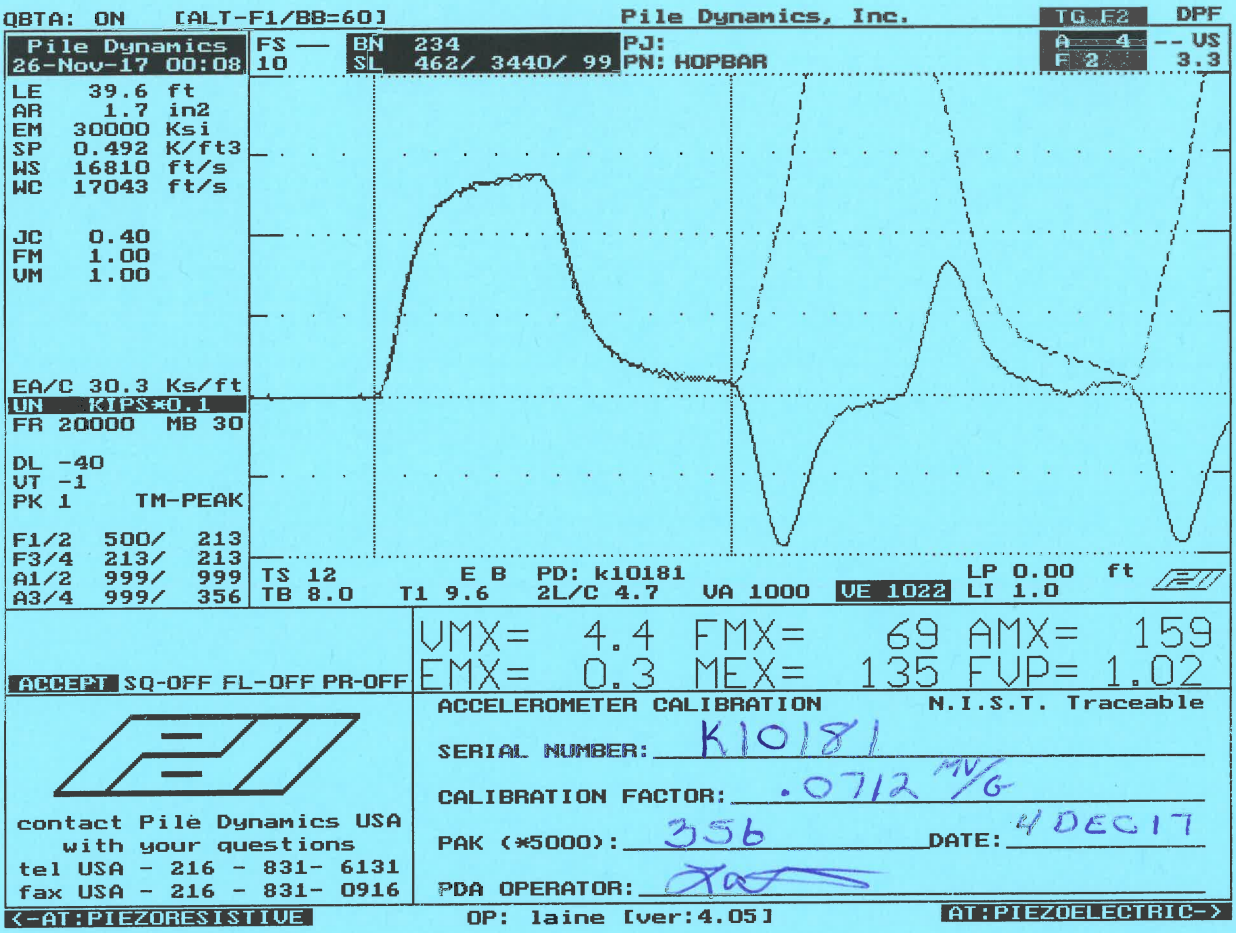
The ability of the individual named to provide appropriate knowledge and advice on a specific project is not implied or warranted by the Pile Driving Contractors Association or Pile Dynamics, Inc. The Pile Driving Contractors Association or Pile Dynamics, Inc. assumes no liability for foundation testing and analysis work performed by the bearer of this certificate. This certificate can be verified at www.PDAproficiencytest.com.

Steven A. Hall, Executive Director
Pile Driving Contractors Association

Garland Likins, President
Pile Dynamics, Inc

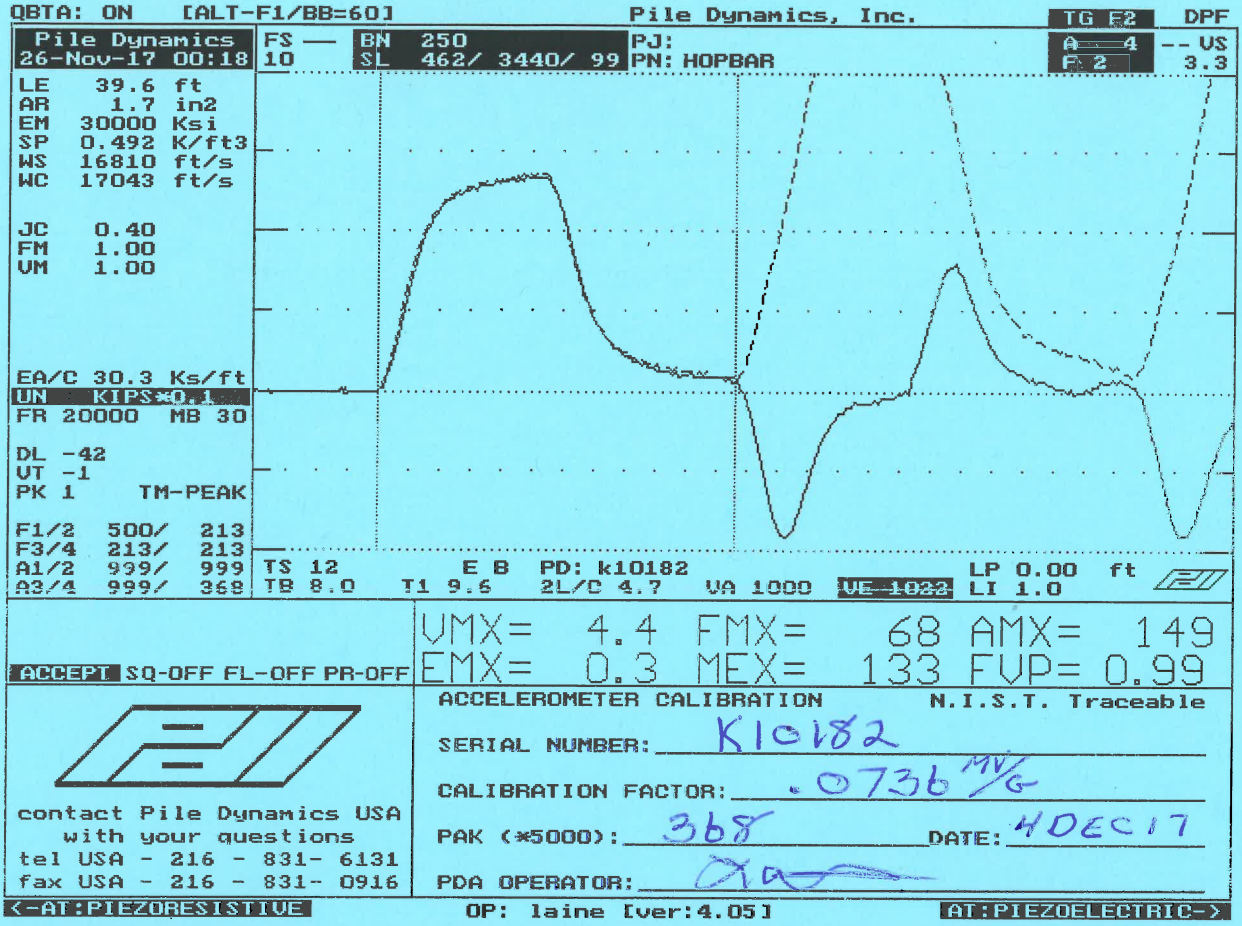
No. 721

Appendix II



Smart Sensor

Smart Chip Programmed By M.W. **on** 4DEC17 **CRC Value** 6A07



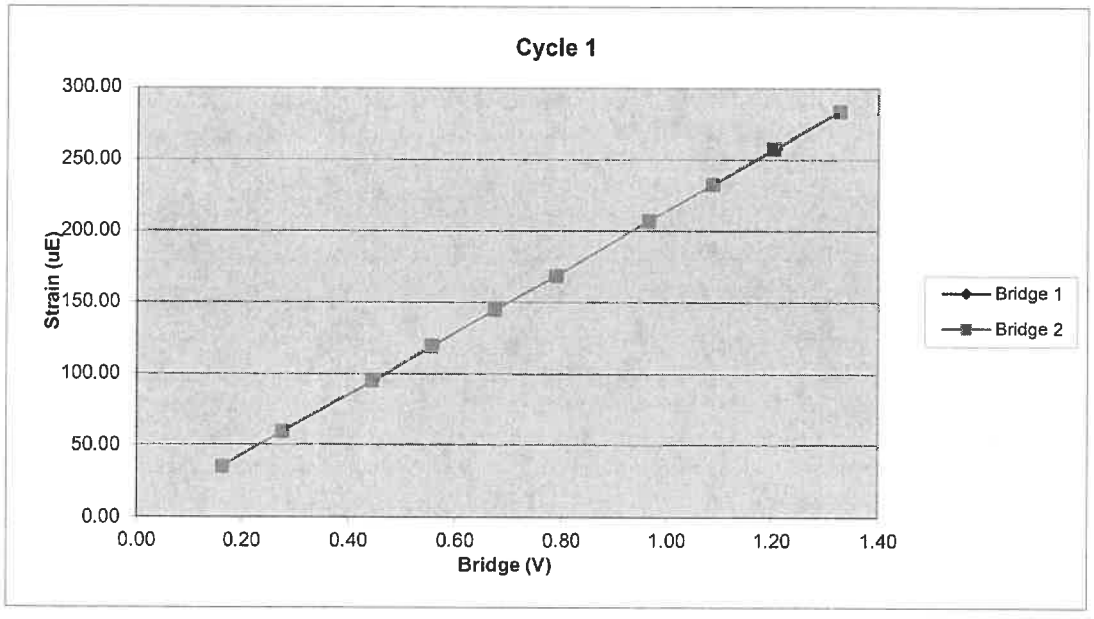
Smart Sensor

Smart Chip Programmed By T.M.W. **on** 4DEC17 **CRC Value** 1798

203AWJ		Cycle 1		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	1238.45	35.09	0.16	0.16
3	2101.82	59.39	0.28	0.28
4	3386.54	94.77	0.44	0.44
5	4235.08	119.35	0.56	0.56
6	5136.73	144.58	0.67	0.67
7	6021.00	168.91	0.79	0.79
8	7359.61	207.34	0.97	0.97
9	8298.94	232.84	1.09	1.09
10	9187.31	257.76	1.21	1.20
11	10120.00	284.12	1.33	1.33

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7630.77**	**Force Calibration (lb/V)**	**7630.97**
Offset	-7.83	Offset	-3.17
Correlation	1.000000	Correlation	0.999999
Strain Calibration (µE/V)	**213.97**	**Strain Calibration (µE/V)**	**213.98**
Offset	0.12	Offset	0.25
Correlation	0.999992	Correlation	0.999995

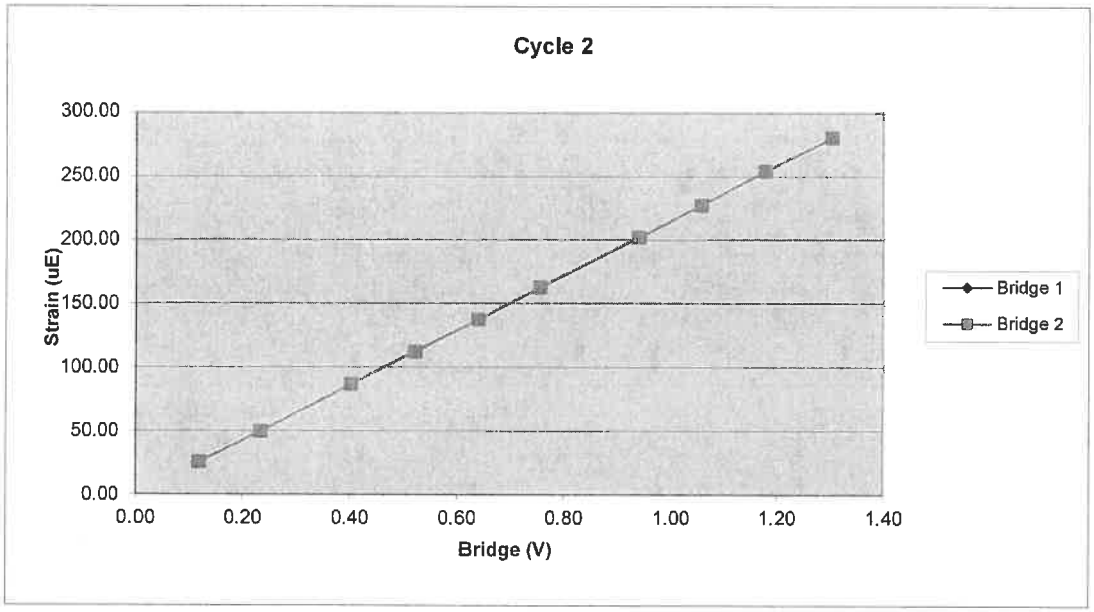
Force Strain Calibration	
EA (Kips)	**35662.28**
Offset	-12.17
Correlation	0.999993



203AWJ		Cycle 2		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	883.29	25.21	0.12	0.12
3	1765.61	49.65	0.23	0.23
4	3049.75	86.59	0.40	0.40
5	3958.42	112.20	0.52	0.52
6	4857.33	137.43	0.64	0.64
7	5743.75	162.78	0.76	0.76
8	7145.42	202.15	0.94	0.94
9	8044.14	227.44	1.06	1.06
10	8969.22	253.99	1.18	1.18
11	9924.95	280.34	1.30	1.30

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7617.86**	**Force Calibration (lb/V)**	**7627.07**
Offset	**-11.91**	Offset	**-18.36**
Correlation	**0.999998**	Correlation	**1.000000**
Strain Calibration (µE/V)	**215.30**	**Strain Calibration (µE/V)**	**215.56**
Offset	**-0.14**	Offset	**-0.33**
Correlation	**0.999995**	Correlation	**0.999996**

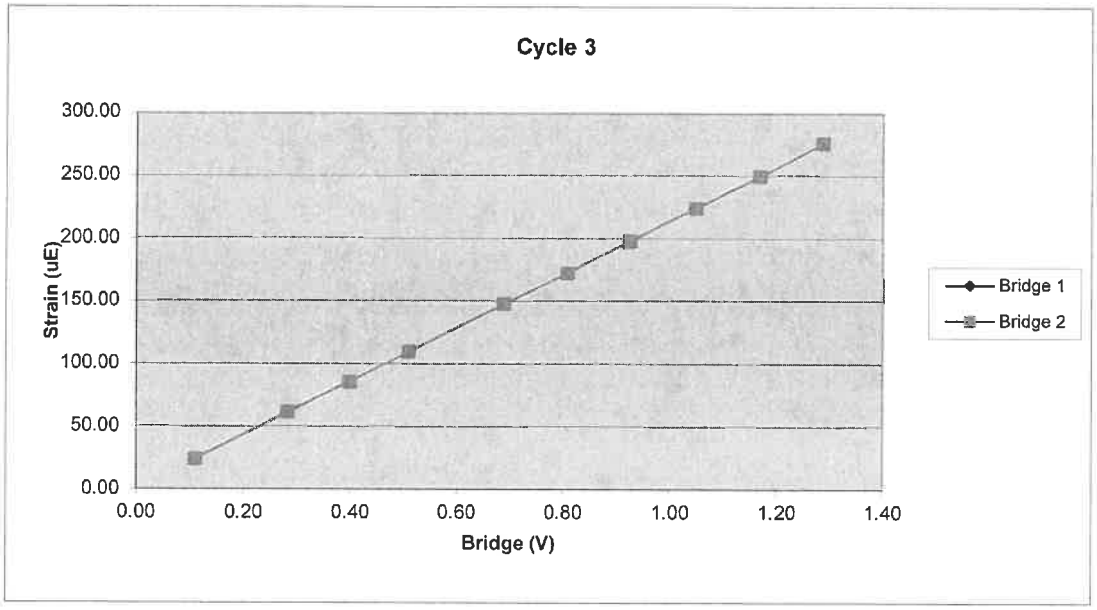
Force Strain Calibration	
EA (Kips)	**35381.61**
Offset	**-6.76**
Correlation	**0.999996**



203AWJ		Cycle 3		
Sample	**Force (lb)**	**Strain (µE)**	**Bridge 1 (V)**	**Bridge 2 (V)**
1	0.00	0.00	0.00	0.00
2	843.85	23.93	0.11	0.11
3	2145.36	61.00	0.28	0.28
4	3029.63	85.25	0.40	0.40
5	3880.71	109.47	0.51	0.51
6	5241.19	147.71	0.69	0.69
7	6147.33	172.47	0.81	0.81
8	7034.72	198.06	0.92	0.92
9	7979.71	224.33	1.05	1.05
10	8906.15	249.58	1.17	1.17
11	9817.56	275.86	1.29	1.29

Bridge 1		**Bridge 2**	
Force Calibration (lb/V)	**7623.93**	**Force Calibration (lb/V)**	**7629.88**
Offset	**-3.49**	Offset	**-9.59**
Correlation	**0.999999**	Correlation	**0.999999**
Strain Calibration (µE/V)	**213.65**	**Strain Calibration (µE/V)**	**213.81**
Offset	**0.47**	Offset	**0.30**
Correlation	**0.999992**	Correlation	**0.999991**

Force Strain Calibration	
EA (Kips)	**35684.19**
Offset	**-20.08**
Correlation	**0.999992**



Bridge Excitation (V) 5
Shunt Resitor (ohm) 60.4k

Calibration Factors	203AWJ		
Bridge 1 (µE/V)	214.31	Bridge 2 (µE/V)	214.45
EA Factor (Kips)	35576.02	Area (in^2)	1.19

Calibrated by: David
Calibrated Date: 2/26/2019

Pile Dynamics Inc
30725 Aurora Rd
Solon, OH 44139

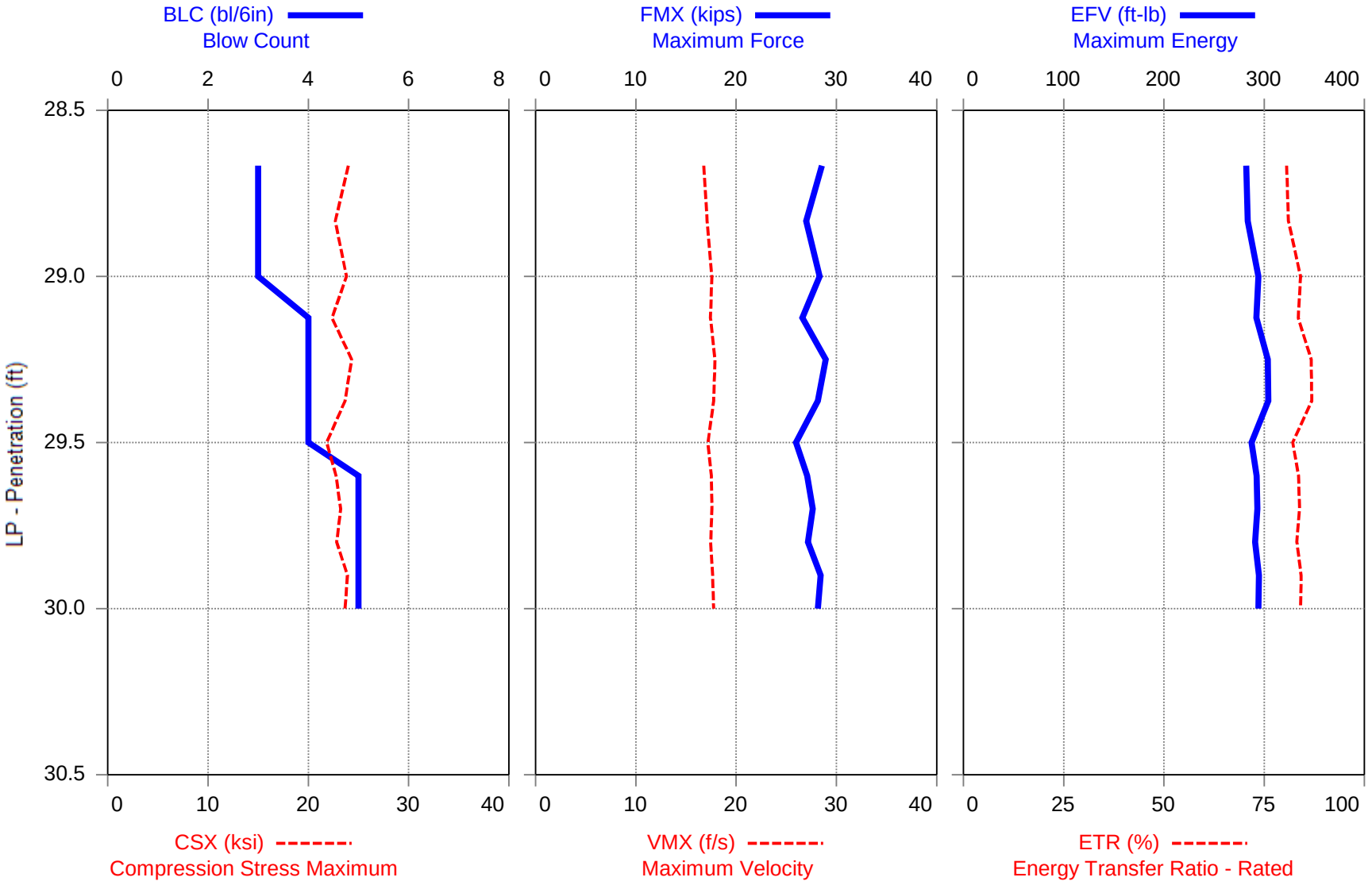
Traceable to N.I.S.T.

Appendix III

Pile Dynamics, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 02-June-2019 **Test started: 01-May-2019**

CME-550X (SN 290593) - 28.5-30.0 FEET
TEST HOLE



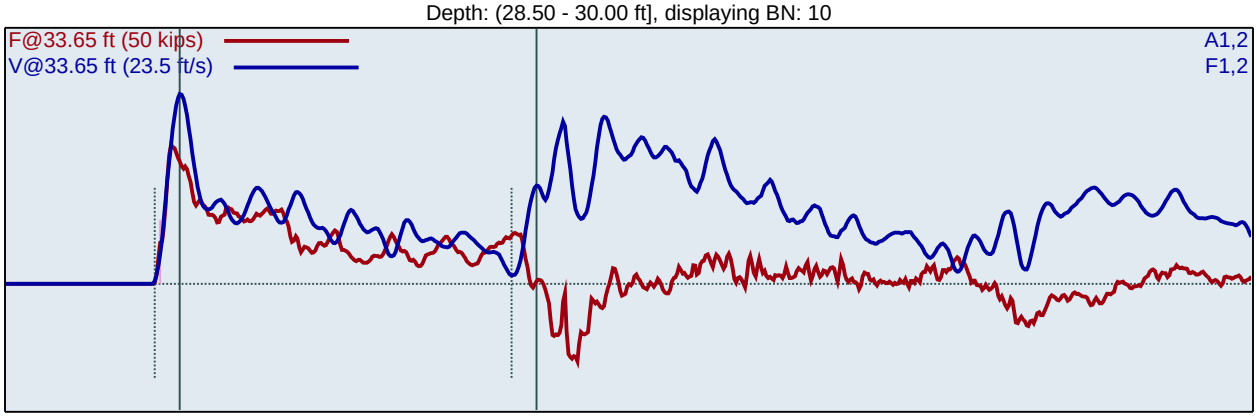
CME-550X (SN 290593)
JRW
TEST HOLE

28.5-30.0 FEET
Test date: 5/1/2019

AR: 1.19 in^2
LE: 33.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (28.50 - 30.00 ft], displaying BN: 10



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	28.67	3	1.9	29	16.8	2.21	24.0	2.02	282	80.6
2	28.83	3	55.5	27	17.1	2.03	22.7	2.00	284	81.1
3	29.00	3	52.9	28	17.6	2.01	23.8	2.00	294	84.1
4	29.13	4	54.0	27	17.4	1.66	22.4	1.50	292	83.5
5	29.25	4	53.7	29	17.9	1.66	24.3	1.50	304	86.7
6	29.38	4	53.6	28	17.8	1.61	23.7	1.50	304	86.9
7	29.50	4	53.9	26	17.2	1.51	21.8	1.50	287	82.1
8	29.60	5	53.5	27	17.5	1.38	22.8	1.20	293	83.6
9	29.70	5	53.7	28	17.6	1.33	23.2	1.20	293	83.8
10	29.80	5	53.8	27	17.5	1.29	22.8	1.20	291	83.1
11	29.90	5	54.0	28	17.7	1.24	23.9	1.20	295	84.2
12	30.00	5	53.8	28	17.7	1.20	23.7	1.20	294	84.1
		Average	53.8	28	17.6	1.43	23.2	1.33	295	84.2
		Std Dev	0.2	1	0.2	0.17	0.8	0.15	5	1.5
		Maximum	54.0	29	17.9	1.66	24.3	1.50	304	86.9
		Minimum	53.5	26	17.2	1.20	21.8	1.20	287	82.1

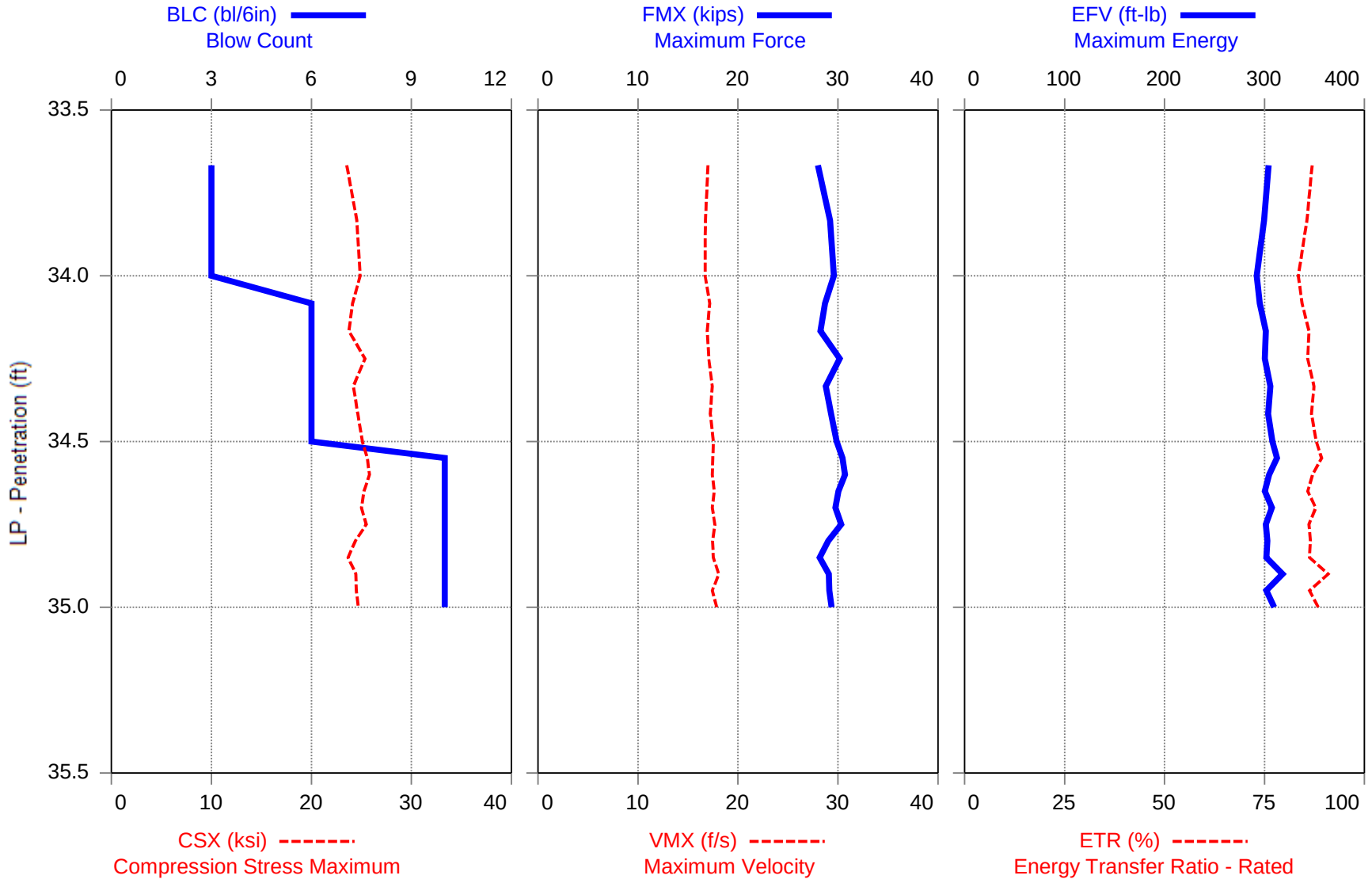
N-value: 9

Sample Interval Time: 12.24 seconds.

Pile Dynamics, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 02-June-2019 **Test started: 01-May-2019**

CME-550X (SN 290593) - 33.5-35.0 FEET
TEST HOLE



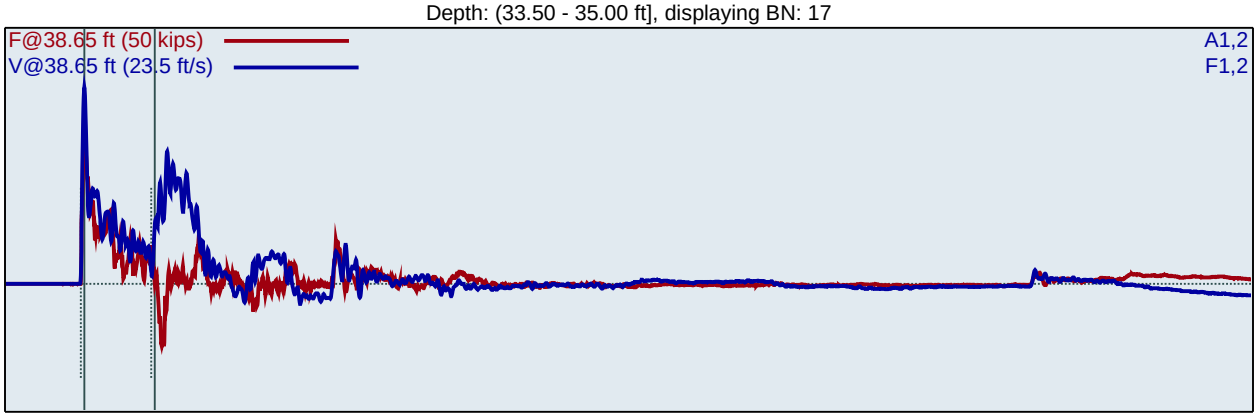
CME-550X (SN 290593)
JRW
TEST HOLE

33.5-35.0 FEET
Test date: 5/1/2019

AR: 1.19 in^2
LE: 38.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (33.50 - 35.00 ft], displaying BN: 17



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	33.67	3	1.9	28	17.0	2.12	23.5	2.02	304	86.9
2	33.83	3	54.8	29	16.7	2.01	24.5	2.00	300	85.6
3	34.00	3	53.2	30	16.7	2.00	24.9	2.00	292	83.5
4	34.08	6	53.3	29	17.2	1.35	24.1	1.00	295	84.4
5	34.17	6	53.6	28	16.9	1.26	23.7	1.00	301	86.1
6	34.25	6	53.8	30	17.1	1.15	25.4	1.00	300	85.8
7	34.33	6	53.2	29	17.4	1.12	24.2	1.00	306	87.4
8	34.42	6	54.0	29	17.2	1.07	24.6	1.03	304	86.7
9	34.50	6	53.5	30	17.5	1.01	25.1	0.99	308	87.9
10	34.55	10	53.8	30	17.5	0.92	25.6	0.60	312	89.3
11	34.60	10	53.7	31	17.4	0.86	25.8	0.60	305	87.0
12	34.65	10	53.3	30	17.6	0.80	25.3	0.60	300	85.8
13	34.70	10	53.8	30	17.4	0.79	25.0	0.59	307	87.8
14	34.75	10	53.8	30	17.7	0.76	25.5	0.60	301	86.1
15	34.80	10	53.8	29	17.5	0.75	24.4	0.60	303	86.5
16	34.85	10	53.8	28	17.5	0.72	23.7	0.60	302	86.2
17	34.90	10	53.9	29	18.1	0.71	24.4	0.60	318	90.9
18	34.95	10	53.8	29	17.4	0.66	24.5	0.60	302	86.3
19	35.00	10	53.5	29	17.9	0.68	24.7	0.61	310	88.4
		Average	53.7	29	17.5	0.91	24.7	0.75	305	87.0
		Std Dev	0.2	1	0.3	0.21	0.6	0.20	5	1.5
		Maximum	54.0	31	18.1	1.35	25.8	1.03	318	90.9
		Minimum	53.2	28	16.9	0.66	23.7	0.59	295	84.4

N-value: 16

Sample Interval Time: 20.08 seconds.

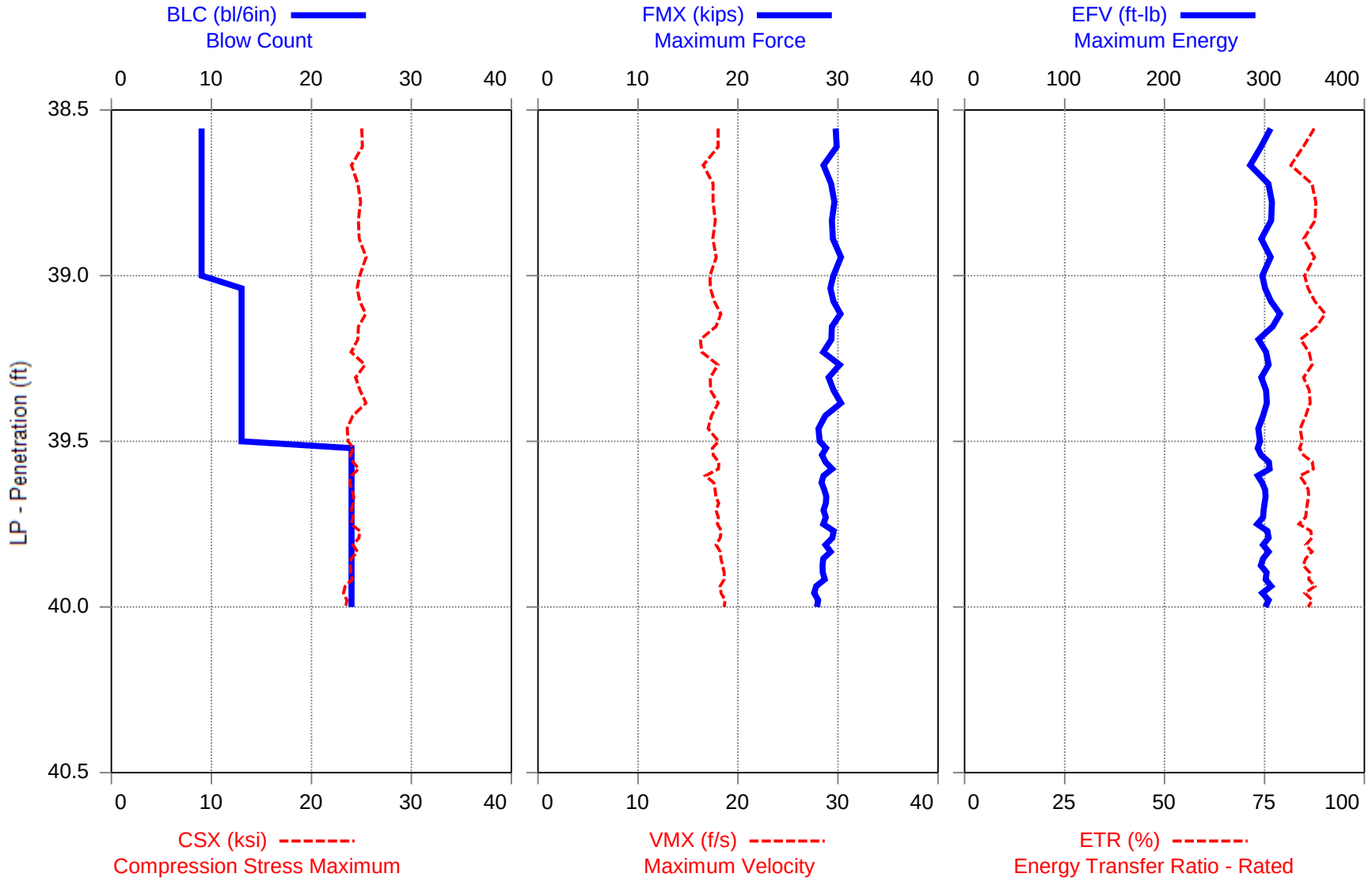
Pile Dynamics, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 02-June-2019

Test started: 01-May-2019

CME-550X (SN 290593) - 38.5-40.0 FEET

TEST HOLE



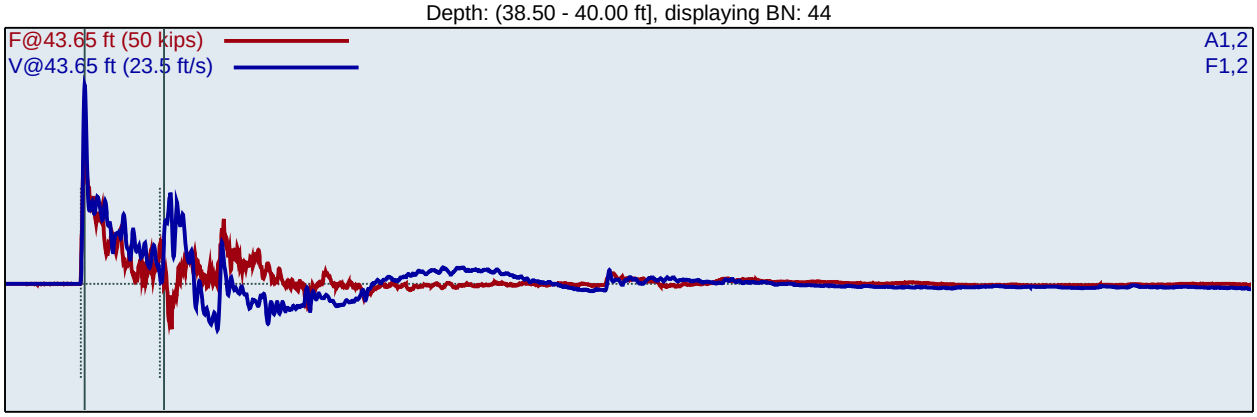
CME-550X (SN 290593)
JRW
TEST HOLE

38.5-40.0 FEET
Test date: 5/1/2019

AR: 1.19 in^2
LE: 43.65 ft
WS: 16807.9 ft/s

SP: 0.492 k/ft3
EM: 30000 ksi

Depth: (38.50 - 40.00 ft], displaying BN: 44



F1 : [203 AWJ-1] 214.31 PDICAL (1) FF1
F2 : [203 AWJ-2] 214.45 PDICAL (1) FF1

A1 (PR): [K10181] 356 mv/6.4v/5000g (1) VF1
A2 (PR): [K10182] 368 mv/6.4v/5000g (1) VF1

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement

CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

BL#	LP ft	BC /6"	BPM bpm	FMX kips	VMX ft/s	DMX in	CSX ksi	DFN in	EFV ft-lb	ETR %
1	38.56	9	1.9	30	18.0	1.15	25.0	0.67	306	87.4
2	38.61	9	54.5	30	18.0	0.78	25.1	0.66	296	84.7
3	38.67	9	53.4	29	16.5	0.79	24.0	0.67	285	81.6
4	38.72	9	54.0	29	17.5	0.77	24.6	0.67	304	86.8
5	38.78	9	53.2	30	17.5	0.73	24.9	0.67	307	87.8
6	38.83	9	53.8	29	17.7	0.73	24.7	0.67	307	87.6
7	38.89	9	53.7	29	17.5	0.73	24.8	0.69	297	84.8
8	38.94	9	53.6	30	17.8	0.74	25.5	0.66	306	87.5
9	39.00	9	53.4	30	17.2	0.73	24.8	0.67	298	85.0
10	39.04	13	53.9	29	17.2	0.74	24.6	0.46	301	85.9
11	39.08	13	53.6	30	17.6	0.71	24.8	0.46	306	87.6
12	39.12	13	53.4	30	18.3	0.66	25.4	0.46	316	90.2
13	39.15	13	53.6	29	17.8	0.61	24.7	0.46	308	88.0
14	39.19	13	54.0	29	16.2	0.56	24.6	0.46	294	84.0
15	39.23	13	53.6	29	16.4	0.59	24.0	0.46	301	86.1
16	39.27	13	53.5	30	18.0	0.59	25.4	0.46	304	86.9
17	39.31	13	53.4	29	17.2	0.57	24.4	0.46	297	84.8
18	39.35	13	53.1	30	17.2	0.58	24.9	0.46	302	86.2
19	39.38	13	53.6	30	18.0	0.57	25.5	0.46	302	86.4
20	39.42	13	53.5	29	17.4	0.57	24.1	0.46	298	85.3
21	39.46	13	53.6	28	17.0	0.56	23.6	0.46	294	83.9
22	39.50	13	53.2	28	18.1	0.54	23.7	0.46	296	84.5
23	39.52	24	53.6	29	17.4	0.50	24.2	0.25	293	83.8
24	39.54	24	52.5	28	17.5	0.50	23.9	0.25	297	84.7
25	39.56	24	53.8	29	18.1	0.50	24.2	0.25	304	86.9
26	39.58	24	53.2	29	18.0	0.50	24.7	0.25	305	87.2
27	39.60	24	53.0	29	16.7	0.49	24.0	0.25	293	83.8

28	39.63	24	53.8	28	17.6	0.49	23.8	0.25	298	85.0
29	39.65	24	53.6	29	17.7	0.49	24.0	0.25	301	85.9
30	39.67	24	52.3	29	17.8	0.49	24.2	0.25	301	86.0
31	39.69	24	53.7	29	18.1	0.48	24.2	0.25	300	85.7
32	39.71	24	53.8	29	17.8	0.48	24.0	0.25	299	85.5
33	39.73	24	53.4	29	18.0	0.48	24.2	0.25	298	85.3
34	39.75	24	53.1	29	17.9	0.47	24.0	0.25	293	83.6
35	39.77	24	53.8	30	18.3	0.47	24.8	0.25	303	86.6
36	39.79	24	53.2	29	18.2	0.47	24.7	0.24	304	86.9
37	39.81	24	53.0	29	17.8	0.45	24.2	0.25	299	85.3
38	39.83	24	53.3	29	18.2	0.45	24.6	0.25	304	86.9
39	39.85	24	53.1	29	18.3	0.44	24.0	0.25	299	85.3
40	39.88	24	53.9	28	18.5	0.44	23.9	0.25	296	84.7
41	39.90	24	53.4	28	18.6	0.44	23.9	0.25	302	86.3
42	39.92	24	52.7	29	18.6	0.44	24.1	0.25	301	86.0
43	39.94	24	43.7	28	18.2	0.43	23.4	0.25	307	87.6
44	39.96	24	55.8	28	18.3	0.43	23.2	0.25	298	85.1
45	39.98	24	52.6	28	18.7	0.44	23.5	0.25	304	86.9
46	40.00	24	54.0	28	18.6	0.43	23.4	0.25	301	85.9
		Average	53.2	29	17.8	0.51	24.2	0.32	300	85.9
		Std Dev	1.7	1	0.6	0.08	0.5	0.10	5	1.3
		Maximum	55.8	30	18.7	0.74	25.5	0.46	316	90.2
		Minimum	43.7	28	16.2	0.43	23.2	0.24	293	83.6
					N-value: 37					

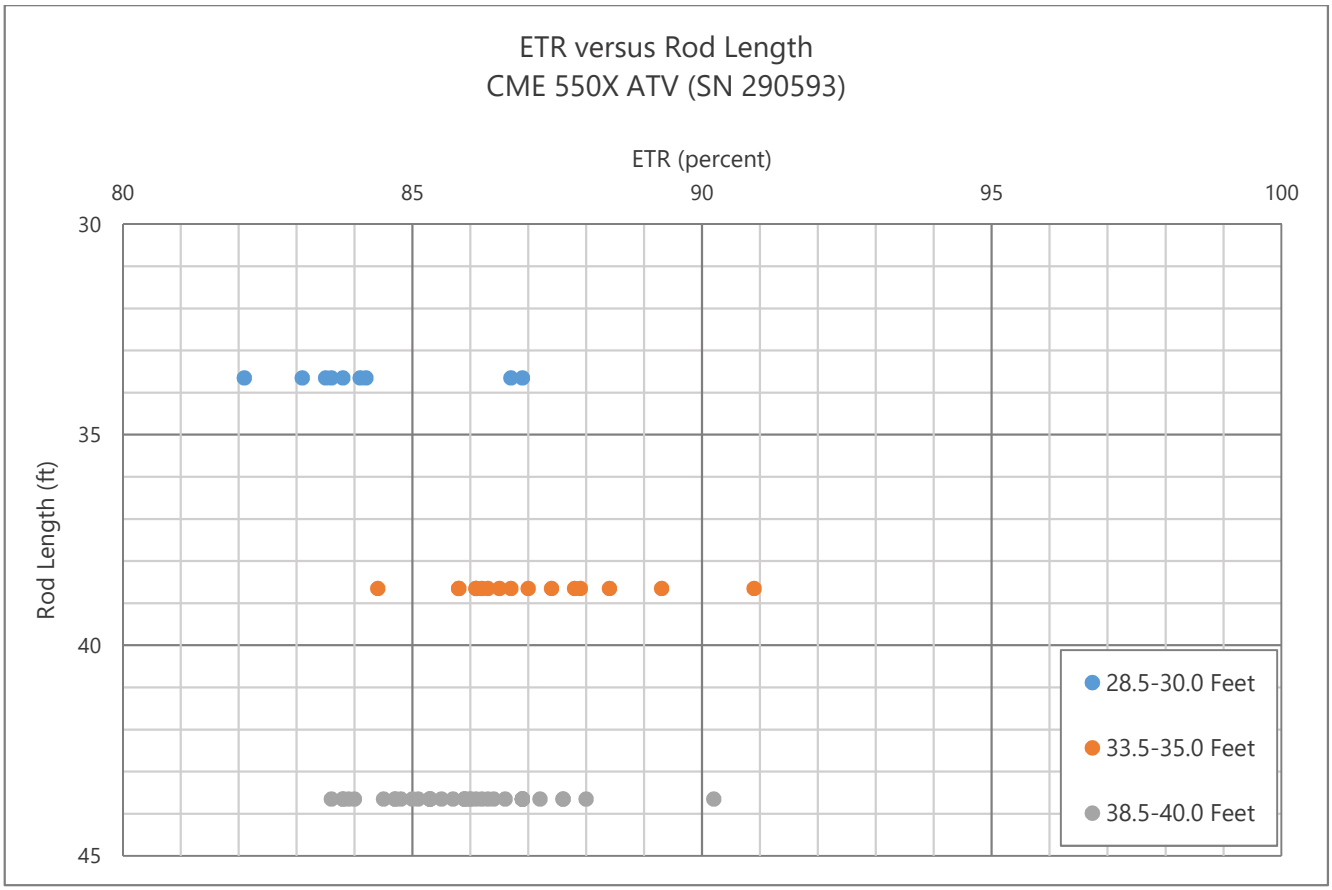
Sample Interval Time: 50.63 seconds.

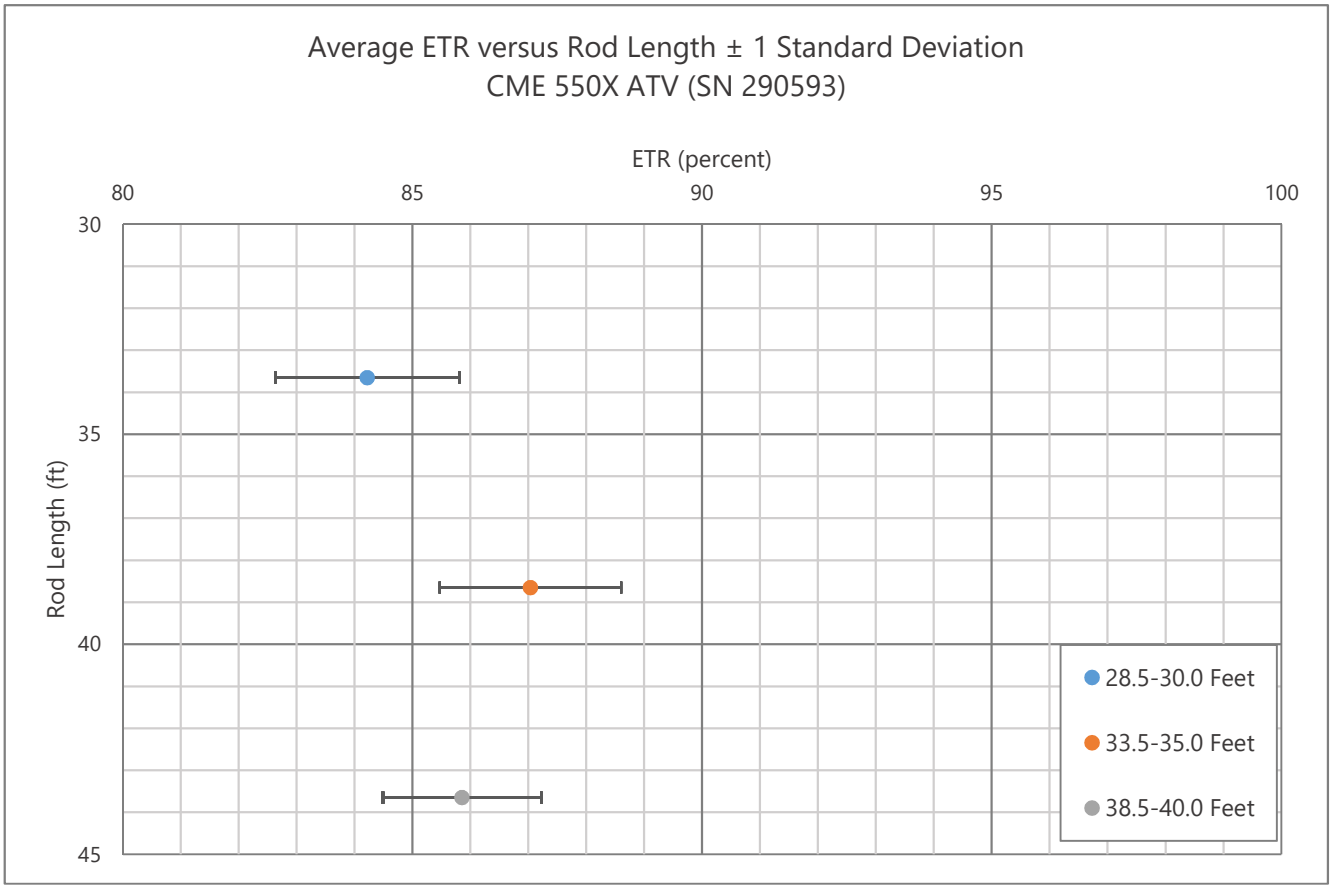
Summary of SPT Test Results

Project: CME-550X (SN 290593), Test Date: 5/1/2019

BPM: Blows/Minute
FMX: Maximum Force
VMX: Maximum Velocity
DMX: Maximum Displacement
CSX: Compression Stress Maximum
DFN: Final Displacement
EFV: Maximum Energy
ETR: Energy Transfer Ratio - Rated

Instr. Length ft	Start Depth ft	Final Depth ft	Blows Applied /6"	**N Value**	**N60 Value**	Average BPM bpm	Average FMX kips	Average VMX ft/s	Average DMX in	Average CSX ksi	Average DFN in	Average EFV ft-lb	Average ETR %
33.65	28.50	30.00	**3-4-5**	**9**	**12**	53.8	28	17.6	1.43	23.2	1.33	295	84.2
38.65	33.50	35.00	**3-6-10**	**16**	**22**	53.7	29	17.5	0.91	24.7	0.75	305	87.0
43.65	38.50	40.00	**9-13-24**	**37**	**52**	53.2	29	17.8	0.51	24.2	0.32	300	85.9
			Overall Average Values:			53.4	29	17.7	0.75	24.2	0.58	301	85.9
			Standard Deviation:			1.3	1	0.5	0.36	0.8	0.39	6	1.7
			Overall Maximum Value:			55.8	31	18.7	1.66	25.8	1.50	318	90.9
			Overall Minimum Value:			43.7	26	16.2	0.43	21.8	0.24	287	82.1


ETR versus Rod Length
CME 550X ATV (SN 290593)
ETR (percent)
80
85
90
95
100
Rod Length (ft)
30
35
40
45
28.5-30.0 Feet
33.5-35.0 Feet
38.5-40.0 Feet


Average ETR versus Rod Length ± 1 Standard Deviation
CME 550X ATV (SN 290593)
ETR (percent)
80
85
90
95
100
Rod Length (ft)
30
35
40
45
28.5-30.0 Feet
33.5-35.0 Feet
38.5-40.0 Feet

Appendix IV

SPT Energy Evaluation Form

Project:	SPT ENERGY TESTING	**Date:**	5/1/2019
Project No.:	6235-17-020	**Weather:**	CLEAR / 80s
Boring No.:	Test Hole	**Drill Rod Type:**	5' LONG AWJ

On-site Personnel

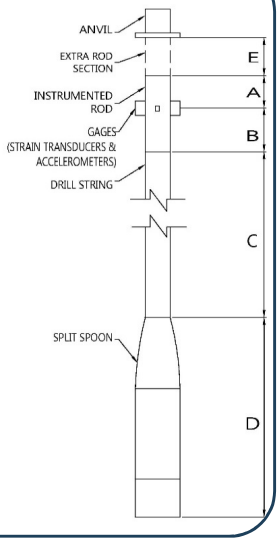
Drilling Company:	S&ME, INC.
Rig Operator:	F. JOHNSON
Engr/Geologist:	N/A
Client Rep.:	N/A
Analyzer Oper.:	J. WILLIAMSON

Rig/Hammer Info

Drill Rig Make/Model:	CME-550X
Carrier Type:	ATV
Rig Serial No.:	290593
Hammer Type/Model:	CME-550X
Hammer Serial No.:	N/A - BUILT IN
Hammer Drop System:	AUTOMATIC
Lubrication Condition:	PER MANUFACTURER
Manufacturer Recommended Operation Rate (bpm):	50
Typical Drop Height (in.):	30
Typical Hammer Weight (lbs):	140
Anvil Dimension (in.):	12
Drilling Method:	3-1/4" HSA

Rod Info

(A + E) Impact Surface to Gages Length:	1.2	ft
(B) Instr. Rod Length below Gages:	0.8	ft
(A) + (B) Instr. Rod Length:	2.0	ft
(D) Spoon Length:	2.85	ft
(E) Rod Length Above Instr. Rod (if applicable):	N/A	ft
Instr. Rod S/N:	203AWJ	
Instr. Rod Outside Dia.:	1.75	in.
Instr. Rod Area:	1.19	in^2
PDA Make/Model:	PDI/PAX	
PDA Serial No.:	3733L	
Calib. Pulse Test (y/n):	Y	



Gage Info

Gage		Serial No.	Calibration No.
Accel.	A3	K10181	356.0
	A4	K10182	368.0
Strain	F3	203AWJ-1	214.31
	F4	203AWJ-2	214.45

Date of Test	Test Depth Increment (ft to ft)	Test Time Start / Stop (military)	Length of Drill String (ft) ***(C)***	(LE) Length below Gages (ft) ***(B) + (C) + (D)***	Avg. Meas. Hammer Rate (BPM)	SPT Blow Counts 6"	12"	18"	N-Value	Drop Height in Tolerance (y/n)	
5/1/2019	28.5-30.0	15:00	30	33.65	54	3	4	5	9	Y	SA SI
	33.5-35.0	15:08	35	38.65	54	3	6	10	16	Y	SA SI
	38.5-40.0	15:19	40	43.65	53	9	13	24	37	Y	SI SA
	43.5-45.0	15:33	45	48.65	54	44	50/0.2	-	100+	Y	WR

Notes: Auger refusal encountered at 46 feet.

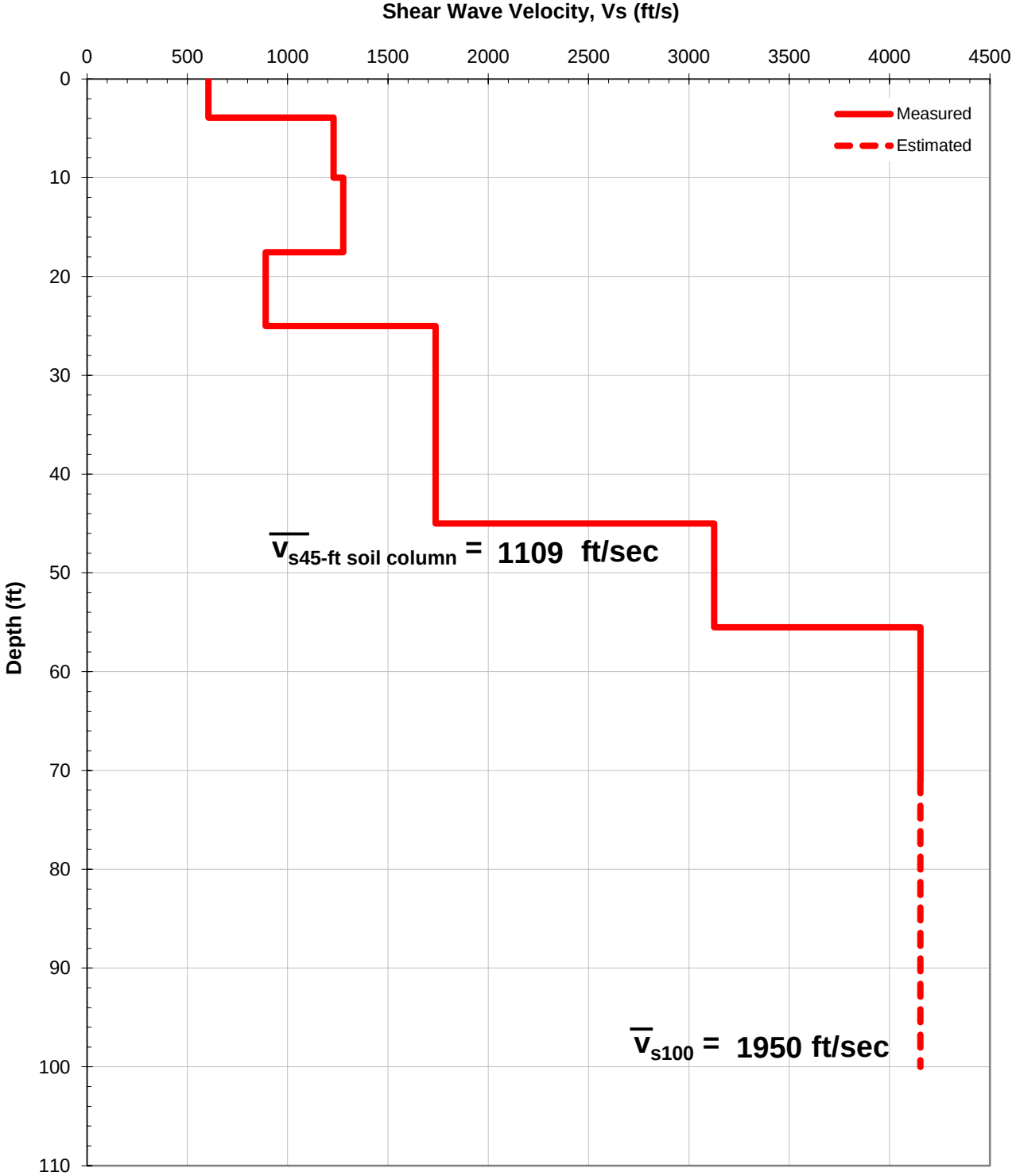
NOTE: (1) Note any unusual hammer operating conditions that affect the hammer performance, or changes in operating conditions (e.g. veritcality, weather, or lubrication between trials). (2) Note any changes in rod diameter along drill string and record locations of short rod sections.

Joseph Wilson — Prepared By (print/signature)

5/1/2019 — Date

Appendix VI – Shear Wave Velocity Measurements

Shear Wave Velocity Profile SW-1
I-77 Panthers Interchange
Rock Hill, South Carolina
1461-19-069



Appendix VII – ADRS Curve

3-Point Acceleration Design Response Spectrum

SCDOT v3.0 - 05/14/2019

Project ID:	P038652			Latitude:	34.9587
Route:	I-77	County:	46 - York	Longitude:	80.9798
Project:	I-77 Interchange near Exit 82				

Designer:	N. Harman - Support
Date:	1/27/2020

Design EQ	PGA	S_{DS}	S_{D1}	M_W	R	PGV	$D_{a5\text{-}95}$	T '$_o$
	g	g	g	-	km	inches/sec	sec	sec
FEE	0.04	0.08	0.01	7.31	182.80	0.35	46.67	0.03
SEE	0.06	0.15	0.02	7.29	171.97	0.78	44.78	0.07

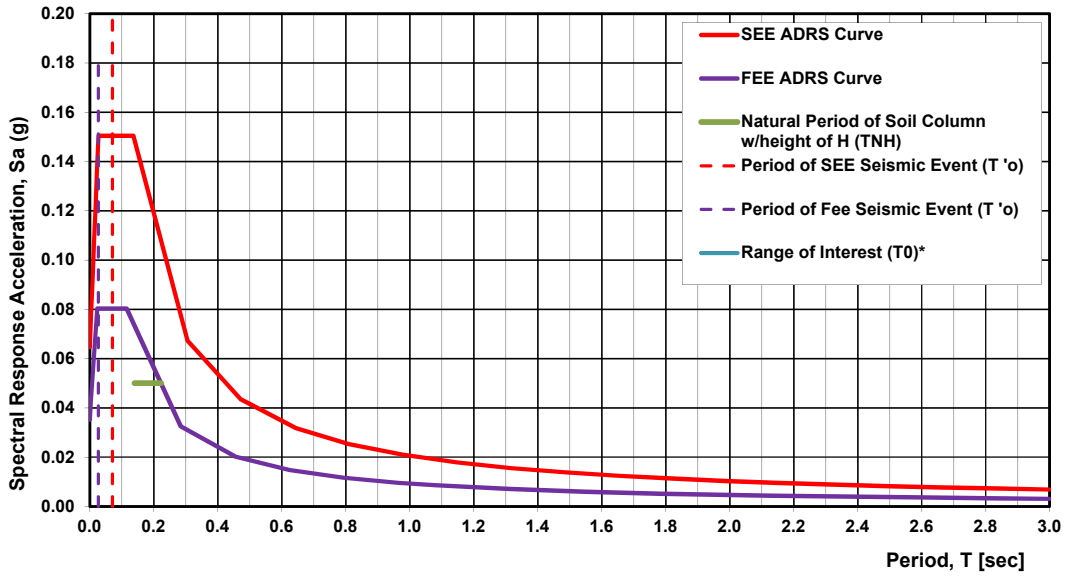
Fundamental Period of Structure, T_0^*	Range of Interest sec		$V^*_{s,H}$	H	T_{NH} sec	
sec	$0.5*T_0$	$2.0*T_0$	ft/sec	ft	$(4*H)/V^*_{s,H}$	$(6*H)/V^*_{s,H}$
0.00	0.00	0.00	1208.89	45.00	0.14	0.22
0.00	0.00	0.00	H = B-C Boundary			

Damping:	5%
Geologic Condition:	Geologically Realistic (Q = 100)*
	SCP
ADRS Location within Soil Column:	At Ground Surface

South Carolina Piedmont

*Same Geologic Condition as used in SCENARIO_PC (2006)

SC Seismic ADRS Curve



	FEE Data			SEE Data	
	T	S_a		T	S_a
	0.00	0.035		0.00	0.065
	0.00	0.043		0.00	0.079
	0.01	0.050		0.01	0.093
	0.01	0.058		0.01	0.108
	0.02	0.065		0.02	0.122
	0.02	0.073		0.02	0.136
To	0.02	0.080	To	0.03	0.150
	0.03	0.080		0.04	0.150
	0.04	0.080		0.05	0.150
	0.05	0.080		0.05	0.150
	0.05	0.080		0.06	0.150
	0.06	0.080		0.07	0.150
	0.07	0.080		0.08	0.150
	0.08	0.080		0.09	0.150
	0.08	0.080		0.10	0.150
	0.09	0.080		0.11	0.150
	0.10	0.080		0.12	0.150
	0.11	0.080		0.13	0.150
Ts	0.12	0.080	Ts	0.14	0.150
	0.28	0.032		0.31	0.067
	0.45	0.020		0.47	0.043
	0.62	0.015		0.64	0.032
	0.79	0.012		0.81	0.025
	0.96	0.010		0.98	0.021
	1.13	0.008		1.15	0.018
	1.30	0.007		1.32	0.016
	1.47	0.006		1.48	0.014
	1.64	0.006		1.65	0.012
	1.81	0.005		1.82	0.011
	1.98	0.005		1.99	0.010
	2.15	0.004		2.16	0.010
	2.32	0.004		2.33	0.009
	2.49	0.004		2.49	0.008
	2.66	0.003		2.66	0.008
	2.83	0.003		2.83	0.007
	3.00	0.003		3.00	0.007

Appendix VIII – Split-spoon Sample Laboratory Test Results

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

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

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/04 - 2/05/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sampled by:	S&ME/Metro	Sample Date(s):	1-6/8-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-1	SS-1	2 - 4'	YM-6	93.70	193.89	168.81	25.08	33.4%
IB-1	SS-3	6 - 8'	D-22	92.86	250.34	222.87	27.47	21.1%
IB-1	SS-4	8 - 10'	YM-2	90.97	250.61	214.62	35.99	29.1%
IB-1	SS-5	13.5 - 15'	D-11	93.30	250.58	223.70	26.88	20.6%
IB-1	SS-6	18.5 - 20'	D-9	91.01	210.07	185.05	25.02	26.6%
IB-1	SS-7	23.5 - 25'	D-17	99.93	204.96	193.90	11.06	11.8%
IB-1	SS-8	28.5 - 30'	D-16	97.75	251.00	231.07	19.93	14.9%
IB-1	SS-9	33.5 - 34.2	D-10	95.41	252.42	235.28	17.14	12.3%

Notes / Deviations / References

Benjamin Kovaleski — *Technician Name*

NICET Lab Level III / 117226 — *Certification Type / No.*

Robert C. Bruorton, P.E. — *Technical Responsibility*

Senior Engineer — *Position*

2/18/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence	Sample Date(s):	1/6-17/20
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-3	SS-1	0 - 2	314	128.89	272.98	247.83	25.15	21.1%
IB-3	SS-2	2 - 4	305	130.46	236.86	214.03	22.83	27.3%
IB-3	SS-3	4 - 6	301	129.07	209.88	192.31	17.57	27.8%
IB-3	SS-4	6 - 8	40	124.15	224.07	204.33	19.74	24.6%
IB-3	SS-5	8 - 10	313	131.62	218.78	194.54	24.24	38.5%
IB-3	SS-6	13.5 - 15	300	130.41	262.26	216.82	45.44	52.6%
IB-3	SS-7	18.5 - 20	43	123.50	266.90	235.74	31.16	27.8%
IB-3	SS-8	23.5 - 25	311	129.51	324.67	287.58	37.09	23.5%
IB-3	SS-9	28.5 - 30	50	123.87	*	284.69	*	*

Notes / Deviations / References *Wet weight and tare of the sample was recorded incorrectly. The moisture content was not determined.

Matthew Wolfe — *Technician Name*

NICET 123218 — *Certification Type / No.*

Robert C. Bruorton, P.E. — *Technical Responsibility*

Senior Engineer — *Position*

2/13/2020 — *Date*

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

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

Project No:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/05 - 2/14/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Metro	Sample Dates:	1-6/8-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Boring #, Sample #	ft.		grams	grams	grams	grams	%
IB-1, SS-1	2 - 4'	YM-6	93.70	193.89	168.81	106.35	**83.2%**
IB-1, SS-3	6 - 8'	D-22	92.86	250.34	222.87	146.43	**58.8%**
IB-1, SS-4	8 - 10'	YM-2	90.97	250.61	214.62	133.69	**65.5%**
IB-1, SS-5	13.5 - 15'	D-11	93.30	250.58	223.70	173.65	**38.4%**
IB-1, SS-6	18.5 - 20'	D-9	91.01	210.07	185.05	148.64	**38.7%**
IB-1, SS-7	23.5 - 25'	D-17	99.93	204.96	193.90	165.66	**30.1%**
IB-1, SS-8	28.5 - 30'	D-16	97.75	251.00	231.07	186.34	**33.6%**
IB-1, SS-9	33.5 - 34.2	D-10	95.41	252.42	235.28	202.65	**23.3%**

Balance ID. *13942* *Calibration Date:* *9/10/19* *#200 Sieve* *23239* *Calibration Date:* *2/19/19*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Benjamin Kovaleski
Technician Name

NICET Lab Level III / 117226
Certification Type/No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/18/2020
Date

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project No:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence	Sample Dates:	1/6-17/20
Sampling Method:	Split Spoon	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
IB-3 SS-1	0 - 2	314	128.9	273.0	247.8	173.7	**62.3%**
IB-3 SS-2	2 - 4	305	130.5	236.9	214.0	159.0	**65.9%**
IB-3 SS-3	4 - 6	301	129.1	209.9	192.3	138.1	**85.8%**
IB-3 SS-4	6 - 8	40	124.2	224.1	204.3	147.5	**70.9%**
IB-3 SS-5	8 - 10	313	131.6	218.8	194.5	150.0	**70.7%**
IB-3 SS-6	13.5 - 15	300	130.4	262.3	216.8	171.5	**52.4%**
IB-3 SS-7	18.5 - 20	43	123.5	266.9	235.7	204.0	**28.3%**
IB-3 SS-8	23.5 - 25	311	129.5	324.7	287.6	238.4	**31.1%**
IB-3 SS-9	28.5 - 30	50	123.9	*	284.7	183.1	**63.2%**

Balance ID. *25722* *Calibration Date:* *8/5/19* *#200 Sieve* *28632* *Calibration Date:* *1/2/20*

References / Comments / Deviations: *Wet weight and tare of sample was recorded incorrectly. The moisture content was not determined.

Samples are washed using Method B, "Washing Using a Wetting Agent."

Matthew Wolfe
Technician Name

NICET 123218
Certification Type/No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

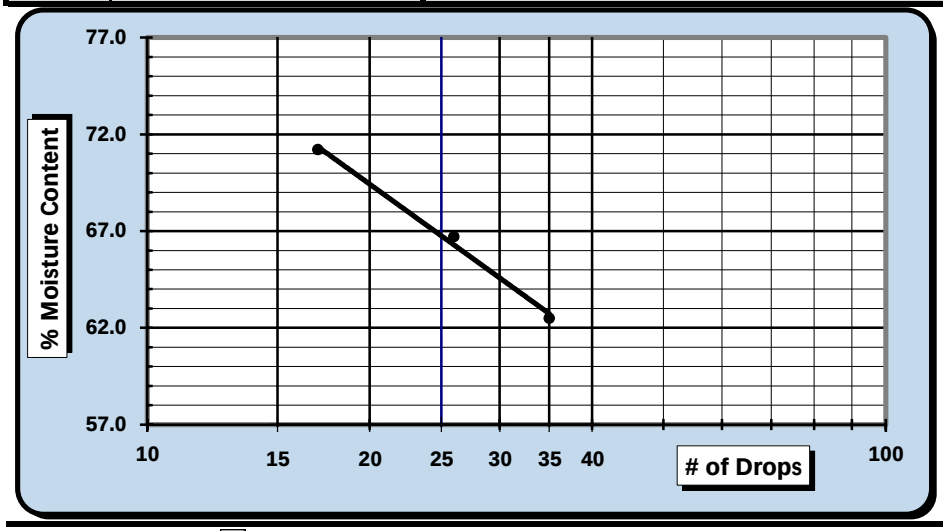
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-1	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	2 - 4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	P-1	P-2	P-3				1		
A	Tare Weight	16.33	15.22	16.52				12.11		
B	Wet Soil Weight + A	34.81	33.66	33.97				22.24		
C	Dry Soil Weight + A	27.70	26.28	26.71				20.13		
D	Water Weight (B-C)	7.11	7.38	7.26				2.11		
E	Dry Soil Weight (C-A)	11.37	11.06	10.19				8.02		
F	% Moisture (D/E)*100	62.5%	66.7%	71.2%				26.3%		
N	# OF DROPS	35	26	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.3%		



One Point Liquid Limit

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

NP, Non-Plastic ☐

Liquid Limit	**67**
Plastic Limit	**26**
Plastic Index	**41**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 83.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/17/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

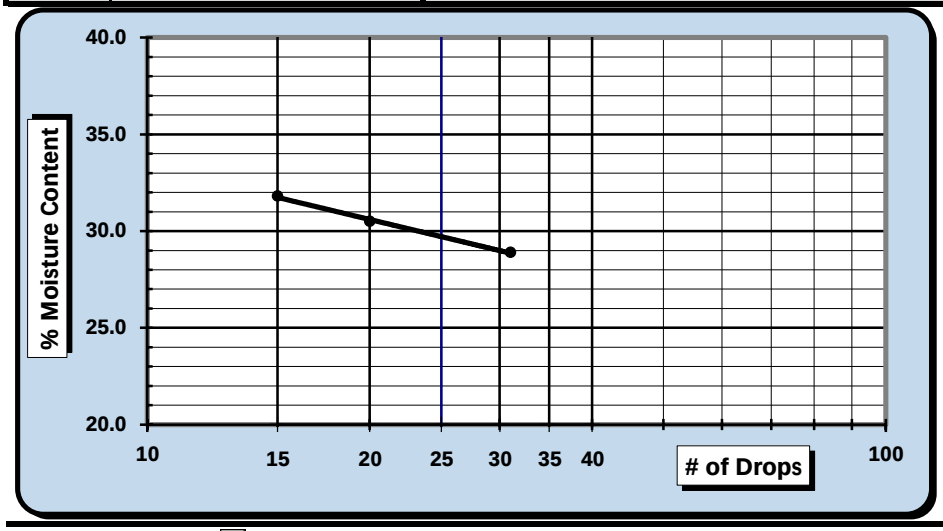
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-3	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	6 - 8'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	Q-1	Q-2	Q-3				2		
A	Tare Weight	16.66	16.60	15.72				12.16		
B	Wet Soil Weight + A	39.70	39.85	38.91				22.43		
C	Dry Soil Weight + A	34.54	34.42	33.31				20.89		
D	Water Weight (B-C)	5.16	5.43	5.60				1.54		
E	Dry Soil Weight (C-A)	17.88	17.82	17.59				8.73		
F	% Moisture (D/E)*100	28.9%	30.5%	31.8%				17.6%		
N	# OF DROPS	31	20	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							17.6%		



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

NP, Non-Plastic ☐

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

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 58.8%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/17/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

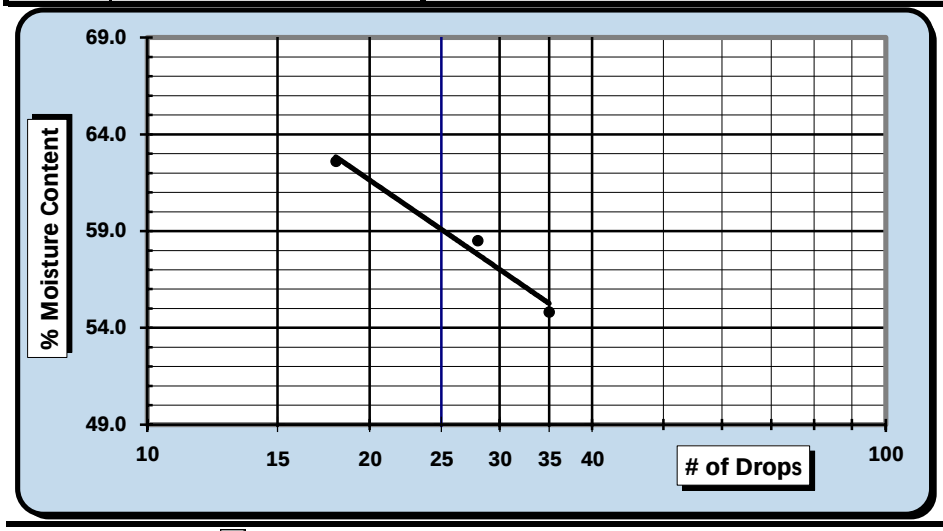
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/12/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-4	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	8 - 10'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	Y-1	Y-2	Y-3				3		
A	Tare Weight	16.41	16.44	16.99				11.59		
B	Wet Soil Weight + A	37.89	35.98	36.57				21.98		
C	Dry Soil Weight + A	30.29	28.77	29.03				19.95		
D	Water Weight (B-C)	7.60	7.21	7.54				2.03		
E	Dry Soil Weight (C-A)	13.88	12.33	12.04				8.36		
F	% Moisture (D/E)*100	54.8%	58.5%	62.6%				24.3%		
N	# OF DROPS	35	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							24.3%		



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

NP, Non-Plastic ☐

Liquid Limit	**59**
Plastic Limit	**24**
Plastic Index	**35**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 65.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/17/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

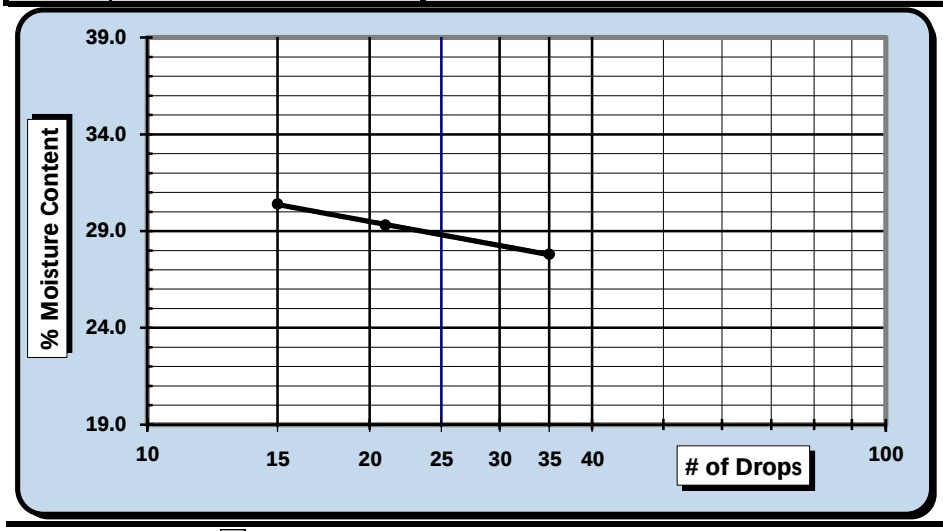
ASTM D 4318 ☐ *AASHTO T 89* ☒ *AASHTO T 90* ☒

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

Project #:	1461-19-069	Report Date:	2/17/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/14/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		
Boring #:	IB-1	Sample #: SS-5	Sample Date: 1/6/20
Location:	Interior Bent	Offset: n/a	Depth: 13.5 - 15'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	Z-1	Z-2	Z-3				4		
A	Tare Weight	15.90	16.59	16.77				12.27		
B	Wet Soil Weight + A	39.52	41.80	40.62				22.58		
C	Dry Soil Weight + A	34.38	36.09	35.06				20.66		
D	Water Weight (B-C)	5.14	5.71	5.56				1.92		
E	Dry Soil Weight (C-A)	18.48	19.50	18.29				8.39		
F	% Moisture (D/E)*100	27.8%	29.3%	30.4%				22.9%		
N	# OF DROPS	35	21	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							22.9%		



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

NP, Non-Plastic ☐

Liquid Limit	**29**
Plastic Limit	**23**
Plastic Index	**6**
Group Symbol	**CL-ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 38.4%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/17/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

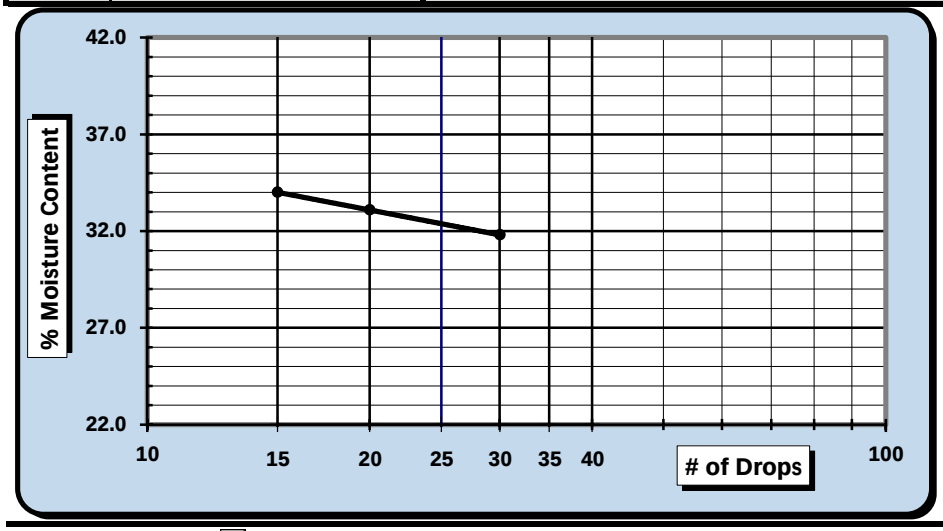
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-6	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	18.5 - 20'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	P-4	P-5	P-6				5		
A	Tare Weight	16.60	16.59	15.97				12.10		
B	Wet Soil Weight + A	39.00	39.91	38.13				22.54		
C	Dry Soil Weight + A	33.59	34.11	32.51				20.38		
D	Water Weight (B-C)	5.41	5.80	5.62				2.16		
E	Dry Soil Weight (C-A)	16.99	17.52	16.54				8.28		
F	% Moisture (D/E)*100	31.8%	33.1%	34.0%				26.1%		
N	# OF DROPS	30	20	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.1%		



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

NP, Non-Plastic ☐

Liquid Limit	**32**
Plastic Limit	**26**
Plastic Index	**6**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 38.7%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

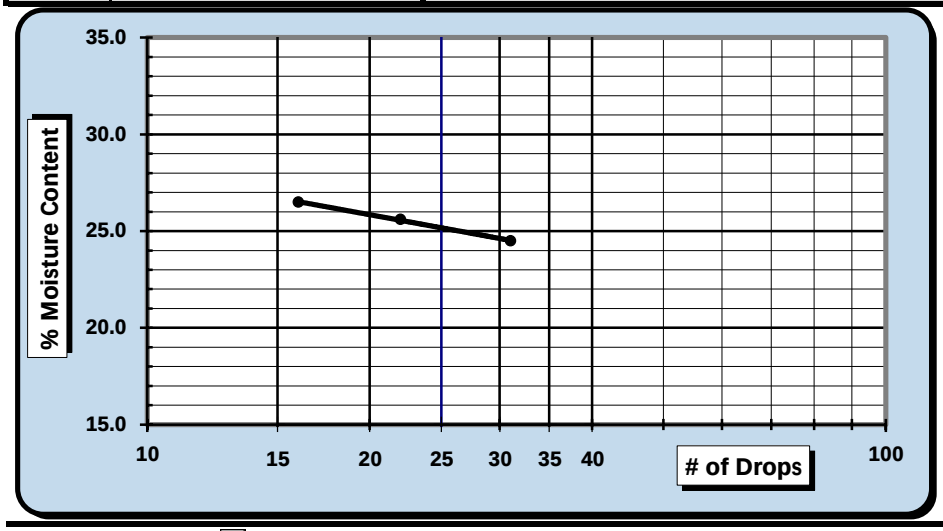
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-7	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	23.5 - 25'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Q-4	Q-5	Q-6				6		
A	Tare Weight	16.68	16.83	16.80				12.29		
B	Wet Soil Weight + A	41.14	41.43	39.95				23.14		
C	Dry Soil Weight + A	36.32	36.41	35.10				21.19		
D	Water Weight (B-C)	4.82	5.02	4.85				1.95		
E	Dry Soil Weight (C-A)	19.64	19.58	18.30				8.90		
F	% Moisture (D/E)*100	24.5%	25.6%	26.5%				21.9%		
N	# OF DROPS	31	22	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							21.9%		



One Point Liquid Limit

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

NP, Non-Plastic ☐

Liquid Limit	**25**
Plastic Limit	**22**
Plastic Index	**3**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 30.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

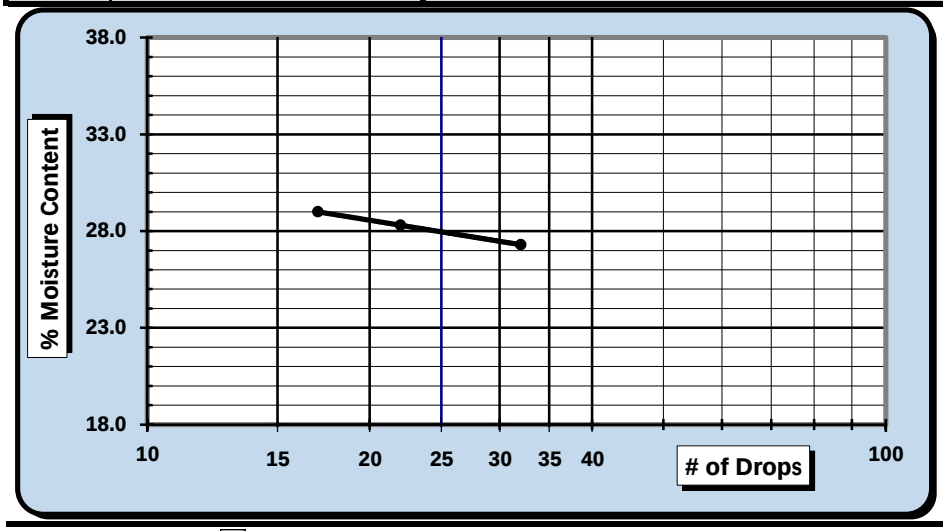
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-8	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	28.5 - 30'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Y-4	Y-5	Y-6				7		
A	Tare Weight	16.81	16.73	15.92				12.00		
B	Wet Soil Weight + A	44.01	43.91	42.73				23.72		
C	Dry Soil Weight + A	38.17	37.91	36.70				21.37		
D	Water Weight (B-C)	5.84	6.00	6.03				2.35		
E	Dry Soil Weight (C-A)	21.36	21.18	20.78				9.37		
F	% Moisture (D/E)*100	27.3%	28.3%	29.0%				25.1%		
N	# OF DROPS	32	22	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							25.1%		



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

NP, Non-Plastic ☐

Liquid Limit	**28**
Plastic Limit	**25**
Plastic Index	**3**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 33.6%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

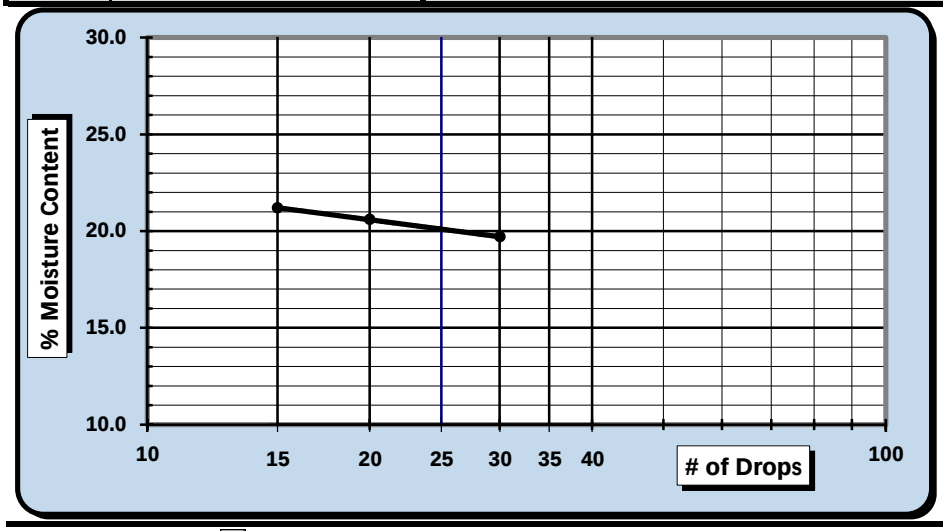
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	IB-1	Sample #:	SS-9	Sample Date:	1/6/20
Location:	Interior Bent	Offset:	n/a	Depth:	33.5 - 34.2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Z-4	Z-5	Z-6				9		
A	Tare Weight	15.74	15.55	16.92				12.24		
B	Wet Soil Weight + A	40.29	40.90	41.36				24.52		
C	Dry Soil Weight + A	36.25	36.57	37.08				22.53		
D	Water Weight (B-C)	4.04	4.33	4.28				1.99		
E	Dry Soil Weight (C-A)	20.51	21.02	20.16				10.29		
F	% Moisture (D/E)*100	19.7%	20.6%	21.2%				19.3%		
N	# OF DROPS	30	20	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							19.3%		



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

NP, Non-Plastic ☐

Liquid Limit	**20**
Plastic Limit	**19**
Plastic Index	**1**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 23.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

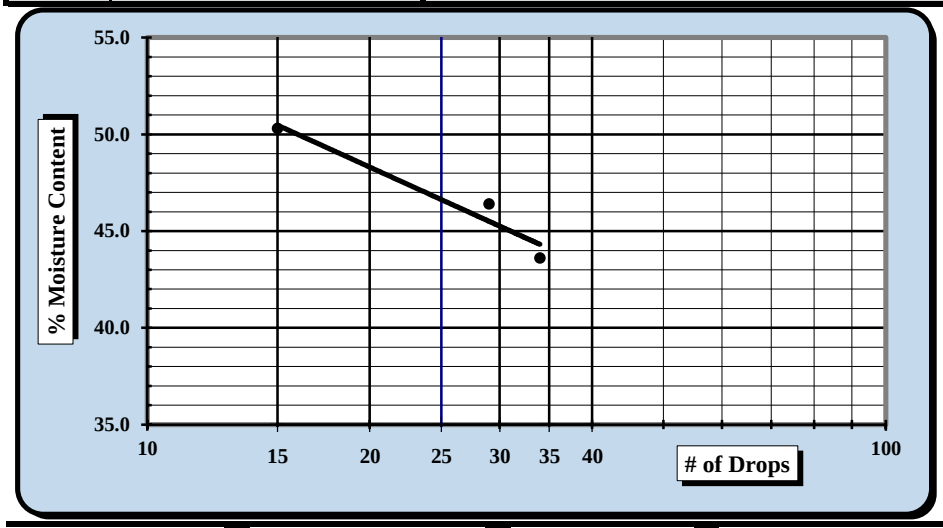
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-1	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 0 - 2 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

		Liquid Limit						Plastic Limit		
Pan #	12									
	Tare #:	16	3	1				9		
A	Tare Weight	20.70	20.81	20.66				20.81		
B	Wet Soil Weight + A	27.32	26.77	26.43				31.04		
C	Dry Soil Weight + A	25.31	24.88	24.50				28.99		
D	Water Weight (B-C)	2.01	1.89	1.93				2.05		
E	Dry Soil Weight (C-A)	4.61	4.07	3.84				8.18		
F	% Moisture (D/E)*100	43.6%	46.4%	50.3%				25.1%		
N	# OF DROPS	34	29	15				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.1%**		



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

NP, Non-Plastic ☐

Liquid Limit	**47**
Plastic Limit	**25**
Plastic Index	**22**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 62%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

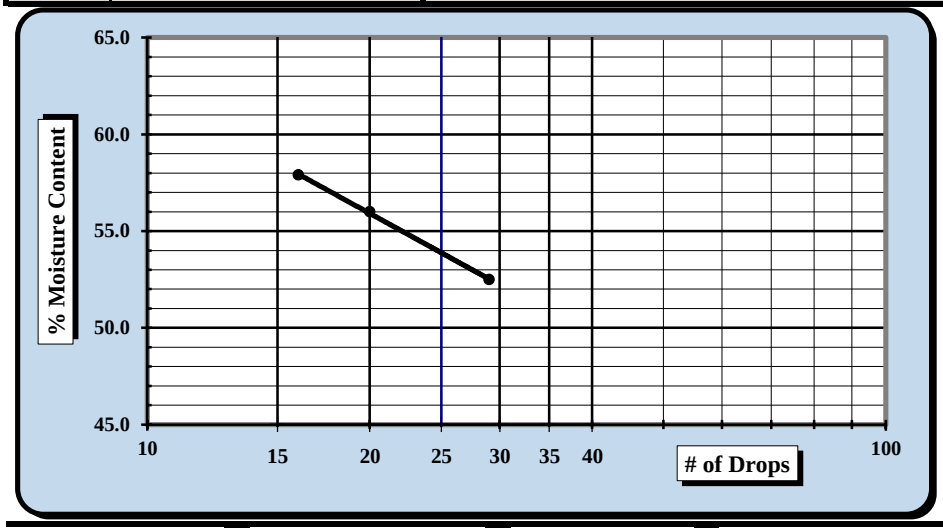
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-2	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 2 - 4 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 31		Liquid Limit						Plastic Limit		
	Tare #:	13	4	195				210		
A	Tare Weight	20.74	20.56	20.52				20.94		
B	Wet Soil Weight + A	27.22	26.19	26.19				31.52		
C	Dry Soil Weight + A	24.99	24.17	24.11				28.81		
D	Water Weight (B-C)	2.23	2.02	2.08				2.71		
E	Dry Soil Weight (C-A)	4.25	3.61	3.59				7.87		
F	% Moisture (D/E)*100	52.5%	56.0%	57.9%				34.4%		
N	# OF DROPS	29	20	16				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**34.4%**		



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

NP, Non-Plastic ☐

Liquid Limit	**54**
Plastic Limit	**34**
Plastic Index	**20**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 66%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

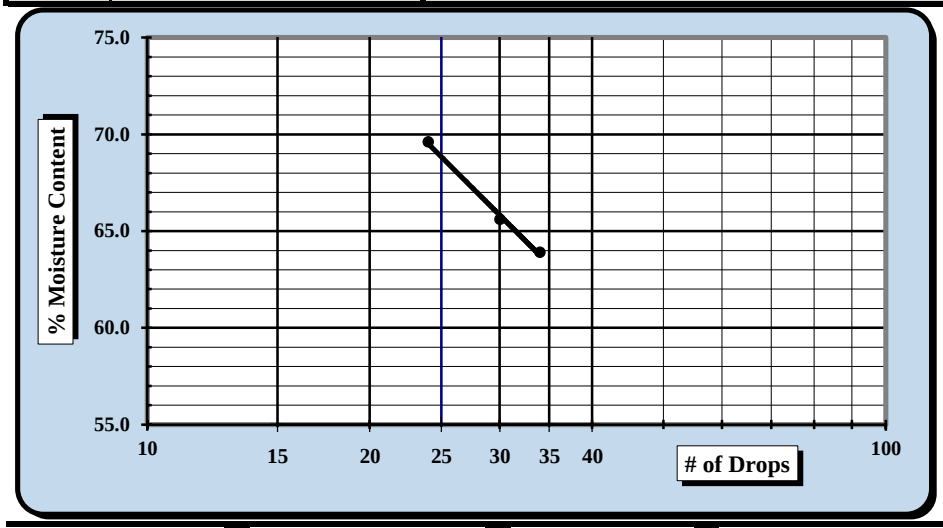
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-3	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 4 - 6 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan # 2	Liquid Limit						Plastic Limit		
	Tare #:	246	23	214				134		
A	Tare Weight	20.66	20.72	20.83				20.60		
B	Wet Soil Weight + A	27.48	26.50	26.12				30.75		
C	Dry Soil Weight + A	24.82	24.21	23.95				28.47		
D	Water Weight (B-C)	2.66	2.29	2.17				2.28		
E	Dry Soil Weight (C-A)	4.16	3.49	3.12				7.87		
F	% Moisture (D/E)*100	63.9%	65.6%	69.6%				29.0%		
N	# OF DROPS	34	30	24				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.0%**		



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

NP, Non-Plastic ☐

Liquid Limit	**69**
Plastic Limit	**29**
Plastic Index	**40**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 86%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

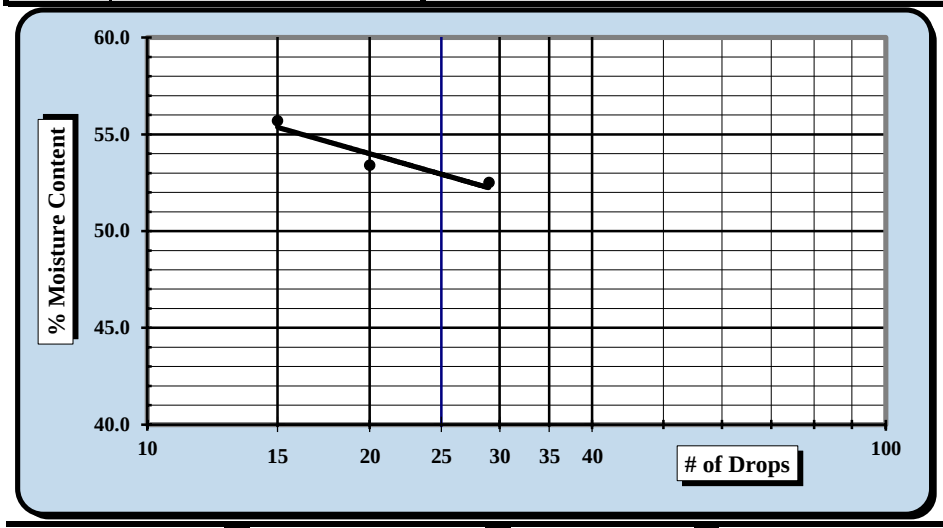
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-4	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 6 - 8 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan # 6	Liquid Limit						Plastic Limit		
	Tare #:	43	7	35				243		
A	Tare Weight	20.82	20.81	20.90				20.75		
B	Wet Soil Weight + A	26.08	27.39	27.50				30.79		
C	Dry Soil Weight + A	24.27	25.10	25.14				28.77		
D	Water Weight (B-C)	1.81	2.29	2.36				2.02		
E	Dry Soil Weight (C-A)	3.45	4.29	4.24				8.02		
F	% Moisture (D/E)*100	52.5%	53.4%	55.7%				25.2%		
N	# OF DROPS	29	20	15				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.2%**		



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

NP, Non-Plastic ☐

Liquid Limit	**53**
Plastic Limit	**25**
Plastic Index	**28**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

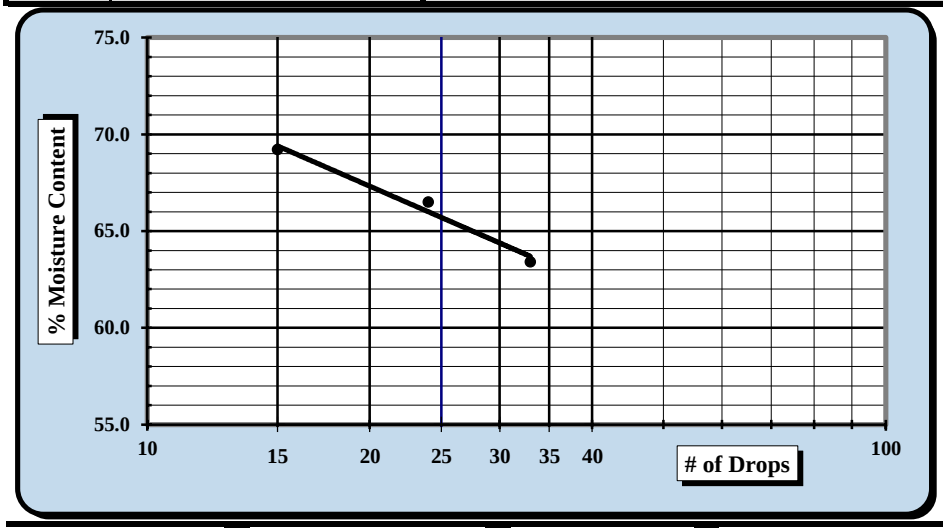
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-5	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 8 - 10 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan # 5	Liquid Limit						Plastic Limit		
	Tare #:	15	24	29				245		
A	Tare Weight	20.81	20.77	20.84				20.76		
B	Wet Soil Weight + A	26.89	26.33	27.15				30.86		
C	Dry Soil Weight + A	24.53	24.11	24.57				28.12		
D	Water Weight (B-C)	2.36	2.22	2.58				2.74		
E	Dry Soil Weight (C-A)	3.72	3.34	3.73				7.36		
F	% Moisture (D/E)*100	63.4%	66.5%	69.2%				37.2%		
N	# OF DROPS	33	24	15				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**37.2%**		



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

NP, Non-Plastic ☐

Liquid Limit	**66**
Plastic Limit	**37**
Plastic Index	**29**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

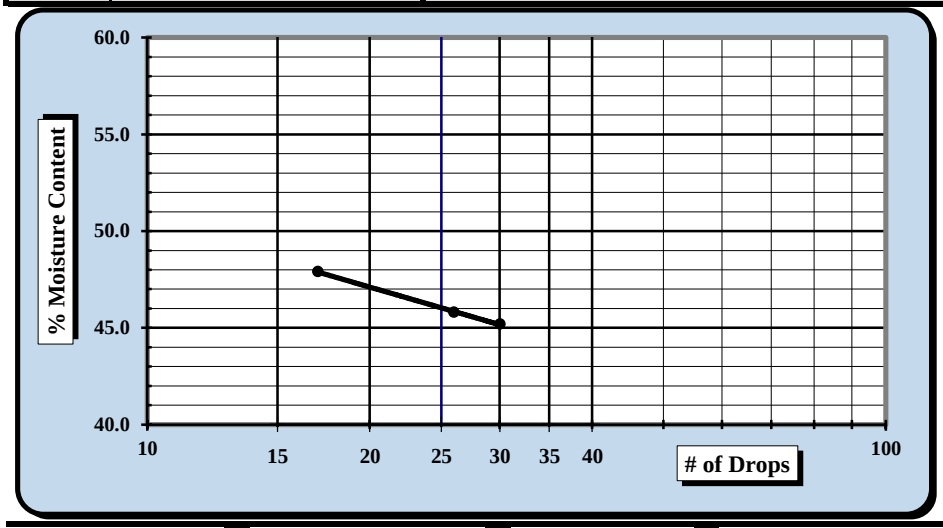
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-6	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 13.5 - 15 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

		Liquid Limit						Plastic Limit		
Pan #	8									
	Tare #:	5	44	17				31		
A	Tare Weight	20.74	20.74	20.73				20.81		
B	Wet Soil Weight + A	27.42	27.04	25.76				31.48		
C	Dry Soil Weight + A	25.34	25.06	24.13				29.26		
D	Water Weight (B-C)	2.08	1.98	1.63				2.22		
E	Dry Soil Weight (C-A)	4.60	4.32	3.40				8.45		
F	% Moisture (D/E)*100	45.2%	45.8%	47.9%				26.3%		
N	# OF DROPS	30	26	17				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**26.3%**		



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

NP, Non-Plastic ☐

Liquid Limit	**46**
Plastic Limit	**26**
Plastic Index	**20**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 52%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

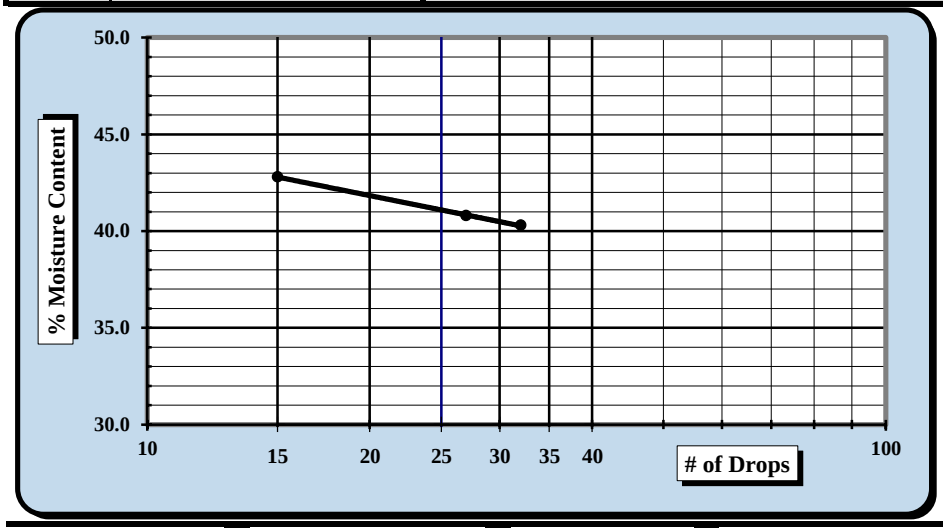
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-7	Sample Date: 1/17/20
Location:	Interior bent	Offset: n/a	Depth: 18.5 - 20 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

		Liquid Limit						Plastic Limit		
Pan #	3									
	Tare #:	6	37	200				36		
A	Tare Weight	20.69	20.80	20.86				20.96		
B	Wet Soil Weight + A	28.90	27.74	27.00				31.28		
C	Dry Soil Weight + A	26.54	25.73	25.16				28.95		
D	Water Weight (B-C)	2.36	2.01	1.84				2.33		
E	Dry Soil Weight (C-A)	5.85	4.93	4.30				7.99		
F	% Moisture (D/E)*100	40.3%	40.8%	42.8%				29.2%		
N	# OF DROPS	32	27	15				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.2%**		



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

NP, Non-Plastic ☐

Liquid Limit	**41**
Plastic Limit	**29**
Plastic Index	**12**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 28%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

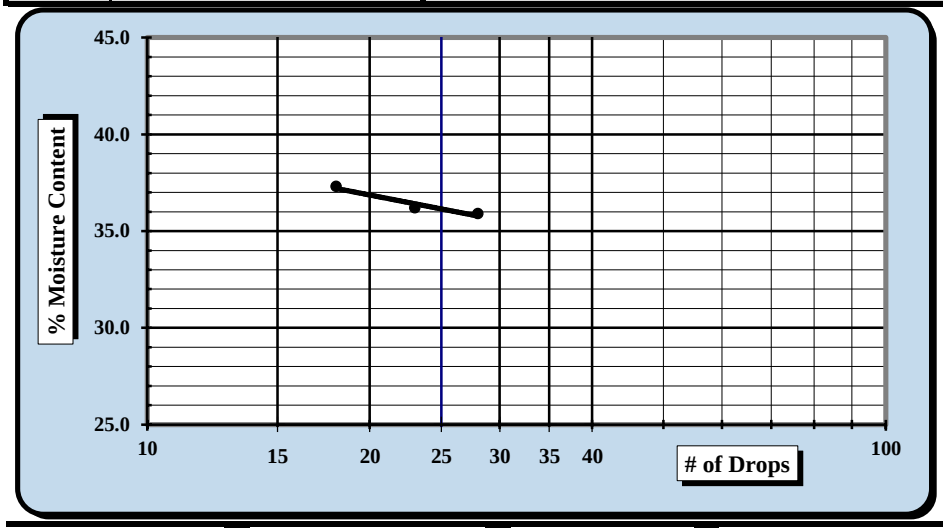
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-8	Sample Date: 1/17/20
Location:	Interior Bent	Offset: n/a	Depth: 23.5 - 25 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

		Liquid Limit						Plastic Limit		
Pan #	9									
	Tare #:	45	40	39				222		
A	Tare Weight	20.77	20.85	20.82				20.82		
B	Wet Soil Weight + A	28.23	28.08	26.86				31.71		
C	Dry Soil Weight + A	26.26	26.16	25.22				29.35		
D	Water Weight (B-C)	1.97	1.92	1.64				2.36		
E	Dry Soil Weight (C-A)	5.49	5.31	4.40				8.53		
F	% Moisture (D/E)*100	35.9%	36.2%	37.3%				27.7%		
N	# OF DROPS	28	23	18				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**27.7%**		



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

NP, Non-Plastic ☐

Liquid Limit	**36**
Plastic Limit	**28**
Plastic Index	**8**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 31%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

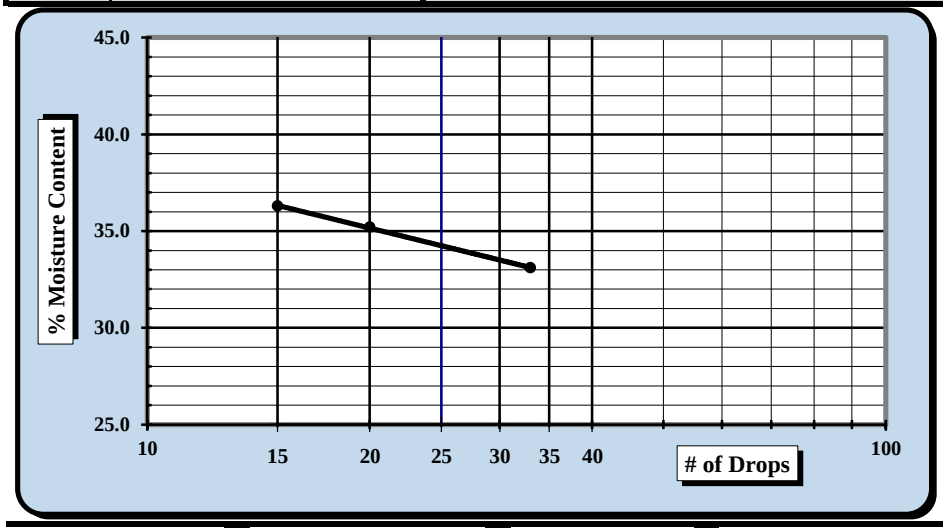
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: SS-9	Sample Date: 1/17/20
Location:	Interior Bent	Offset: n/a	Depth: 28.5 - 30 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

		Liquid Limit						Plastic Limit		
Pan #	40									
	Tare #:	32	219	209				30		
A	Tare Weight	20.43	20.80	21.10				20.82		
B	Wet Soil Weight + A	28.47	28.02	29.29				30.90		
C	Dry Soil Weight + A	26.47	26.14	27.11				28.66		
D	Water Weight (B-C)	2.00	1.88	2.18				2.24		
E	Dry Soil Weight (C-A)	6.04	5.34	6.01				7.84		
F	% Moisture (D/E)*100	33.1%	35.2%	36.3%				28.6%		
N	# OF DROPS	33	20	15				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.6%**		



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

NP, Non-Plastic ☐

Liquid Limit	**34**
Plastic Limit	**29**
Plastic Index	**5**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 63%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 33084 Calibration Date: 11/21/19 Oven ID. 31332 Calibration Date: 10/21/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-1	SS-1	0'-2'	NP4	103.95	251.54	221.91	29.63	25.1%
EM-2	SS-1	0'-2'	NP2	104.74	388.03	325.55	62.48	28.3%
EM-11	SS-1	0'-2'	J13	95.04	211.27	182.63	28.64	32.7%
EM-17	SS-1	0'-2'	J13	90.12	209.74	180.78	28.96	31.9%

Notes / Deviations / References

Jimmy Hanson — *Technical Responsibility*
Geotechnical Lab Supervisor — *Position*
2/10/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:		Sample Date(s):	1/17/2020
Sampling Method:	Boring	Drill Rig :	

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-4	SS-1	0 - 2	315	161.62	243.39	214.69	28.70	54.1%

Notes / Deviations / References

Matthew Wolfe — *Technician Name*; NICET 123218 — *Certification Type / No.*; 2/10/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility*; Senior Engineer — *Position*; 2/13/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-5	SS-1	0-2	Mo	30.70	53.80	48.81	4.99	27.6%
EM-6	SS-1	0-2	J3	17.40	26.40	24.77	1.63	22.1%
EM-14	SS-1	0-2	SD	30.60	39.80	38.08	1.72	23.0%
EM-16	SS-1	0-2	Hh	17.40	29.30	26.80	2.50	26.6%
EM-20	SS-1	1.3-3.3	Ss	17.40	33.40	29.28	4.12	34.7%
EM-21	SS-1	1.3-3.3	KS	30.60	48.00	45.26	2.74	18.7%

Notes / Deviations / References

Ashley Parkans
Technician Name

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/5/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Metro	Sample Date(s):	1-9/16-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 14862 Calibration Date: 7/1/19 Oven ID. 14603 Calibration Date: 7/17/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-9	SS-1	0-2'	H	0.00	95.06	73.02	22.04	30.2%
EM-10	SS-1	0-2'	A	0.00	101.27	81.48	19.79	24.3%
EM-12	SS-1	0-2'	T	0.00	93.15	72.51	20.64	28.5%
EM-13	SS-1	0-2'	E	0.00	92.76	69.75	23.01	33.0%
EM-15	SS-1	0-2'	S	0.00	109.16	84.81	24.35	28.7%

Notes / Deviations / References

J. Faucette — *Technician Name* — 2/7/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility* — Senior Engineer — *Position* — 2/13/2020 — *Date*

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project No:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Dates:	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.	grams	grams	grams	grams	grams	%
EM-1, SS-1	0'-2'	NP4	104.0	251.5	221.9	138.5	**70.7%**
EM-2, SS-1	0'-2'	NP2	104.7	388.0	325.6	214.7	**50.2%**
EM-11, SS-1	0'-2'	J13	95.0	211.3	182.6	109.9	**83.0%**
EM-17, SS-1	0'-2'	J13	90.1	209.7	180.8	106.2	**82.2%**

Balance ID. *33084* *Calibration Date:* *11/21/19* *#200 Sieve* *29552* *Calibration Date:* *12/16/19*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Jimmy Hanson — *Technical Responsibility*
Geotechnical Lab Supervisor — *Position*
2/10/2020 — *Date*

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project No:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Independence	Sample Dates:	1/6/20
Sampling Method:	Split Spoon	Drill Rig :	CME 55

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
EM-4 SS-1	0 - 2	315	131.6	243.4	214.7	155.5	**71.2%**

Balance ID. *25722* *Calibration Date:* *8/5/19* *#200 Sieve* *28632* *Calibration Date:* *1/2/20*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Matthew Wolfe
Technician Name

NICET 123218
Certification Type/No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project No:	1461-19-069	Report Date:	2/11/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Dates:	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.	grams	grams	grams	grams	grams	%
EM-5 / SS-1	0-2	2	96.6	293.4	250.3	127.1	**80.2%**
EM-6 / SS-1	0-2	5	98.3	308.2	273.1	166.9	**60.8%**
EM-14 / SS-1	0-2	DEAL	89.4	180.6	167.6	140.2	**35.0%**
EM-16 / SS-1	0-2	11	100.8	165.4	152.5	135.9	**32.1%**
EM-20 / SS-1	1.3-3.3	Pock	98.6	291.3	241.0	123.1	**82.8%**
EM-21 / SS-1	1.3-3.3	DY	115.0	294.7	269.5	220.2	**31.9%**

Balance ID. *25722* *Calibration Date:* *8/20/18* *#200 Sieve* *28488* *Calibration Date:* *12/20/18*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Ashley Parkans
Technician Name

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project No:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Metro	Sample Dates:	1-9/16-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Soak Time: 20 hrs

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
EM-9/SS-1	0-2'	H	0.00	95.06	73.02	26.28	**64.0%**
EM-10/SS-1	0-2'	A	0.00	101.27	81.48	17.26	**78.8%**
EM-12/SS-1	0-2'	T	0.00	93.15	72.51	13.27	**81.7%**
EM-13/SS-1	0-2'	E	0.00	92.76	69.75	13.32	**80.9%**
EM-15/SS-1	0-2'	S	0.00	109.16	84.81	25.38	**70.1%**

Balance ID. 14862 Calibration Date: 7/1/19 #200 Sieve 14977 Calibration Date: 1/27/20

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

J.Faucette — *Technician Name* — 2/7/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility* — Senior Engineer — *Position* — 2/13/2020 — *Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

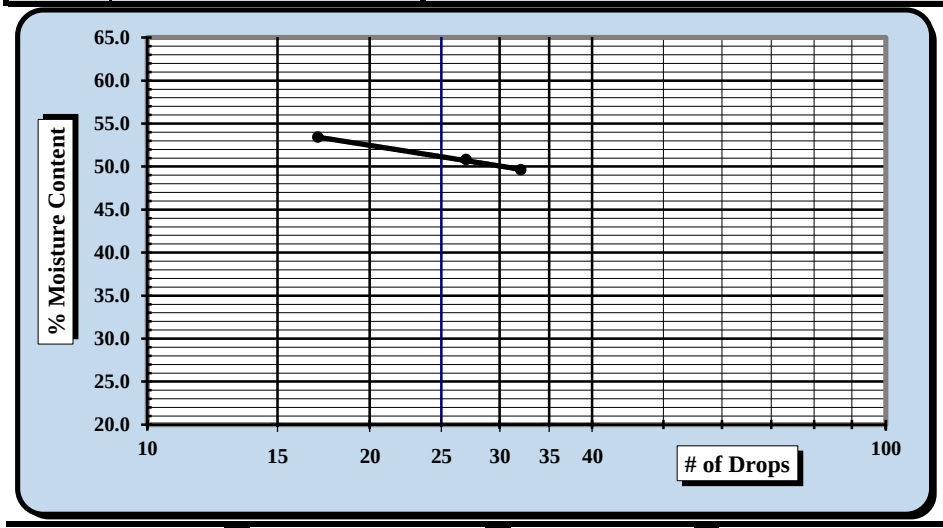
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-1	Sample #: SS-1	Sample Date: 1-6-2020
Location:	Embankment	Offset: n/a	Depth: 0'-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

	Pan # 204	Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9		
A	Tare Weight	16.59	16.61	16.79				16.84		
B	Wet Soil Weight + A	28.77	30.45	29.46				25.82		
C	Dry Soil Weight + A	24.73	25.79	25.05				24.15		
D	Water Weight (B-C)	4.04	4.66	4.41				1.67		
E	Dry Soil Weight (C-A)	8.14	9.18	8.26				7.31		
F	% Moisture (D/E)*100	49.6%	50.8%	53.4%				22.8%		
N	# OF DROPS	32	27	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.8%**		



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

NP, Non-Plastic ☐

Liquid Limit	**51**
Plastic Limit	**23**
Plastic Index	**28**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 71%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-2	Sample #: SS-1	Sample Date: 1-6-2020
Location:	Embankment	Offset: n/a	Depth: 0'-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan # 222		Liquid Limit						Plastic Limit		
	Tare #:	16	17	18				19		
A	Tare Weight	16.80	16.84	16.80				15.77		
B	Wet Soil Weight + A	30.92	30.63	33.22				24.73		
C	Dry Soil Weight + A	26.36	26.03	27.40				22.22		
D	Water Weight (B-C)	4.56	4.60	5.82				2.51		
E	Dry Soil Weight (C-A)	9.56	9.19	10.60				6.45		
F	% Moisture (D/E)*100	47.7%	50.1%	54.9%				38.9%		
N	# OF DROPS	28	22	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**38.9%**		

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

NP, Non-Plastic ☐

Liquid Limit	**49**
Plastic Limit	**39**
Plastic Index	**10**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 50%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

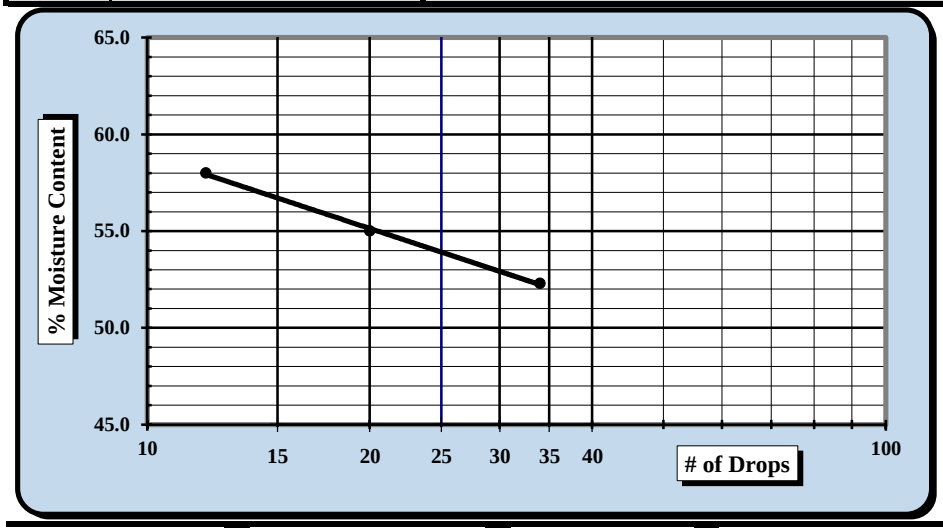
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-4	Sample #: SS-1	Sample Date: 1/6/2020
Location:	Embankment	Offset: n/a	Depth: 0 - 2 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan # 10	Liquid Limit						Plastic Limit		
	Tare #:	19	204	216				235		
A	Tare Weight	20.53	20.86	20.67				20.77		
B	Wet Soil Weight + A	26.09	26.72	26.20				30.93		
C	Dry Soil Weight + A	24.18	24.64	24.17				28.11		
D	Water Weight (B-C)	1.91	2.08	2.03				2.82		
E	Dry Soil Weight (C-A)	3.65	3.78	3.50				7.34		
F	% Moisture (D/E)*100	52.3%	55.0%	58.0%				38.4%		
N	# OF DROPS	34	20	12				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**38.4%**		



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

NP, Non-Plastic ☐

Liquid Limit	**54**
Plastic Limit	**38**
Plastic Index	**16**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 71%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

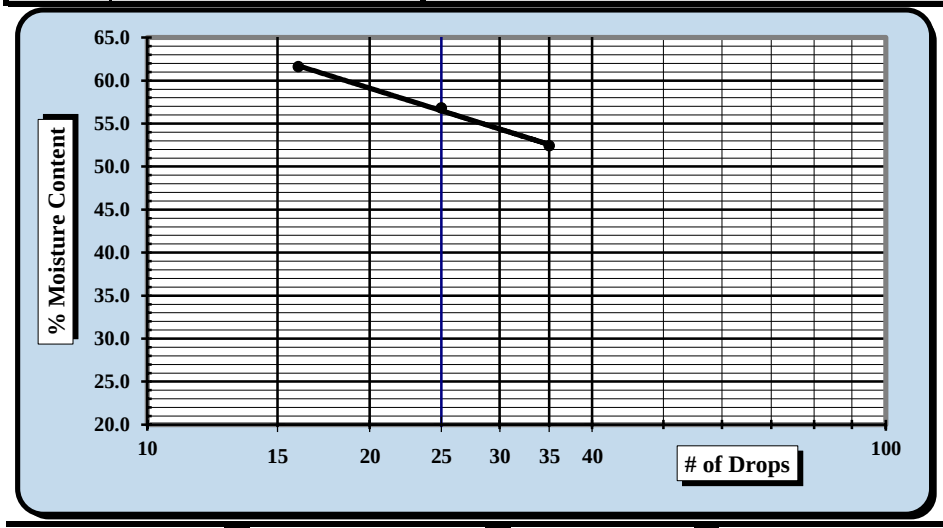
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-5	Sample #: SS-1	Sample Date: 1-6-2020
Location:	Embankment	Offset: n/a	Depth: 0-2

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Gale	Strike	Mo				Ss	Hh	
A	Tare Weight	30.78	30.54	30.66				17.34	17.34	
B	Wet Soil Weight + A	39.07	39.95	40.05				24.37	25.36	
C	Dry Soil Weight + A	36.22	36.54	36.47				22.55	23.23	
D	Water Weight (B-C)	2.85	3.41	3.58				1.82	2.13	
E	Dry Soil Weight (C-A)	5.44	6.00	5.81				5.21	5.89	
F	% Moisture (D/E)*100	52.4%	56.8%	61.6%				34.9%	36.2%	
N	# OF DROPS	35	25	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**35.6%**		



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

NP, Non-Plastic ☐

Liquid Limit	**57**
Plastic Limit	**36**
Plastic Index	**21**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

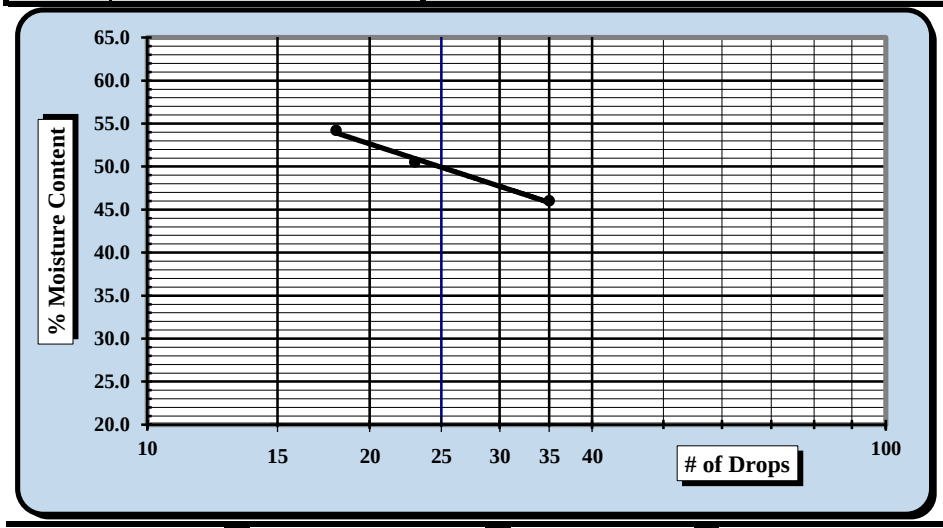
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-6	Sample #: SS-1	Sample Date: 1-6-2020
Location:	Embankment	Offset: n/a	Depth: 0-2

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Ms	Ks	NY				A-9	J3	
A	Tare Weight	30.74	30.62	30.55				16.81	17.35	
B	Wet Soil Weight + A	40.68	38.76	37.04				24.74	24.92	
C	Dry Soil Weight + A	37.55	36.03	34.76				23.21	23.45	
D	Water Weight (B-C)	3.13	2.73	2.28				1.53	1.47	
E	Dry Soil Weight (C-A)	6.81	5.41	4.21				6.40	6.10	
F	% Moisture (D/E)*100	46.0%	50.5%	54.2%				23.9%	24.1%	
N	# OF DROPS	35	23	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**24.0%**		



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

NP, Non-Plastic ☐

Liquid Limit	**50**
Plastic Limit	**24**
Plastic Index	**26**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-9	Sample #: SS-1	Sample Date: 1-16-2020
Location:	Embankment	Offset: n/a	Depth: 0-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	11.07	10.65	11.62				11.34	10.73	
B	Wet Soil Weight + A	21.76	20.63	22.24				21.05	20.48	
C	Dry Soil Weight + A	18.40	17.45	18.66				18.86	18.28	
D	Water Weight (B-C)	3.36	3.18	3.58				2.19	2.20	
E	Dry Soil Weight (C-A)	7.33	6.80	7.04				7.52	7.55	
F	% Moisture (D/E)*100	45.8%	46.8%	50.9%				29.1%	29.1%	
N	# OF DROPS	35	25	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.1%**		

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

NP, Non-Plastic ☐

Liquid Limit	**48**
Plastic Limit	**29**
Plastic Index	**19**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 64.0%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

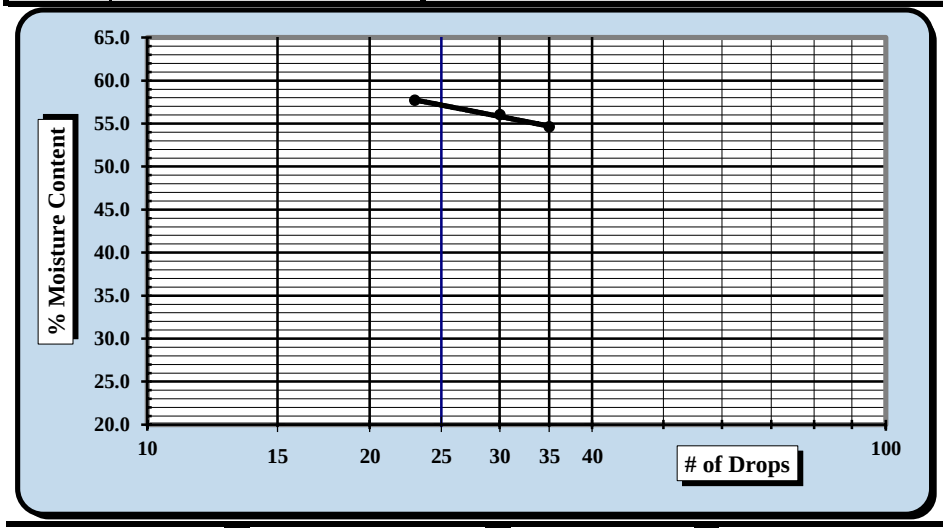
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-10	Sample #: SS-1	Sample Date: 1-16-2020
Location:	Embankment	Offset: n/a	Depth: 0-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9	10	
A	Tare Weight	11.24	11.70	10.90				11.97	11.73	
B	Wet Soil Weight + A	21.23	20.98	19.73				21.38	21.13	
C	Dry Soil Weight + A	17.70	17.65	16.50				19.64	19.38	
D	Water Weight (B-C)	3.53	3.33	3.23				1.74	1.75	
E	Dry Soil Weight (C-A)	6.46	5.95	5.60				7.67	7.65	
F	% Moisture (D/E)*100	54.6%	56.0%	57.7%				22.7%	22.9%	
N	# OF DROPS	35	30	23				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**22.8%**		



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

NP, Non-Plastic ☐

Liquid Limit	**57**
Plastic Limit	**23**
Plastic Index	**34**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 78.8%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

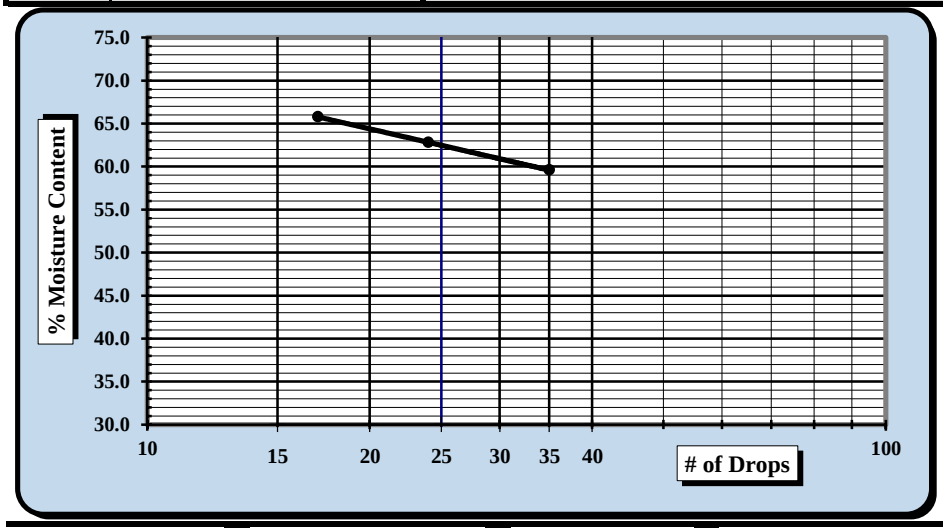
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-11	Sample #: SS-1	Sample Date: 1-10-2020
Location:	Embankment	Offset: n/a	Depth: 0'-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

		Liquid Limit						Plastic Limit		
Pan #	374									
	Tare #:	11	12	13				14		
A	Tare Weight	16.74	16.71	16.75				16.90		
B	Wet Soil Weight + A	29.73	31.77	30.53				25.78		
C	Dry Soil Weight + A	24.88	25.96	25.06				23.83		
D	Water Weight (B-C)	4.85	5.81	5.47				1.95		
E	Dry Soil Weight (C-A)	8.14	9.25	8.31				6.93		
F	% Moisture (D/E)*100	59.6%	62.8%	65.8%				28.1%		
N	# OF DROPS	35	24	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**28.1%**		



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

NP, Non-Plastic ☐

Liquid Limit	**63**
Plastic Limit	**28**
Plastic Index	**35**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 83%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		

Boring No.	EM-11	Sample No.	SS-2	Sample Date:	1-10-2020
Location:	Embankment	Sampled by:	Metro	Depth:	2'-4'

Sample Description: Dark reddish brown clay with some sand

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* *33084* *Cal. Date:* *11/21/19* *Due:* *11/21/20*

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

Oven Temperature: 105 °C		*Tare #*	S-24
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	123.23
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	302.38
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	256.70
w	Water Weight	*(a-b)*	45.68
A	Mass of As-Received Specimen	*(a-t)*	179.15
B	Mass of Oven Dry Specimen	*(b-t)*	133.47
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**25.5%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**34.2%**

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

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

Muffle Furnace: 440 °C		*Tare #*	1
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	113.57
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	247.27
c	Ash Weight + Tare Wt.	*grams*	239.46
C	Ash Weight	*c-t*	125.89
B	Mass of Oven Dry Specimen	*(b-t)*	133.70
D	***% Ash Content***	*(C/B)*100*	**94.2%**
	% Organic Matter	*100-D*	**5.8%**

Muffle Furnace: *S&ME ID #:* *26317* *Cal. Date:* *9/23/19* *Due:* *9/23/20*

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

Jimmy Hanson		Geotechnical Lab Supervisor	2/10/2020
Technical Responsibility	*Signature*	*Position*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

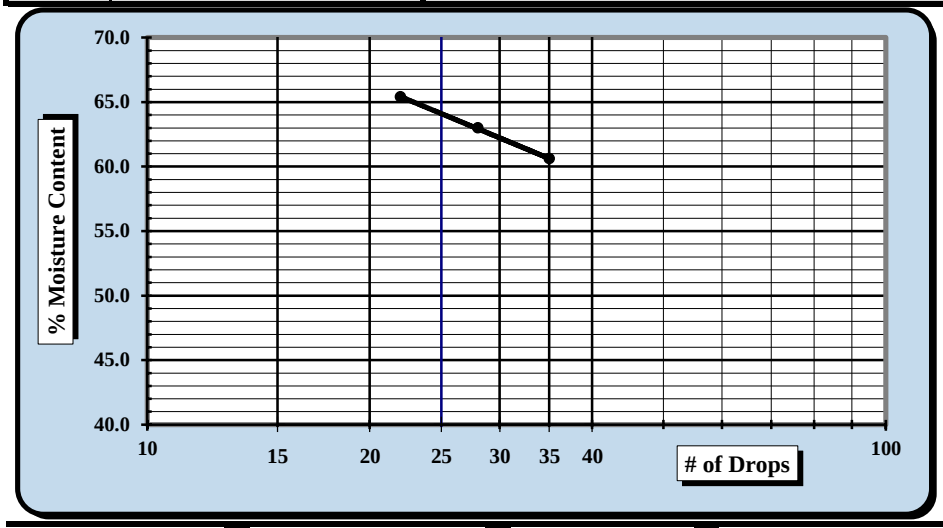
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-12	Sample #: SS-1	Sample Date: 1-10-2020
Location:	Embankment	Offset: n/a	Depth: 0-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14	15	
A	Tare Weight	11.05	10.76	12.04				11.79	11.82	
B	Wet Soil Weight + A	20.46	20.28	21.27				20.40	20.74	
C	Dry Soil Weight + A	16.91	16.60	17.62				18.57	18.88	
D	Water Weight (B-C)	3.55	3.68	3.65				1.83	1.86	
E	Dry Soil Weight (C-A)	5.86	5.84	5.58				6.78	7.06	
F	% Moisture (D/E)*100	60.6%	63.0%	65.4%				27.0%	26.3%	
N	# OF DROPS	35	28	22				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**26.7%**		



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

NP, Non-Plastic ☐

Liquid Limit	**64**
Plastic Limit	**27**
Plastic Index	**37**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 81.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

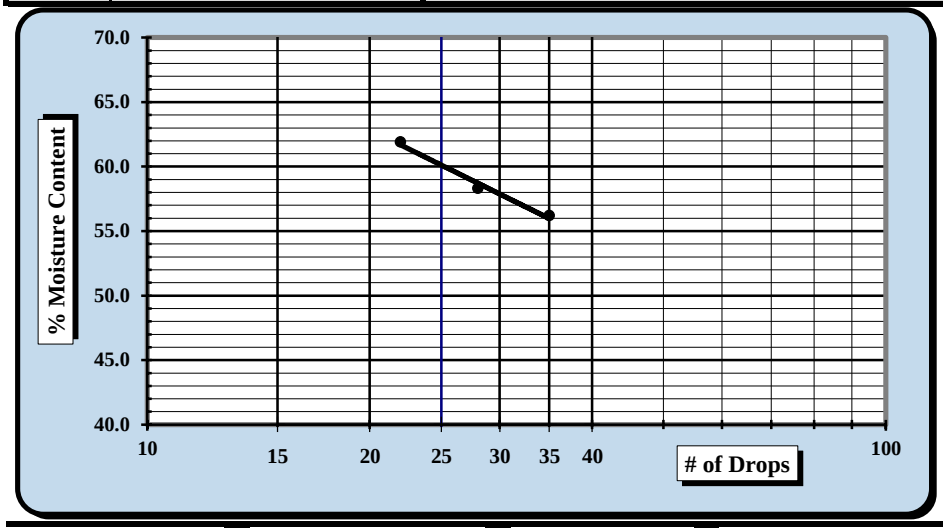
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-13	Sample #: SS-1	Sample Date: 1-10-2020
Location:	Embankment	Offset: n/a	Depth: 0-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	16	17	18				19	20	
A	Tare Weight	11.88	11.90	11.91				11.82	11.89	
B	Wet Soil Weight + A	20.52	21.27	21.33				20.88	21.15	
C	Dry Soil Weight + A	17.41	17.82	17.73				19.05	19.30	
D	Water Weight (B-C)	3.11	3.45	3.60				1.83	1.85	
E	Dry Soil Weight (C-A)	5.53	5.92	5.82				7.23	7.41	
F	% Moisture (D/E)*100	56.2%	58.3%	61.9%				25.3%	25.0%	
N	# OF DROPS	35	28	22				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.2%**		



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

NP, Non-Plastic ☐

Liquid Limit	**60**
Plastic Limit	**25**
Plastic Index	**35**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 80.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

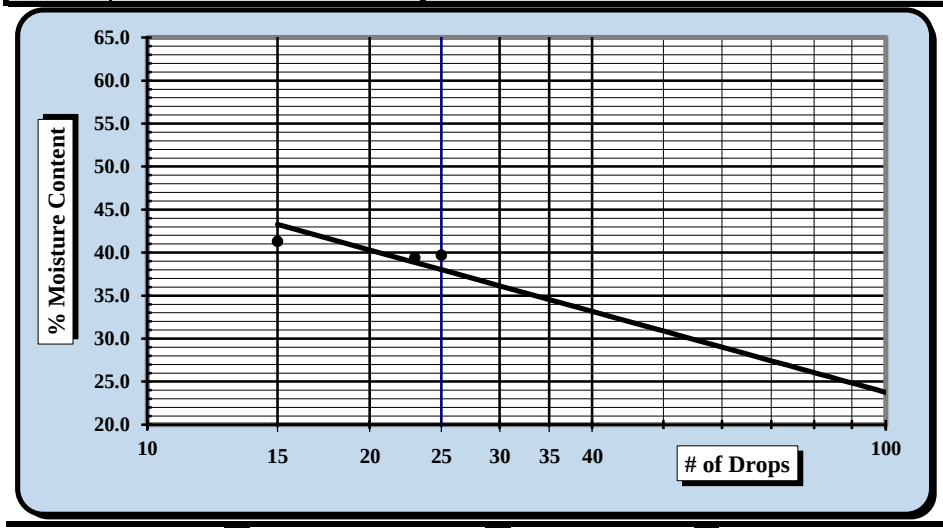
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-14	Sample #: SS-1	Sample Date: 1-16-2020
Location:	Embankment	Offset: n/a	Depth: 0-2

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	NB	443	NH				Z-5	44	
A	Tare Weight	30.67	25.14	30.65				17.30	11.97	
B	Wet Soil Weight + A	38.45	31.51	37.39				24.35	18.94	
C	Dry Soil Weight + A	36.24	29.71	35.42				22.57	17.18	
D	Water Weight (B-C)	2.21	1.80	1.97				1.78	1.76	
E	Dry Soil Weight (C-A)	5.57	4.57	4.77				5.27	5.21	
F	% Moisture (D/E)*100	39.7%	39.4%	41.3%				33.8%	33.8%	
N	# OF DROPS	25	23	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**33.8%**		



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

NP, Non-Plastic ☐

Liquid Limit	**40**
Plastic Limit	**34**
Plastic Index	**6**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

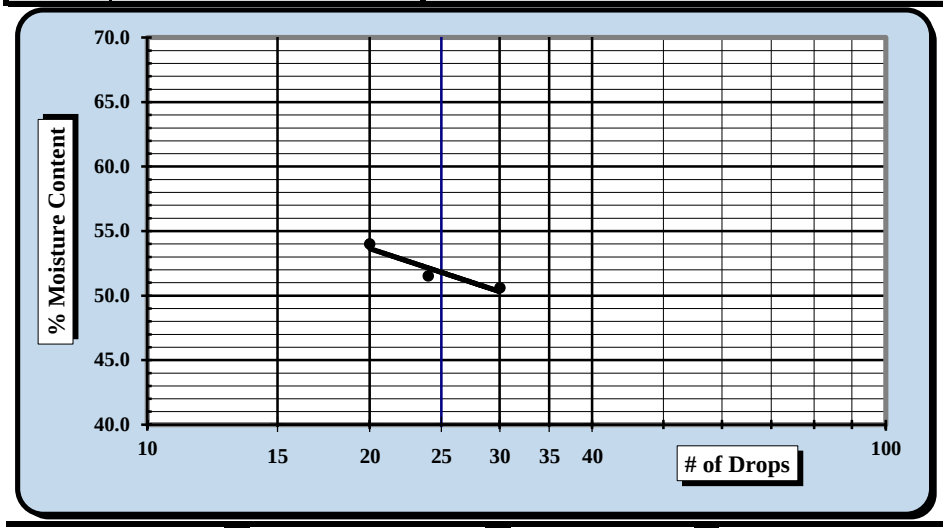
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-15	Sample #: SS-1	Sample Date: 1-16-2020
Location:	Embankment	Offset: n/a	Depth: 0-2'

Type and Specification	S&ME ID #	Cal Date:	Type and Specification	S&ME ID #	Cal Date:
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				21D	22D	
A	Tare Weight	11.97	11.69	11.86				17.06	17.06	
B	Wet Soil Weight + A	21.52	21.72	21.96				26.12	26.37	
C	Dry Soil Weight + A	18.31	18.31	18.42				24.29	24.50	
D	Water Weight (B-C)	3.21	3.41	3.54				1.83	1.87	
E	Dry Soil Weight (C-A)	6.34	6.62	6.56				7.23	7.44	
F	% Moisture (D/E)*100	50.6%	51.5%	54.0%				25.3%	25.1%	
N	# OF DROPS	30	24	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**25.2%**		



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

NP, Non-Plastic ☐

Liquid Limit	**52**
Plastic Limit	**25**
Plastic Index	**27**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 70.1%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

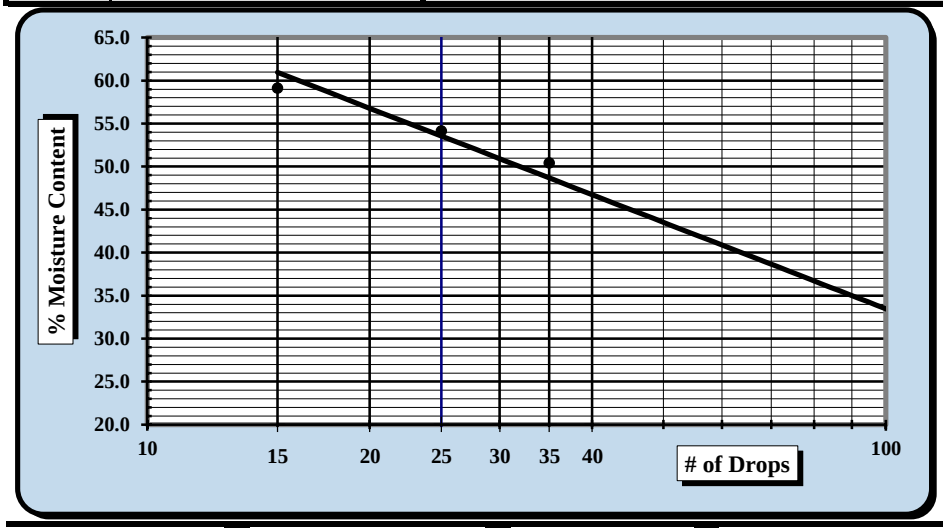
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-16	Sample #: SS-1	Sample Date: 1-16-2020
Location:	Embankment	Offset: n/a	Depth: 0-2

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	NY	Ks	Ms				A-9	J3	
A	Tare Weight	30.54	30.62	30.73				16.81	17.35	
B	Wet Soil Weight + A	37.70	37.63	38.40				23.49	25.52	
C	Dry Soil Weight + A	35.30	35.17	35.55				21.71	23.33	
D	Water Weight (B-C)	2.40	2.46	2.85				1.78	2.19	
E	Dry Soil Weight (C-A)	4.76	4.55	4.82				4.90	5.98	
F	% Moisture (D/E)*100	50.4%	54.1%	59.1%				36.3%	36.6%	
N	# OF DROPS	35	25	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**36.5%**		



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

NP, Non-Plastic ☐

Liquid Limit	**55**
Plastic Limit	**37**
Plastic Index	**18**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

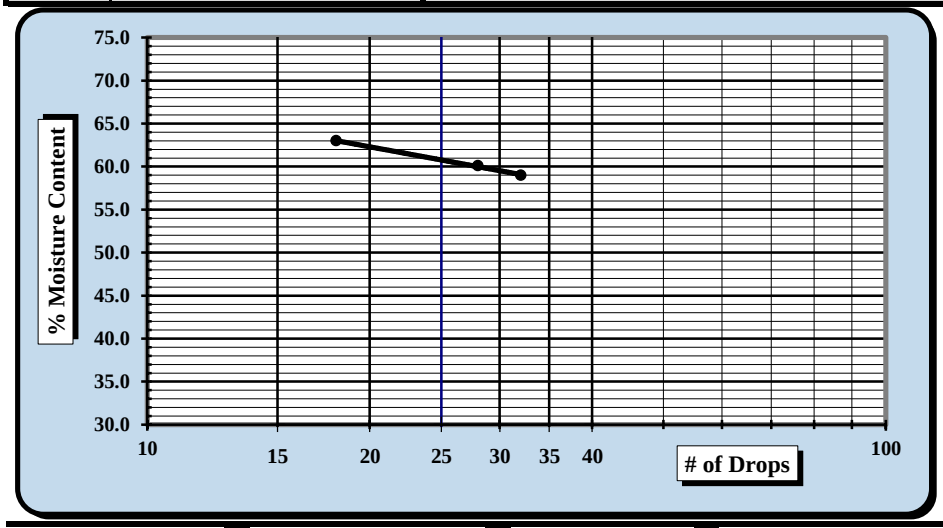
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-17	Sample #: SS-1	Sample Date: 1-14-2020
Location:	Embankment	Offset: n/a	Depth: 0'-2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

	Pan # 102	Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4		
A	Tare Weight	16.57	16.52	16.81				16.72		
B	Wet Soil Weight + A	29.70	31.06	30.88				25.58		
C	Dry Soil Weight + A	24.83	25.60	25.44				23.82		
D	Water Weight (B-C)	4.87	5.46	5.44				1.76		
E	Dry Soil Weight (C-A)	8.26	9.08	8.63				7.10		
F	% Moisture (D/E)*100	59.0%	60.1%	63.0%				24.8%		
N	# OF DROPS	32	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**24.8%**		



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

NP, Non-Plastic ☐

Liquid Limit	**61**
Plastic Limit	**25**
Plastic Index	**36**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 82%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		

Boring No.	EM-17	Sample No.	SS-2	Sample Date:	1-14-2020
Location:	Embankment	Sampled by:	S&ME	Depth:	2'-4'

Sample Description: Very dark grayish brown clay

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* *33084* *Cal. Date:* *11/21/19* *Due:* *11/21/20*

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

Oven Temperature: 105 °C		*Tare #*	S-5
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	122.49
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	435.01
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	362.97
w	Water Weight	*(a-b)*	72.04
A	Mass of As-Received Specimen	*(a-t)*	312.52
B	Mass of Oven Dry Specimen	*(b-t)*	240.48
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**23.1%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**30.0%**

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

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

Muffle Furnace: 440 °C		*Tare #*	2
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	111.93
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	253.63
c	Ash Weight + Tare Wt.	*grams*	248.60
C	Ash Weight	*c-t*	136.67
B	Mass of Oven Dry Specimen	*(b-t)*	141.70
D	***% Ash Content***	*(C/B)*100*	**96.5%**
	% Organic Matter	*100-D*	**3.5%**

Muffle Furnace: *S&ME ID #:* *26317* *Cal. Date:* *9/23/19* *Due:* *9/23/20*

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

Jimmy Hanson		Geotechnical Lab Supervisor	2/10/2020
Technical Responsibility	*Signature*	*Position*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

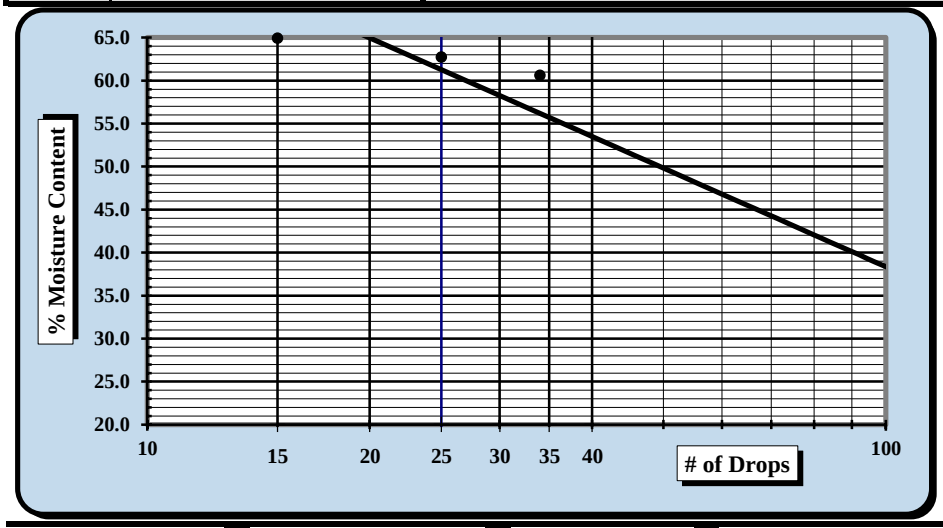
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-20	Sample #: SS-1	Sample Date: 1-7-2020
Location:	Embankment	Offset: n/a	Depth: 1.3-3.3

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	MICH	Mo	Strike				Ss	Hh	
A	Tare Weight	30.77	30.68	30.56				17.35	17.35	
B	Wet Soil Weight + A	37.74	37.32	37.93				24.98	25.30	
C	Dry Soil Weight + A	35.11	34.76	35.03				22.73	22.95	
D	Water Weight (B-C)	2.63	2.56	2.90				2.25	2.35	
E	Dry Soil Weight (C-A)	4.34	4.08	4.47				5.38	5.60	
F	% Moisture (D/E)*100	60.6%	62.7%	64.9%				41.8%	42.0%	
N	# OF DROPS	34	25	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**41.9%**		



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

NP, Non-Plastic ☐

Liquid Limit	**63**
Plastic Limit	**42**
Plastic Index	**21**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

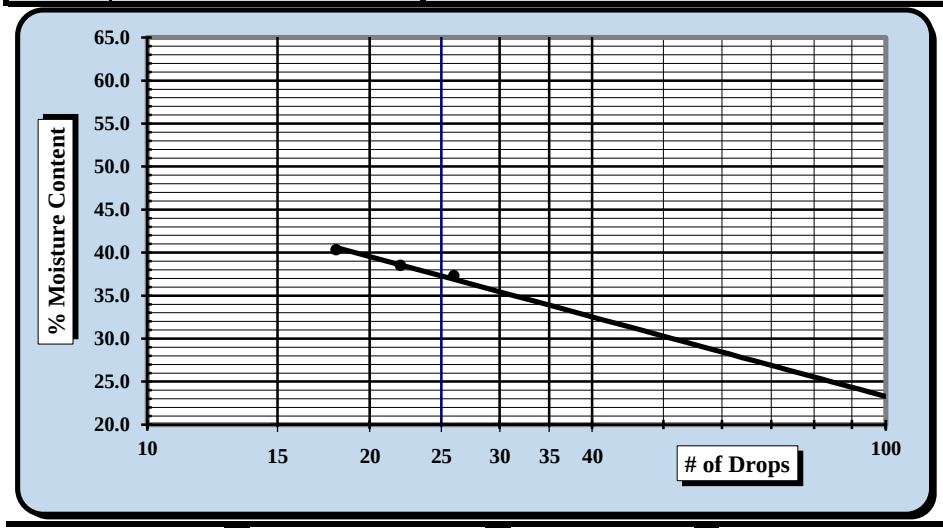
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-21	Sample #: SS-1	Sample Date: 1-7-2020
Location:	Embankment	Offset: n/a	Depth: 1.3-3.3

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	Gale	SD	FLA				10	B-3	
A	Tare Weight	30.67	30.64	30.58				14.29	17.32	
B	Wet Soil Weight + A	41.89	39.67	39.53				23.07	25.94	
C	Dry Soil Weight + A	38.84	37.16	36.96				21.41	24.31	
D	Water Weight (B-C)	3.05	2.51	2.57				1.66	1.63	
E	Dry Soil Weight (C-A)	8.17	6.52	6.38				7.12	6.99	
F	% Moisture (D/E)*100	37.3%	38.5%	40.3%				23.3%	23.3%	
N	# OF DROPS	26	22	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**23.3%**		



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

NP, Non-Plastic ☐

Liquid Limit	**39**
Plastic Limit	**23**
Plastic Index	**16**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

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

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/04 - 2/05/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sampled by:	S&ME/Metro	Sample Date(s):	1-6/8-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-7	SS-1	0 - 2'	WX-Z	87.95	166.02	144.64	21.38	37.7%
RW-7	SS-2	2 - 4'	D-14	101.57	206.99	186.48	20.51	24.2%

Notes / Deviations / References

Benjamin Kovaleski — *Technician Name*

NICET Lab Level III / 117226 — *Certification Type / No.*

Robert C. Bruorton, P.E. — *Technical Responsibility*

Senior Engineer — *Position*

2/18/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 33084 Calibration Date: 11/21/19 Oven ID. 31332 Calibration Date: 10/21/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-8	SS-3	4'-6'	J7	89.25	193.37	176.41	16.96	19.5%
RW-10	SS-2	2'-4'	M6	94.07	135.35	127.33	8.02	24.1%
RW-10	SS-3	4'-6'	G4	95.89	209.46	183.26	26.20	30.0%
RW-12	SS-2	2'-4'	P100	88.92	213.48	180.92	32.56	35.4%
RW-12	SS-4	6'-8'	J9	88.29	185.27	155.29	29.98	44.7%
RW-12	SS-8	23.5'-25'	J17	87.68	230.87	207.55	23.32	19.5%

Notes / Deviations / References

Jimmy Hanson — *Technical Responsibility*
Geotechnical Lab Supervisor — *Position*
2/10/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/5/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Metro	Sample Date(s):	1-9/16-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Method: **A (1%)** ☐ **B (0.1%)** ☑ Balance ID. 14862 Calibration Date: 7/1/19 Oven ID. 14603 Calibration Date: 7/17/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-9	SS-2	2'-4'	LD	0.00	93.01	78.73	14.28	18.1%
RW-9	SS-4	6'-8'	HN	0.00	57.69	44.20	13.49	30.5%
RW-9	SS-5	8'-10'	DK	0.00	104.39	84.94	19.45	22.9%
RW-11	SS-2	2'-4'	520	0.00	61.99	44.49	17.50	39.3%
RW-11	SS-3	4'-6'	1	0.00	96.62	75.86	20.76	27.4%

Notes / Deviations / References

J. Faucette — *Technician Name* — 2/7/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility* — Senior Engineer — *Position* — 2/13/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME	Sample Date(s):	1/14/20
Sampling Method:	Boring	Drill Rig :	CME 550

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-13	SS-1	0 - 2	58	130.47	274.14	238.38	35.76	33.1%

Notes / Deviations / References

Matthew Wolfe — *Technician Name*; NICET 123218 — *Certification Type / No.*; 2/10/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility*; Senior Engineer — *Position*; 2/13/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/6/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Date(s):	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
RW-13	SS-4	6-8	Gale	30.90	43.70	42.13	1.57	14.0%
RW-14	SS-3	4-6	Strike	30.60	47.00	43.91	3.09	23.2%

Notes / Deviations / References

Ashley Parkans
Technician Name

Robert C. Bruorton, P.E. — Senior Engineer — 2/13/2020
Technical Responsibility — *Position* — *Date*

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Greenville:	48 Brookfield Oaks Dr., Suite F Greenville, SC 29607		
Project No:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/05 - 2/14/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Metro	Sample Dates:	1-6/8-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Boring #, Sample #	ft.		grams	grams	grams	grams	%
RW-7, SS-1	0 - 2'	WX-Z	87.95	166.02	144.64	98.80	**80.9%**
RW-7, SS-2	2 - 4'	D-14	101.57	206.99	186.48	153.10	**39.3%**

Balance ID. *13942* *Calibration Date:* *9/10/19* *#200 Sieve* *23239* *Calibration Date:* *2/19/19*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Benjamin Kovaleski
Technician Name

NICET Lab Level III / 117226
Certification Type/No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/18/2020
Date

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project No:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Dates:	1-6/14-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.	grams	grams	grams	grams	grams	%
RW-8, SS-3	4'-6'	J7	89.3	193.4	176.4	155.9	**23.5%**
RW-10, SS-2	2'-4'	M6	94.1	135.4	127.3	110.4	**50.9%**
RW-10, SS-3	4'-6'	G4	95.9	209.5	183.3	126.4	**65.1%**
RW-12, SS-2	2'-4'	P100	88.9	213.5	180.9	99.1	**88.9%**
RW-12, SS-4	6'-8'	J9	88.3	185.3	155.3	101.3	**80.6%**
RW-12, SS-8	23.5'-25'	J17	87.7	230.9	207.6	167.5	**33.4%**

Balance ID. *33084* *Calibration Date:* *11/21/19* *#200 Sieve* *29552* *Calibration Date:* *12/16/19*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Jimmy Hanson — *Technical Responsibility*
Geotechnical Lab Supervisor — *Position*
2/10/2020 — *Date*

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project No:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	Metro	Sample Dates:	1-9/16-2020
Sampling Method:	Boring	Drill Rig :	CME 550

Soak Time: 20 hrs

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
RW-9/SS-2	2'-4'	LD	0.00	93.01	78.73	26.28	**66.6%**
RW-9/SS-4	6'-8'	HN	0.00	57.69	44.20	17.26	**61.0%**
RW-9/SS-5	8'-10'	DK	0.00	104.39	84.94	13.27	**84.4%**
RW-11/SS-2	2'-4'	520	0.00	61.99	44.49	13.32	**70.1%**
RW-11/SS-3	4'-6'	1	0.00	96.62	75.86	25.38	**66.5%**

Balance ID. 14862 Calibration Date: 7/1/19 #200 Sieve 14977 Calibration Date: 1/27/20

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

J.Faucette — *Technician Name* — 2/7/2020 — *Date*

Robert C. Bruorton, P.E. — *Technical Responsibility* — Senior Engineer — *Position* — 2/13/2020 — *Date*

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project No:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/3 - 2/4/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME	Sample Dates:	1/14/20
Sampling Method:	Split Spoon	Drill Rig :	CME 550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.		grams	grams	grams	grams	%
RW-13 SS-1	0 - 2	58	130.5	274.1	238.4	151.2	**80.8%**

Balance ID. *25722* *Calibration Date:* *8/5/19* *#200 Sieve* *28632* *Calibration Date:* *1/2/20*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Matthew Wolfe
Technician Name

NICET 123218
Certification Type/No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

Form No: TR-C117-1
Revision No. 1
Revision Date: 7/27/17

MATERIAL FINER THAN THE #200 SIEVE

ASTM D1140

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project No:	1461-19-069	Report Date:	2/11/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME/Independence/Metro	Sample Dates:	1-6/16-2020
Sampling Method:	Boring	Drill Rig :	CME 55/550

Sample Identification	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Tare Wt. + Dry Wt. after Wash	% Passing #200
Sample #	ft.	grams	grams	grams	grams	grams	%
RW-13 / SS-4	6-8	C	89.2	197.0	183.7	146.0	**39.9%**
RW-14 / SS-3	4-6	Ash	80.1	167.2	151.8	116.1	**49.8%**

Balance ID. *25722* *Calibration Date:* *8/20/18* *#200 Sieve* *28488* *Calibration Date:* *12/20/18*

References / Comments / Deviations:

Samples are washed using Method B, "Washing Using a Wetting Agent."

Ashley Parkans
Technician Name

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

2/13/2020
Date

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

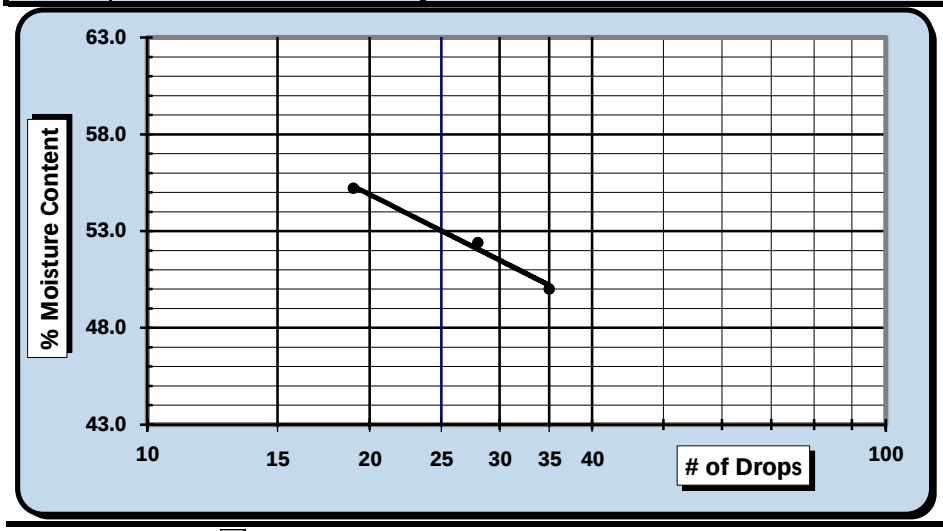
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	RW-7	Sample #:	SS-1	Sample Date:	1/8/20
Location:	Retaining Wall	Offset:	n/a	Depth:	0 - 2'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	P-7	P-8	P-9				12		
A	Tare Weight	15.77	15.64	15.94				11.16		
B	Wet Soil Weight + A	33.42	36.25	34.81				21.40		
C	Dry Soil Weight + A	27.54	29.16	28.10				19.10		
D	Water Weight (B-C)	5.88	7.09	6.71				2.30		
E	Dry Soil Weight (C-A)	11.77	13.52	12.16				7.94		
F	% Moisture (D/E)*100	50.0%	52.4%	55.2%				29.0%		
N	# OF DROPS	35	28	19				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							29.0%		



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

NP, Non-Plastic ☐

Liquid Limit	**53**
Plastic Limit	**29**
Plastic Index	**24**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 80.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

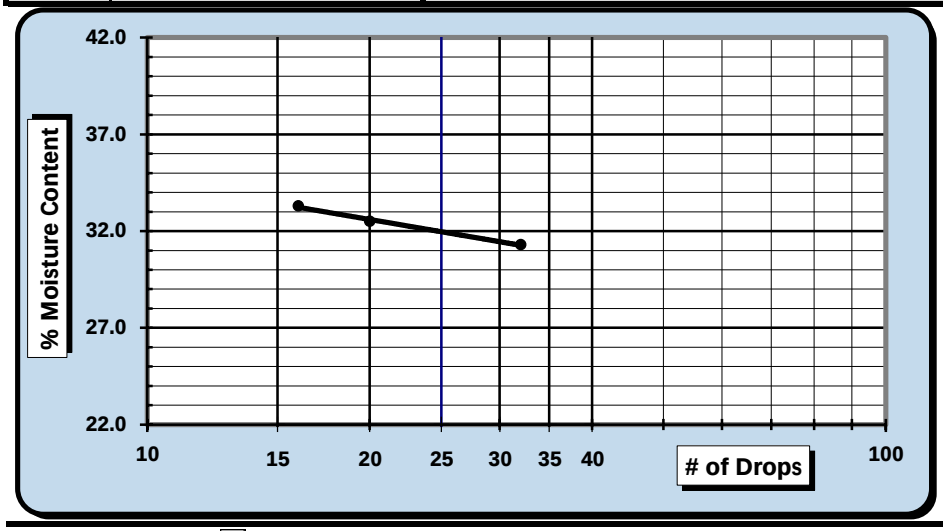
S&ME, Inc. - Spartanburg: 301 Zima Park Drive, Spartanburg, SC 29301

Project #:	1461-19-069	Report Date:	2/18/20
Project Name:	I-77 Panthers Interchange	Test Date:	2/17/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130 N. Charleston, SC 29405		

Boring #:	RW-7	Sample #:	SS-2	Sample Date:	1/8/20
Location:	Retaining Wall	Offset:	n/a	Depth:	2 - 4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	7537	1/31/2020	AASHTO Grooving tool	7797	1/31/2020
LL Apparatus	13859	9/27/2019			
Oven	7313	7/29/2019	No. 40 sieve	14100	6/27/2019

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	Q-7	Q-8	Q-9				13		
A	Tare Weight	16.89	16.90	16.77				12.10		
B	Wet Soil Weight + A	38.64	39.55	38.21				23.08		
C	Dry Soil Weight + A	33.46	33.99	32.85				20.79		
D	Water Weight (B-C)	5.18	5.56	5.36				2.29		
E	Dry Soil Weight (C-A)	16.57	17.09	16.08				8.69		
F	% Moisture (D/E)*100	31.3%	32.5%	33.3%				26.4%		
N	# OF DROPS	32	20	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							26.4%		



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

NP, Non-Plastic ☐

Liquid Limit	**32**
Plastic Limit	**26**
Plastic Index	**6**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 Sieve:* 39.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

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

Matt Jacobs	2/18/20	Robert C. Brourton, P.E.	2/18/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		

Boring No.	RW-8	Sample No.	SS-2	Sample Date:	1-7-2020
Location:	Retaining Wall	Sampled by:	Metro	Depth:	2'-4'

Sample Description: Very dark grayish brown clay with some sand and gravel

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* *33084* *Cal. Date:* *11/21/19* *Due:* *11/21/20*

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

Oven Temperature: 105 °C		*Tare #*	S-4
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	122.46
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	382.87
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	320.21
w	Water Weight	*(a-b)*	62.66
A	Mass of As-Received Specimen	*(a-t)*	260.41
B	Mass of Oven Dry Specimen	*(b-t)*	197.75
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**24.1%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**31.7%**

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

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

Muffle Furnace: 440 °C		*Tare #*	3
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	111.77
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	231.82
c	Ash Weight + Tare Wt.	*grams*	227.90
C	Ash Weight	*c-t*	116.13
B	Mass of Oven Dry Specimen	*(b-t)*	120.05
D	***% Ash Content***	*(C/B)*100*	**96.7%**
	% Organic Matter	*100-D*	**3.3%**

Muffle Furnace: *S&ME ID #:* *26317* *Cal. Date:* *9/23/19* *Due:* *9/23/20*

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

Jimmy Hanson		Geotechnical Lab Supervisor	2/10/2020
Technical Responsibility	*Signature*	*Position*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

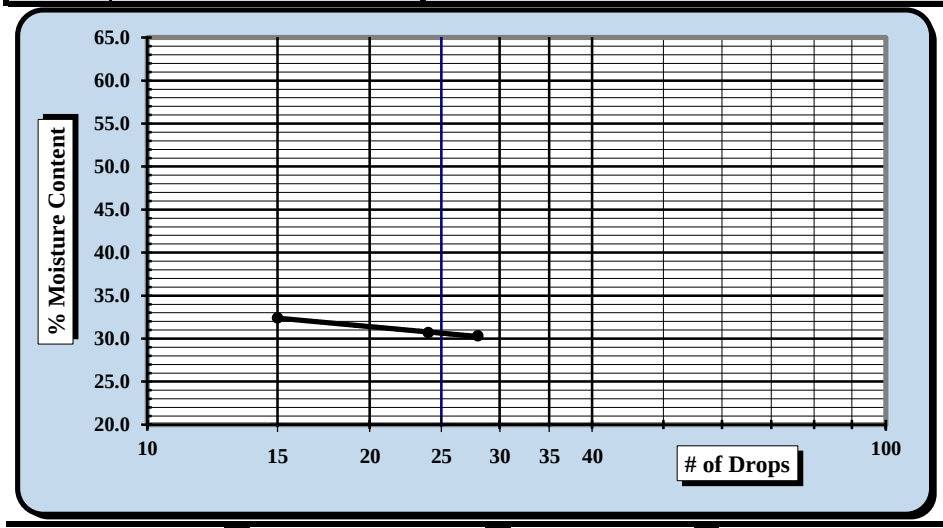
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-8	Sample #: SS-3	Sample Date: 1-7-2020
Location:	Retaining Wall	Offset: n/a	Depth: 4'-6'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

	Pan # 160	Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				24		
A	Tare Weight	16.52	16.86	15.81				16.75		
B	Wet Soil Weight + A	31.90	31.33	30.21				25.64		
C	Dry Soil Weight + A	28.32	27.93	26.69				24.38		
D	Water Weight (B-C)	3.58	3.40	3.52				1.26		
E	Dry Soil Weight (C-A)	11.80	11.07	10.88				7.63		
F	% Moisture (D/E)*100	30.3%	30.7%	32.4%				16.5%		
N	# OF DROPS	28	24	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**16.5%**		



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

NP, Non-Plastic ☐

Liquid Limit	**31**
Plastic Limit	**17**
Plastic Index	**14**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 24%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

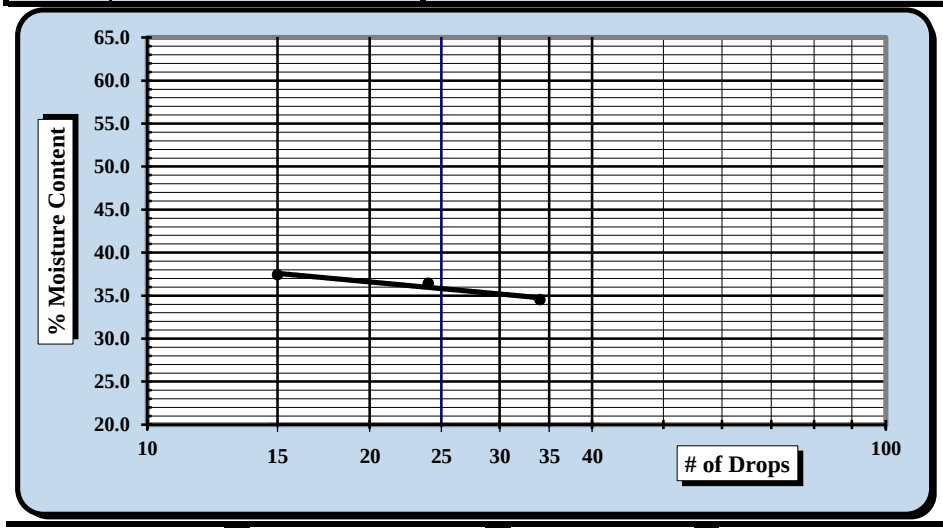
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #: SS-2	Sample Date: 1-9-2020
Location:	Retaining Wall	Offset: n/a	Depth: 2'-4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	1	2	3				4	5	
A	Tare Weight	11.07	10.64	11.61				11.34	10.73	
B	Wet Soil Weight + A	25.23	23.83	24.50				21.00	20.39	
C	Dry Soil Weight + A	21.60	20.31	20.99				19.54	18.90	
D	Water Weight (B-C)	3.63	3.52	3.51				1.46	1.49	
E	Dry Soil Weight (C-A)	10.53	9.67	9.38				8.20	8.17	
F	% Moisture (D/E)*100	34.5%	36.4%	37.4%				17.8%	18.2%	
N	# OF DROPS	34	24	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**18.0%**		



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

NP, Non-Plastic ☐

Liquid Limit	**36**
Plastic Limit	**18**
Plastic Index	**18**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 57.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

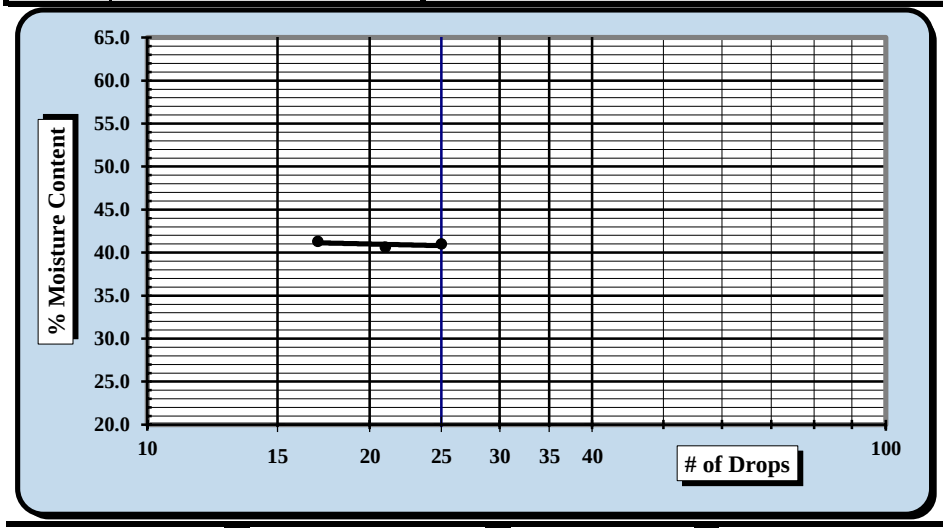
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #: SS-4	Sample Date: 1-9-2020
Location:	Retaining Wall	Offset: n/a	Depth: 6'-8'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9	10	
A	Tare Weight	11.23	11.69	10.88				11.97	11.74	
B	Wet Soil Weight + A	22.07	22.91	23.50				21.74	21.26	
C	Dry Soil Weight + A	18.92	19.67	19.81				19.41	18.97	
D	Water Weight (B-C)	3.15	3.24	3.69				2.33	2.29	
E	Dry Soil Weight (C-A)	7.69	7.98	8.93				7.44	7.23	
F	% Moisture (D/E)*100	41.0%	40.6%	41.3%				31.3%	31.7%	
N	# OF DROPS	25	21	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**31.5%**		



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

NP, Non-Plastic ☐

Liquid Limit	**41**
Plastic Limit	**32**
Plastic Index	**9**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 53.3%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

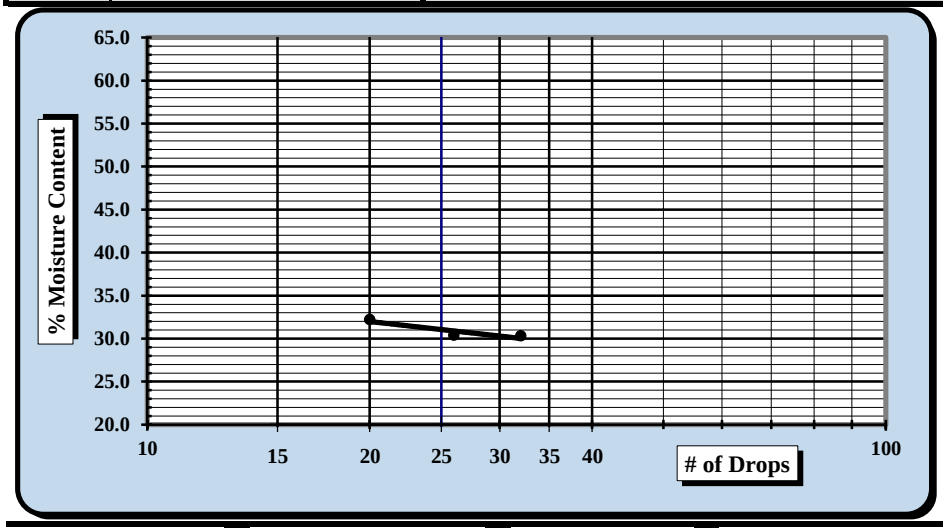
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-9	Sample #: SS-5	Sample Date: 1-9-2020
Location:	Retaining Wall	Offset: n/a	Depth: 8'-10'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	11	12	13				14	15	
A	Tare Weight	11.03	10.75	12.04				11.79	11.83	
B	Wet Soil Weight + A	23.47	22.64	24.60				21.30	21.32	
C	Dry Soil Weight + A	20.58	19.87	21.54				19.63	19.74	
D	Water Weight (B-C)	2.89	2.77	3.06				1.67	1.58	
E	Dry Soil Weight (C-A)	9.55	9.12	9.50				7.84	7.91	
F	% Moisture (D/E)*100	30.3%	30.4%	32.2%				21.3%	20.0%	
N	# OF DROPS	32	26	20				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**20.7%**		



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

NP, Non-Plastic ☐

Liquid Limit	**31**
Plastic Limit	**21**
Plastic Index	**10**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 47.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE, ASH, AND ORGANIC MATTER

ASTM D-2974

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC 29405		

Boring No.	RW-10	Sample No.	SS-1	Sample Date:	1-9-2020
Location:	Retaining Wall	Sampled by:	Metro	Depth:	0'-2'

Sample Description: Dark reddish brown sandy clay

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: *S&ME ID #:* *33084* *Cal. Date:* *11/21/19* *Due:* *11/21/20*

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

Oven Temperature: 105 °C		*Tare #*	S-23
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	121.85
a	Mass of *As-Received* Specimen + Tare Wt.	*grams*	388.83
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	348.23
w	Water Weight	*(a-b)*	40.60
A	Mass of As-Received Specimen	*(a-t)*	266.98
B	Mass of Oven Dry Specimen	*(b-t)*	226.38
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**15.2%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**17.9%**

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

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

Muffle Furnace: 440 °C		*Tare #*	4
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	114.67
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	268.24
c	Ash Weight + Tare Wt.	*grams*	261.80
C	Ash Weight	*c-t*	147.13
B	Mass of Oven Dry Specimen	*(b-t)*	153.57
D	***% Ash Content***	*(C/B)*100*	**95.8%**
	% Organic Matter	*100-D*	**4.2%**

Muffle Furnace: *S&ME ID #:* *26317* *Cal. Date:* *9/23/19* *Due:* *9/23/20*

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

Jimmy Hanson		Geotechnical Lab Supervisor	2/10/2020
Technical Responsibility	*Signature*	*Position*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

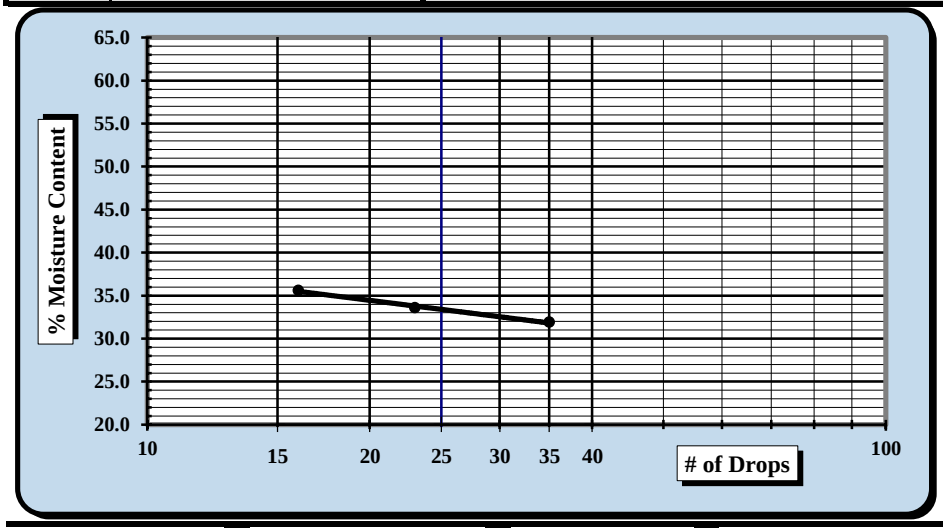
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #: SS-2	Sample Date: 1-9-2020
Location:	Retaining Wall	Offset: n/a	Depth: 2'-4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan # 143		Liquid Limit						Plastic Limit		
	Tare #:	26	27	28				29		
A	Tare Weight	16.67	16.76	16.72				16.60		
B	Wet Soil Weight + A	28.09	27.37	31.20				25.63		
C	Dry Soil Weight + A	25.33	24.70	27.40				24.17		
D	Water Weight (B-C)	2.76	2.67	3.80				1.46		
E	Dry Soil Weight (C-A)	8.66	7.94	10.68				7.57		
F	% Moisture (D/E)*100	31.9%	33.6%	35.6%				19.3%		
N	# OF DROPS	35	23	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**19.3%**		



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

NP, Non-Plastic ☐

Liquid Limit	**33**
Plastic Limit	**19**
Plastic Index	**14**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 51%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

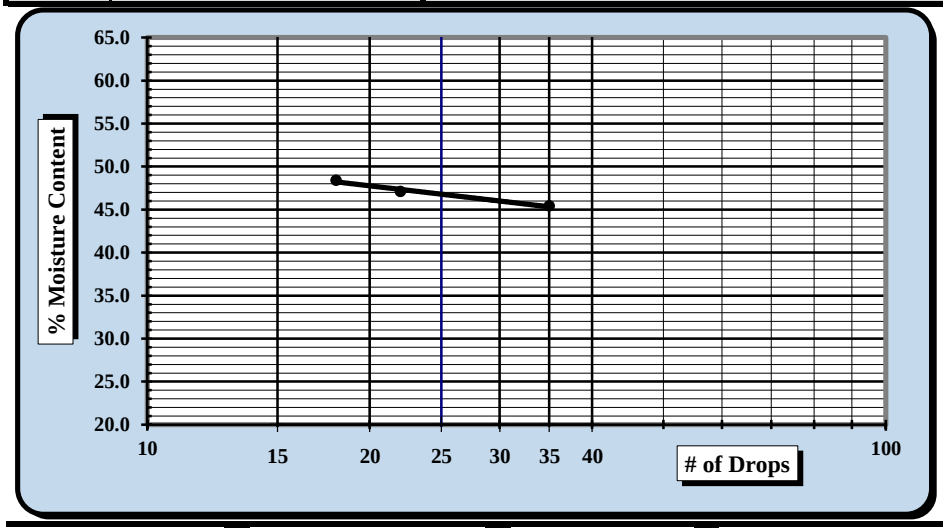
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-10	Sample #: SS-3	Sample Date: 1-9-2020
Location:	Retaining Wall	Offset: n/a	Depth: 4'-6'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

	Pan # 197	Liquid Limit						Plastic Limit		
	Tare #:	46	47	48				49		
A	Tare Weight	15.88	15.68	14.96				15.30		
B	Wet Soil Weight + A	27.45	26.46	27.40				24.16		
C	Dry Soil Weight + A	23.84	23.01	23.34				22.69		
D	Water Weight (B-C)	3.61	3.45	4.06				1.47		
E	Dry Soil Weight (C-A)	7.96	7.33	8.38				7.39		
F	% Moisture (D/E)*100	45.4%	47.1%	48.4%				19.9%		
N	# OF DROPS	35	22	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**19.9%**		



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

NP, Non-Plastic ☐

Liquid Limit	**47**
Plastic Limit	**20**
Plastic Index	**27**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 65%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

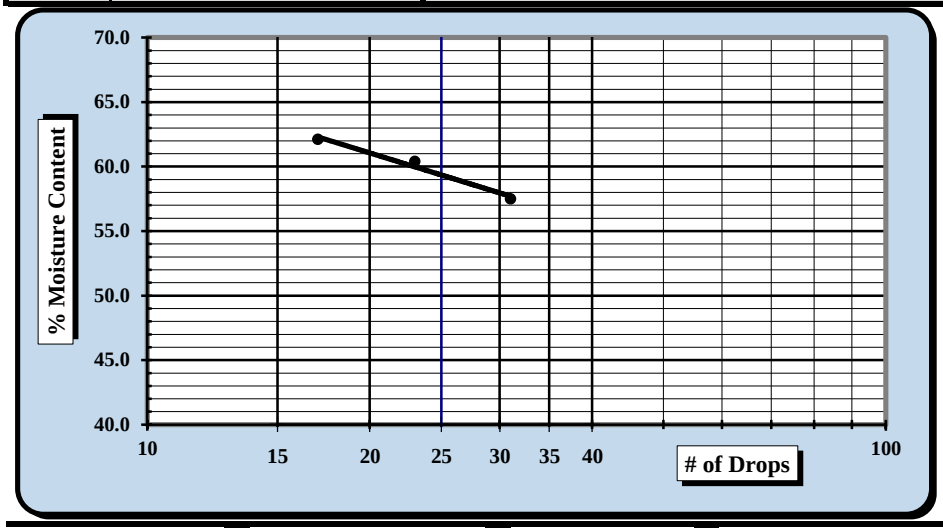
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-11	Sample #: SS-2	Sample Date: 1-14-2020
Location:	Retaining Wall	Offset: n/a	Depth: 2'-4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	16	17	18				19	20	
A	Tare Weight	11.87	11.89	11.89				11.83	11.89	
B	Wet Soil Weight + A	20.58	21.53	21.29				20.38	21.08	
C	Dry Soil Weight + A	17.40	17.90	17.69				18.46	18.90	
D	Water Weight (B-C)	3.18	3.63	3.60				1.92	2.18	
E	Dry Soil Weight (C-A)	5.53	6.01	5.80				6.63	7.01	
F	% Moisture (D/E)*100	57.5%	60.4%	62.1%				29.0%	31.1%	
N	# OF DROPS	31	23	17				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**30.1%**		



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

NP, Non-Plastic ☐

Liquid Limit	**59**
Plastic Limit	**30**
Plastic Index	**29**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 78.4%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

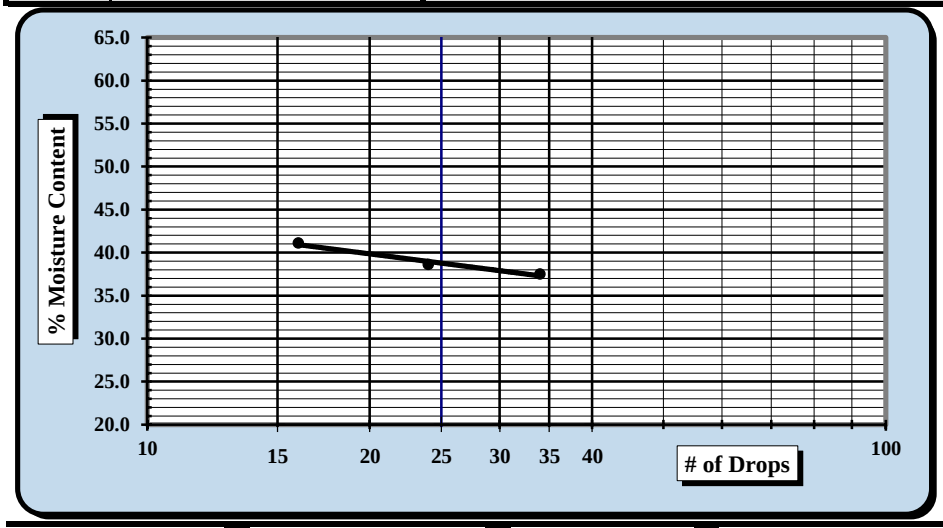
S&ME, Inc. - Wilmington: 3006 Hall Waters Drive, Suite 100, Wilmington, NC 28405

Project #:	1461-19-069	Report Date:	2/7/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/7/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	RW-11	Sample #: SS-3		Sample Date: 1-14-2020	
Location:	Retaining Wall	Offset: n/a		Depth: 4'-6'	

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	14862	7/1/2019	Flat Grooving tool	14946 (A)	7/10/2019
LL Apparatus	14958	7/10/2019			
Oven	14603	7/17/2019	No. 40 Sieve	14665	1/22/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	21	22	23				21D	22D	
A	Tare Weight	11.99	11.68	11.86				17.04	17.04	
B	Wet Soil Weight + A	22.99	22.66	22.70				25.98	26.35	
C	Dry Soil Weight + A	19.99	19.60	19.54				24.42	24.69	
D	Water Weight (B-C)	3.00	3.06	3.16				1.56	1.66	
E	Dry Soil Weight (C-A)	8.00	7.92	7.68				7.38	7.65	
F	% Moisture (D/E)*100	37.5%	38.6%	41.1%				21.1%	21.7%	
N	# OF DROPS	34	24	16				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**21.4%**		



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

NP, Non-Plastic ☐

Liquid Limit	**39**
Plastic Limit	**21**
Plastic Index	**18**
Group Symbol	**CL**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 56.9%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

J. Faucette	2/7/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

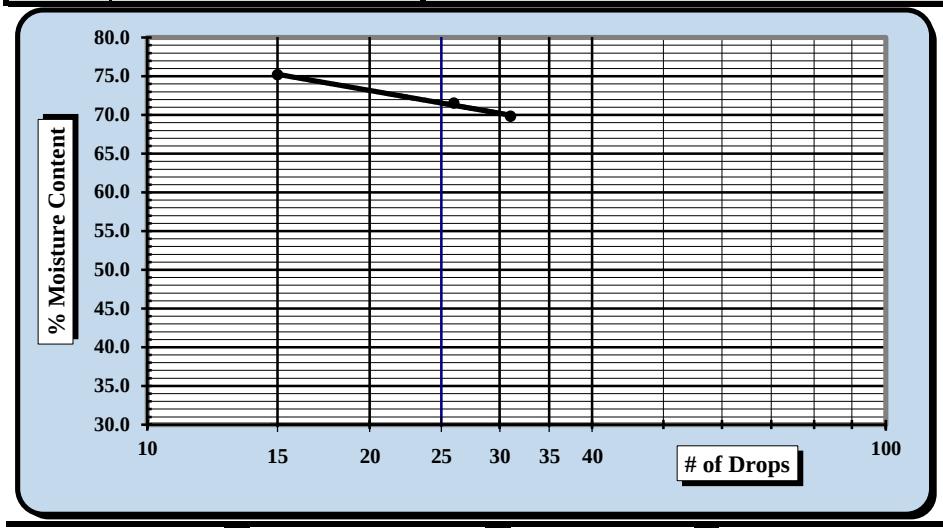
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #: SS-2	Sample Date: 1-14-2020
Location:	Retaining Wall	Offset: n/a	Depth: 2'-4'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan # 101		Liquid Limit						Plastic Limit		
	Tare #:	41	42	43				44		
A	Tare Weight	15.10	15.03	14.95				15.09		
B	Wet Soil Weight + A	27.51	27.43	29.05				23.89		
C	Dry Soil Weight + A	22.41	22.26	23.00				21.70		
D	Water Weight (B-C)	5.10	5.17	6.05				2.19		
E	Dry Soil Weight (C-A)	7.31	7.23	8.05				6.61		
F	% Moisture (D/E)*100	69.8%	71.5%	75.2%				33.1%		
N	# OF DROPS	31	26	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**33.1%**		



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

NP, Non-Plastic ☐

Liquid Limit	**71**
Plastic Limit	**33**
Plastic Index	**38**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 89%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

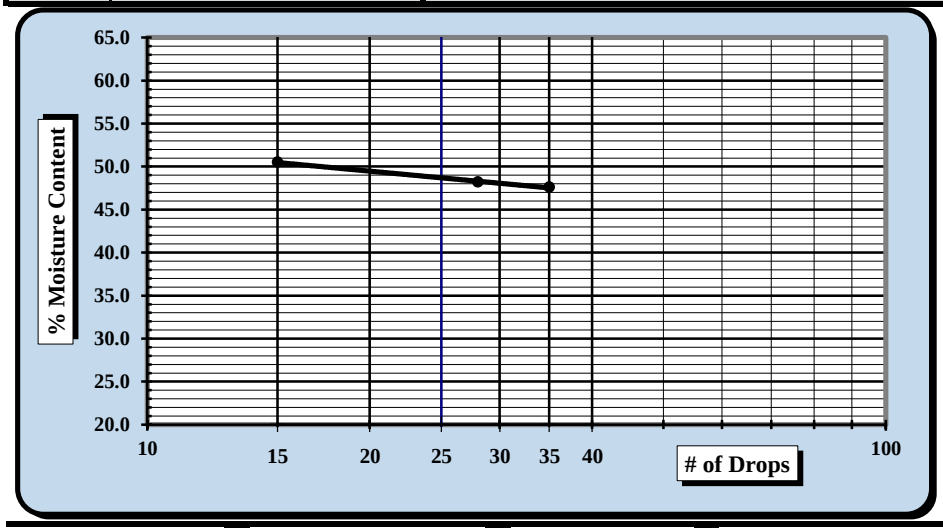
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #: SS-4	Sample Date: 1-14-2020
Location:	Retaining Wall	Offset: n/a	Depth: 6'-8'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

		Liquid Limit						Plastic Limit		
Pan #	479									
	Tare #:	5	10	15				20		
A	Tare Weight	16.63	16.82	16.83				16.65		
B	Wet Soil Weight + A	28.35	27.18	29.43				24.91		
C	Dry Soil Weight + A	24.57	23.81	25.20				23.02		
D	Water Weight (B-C)	3.78	3.37	4.23				1.89		
E	Dry Soil Weight (C-A)	7.94	6.99	8.37				6.37		
F	% Moisture (D/E)*100	47.6%	48.2%	50.5%				29.7%		
N	# OF DROPS	35	28	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.7%**		



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

NP, Non-Plastic ☐

Liquid Limit	**49**
Plastic Limit	**30**
Plastic Index	**19**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 81%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

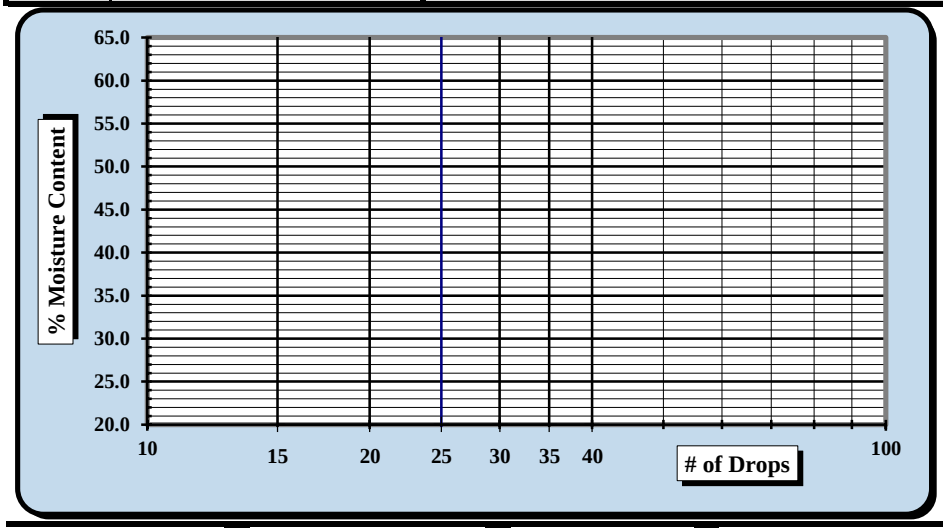
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Atlanta: 4350 River Green Parkway, Suite 200, Duluth, GA 30096

Project #:	1461-19-069	Report Date:	2/10/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/4-2/10/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-12	Sample #: SS-8	Sample Date: 1-14-2020
Location:	Retaining Wall	Offset: n/a	Depth: 23.5'-25'

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	25128	4/2/2019	Flat Grooving tool	26551	2/23/2019
LL Apparatus	31336	2/23/2019			
Oven	31332	10/21/2019	No. 40 Sieve	26285	12/6/2019

Pan # 112		Liquid Limit						Plastic Limit		
	Tare #:	25	30	45				50		
A	Tare Weight									
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							*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*									



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

NP, Non-Plastic ☒

Liquid Limit	**NP**
Plastic Limit	**NP**
Plastic Index	**NP**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 33%

Notes / Deviations / References: Specimen was found to be non-plastic

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Jimmy Hanson	2/10/2020	Jimmy Hanson	2/10/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

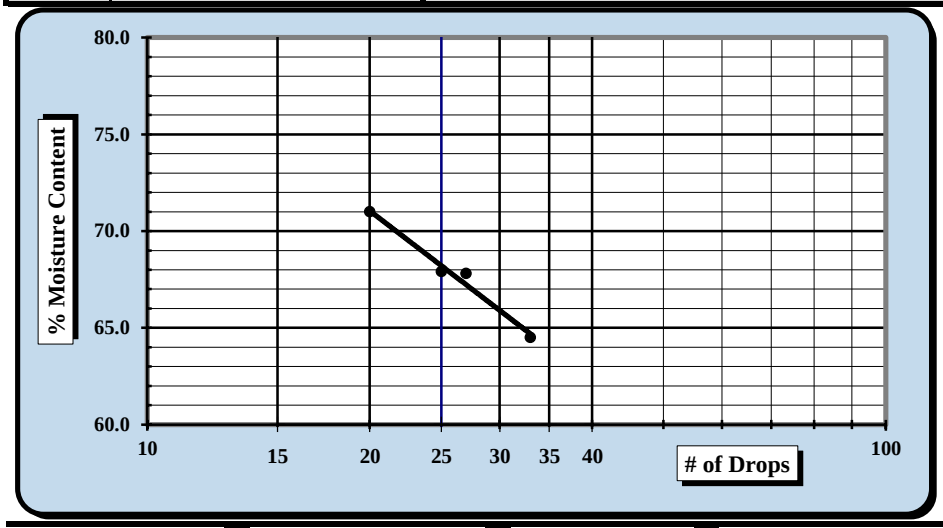
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/10/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/3 - 2/6/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-13	Sample #: SS-1	Sample Date: 1/14/20
Location:	Retaining wall	Offset: n/a	Depth: 0 - 2 ft.

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 30		Liquid Limit						Plastic Limit		
	Tare #:	229	211	46	207			10		
A	Tare Weight	20.70	20.86	20.73	20.94			20.80		
B	Wet Soil Weight + A	26.77	27.05	27.01	26.84			30.83		
C	Dry Soil Weight + A	24.39	24.55	24.47	24.39			28.43		
D	Water Weight (B-C)	2.38	2.50	2.54	2.45			2.40		
E	Dry Soil Weight (C-A)	3.69	3.69	3.74	3.45			7.63		
F	% Moisture (D/E)*100	64.5%	67.8%	67.9%	71.0%			31.5%		
N	# OF DROPS	33	27	25	20			*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**31.5%**		



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

NP, Non-Plastic ☐

Liquid Limit	**68**
Plastic Limit	**32**
Plastic Index	**36**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 81%

Notes / Deviations / References:

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/10/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

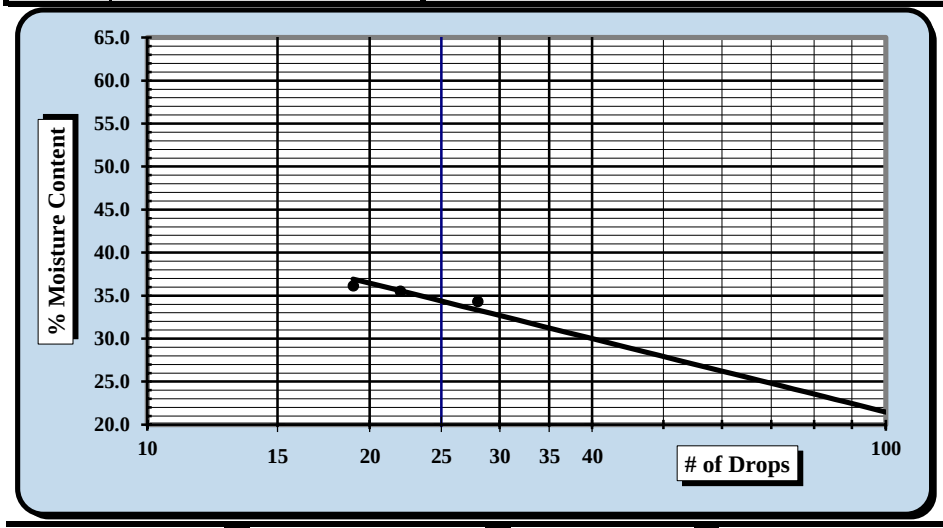
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-13	Sample #: SS-4	Sample Date: 1-14-2020
Location:	Retaining wall	Offset: n/a	Depth: 6 to 8

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

	Pan #	Liquid Limit						Plastic Limit		
	Tare #:	RICO	452	459				A-1	PEPE	
A	Tare Weight	30.60	25.16	25.12				16.83	17.42	
B	Wet Soil Weight + A	39.10	35.12	34.01				25.30	26.24	
C	Dry Soil Weight + A	36.93	32.51	31.65				23.53	24.39	
D	Water Weight (B-C)	2.17	2.61	2.36				1.77	1.85	
E	Dry Soil Weight (C-A)	6.33	7.35	6.53				6.70	6.97	
F	% Moisture (D/E)*100	34.3%	35.5%	36.1%				26.4%	26.5%	
N	# OF DROPS	28	22	19				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**26.5%**		



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

NP, Non-Plastic ☐

Liquid Limit	**35**
Plastic Limit	**27**
Plastic Index	**8**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

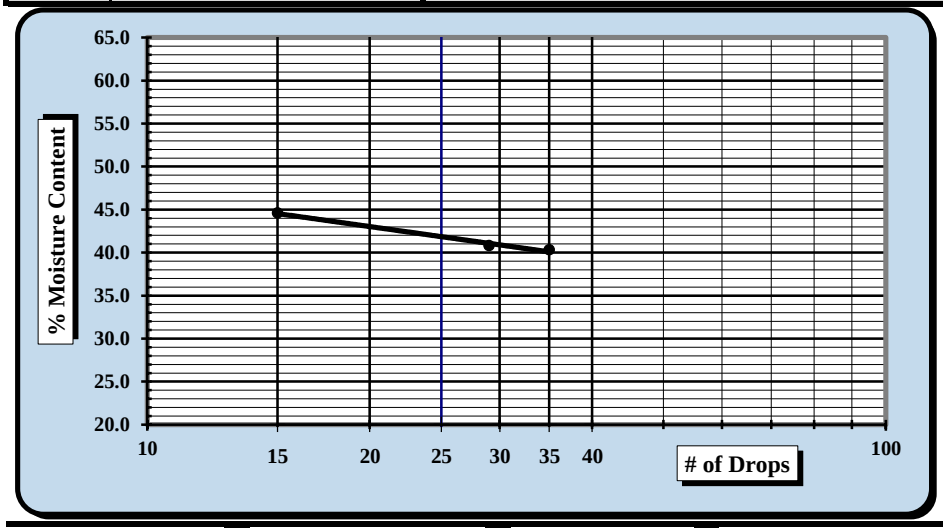
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Nashville: 820 Fesslers Parkway, Nashville, TN 37210

Project #:	1461-19-069	Report Date:	2/11/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/5-2/11
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	RW-14	Sample #: SS-3	Sample Date: 1-14-2020
Location:	Retaining wall	Offset: n/a	Depth: 4 to 6

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	FLA	MICH	SD				10	B-3	
A	Tare Weight	30.57	30.72	30.60				14.29	17.31	
B	Wet Soil Weight + A	39.34	39.86	38.16				21.60	24.06	
C	Dry Soil Weight + A	36.82	37.21	35.83				19.93	22.52	
D	Water Weight (B-C)	2.52	2.65	2.33				1.67	1.54	
E	Dry Soil Weight (C-A)	6.25	6.49	5.23				5.64	5.21	
F	% Moisture (D/E)*100	40.3%	40.8%	44.6%				29.6%	29.6%	
N	# OF DROPS	35	29	15				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**29.6%**		



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

NP, Non-Plastic ☐

Liquid Limit	**42**
Plastic Limit	**30**
Plastic Index	**12**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Kenneth Mitchell	2/11/2020	Robert C. Bruorton, P.E.	2/13/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

Appendix IX – Rock Core Sample Laboratory Test Results

UNCONFINED COMPRESSION
(ASTM D7012 Method C)

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

Project Name: I-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
EB-1	RC-1	42.6 - 43.0	3.78 [1]	1.98	A	3.08	174.0	48	6,659	2,162	0.7
EB-1	RC-2	57.5 - 57.9	4.30	1.98	A	3.08	190.2	79	69,041	22,416	0.0
EB-2	RC-3	25.3 - 25.7	3.95	1.86	A	2.72	171.6	79	92,568	34,032	0.1
EB-2	RC-4	46.7 - 47.1	4.05	1.87	A	2.75	175.8	77	109,544	39,834	0.0
IB-1	RC-5	45.7 - 46.2	4.34	1.98	A	3.08	191.4	69	100,469	32,620	0.1

NOTES:
1. The length to diameter ratio is 1.9:1 and does not meet the requirements of ASTM D7012e1, Sec. 8.1.1, therefore the results may differ from a test specimen that meets the requirements of ASTM D7012.
2. Effective (as received) unit weight as determined by RTH 109-93.
3. Loading rates were selected to target reaching failure between 2 and 15 minutes.
4. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 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 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 and error 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 D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 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 D4543-19 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 D4543-19 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 D4543-19 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-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
IB-1	RC-6	65.0 - 65.5	4.21	1.98	A	3.08	192.8	67	101,164	32,845	0.1
IB-2B	RC-7	43.3 - 43.8	4.38	1.98	A	3.08	189.7	68	109,764	35,638	0.0
IB-2B	RC-8	57.5 - 57.9	4.38	1.98	A	3.08	194.9	64	88,279	28,662	0.1
IB-3	RC-9	53.7 - 54.1	4.45	1.98	A	3.08	181.8	63	64,809	21,042	0.2
IB-3	RC-10	60.5 - 60.9	4.30	1.98	A	3.08	187.8	71	124,042	40,273	0.1

NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 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 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 and error 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 D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 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 D4543-19 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 D4543-19 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 D4543-19 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-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
IB-4A	RC-11	24.7 - 25.1	4.38	1.98	A	3.08	186.3	71	103,284	33,534	0.4
IB-4A	RC-12	34.8 - 35.2	4.35	1.98	A	3.08	187.5	75	112,693	36,589	0.0
IB-4A	RC-13	54.3 - 54.7	4.37	1.98	A	3.08	187.7	67	79,955	25,959	0.0
EB-3	RC-14	55.0 - 55.35	3.95	1.84	A	2.66	197.5	86	109,492	41,162	0.0
EB-3	RC-15	62.6 - 62.95	4.12	1.85	A	2.69	189.7	80	58,298	21,672	0.1

NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 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 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 and error 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 D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 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 D4543-19 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 D4543-19 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 D4543-19 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-77 Panthers Interchange
Project Number: 1461-19-069

Report Date: February 17, 2020
Reviewed By: N. Randy Rainwater

Boring No.	Sample No.	Depth (ft)	Dimensions, in.		Shape (See Key)	Area (in^2)	Unit Weight (lbs/ft^3)	Loading Rate (psi/sec)	Maximum Load (lbs)	Strength (psi)	Moisture (%)
			Length	Diameter							
EB-4	RC-16	44.0 - 44.4	3.97	1.98	A	3.08	193.2	72	73,772	23,952	0.1
EB-4	RC-17	55.5 - 55.9	4.16	1.98	A	3.08	186.5	74	140,391	45,581	0.0

NOTES:
1. Effective (as received) unit weight as determined by RTH 109-93.
2. Loading rates were selected to target reaching failure between 2 and 15 minutes.
3. Test results for specimens not meeting the requirements of ASTM D4543-19 may differ from a test specimen that meets the requirements of ASTM D4543.

SHAPE KEY

ASTM D4543-19 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 D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

B Test specimen measurements met the desired shape tolerances of ASTM D4543-19 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 D4543-19 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 D4543-19 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 D4543-19 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.

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

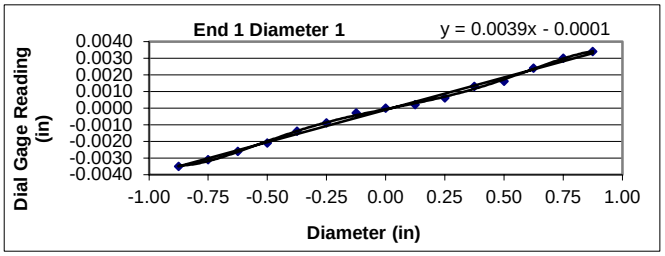
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	3.78	**Tested by:**	Tori Igoe
Boring Id:	EB-1	**Unit Weight (pcf):**	174.0	**Reviewed by:**	John Pearson
Sample No.:	RC-1	**Moisture Content (%):**	0.7		
Depth (ft):	42.6 - 43.0				

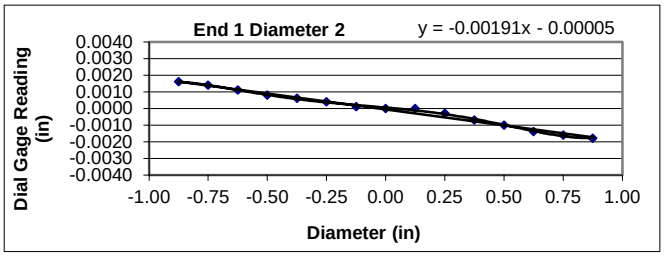
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

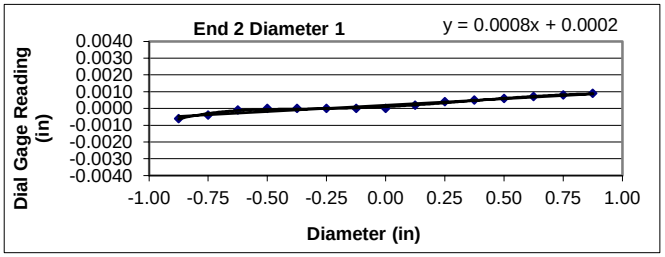
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0035	0.0016	-0.0006	0.0021
- 6/8	-0.0031	0.0014	-0.0004	0.0018
- 5/8	-0.0026	0.0011	-0.0001	0.0015
- 4/8	-0.0021	0.0008	0.0000	0.0010
- 3/8	-0.0014	0.0006	0.0000	0.0006
- 2/8	-0.0009	0.0004	0.0000	0.0001
- 1/8	-0.0003	0.0001	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0002	-0.0002
2/8	0.0006	-0.0003	0.0004	-0.0004
3/8	0.0013	-0.0007	0.0005	-0.0009
4/8	0.0016	-0.0010	0.0006	-0.0011
5/8	0.0024	-0.0014	0.0007	-0.0016
6/8	0.0030	-0.0016	0.0008	-0.0018
7/8	0.0034	-0.0018	0.0009	-0.0023

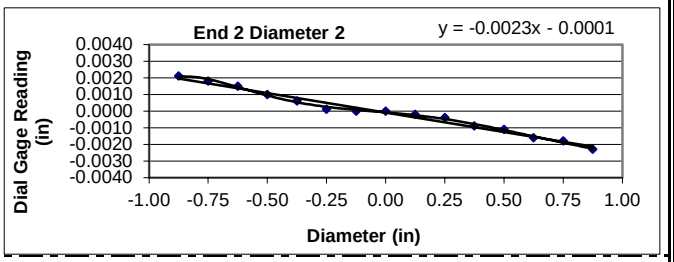




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00389
	Angle of Best Fit Line:	0.22313
End 2:	Slope of Best Fit Line:	0.00076
	Angle of Best Fit Line:	0.04354
	Max Angular Difference:	**0.18**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00191
	Angle of Best Fit Line:	-0.10952
End 2:	Slope of Best Fit Line:	-0.00234
	Angle of Best Fit Line:	-0.13424
	Max Angular Difference:	**0.02**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0069	0.0035	**YES**
End 1 Diam 2	0.0034	0.0017	**YES**
End 2 Diam 1	0.0015	0.0008	**YES**
End 2 Diam 2	0.0044	0.0022	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

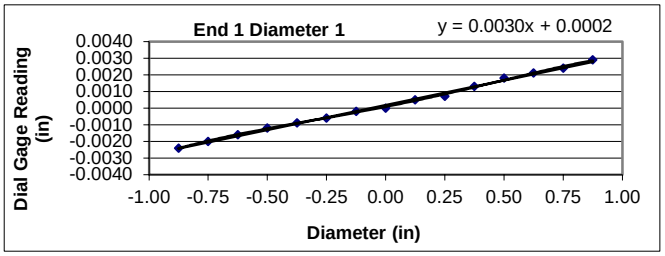
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.30	**Tested by:**	Tori Igoe
Boring Id:	EB-1	**Unit Weight (pcf):**	190.2	**Reviewed by:**	John Pearson
Sample No.:	RC-2	**Moisture Content (%):**	0.0		
Depth (ft):	57.5 - 57.9				

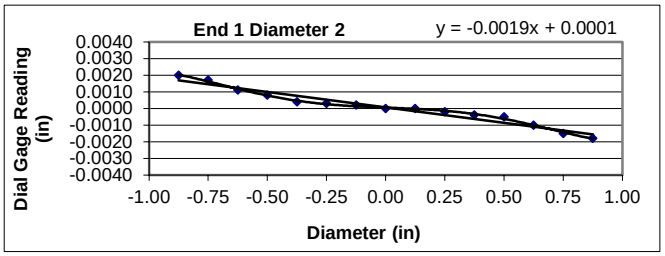
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

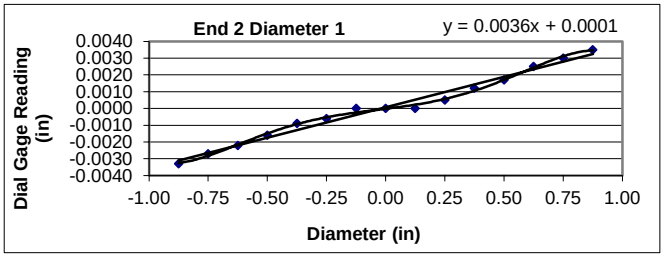
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0024	0.0020	-0.0033	0.0035
- 6/8	-0.0020	0.0017	-0.0027	0.0033
- 5/8	-0.0016	0.0011	-0.0022	0.0027
- 4/8	-0.0012	0.0008	-0.0016	0.0023
- 3/8	-0.0009	0.0004	-0.0009	0.0017
- 2/8	-0.0006	0.0003	-0.0006	0.0010
- 1/8	-0.0002	0.0002	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0005	0.0000	0.0000	-0.0002
2/8	0.0007	-0.0002	0.0005	-0.0011
3/8	0.0013	-0.0004	0.0012	-0.0015
4/8	0.0018	-0.0005	0.0017	-0.0020
5/8	0.0021	-0.0010	0.0025	-0.0028
6/8	0.0024	-0.0015	0.0030	-0.0032
7/8	0.0029	-0.0018	0.0035	-0.0038

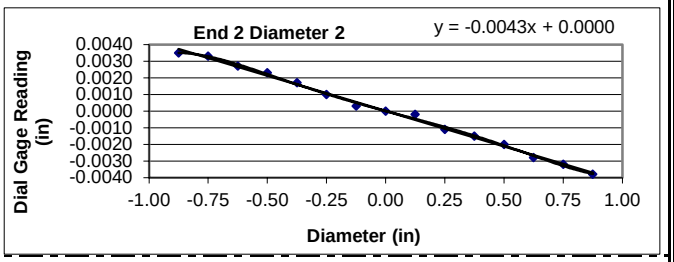




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00297
	Angle of Best Fit Line:	0.17009
End 2:	Slope of Best Fit Line:	0.00363
	Angle of Best Fit Line:	0.20790
	Max Angular Difference:	**-0.04**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00186
	Angle of Best Fit Line:	-0.10657
End 2:	Slope of Best Fit Line:	-0.00426
	Angle of Best Fit Line:	-0.24408
	Max Angular Difference:	**0.14**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0053	0.0027	**YES**
End 1 Diam 2	0.0038	0.0019	**YES**
End 2 Diam 1	0.0068	0.0034	**YES**
End 2 Diam 2	0.0073	0.0037	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

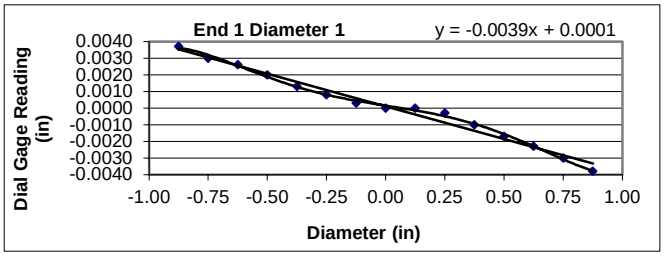
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.86	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	3.95	**Tested by:**	Tori Igoe
Boring Id:	EB-2	**Unit Weight (pcf):**	171.6	**Reviewed by:**	John Pearson
Sample No.:	RC-3	**Moisture Content (%):**	0.1		
Depth (ft):	22.3 - 25.7				

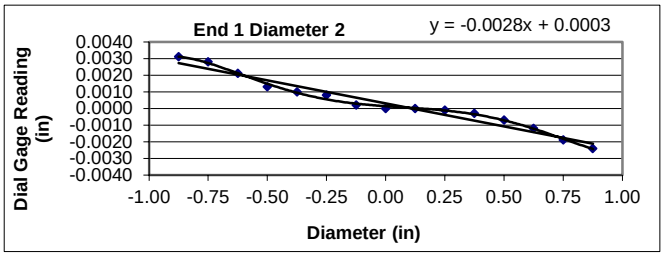
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

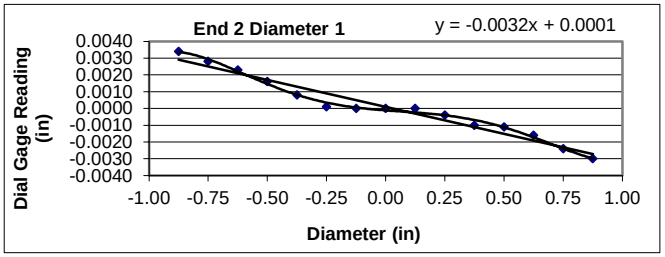
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0037	0.0031	0.0034	0.0024
- 6/8	0.0030	0.0028	0.0028	0.0018
- 5/8	0.0026	0.0021	0.0023	0.0012
- 4/8	0.0020	0.0013	0.0016	0.0008
- 3/8	0.0013	0.0010	0.0008	0.0004
- 2/8	0.0008	0.0008	0.0001	0.0001
- 1/8	0.0003	0.0002	0.0000	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	-0.0003	-0.0001	-0.0004	-0.0004
3/8	-0.0010	-0.0003	-0.0010	-0.0013
4/8	-0.0017	-0.0007	-0.0011	-0.0018
5/8	-0.0023	-0.0012	-0.0016	-0.0026
6/8	-0.0030	-0.0019	-0.0024	-0.0030
7/8	-0.0038	-0.0024	-0.0030	-0.0032

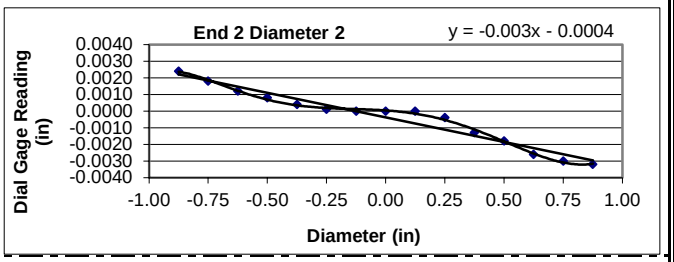




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00392
	Angle of Best Fit Line:	-0.22460
End 2:	Slope of Best Fit Line:	-0.00322
	Angle of Best Fit Line:	-0.18449
	Max Angular Difference:	**-0.04**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00277
	Angle of Best Fit Line:	-0.15895
End 2:	Slope of Best Fit Line:	-0.00296
	Angle of Best Fit Line:	-0.16943
	Max Angular Difference:	**0.01**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0075	0.0040	**YES**
End 1 Diam 2	0.0055	0.0030	**YES**
End 2 Diam 1	0.0064	0.0034	**YES**
End 2 Diam 2	0.0056	0.0030	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

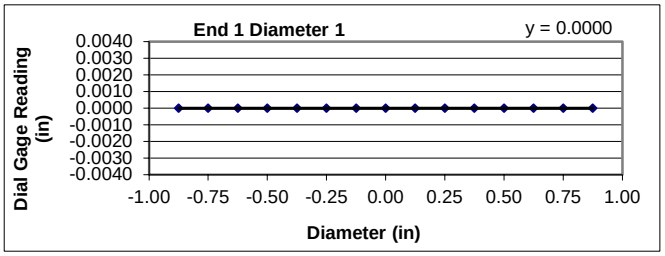
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.87	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.05	**Tested by:**	Tori Igoe
Boring Id:	EB-2	**Unit Weight (pcf):**	175.8	**Reviewed by:**	John Pearson
Sample No.:	RC-4	**Moisture Content (%):**	0.0		
Depth (ft):	46.7 - 47.1				

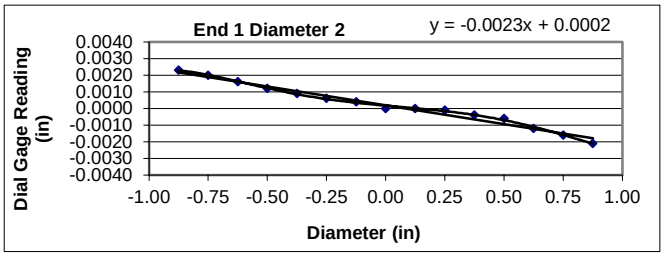
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

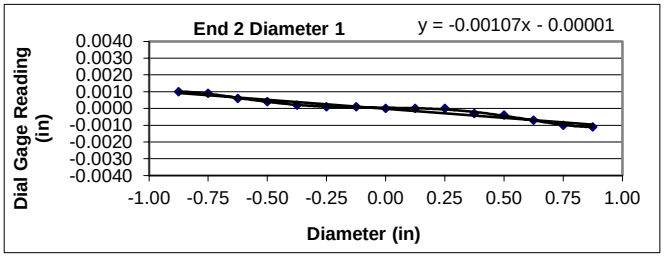
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0023	0.0010	0.0039
- 6/8	0.0000	0.0020	0.0009	0.0035
- 5/8	0.0000	0.0016	0.0006	0.0028
- 4/8	0.0000	0.0012	0.0004	0.0021
- 3/8	0.0000	0.0009	0.0002	0.0016
- 2/8	0.0000	0.0006	0.0001	0.0009
- 1/8	0.0000	0.0004	0.0001	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0006
2/8	0.0000	-0.0001	0.0000	-0.0012
3/8	0.0000	-0.0004	-0.0003	-0.0018
4/8	0.0000	-0.0006	-0.0004	-0.0024
5/8	0.0000	-0.0012	-0.0007	-0.0030
6/8	0.0000	-0.0016	-0.0010	-0.0036
7/8	0.0000	-0.0021	-0.0011	-0.0040

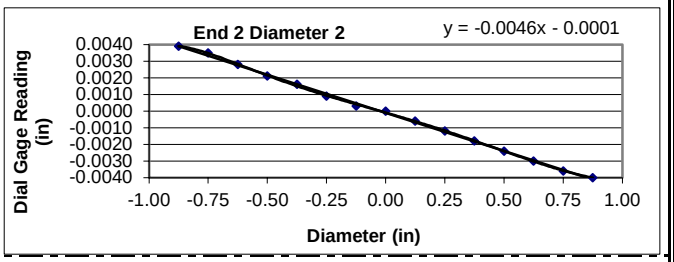




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	-0.00107
	Angle of Best Fit Line:	-0.06155
	Max Angular Difference:	**0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00227
	Angle of Best Fit Line:	-0.12982
End 2:	Slope of Best Fit Line:	-0.00458
	Angle of Best Fit Line:	-0.26225
	Max Angular Difference:	**0.13**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	**YES**
End 1 Diam 2	0.0044	0.0024	**YES**
End 2 Diam 1	0.0021	0.0011	**YES**
End 2 Diam 2	0.0079	0.0042	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

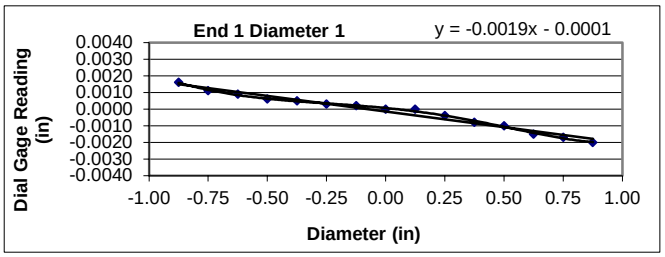
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.84	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	3.95	**Tested by:**	Tori Igoe
Boring Id:	EB-3	**Unit Weight (pcf):**	197.5	**Reviewed by:**	John Pearson
Sample No.:	RC-14	**Moisture Content (%):**	0.0		
Depth (ft):	55.0 - 55.35				

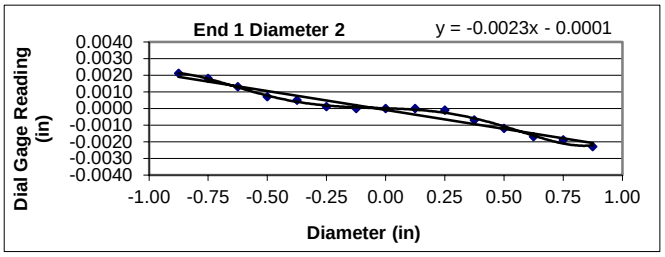
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

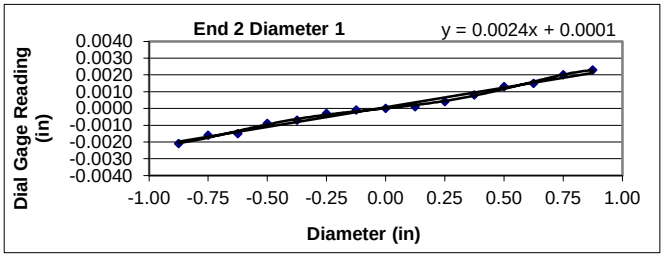
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0016	0.0021	-0.0021	0.0038
- 6/8	0.0011	0.0018	-0.0016	0.0035
- 5/8	0.0009	0.0013	-0.0015	0.0027
- 4/8	0.0006	0.0007	-0.0009	0.0022
- 3/8	0.0005	0.0005	-0.0007	0.0018
- 2/8	0.0003	0.0001	-0.0003	0.0012
- 1/8	0.0002	0.0000	-0.0001	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0001	-0.0002
2/8	-0.0004	-0.0001	0.0004	-0.0009
3/8	-0.0008	-0.0007	0.0008	-0.0013
4/8	-0.0010	-0.0012	0.0013	-0.0019
5/8	-0.0015	-0.0017	0.0015	-0.0024
6/8	-0.0017	-0.0019	0.0020	-0.0030
7/8	-0.0020	-0.0023	0.0023	-0.0036

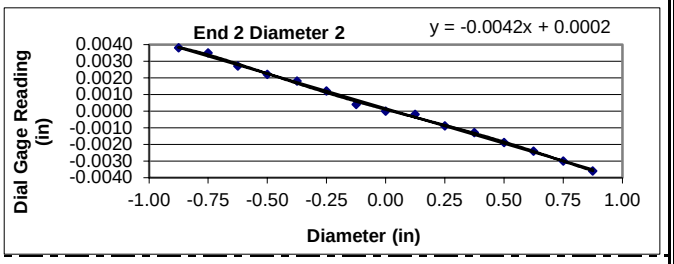




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00188
	Angle of Best Fit Line:	-0.10788
End 2:	Slope of Best Fit Line:	0.00235
	Angle of Best Fit Line:	0.13473
	Max Angular Difference:	**-0.24**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00227
	Angle of Best Fit Line:	-0.13031
End 2:	Slope of Best Fit Line:	-0.00419
	Angle of Best Fit Line:	-0.24031
	Max Angular Difference:	**0.11**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0036	0.0020	**YES**
End 1 Diam 2	0.0044	0.0024	**YES**
End 2 Diam 1	0.0044	0.0024	**YES**
End 2 Diam 2	0.0074	0.0040	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

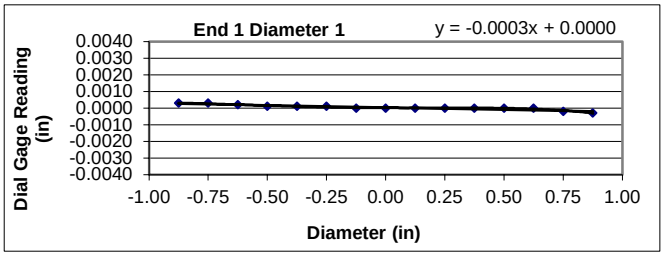
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.85	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.12	**Tested by:**	Tori Igoe
Boring Id:	EB-3	**Unit Weight (pcf):**	189.7	**Reviewed by:**	John Pearson
Sample No.:	RC-15	**Moisture Content (%):**	0.1		
Depth (ft):	62.6 - 62.95				

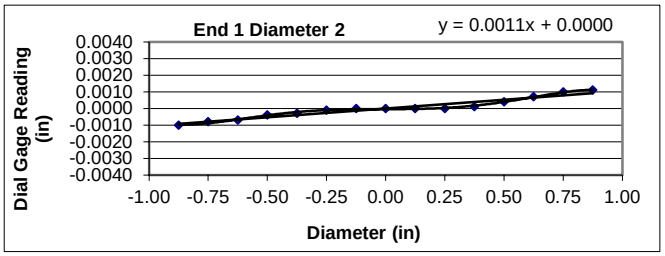
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

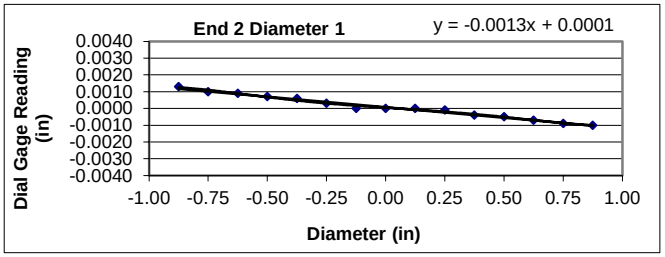
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0003	-0.0010	0.0013	-0.0027
- 6/8	0.0003	-0.0008	0.0010	-0.0022
- 5/8	0.0002	-0.0007	0.0009	-0.0020
- 4/8	0.0001	-0.0004	0.0007	-0.0016
- 3/8	0.0001	-0.0003	0.0006	-0.0010
- 2/8	0.0001	-0.0001	0.0003	-0.0006
- 1/8	0.0000	0.0000	0.0000	-0.0001
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0001
2/8	0.0000	0.0000	-0.0001	0.0003
3/8	0.0000	0.0001	-0.0004	0.0005
4/8	0.0000	0.0004	-0.0005	0.0010
5/8	0.0000	0.0007	-0.0007	0.0013
6/8	-0.0002	0.0010	-0.0009	0.0018
7/8	-0.0003	0.0011	-0.0010	0.0024

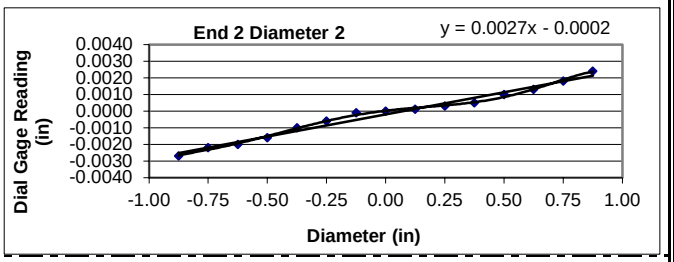




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00026
	Angle of Best Fit Line:	-0.01490
End 2:	Slope of Best Fit Line:	-0.00126
	Angle of Best Fit Line:	-0.07219
	Max Angular Difference:	**0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	0.00106
	Angle of Best Fit Line:	0.06073
End 2:	Slope of Best Fit Line:	0.00266
	Angle of Best Fit Line:	0.15241
	Max Angular Difference:	**-0.09**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0006	0.0003	**YES**
End 1 Diam 2	0.0021	0.0011	**YES**
End 2 Diam 1	0.0023	0.0012	**YES**
End 2 Diam 2	0.0051	0.0028	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

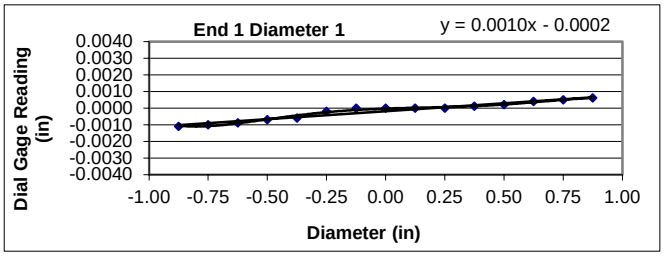
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	3.97	**Tested by:**	Tori Igoe
Boring Id:	EB-4	**Unit Weight (pcf):**	193.2	**Reviewed by:**	John Pearson
Sample No.:	RC-16	**Moisture Content (%):**	0.1		
Depth (ft):	44.0 - 44.4				

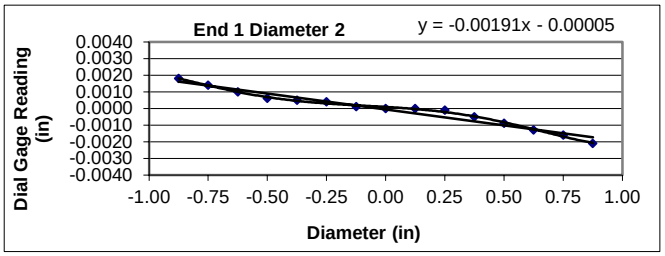
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

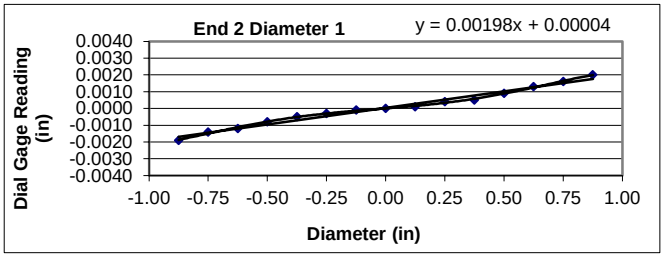
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0011	0.0018	-0.0019	0.0027
- 6/8	-0.0010	0.0014	-0.0014	0.0021
- 5/8	-0.0009	0.0010	-0.0012	0.0015
- 4/8	-0.0007	0.0006	-0.0008	0.0011
- 3/8	-0.0006	0.0005	-0.0005	0.0009
- 2/8	-0.0002	0.0004	-0.0003	0.0004
- 1/8	0.0000	0.0001	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0001	-0.0001
2/8	0.0000	-0.0001	0.0004	-0.0005
3/8	0.0001	-0.0005	0.0005	-0.0010
4/8	0.0002	-0.0009	0.0009	-0.0011
5/8	0.0004	-0.0013	0.0013	-0.0015
6/8	0.0005	-0.0016	0.0016	-0.0019
7/8	0.0006	-0.0021	0.0020	-0.0023

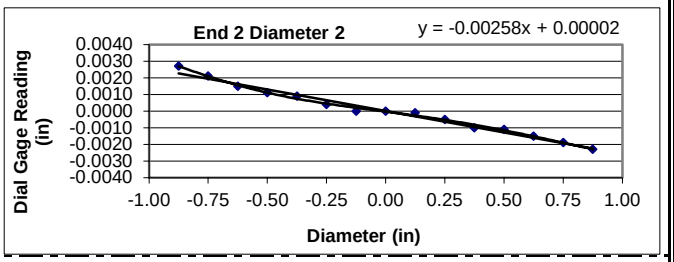




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00096
	Angle of Best Fit Line:	0.05484
End 2:	Slope of Best Fit Line:	0.00198
	Angle of Best Fit Line:	0.11328
	Max Angular Difference:	**-0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00191
	Angle of Best Fit Line:	-0.10952
End 2:	Slope of Best Fit Line:	-0.00258
	Angle of Best Fit Line:	-0.14799
	Max Angular Difference:	**0.04**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0017	0.0009	**YES**
End 1 Diam 2	0.0039	0.0020	**YES**
End 2 Diam 1	0.0039	0.0020	**YES**
End 2 Diam 2	0.0050	0.0025	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

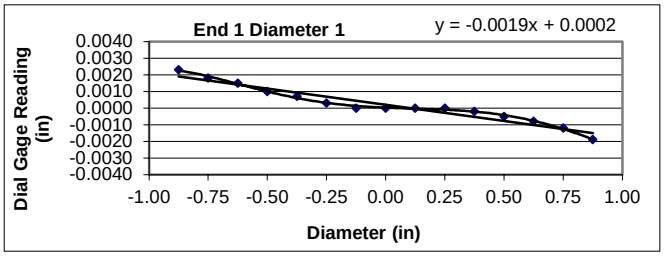
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.16	**Tested by:**	Tori Igoe
Boring Id:	EB-4	**Unit Weight (pcf):**	186.5	**Reviewed by:**	John Pearson
Sample No.:	RC-17	**Moisture Content (%):**	0.0		
Depth (ft):	55.5 - 55.9				

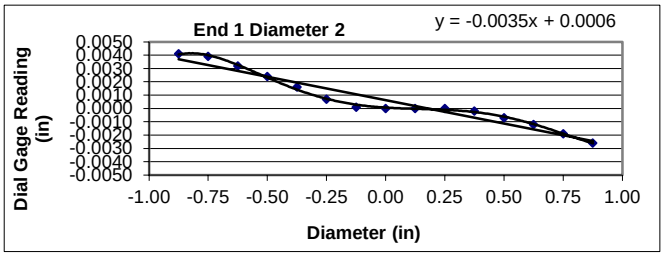
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

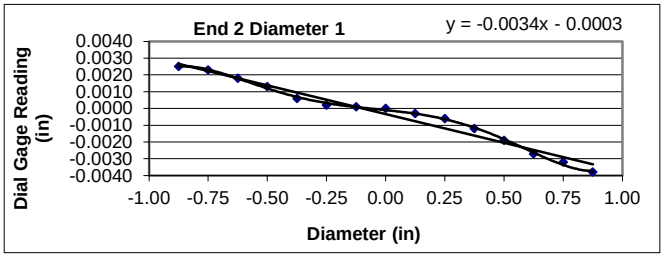
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0023	0.0041	0.0025	0.0024
- 6/8	0.0018	0.0039	0.0023	0.0017
- 5/8	0.0015	0.0032	0.0018	0.0010
- 4/8	0.0010	0.0024	0.0013	0.0004
- 3/8	0.0007	0.0016	0.0006	0.0001
- 2/8	0.0003	0.0007	0.0002	0.0000
- 1/8	0.0000	0.0001	0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	-0.0003	0.0000
2/8	0.0000	0.0000	-0.0006	0.0000
3/8	-0.0002	-0.0002	-0.0012	-0.0006
4/8	-0.0005	-0.0007	-0.0019	-0.0014
5/8	-0.0008	-0.0012	-0.0027	-0.0020
6/8	-0.0012	-0.0019	-0.0032	-0.0027
7/8	-0.0019	-0.0026	-0.0038	-0.0033

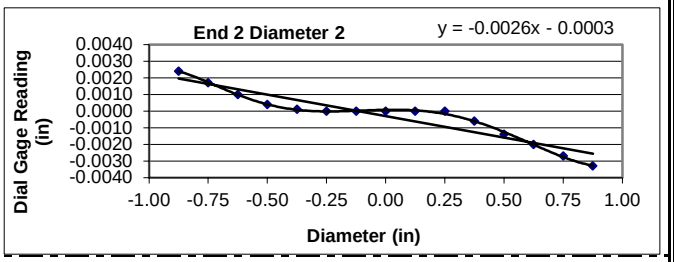




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	-0.00195
	Angle of Best Fit Line:	-0.11164
End 2:	Slope of Best Fit Line:	-0.00342
	Angle of Best Fit Line:	-0.19612
	Max Angular Difference:	**0.08**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00351
	Angle of Best Fit Line:	-0.20135
End 2:	Slope of Best Fit Line:	-0.00259
	Angle of Best Fit Line:	-0.14831
	Max Angular Difference:	**-0.05**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0042	0.0021	**YES**
End 1 Diam 2	0.0067	0.0034	**YES**
End 2 Diam 1	0.0063	0.0032	**YES**
End 2 Diam 2	0.0057	0.0029	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

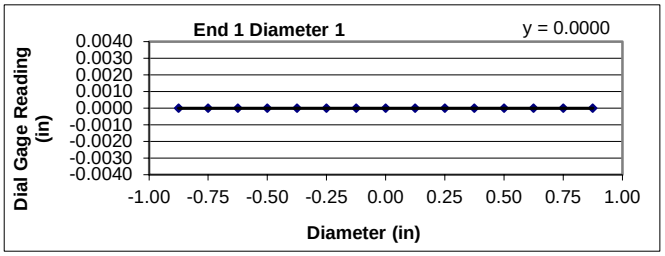
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.34	**Tested by:**	Tori Igoe
Boring Id:	IB-1	**Unit Weight (pcf):**	191.4	**Reviewed by:**	John Pearson
Sample No.:	RC-5	**Moisture Content (%):**	0.1		
Depth (ft):	45.7 - 46.2				

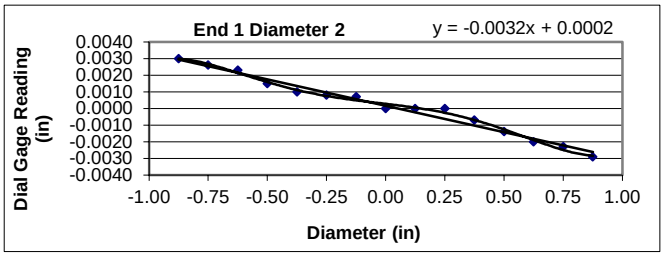
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

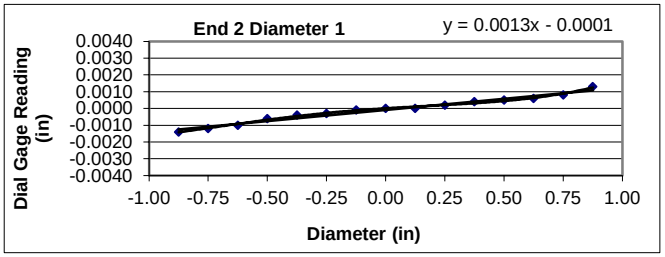
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0030	-0.0014	0.0015
- 6/8	0.0000	0.0026	-0.0012	0.0010
- 5/8	0.0000	0.0023	-0.0010	0.0009
- 4/8	0.0000	0.0015	-0.0006	0.0003
- 3/8	0.0000	0.0010	-0.0004	0.0002
- 2/8	0.0000	0.0008	-0.0003	0.0000
- 1/8	0.0000	0.0007	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0001
2/8	0.0000	0.0000	0.0002	-0.0002
3/8	0.0000	-0.0007	0.0004	-0.0007
4/8	0.0000	-0.0014	0.0005	-0.0010
5/8	0.0000	-0.0020	0.0006	-0.0013
6/8	0.0000	-0.0023	0.0008	-0.0016
7/8	0.0000	-0.0029	0.0013	-0.0019

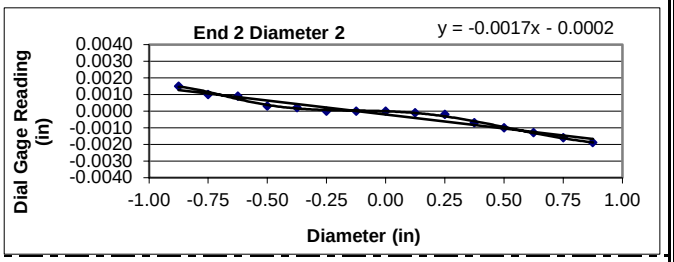




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00134
	Angle of Best Fit Line:	0.07661
	Max Angular Difference:	**-0.08**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00318
	Angle of Best Fit Line:	-0.18204
End 2:	Slope of Best Fit Line:	-0.00168
	Angle of Best Fit Line:	-0.09626
	Max Angular Difference:	**-0.09**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	**YES**
End 1 Diam 2	0.0059	0.0030	**YES**
End 2 Diam 1	0.0027	0.0014	**YES**
End 2 Diam 2	0.0034	0.0017	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

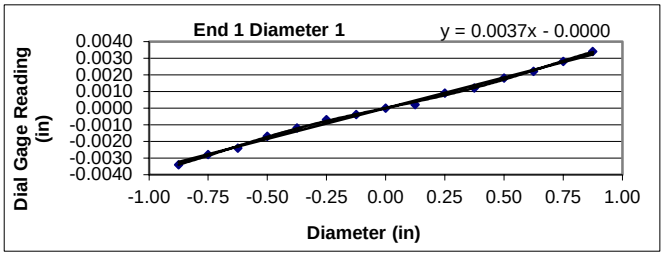
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.21	**Tested by:**	Tori Igoe
Boring Id:	IB-1	**Unit Weight (pcf):**	192.8	**Reviewed by:**	John Pearson
Sample No.:	RC-6	**Moisture Content (%):**	0.1		
Depth (ft):	65.0 - 65.5				

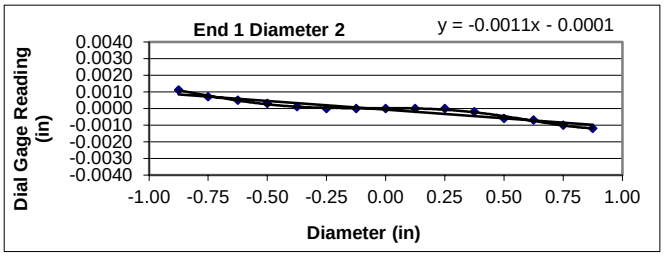
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

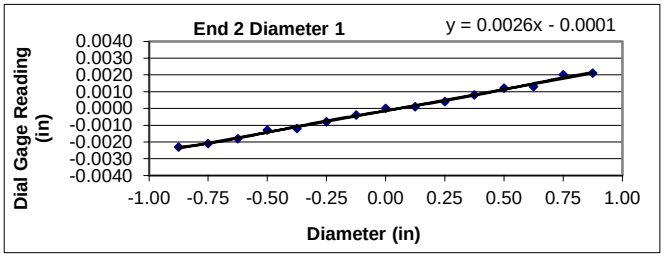
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0034	0.0011	-0.0023	0.0027
- 6/8	-0.0028	0.0007	-0.0021	0.0021
- 5/8	-0.0024	0.0005	-0.0018	0.0015
- 4/8	-0.0017	0.0003	-0.0013	0.0010
- 3/8	-0.0012	0.0001	-0.0012	0.0007
- 2/8	-0.0007	0.0000	-0.0008	0.0003
- 1/8	-0.0004	0.0000	-0.0004	0.0002
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0001	0.0000
2/8	0.0009	0.0000	0.0004	-0.0002
3/8	0.0012	-0.0002	0.0008	-0.0008
4/8	0.0018	-0.0006	0.0012	-0.0012
5/8	0.0022	-0.0007	0.0013	-0.0019
6/8	0.0028	-0.0010	0.0020	-0.0023
7/8	0.0034	-0.0012	0.0021	-0.0030

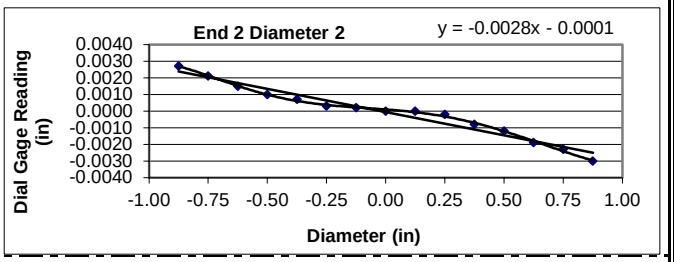




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00369
	Angle of Best Fit Line:	0.21150
End 2:	Slope of Best Fit Line:	0.00257
	Angle of Best Fit Line:	0.14700
	Max Angular Difference:	**0.06**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00105
	Angle of Best Fit Line:	-0.06024
End 2:	Slope of Best Fit Line:	-0.00279
	Angle of Best Fit Line:	-0.16010
	Max Angular Difference:	**0.10**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0068	0.0034	**YES**
End 1 Diam 2	0.0023	0.0012	**YES**
End 2 Diam 1	0.0044	0.0022	**YES**
End 2 Diam 2	0.0057	0.0029	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

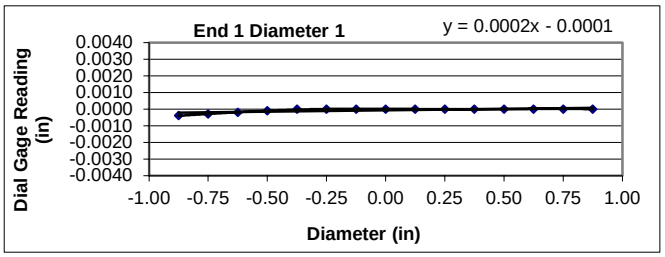
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.38	**Tested by:**	Tori Igoe
Boring Id:	IB-2	**Unit Weight (pcf):**	189.7	**Reviewed by:**	John Pearson
Sample No.:	RC-7	**Moisture Content (%):**	0.0		
Depth (ft):	43.3 - 43.8				

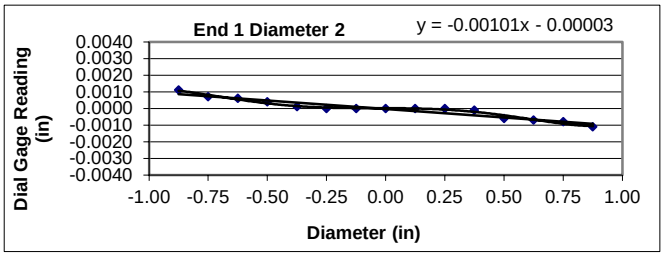
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

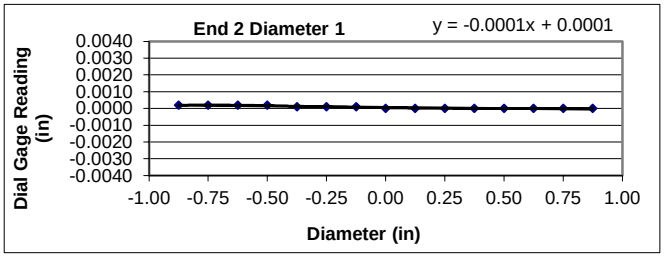
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0004	0.0011	0.0002	0.0041
- 6/8	-0.0003	0.0007	0.0002	0.0037
- 5/8	-0.0002	0.0006	0.0002	0.0032
- 4/8	-0.0001	0.0004	0.0002	0.0025
- 3/8	0.0000	0.0001	0.0001	0.0018
- 2/8	0.0000	0.0000	0.0001	0.0011
- 1/8	0.0000	0.0000	0.0001	0.0006
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0003
2/8	0.0000	0.0000	0.0000	-0.0009
3/8	0.0000	-0.0001	0.0000	-0.0016
4/8	0.0000	-0.0006	0.0000	-0.0020
5/8	0.0000	-0.0007	0.0000	-0.0028
6/8	0.0000	-0.0008	0.0000	-0.0034
7/8	0.0000	-0.0011	0.0000	-0.0040

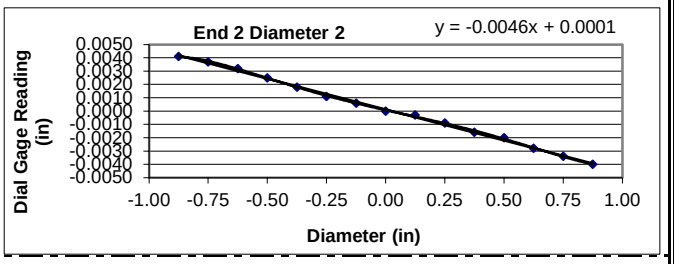




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00017
	Angle of Best Fit Line:	0.00982
End 2:	Slope of Best Fit Line:	-0.00014
	Angle of Best Fit Line:	-0.00819
	Max Angular Difference:	**0.02**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00101
	Angle of Best Fit Line:	-0.05811
End 2:	Slope of Best Fit Line:	-0.00464
	Angle of Best Fit Line:	-0.26585
	Max Angular Difference:	**0.21**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0004	0.0002	**YES**
End 1 Diam 2	0.0022	0.0011	**YES**
End 2 Diam 1	0.0002	0.0001	**YES**
End 2 Diam 2	0.0081	0.0041	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

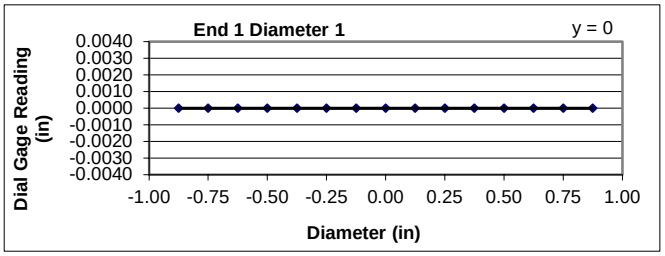
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.38	**Tested by:**	Tori Igoe
Boring Id:	IB-2B	**Unit Weight (pcf):**	194.9	**Reviewed by:**	John Pearson
Sample No.:	RC-8	**Moisture Content (%):**	0.1		
Depth (ft):	57.5 - 57.9				

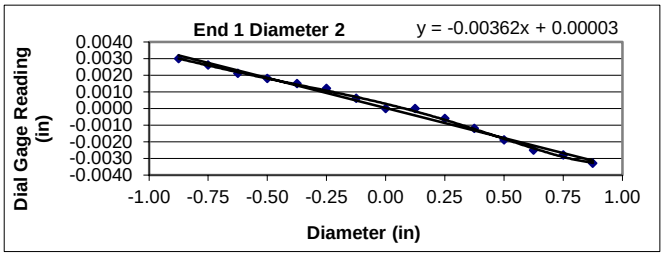
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

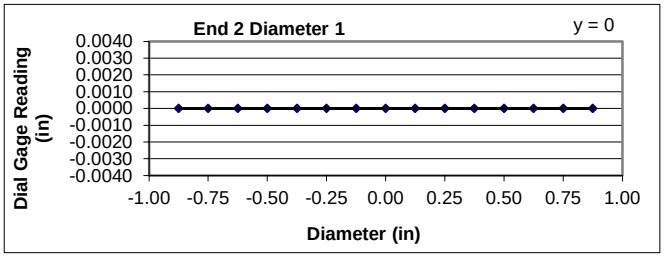
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	0.0000	0.0030	0.0000	0.0024
- 6/8	0.0000	0.0026	0.0000	0.0021
- 5/8	0.0000	0.0021	0.0000	0.0018
- 4/8	0.0000	0.0018	0.0000	0.0016
- 3/8	0.0000	0.0015	0.0000	0.0009
- 2/8	0.0000	0.0012	0.0000	0.0006
- 1/8	0.0000	0.0006	0.0000	0.0005
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	0.0000
2/8	0.0000	-0.0006	0.0000	-0.0003
3/8	0.0000	-0.0012	0.0000	-0.0005
4/8	0.0000	-0.0019	0.0000	-0.0010
5/8	0.0000	-0.0025	0.0000	-0.0014
6/8	0.0000	-0.0028	0.0000	-0.0019
7/8	0.0000	-0.0033	0.0000	-0.0025

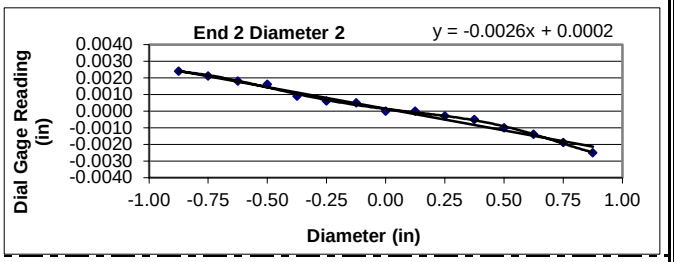




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
End 2:	Slope of Best Fit Line:	0.00000
	Angle of Best Fit Line:	0.00000
	Max Angular Difference:	**0.00**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00362
	Angle of Best Fit Line:	-0.20725
End 2:	Slope of Best Fit Line:	-0.00261
	Angle of Best Fit Line:	-0.14930
	Max Angular Difference:	**-0.06**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0000	0.0000	**YES**
End 1 Diam 2	0.0063	0.0032	**YES**
End 2 Diam 1	0.0000	0.0000	**YES**
End 2 Diam 2	0.0049	0.0025	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

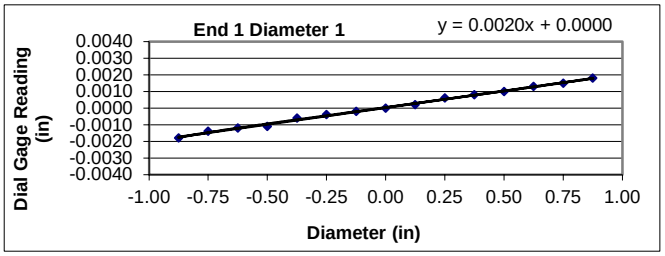
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.45	**Tested by:**	Tori Igoe
Boring Id:	IB-3	**Unit Weight (pcf):**	181.8	**Reviewed by:**	John Pearson
Sample No.:	RC-9	**Moisture Content (%):**	0.2		
Depth (ft):	53.7 - 54.1				

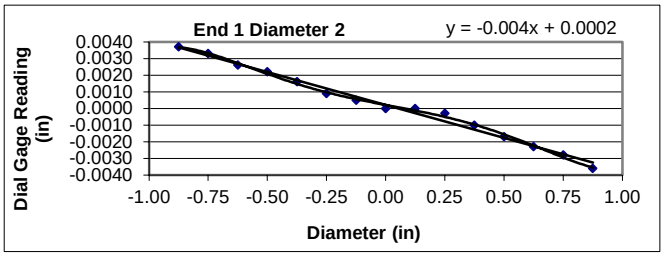
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

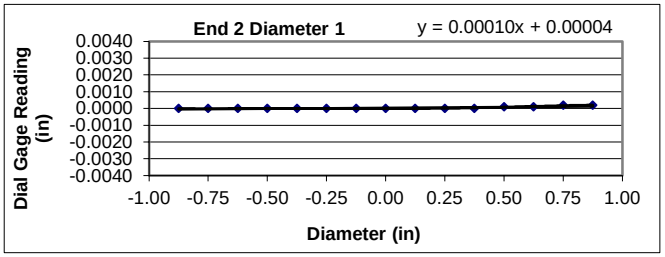
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0018	0.0037	0.0000	0.0036
- 6/8	-0.0014	0.0033	0.0000	0.0031
- 5/8	-0.0012	0.0026	0.0000	0.0024
- 4/8	-0.0011	0.0022	0.0000	0.0020
- 3/8	-0.0006	0.0016	0.0000	0.0014
- 2/8	-0.0004	0.0009	0.0000	0.0007
- 1/8	-0.0002	0.0005	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0002	0.0000	0.0000	0.0000
2/8	0.0006	-0.0003	0.0000	-0.0001
3/8	0.0008	-0.0010	0.0000	-0.0009
4/8	0.0010	-0.0017	0.0001	-0.0015
5/8	0.0013	-0.0023	0.0001	-0.0021
6/8	0.0015	-0.0028	0.0002	-0.0029
7/8	0.0018	-0.0036	0.0002	-0.0035

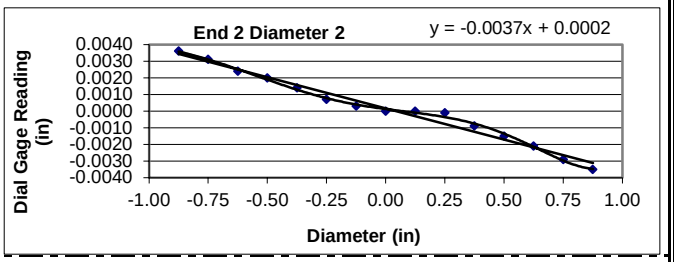




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00200
	Angle of Best Fit Line:	0.11476
End 2:	Slope of Best Fit Line:	0.00010
	Angle of Best Fit Line:	0.00573
	Max Angular Difference:	**0.11**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00396
	Angle of Best Fit Line:	-0.22673
End 2:	Slope of Best Fit Line:	-0.00374
	Angle of Best Fit Line:	-0.21445
	Max Angular Difference:	**-0.01**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0036	0.0018	**YES**
End 1 Diam 2	0.0073	0.0037	**YES**
End 2 Diam 1	0.0002	0.0001	**YES**
End 2 Diam 2	0.0071	0.0036	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

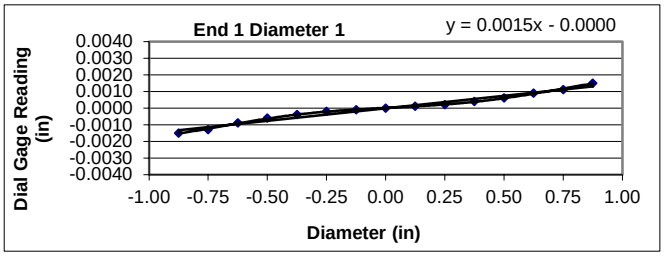
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.30	**Tested by:**	Tori Igoe
Boring Id:	IB-3	**Unit Weight (pcf):**	187.8	**Reviewed by:**	John Pearson
Sample No.:	RC-10	**Moisture Content (%):**	0.1		
Depth (ft):	60.5 - 60.9				

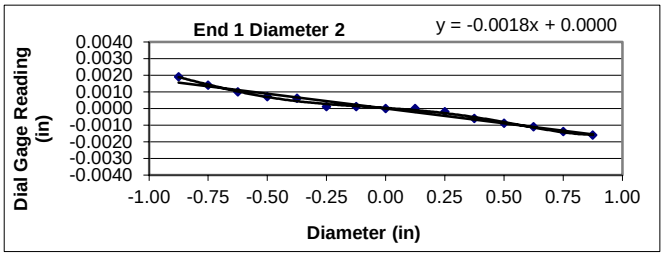
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

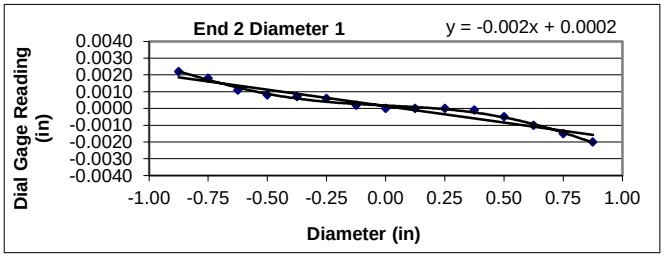
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0015	0.0019	0.0022	0.0022
- 6/8	-0.0013	0.0014	0.0018	0.0020
- 5/8	-0.0009	0.0010	0.0011	0.0015
- 4/8	-0.0006	0.0007	0.0008	0.0013
- 3/8	-0.0004	0.0006	0.0007	0.0009
- 2/8	-0.0002	0.0001	0.0006	0.0006
- 1/8	-0.0001	0.0001	0.0002	0.0002
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0001	0.0000	0.0000	0.0000
2/8	0.0002	-0.0002	0.0000	-0.0001
3/8	0.0004	-0.0006	-0.0001	-0.0004
4/8	0.0006	-0.0009	-0.0005	-0.0008
5/8	0.0009	-0.0011	-0.0010	-0.0011
6/8	0.0011	-0.0014	-0.0015	-0.0014
7/8	0.0015	-0.0016	-0.0020	-0.0017

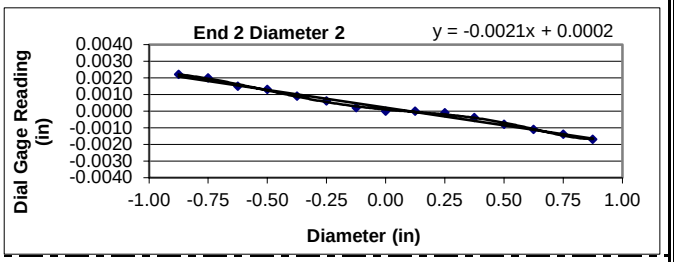




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00150
	Angle of Best Fit Line:	0.08611
End 2:	Slope of Best Fit Line:	-0.00196
	Angle of Best Fit Line:	-0.11246
	Max Angular Difference:	**0.20**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00179
	Angle of Best Fit Line:	-0.10231
End 2:	Slope of Best Fit Line:	-0.00213
	Angle of Best Fit Line:	-0.12212
	Max Angular Difference:	**0.02**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0030	0.0015	**YES**
End 1 Diam 2	0.0035	0.0018	**YES**
End 2 Diam 1	0.0042	0.0021	**YES**
End 2 Diam 2	0.0039	0.0020	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

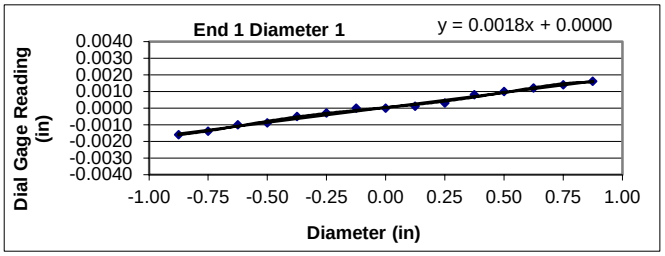
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.38	**Tested by:**	Tori Igoe
Boring Id:	IB-4A	**Unit Weight (pcf):**	186.3	**Reviewed by:**	John Pearson
Sample No.:	RC-11	**Moisture Content (%):**	0.4		
Depth (ft):	24.7 - 25.1				

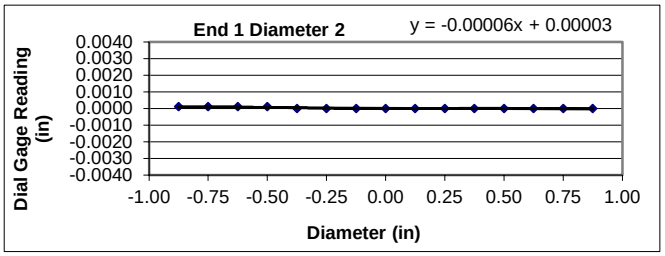
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

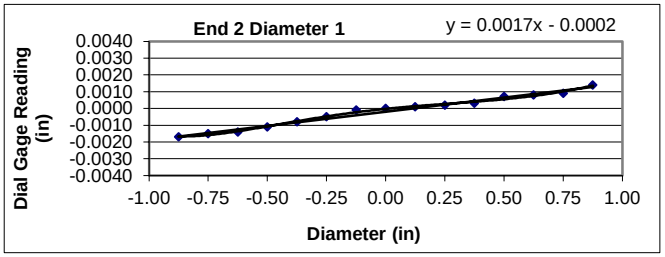
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0016	0.0001	-0.0017	0.0029
- 6/8	-0.0014	0.0001	-0.0015	0.0024
- 5/8	-0.0010	0.0001	-0.0014	0.0019
- 4/8	-0.0009	0.0001	-0.0011	0.0014
- 3/8	-0.0005	0.0000	-0.0008	0.0009
- 2/8	-0.0003	0.0000	-0.0005	0.0002
- 1/8	0.0000	0.0000	-0.0001	0.0000
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0001	0.0000	0.0001	0.0000
2/8	0.0003	0.0000	0.0002	-0.0006
3/8	0.0008	0.0000	0.0003	-0.0010
4/8	0.0010	0.0000	0.0007	-0.0018
5/8	0.0012	0.0000	0.0008	-0.0024
6/8	0.0014	0.0000	0.0009	-0.0029
7/8	0.0016	0.0000	0.0014	-0.0034

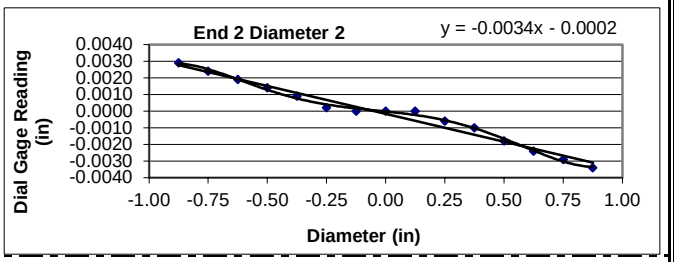




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00180
	Angle of Best Fit Line:	0.10313
End 2:	Slope of Best Fit Line:	0.00169
	Angle of Best Fit Line:	0.09691
	Max Angular Difference:	**0.01**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00006
	Angle of Best Fit Line:	-0.00360
End 2:	Slope of Best Fit Line:	-0.00336
	Angle of Best Fit Line:	-0.19235
	Max Angular Difference:	**0.19**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0032	0.0016	**YES**
End 1 Diam 2	0.0001	0.0001	**YES**
End 2 Diam 1	0.0031	0.0016	**YES**
End 2 Diam 2	0.0063	0.0032	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

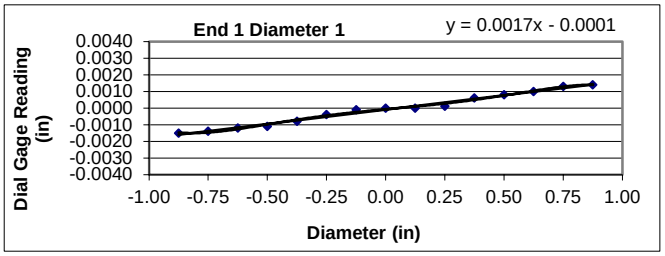
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.35	**Tested by:**	Tori Igoe
Boring Id:	IB-4A	**Unit Weight (pcf):**	187.5	**Reviewed by:**	John Pearson
Sample No.:	RC-12	**Moisture Content (%):**	0.0		
Depth (ft):	34.8 - 35.2				

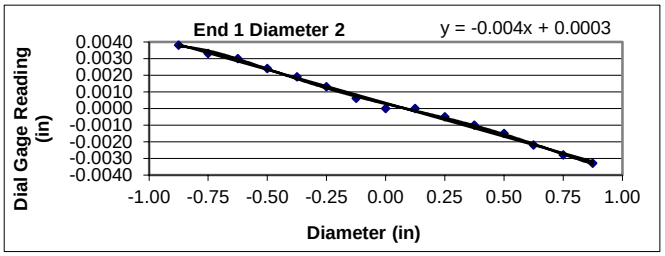
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

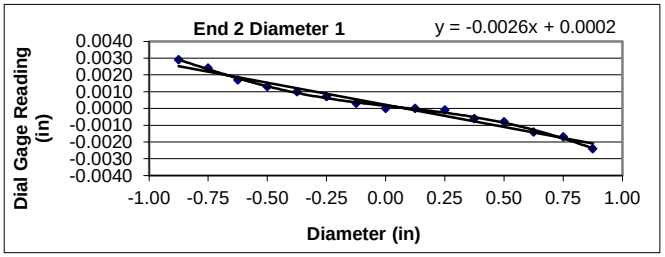
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0015	0.0038	0.0029	0.0039
- 6/8	-0.0014	0.0033	0.0024	0.0032
- 5/8	-0.0012	0.0030	0.0017	0.0027
- 4/8	-0.0011	0.0024	0.0013	0.0020
- 3/8	-0.0008	0.0019	0.0010	0.0015
- 2/8	-0.0004	0.0013	0.0007	0.0009
- 1/8	-0.0001	0.0006	0.0003	0.0004
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0002
2/8	0.0001	-0.0005	-0.0001	-0.0010
3/8	0.0006	-0.0010	-0.0006	-0.0012
4/8	0.0008	-0.0015	-0.0008	-0.0018
5/8	0.0010	-0.0022	-0.0014	-0.0024
6/8	0.0013	-0.0028	-0.0017	-0.0030
7/8	0.0014	-0.0033	-0.0024	-0.0035

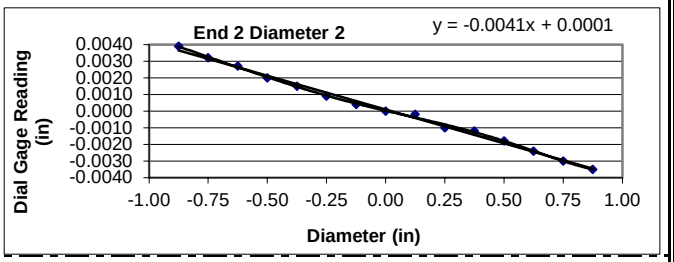




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00173
	Angle of Best Fit Line:	0.09888
End 2:	Slope of Best Fit Line:	-0.00264
	Angle of Best Fit Line:	-0.15110
	Max Angular Difference:	**0.25**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00402
	Angle of Best Fit Line:	-0.23049
End 2:	Slope of Best Fit Line:	-0.00406
	Angle of Best Fit Line:	-0.23278
	Max Angular Difference:	**0.00**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0029	0.0015	**YES**
End 1 Diam 2	0.0071	0.0036	**YES**
End 2 Diam 1	0.0053	0.0027	**YES**
End 2 Diam 2	0.0074	0.0037	**YES**

Perpendicularity Tolerance Met? **YES**

PREPARING ROCK CORE AS CYLINDRICAL TEST SPECIMENS AND VERIFYING CONFORMANCE TO DIMENSIONAL AND SHAPE TOLERANCES (ASTM D4543)

1413 Topside Road, Louisville, TN 37777

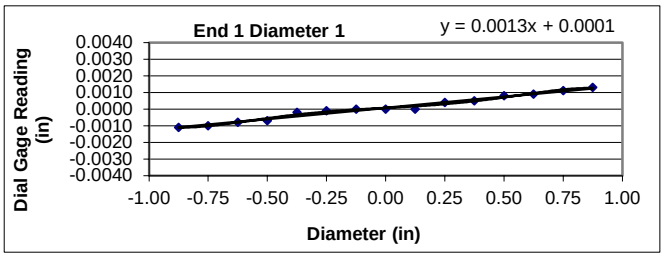
Project:	I-77 Panthers Interchange	**Diameter (in):**	1.98	**Date:**	2/4/2020
Project No.:	1461-19-069	**Length (in):**	4.37	**Tested by:**	Tori Igoe
Boring Id:	IB-4A	**Unit Weight (pcf):**	187.7	**Reviewed by:**	John Pearson
Sample No.:	RC-13	**Moisture Content (%):**	0.0		
Depth (ft):	54.3 - 54.7				

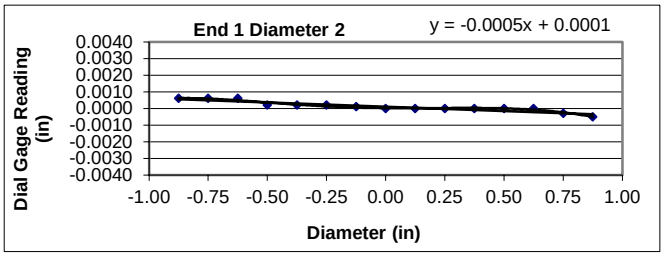
Deviation From Straightness (Procedure S1)

Is the maximum gap ≤ 0.02 in.? **YES** Straightness Tolerance Met? **YES**

End Flatness and Parallelism Readings (Procedure FP1)

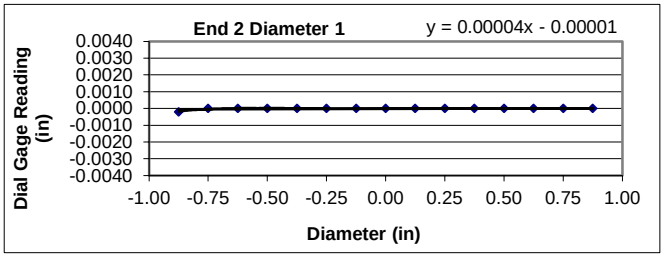
Position	End 1	End 1(90)	End 2	End 2(90)
- 7/8	-0.0011	0.0006	-0.0002	0.0036
- 6/8	-0.0010	0.0006	0.0000	0.0032
- 5/8	-0.0008	0.0006	0.0000	0.0025
- 4/8	-0.0007	0.0002	0.0000	0.0019
- 3/8	-0.0002	0.0002	0.0000	0.0014
- 2/8	-0.0001	0.0002	0.0000	0.0008
- 1/8	0.0000	0.0001	0.0000	0.0003
0	0.0000	0.0000	0.0000	0.0000
1/8	0.0000	0.0000	0.0000	-0.0001
2/8	0.0004	0.0000	0.0000	-0.0005
3/8	0.0005	0.0000	0.0000	-0.0012
4/8	0.0008	0.0000	0.0000	-0.0015
5/8	0.0009	0.0000	0.0000	-0.0018
6/8	0.0011	-0.0003	0.0000	-0.0023
7/8	0.0013	-0.0005	0.0000	-0.0027

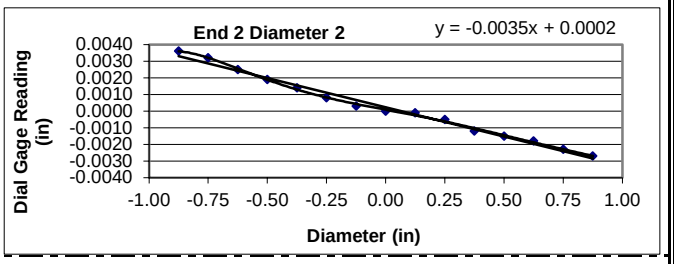




Flatness is met when the difference at any point between a smooth curve drawn through points and a visual best fit line is ≤ 0.001 in.

Flatness Tolerance Met? **YES**





Parallelism is met when the angular difference between best fit lines on opposing ends is ≤ 0.25°.

Parrallelism Diameter 1

End 1:	Slope of Best Fit Line:	0.00134
	Angle of Best Fit Line:	0.07694
End 2:	Slope of Best Fit Line:	0.00004
	Angle of Best Fit Line:	0.00229
	Max Angular Difference:	**0.07**

Parrallelism Diameter 2

End 1:	Slope of Best Fit Line:	-0.00051
	Angle of Best Fit Line:	-0.02947
End 2:	Slope of Best Fit Line:	-0.00351
	Angle of Best Fit Line:	-0.20135
	Max Angular Difference:	**0.17**

Parallelism Tolerance Met? **YES**

Perpendicularity (Procedure P1) is met when the difference between max and min readings along each line divided by the diameter is ≤ 0.0043.

	Difference b/w max & min	Divide by Diameter	Meets Tolerance
End 1 Diam 1	0.0024	0.0012	**YES**
End 1 Diam 2	0.0011	0.0006	**YES**
End 2 Diam 1	0.0002	0.0001	**YES**
End 2 Diam 2	0.0063	0.0032	**YES**

Perpendicularity Tolerance Met? **YES**

UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

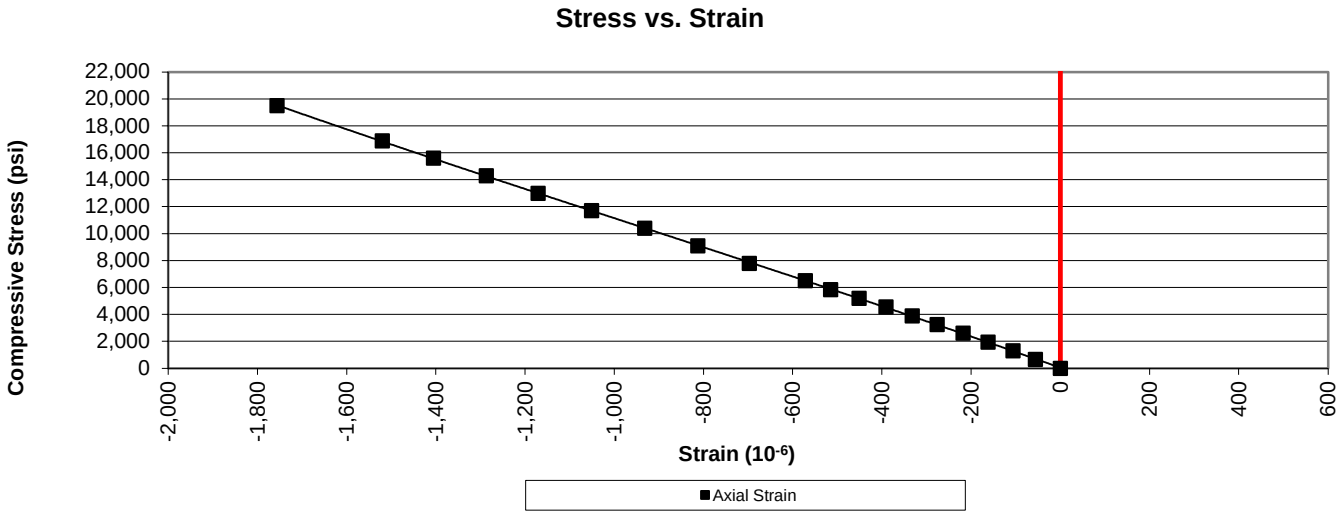
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.30	**Tested by:**	VLI
Boring Id:	EB-1	**Unit Weight, pcf:**	190.2	**Reviewed by:**	NRR
Sample No:	RC-2	**Moisture Content, %:**	0.0		
Depth (ft):	57.5 - 57.9	**Load Rate, psi/sec:**	79		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-56	TNR	2,000	649	11.59	TNR	
3	-106	TNR	4,000	1,299	12.25	TNR	
4	-162	TNR	6,000	1,948	12.02	TNR	
5	-218	TNR	8,000	2,597	11.91	TNR	
6	-276	TNR	10,000	3,247	11.76	TNR	
7	-332	TNR	12,000	3,896	11.73	TNR	
8	-391	TNR	14,000	4,545	11.62	TNR	
9	-451	TNR	16,000	5,195	11.52	TNR	
10	-515	TNR	18,000	5,844	11.35	TNR	
11	-572	TNR	20,000	6,494	11.35	TNR	
12	-697	TNR	24,000	7,792	11.18	TNR	
13	-813	TNR	28,000	9,091	11.18	TNR	
14	-932	TNR	32,000	10,390	11.15	TNR	
15	-1,051	TNR	36,000	11,688	11.12	TNR	
16	-1,171	TNR	40,000	12,987	11.09	TNR	
17	-1,287	TNR	44,000	14,286	11.10	TNR	
18	-1,405	TNR	48,000	15,584	11.09	TNR	
19	-1,520	TNR	52,000	16,883	11.11	TNR	
20	-1,756	TNR	60,000	19,481	11.09	TNR	
21			69,041	22,416			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

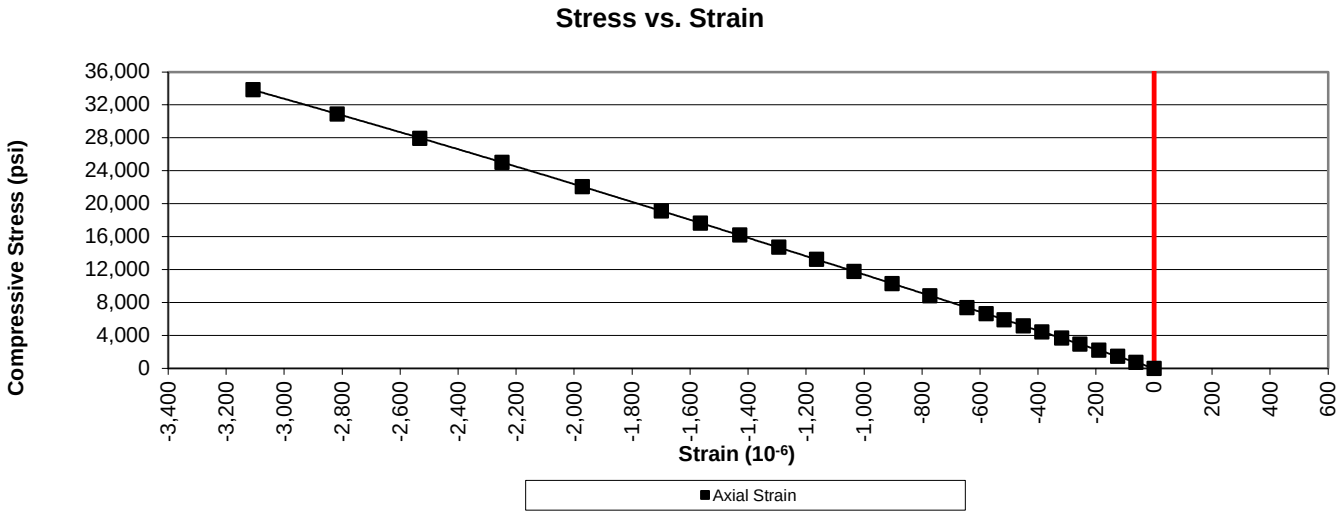
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.86	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	3.95	**Tested by:**	VLI
Boring Id:	EB-2	**Unit Weight, pcf:**	171.6	**Reviewed by:**	NRR
Sample No:	RC-3	**Moisture Content, %:**	0.1		
Depth (ft):	25.3 - 25.7	**Load Rate, psi/sec:**	79		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-63	TNR	2,000	735	11.67	TNR	
3	-125	TNR	4,000	1,471	11.77	TNR	
4	-191	TNR	6,000	2,206	11.55	TNR	
5	-256	TNR	8,000	2,941	11.49	TNR	
6	-318	TNR	10,000	3,676	11.56	TNR	
7	-387	TNR	12,000	4,412	11.40	TNR	
8	-451	TNR	14,000	5,147	11.41	TNR	
9	-517	TNR	16,000	5,882	11.38	TNR	
10	-579	TNR	18,000	6,618	11.43	TNR	
11	-645	TNR	20,000	7,353	11.40	TNR	
12	-773	TNR	24,000	8,824	11.42	TNR	
13	-904	TNR	28,000	10,294	11.39	TNR	
14	-1,035	TNR	32,000	11,765	11.37	TNR	
15	-1,164	TNR	36,000	13,235	11.37	TNR	
16	-1,294	TNR	40,000	14,706	11.36	TNR	
17	-1,429	TNR	44,000	16,176	11.32	TNR	
18	-1,564	TNR	48,000	17,647	11.28	TNR	
19	-1,699	TNR	52,000	19,118	11.25	TNR	
20	-1,972	TNR	60,000	22,059	11.19	TNR	
21	-2,249	TNR	68,000	25,000	11.12	TNR	
22	-2,532	TNR	76,000	27,941	11.04	TNR	
23	-2,817	TNR	84,000	30,882	10.96	TNR	
24	-3,108	TNR	92,000	33,824	10.88	TNR	
25			92,568	34,032			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

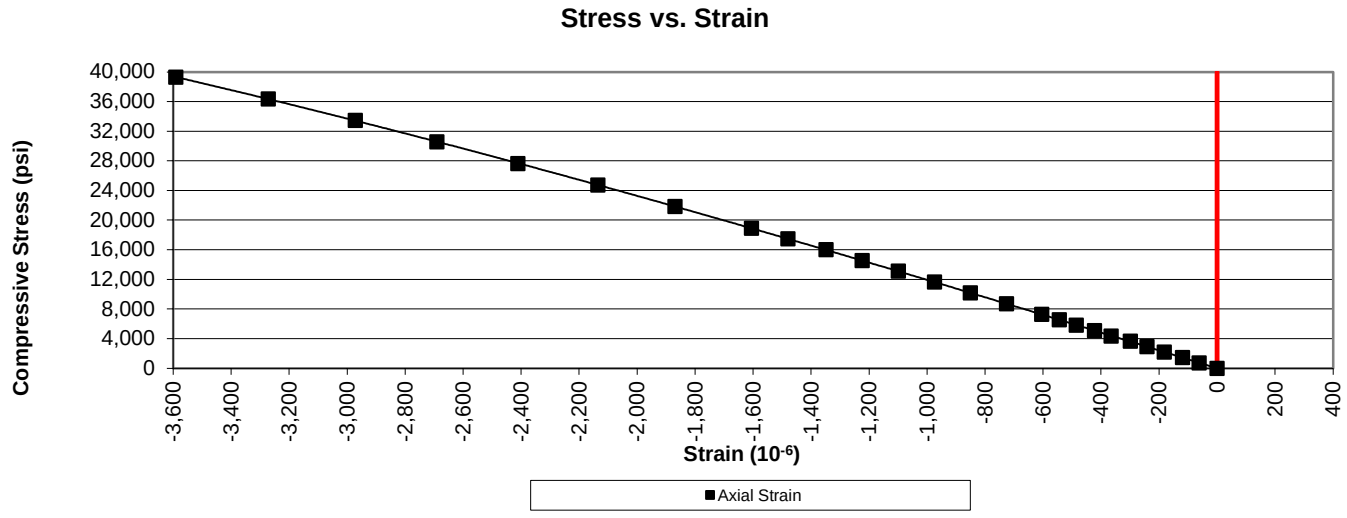
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.87	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.05	**Tested by:**	VLI
Boring Id:	EB-2	**Unit Weight, pcf:**	175.8	**Reviewed by:**	NRR
Sample No:	RC-4	**Moisture Content, %:**	0.0		
Depth (ft):	46.7 - 47.1	**Load Rate, psi/sec:**	77		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-62	TNR	2,000	727	11.73	TNR	
3	-119	TNR	4,000	1,455	12.23	TNR	
4	-182	TNR	6,000	2,182	11.99	TNR	
5	-242	TNR	8,000	2,909	12.02	TNR	
6	-299	TNR	10,000	3,636	12.16	TNR	
7	-365	TNR	12,000	4,364	11.96	TNR	
8	-422	TNR	14,000	5,091	12.06	TNR	
9	-485	TNR	16,000	5,818	12.00	TNR	
10	-544	TNR	18,000	6,545	12.03	TNR	
11	-605	TNR	20,000	7,273	12.02	TNR	
12	-726	TNR	24,000	8,727	12.02	TNR	
13	-851	TNR	28,000	10,182	11.96	TNR	
14	-974	TNR	32,000	11,636	11.95	TNR	
15	-1,099	TNR	36,000	13,091	11.91	TNR	
16	-1,224	TNR	40,000	14,545	11.88	TNR	
17	-1,349	TNR	44,000	16,000	11.86	TNR	
18	-1,480	TNR	48,000	17,455	11.79	TNR	
19	-1,606	TNR	52,000	18,909	11.77	TNR	
20	-1,869	TNR	60,000	21,818	11.67	TNR	
21	-2,135	TNR	68,000	24,727	11.58	TNR	
22	-2,411	TNR	76,000	27,636	11.46	TNR	
23	-2,690	TNR	84,000	30,545	11.36	TNR	
24	-2,972	TNR	92,000	33,455	11.26	TNR	
25	-3,272	TNR	100,000	36,364	11.11	TNR	
26	-3,591	TNR	108,000	39,273	10.94	TNR	
27			109,544	39,834			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

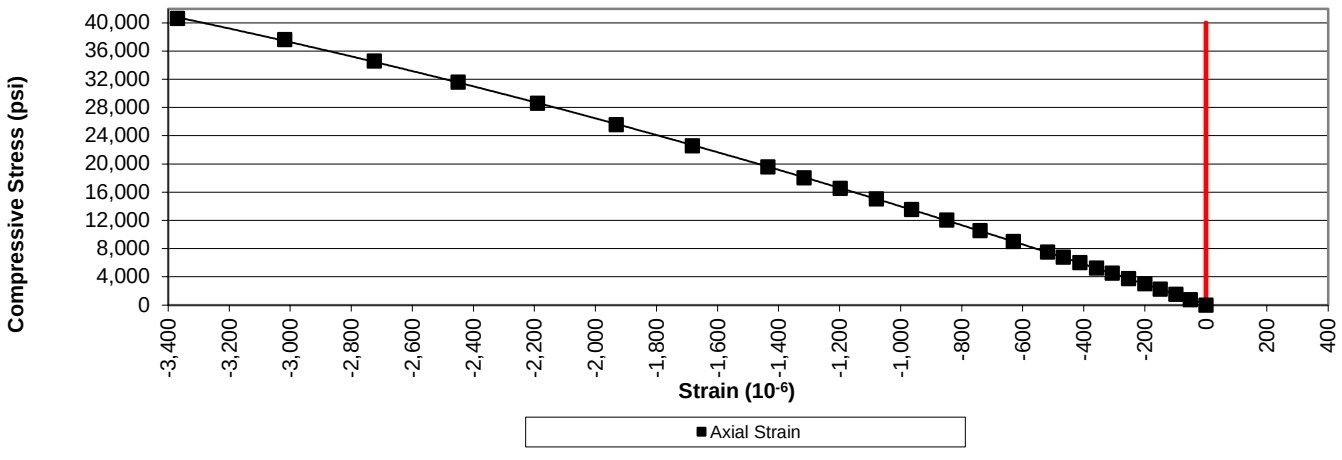
Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.84	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	3.95	**Tested by:**	VLI
Boring Id:	EB-3	**Unit Weight, pcf:**	197.5	**Reviewed by:**	NRR
Sample No:	RC-14	**Moisture Content, %:**	0.0		
Depth (ft):	55.0 - 55.35	**Load Rate, psi/sec:**	86		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-51	TNR	2,000	752	14.75	TNR	
3	-98	TNR	4,000	1,504	15.35	TNR	
4	-150	TNR	6,000	2,256	15.04	TNR	
5	-200	TNR	8,000	3,008	15.04	TNR	
6	-253	TNR	10,000	3,759	14.86	TNR	
7	-307	TNR	12,000	4,511	14.69	TNR	
8	-358	TNR	14,000	5,263	14.70	TNR	
9	-413	TNR	16,000	6,015	14.56	TNR	
10	-467	TNR	18,000	6,767	14.49	TNR	
11	-519	TNR	20,000	7,519	14.49	TNR	
12	-631	TNR	24,000	9,023	14.30	TNR	
13	-740	TNR	28,000	10,526	14.22	TNR	
14	-849	TNR	32,000	12,030	14.17	TNR	
15	-964	TNR	36,000	13,534	14.04	TNR	
16	-1,080	TNR	40,000	15,038	13.92	TNR	
17	-1,198	TNR	44,000	16,541	13.81	TNR	
18	-1,317	TNR	48,000	18,045	13.70	TNR	
19	-1,435	TNR	52,000	19,549	13.62	TNR	
20	-1,683	TNR	60,000	22,556	13.40	TNR	
21	-1,932	TNR	68,000	25,564	13.23	TNR	
22	-2,190	TNR	76,000	28,571	13.05	TNR	
23	-2,450	TNR	84,000	31,579	12.89	TNR	
24	-2,725	TNR	92,000	34,586	12.69	TNR	
25	-3,018	TNR	100,000	37,594	12.46	TNR	
26	-3,370	TNR	108,000	40,602	12.05	TNR	
27			109,492	41,162			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

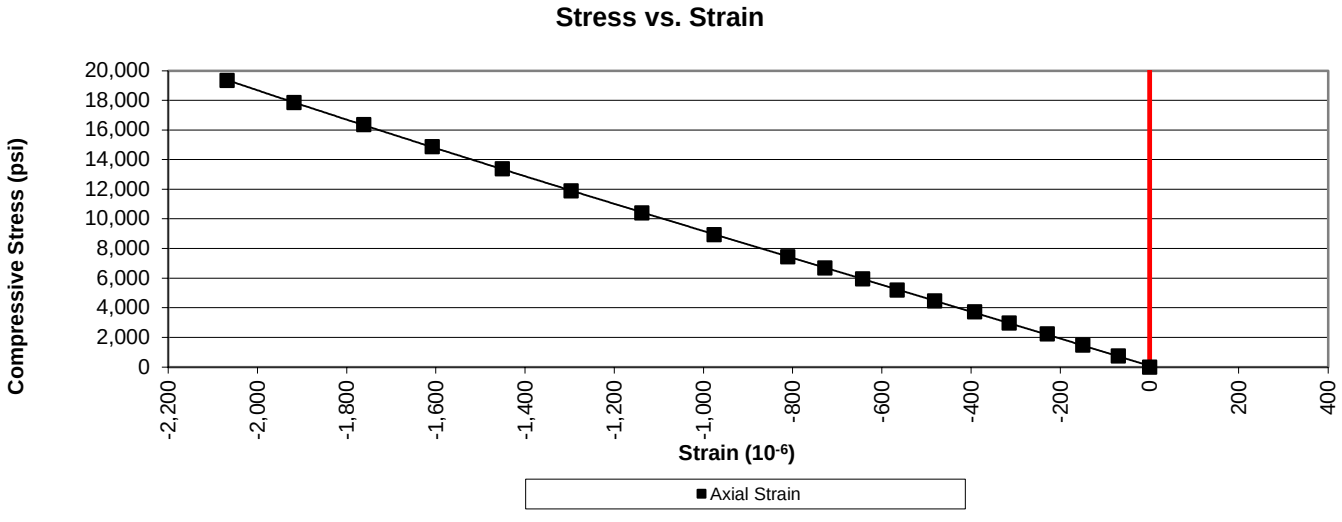
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.85	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	4.12	**Tested by:**	VLI
Boring Id:	EB-3	**Unit Weight, pcf:**	189.7	**Reviewed by:**	NRR
Sample No:	RC-15	**Moisture Content, %:**	0.1		
Depth (ft):	62.6 - 62.95	**Load Rate, psi/sec:**	80		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-70	TNR	2,000	743	10.61	TNR	
3	-150	TNR	4,000	1,487	9.91	TNR	
4	-229	TNR	6,000	2,230	9.74	TNR	
5	-315	TNR	8,000	2,974	9.44	TNR	
6	-392	TNR	10,000	3,717	9.48	TNR	
7	-482	TNR	12,000	4,461	9.26	TNR	
8	-566	TNR	14,000	5,204	9.19	TNR	
9	-643	TNR	16,000	5,948	9.25	TNR	
10	-728	TNR	18,000	6,691	9.19	TNR	
11	-811	TNR	20,000	7,435	9.17	TNR	
12	-976	TNR	24,000	8,922	9.14	TNR	
13	-1,138	TNR	28,000	10,409	9.15	TNR	
14	-1,297	TNR	32,000	11,896	9.17	TNR	
15	-1,451	TNR	36,000	13,383	9.22	TNR	
16	-1,608	TNR	40,000	14,870	9.25	TNR	
17	-1,762	TNR	44,000	16,357	9.28	TNR	
18	-1,918	TNR	48,000	17,844	9.30	TNR	
19	-2,068	TNR	52,000	19,331	9.35	TNR	
20			58,298	21,672			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

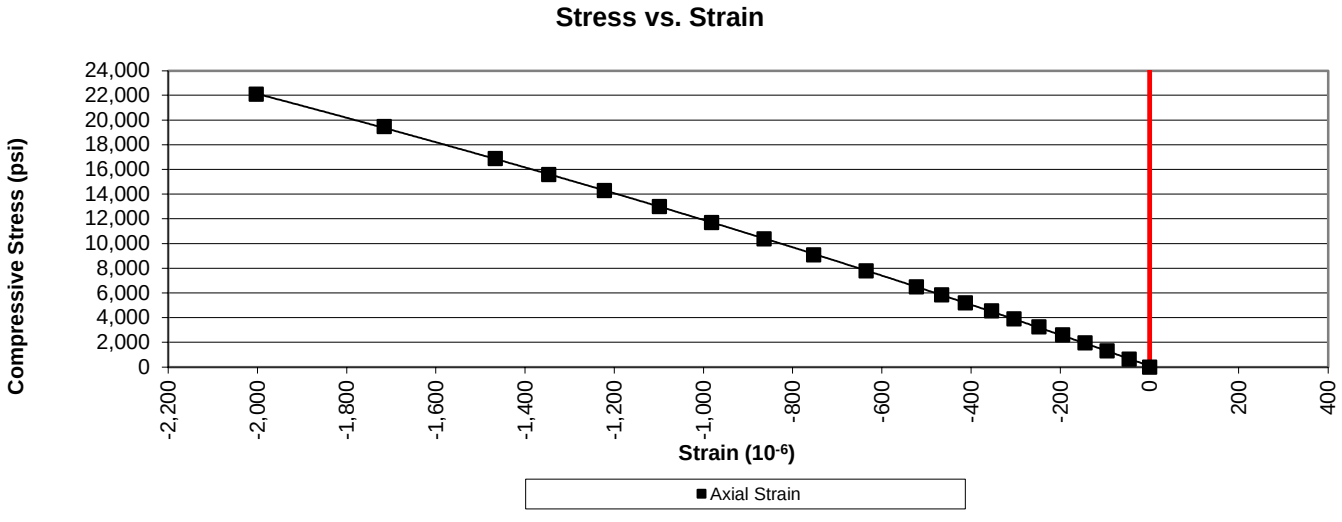
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	3.97	**Tested by:**	VLI
Boring Id:	EB-4	**Unit Weight, pcf:**	193.2	**Reviewed by:**	NRR
Sample No:	RC-16	**Moisture Content, %:**	0.1		
Depth (ft):	44.0 - 44.4	**Load Rate, psi/sec:**	72		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-46	TNR	2,000	649	14.11	TNR	
3	-95	TNR	4,000	1,299	13.67	TNR	
4	-145	TNR	6,000	1,948	13.43	TNR	
5	-195	TNR	8,000	2,597	13.32	TNR	
6	-248	TNR	10,000	3,247	13.09	TNR	
7	-304	TNR	12,000	3,896	12.82	TNR	
8	-354	TNR	14,000	4,545	12.84	TNR	
9	-413	TNR	16,000	5,195	12.58	TNR	
10	-466	TNR	18,000	5,844	12.54	TNR	
11	-523	TNR	20,000	6,494	12.42	TNR	
12	-635	TNR	24,000	7,792	12.27	TNR	
13	-753	TNR	28,000	9,091	12.07	TNR	
14	-864	TNR	32,000	10,390	12.03	TNR	
15	-982	TNR	36,000	11,688	11.90	TNR	
16	-1,099	TNR	40,000	12,987	11.82	TNR	
17	-1,222	TNR	44,000	14,286	11.69	TNR	
18	-1,347	TNR	48,000	15,584	11.57	TNR	
19	-1,467	TNR	52,000	16,883	11.51	TNR	
20	-1,716	TNR	60,000	19,481	11.35	TNR	
21	-2,003	TNR	68,000	22,078	11.02	TNR	
22		TNR	73,772	23,952			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

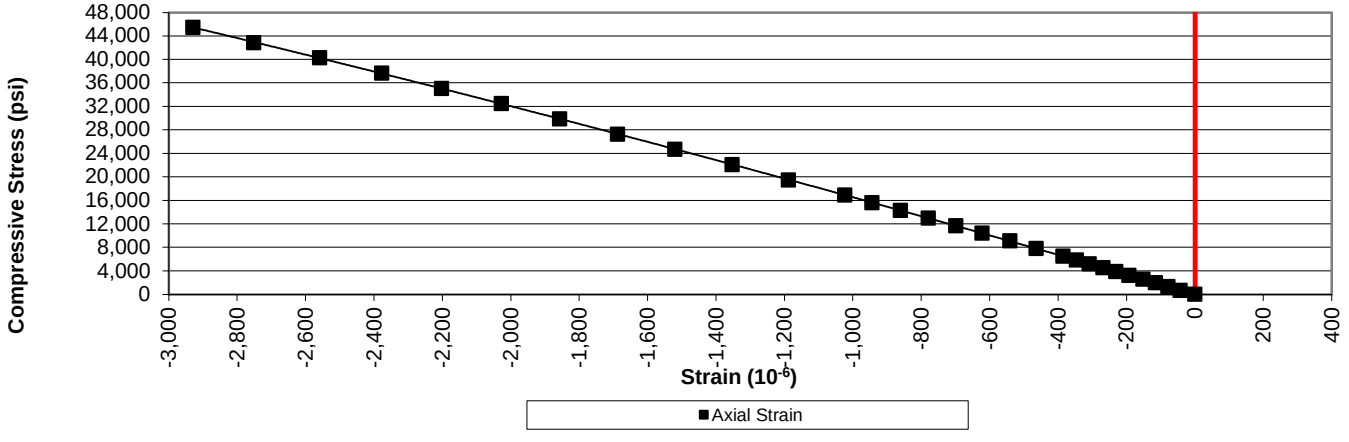
Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	4.16	**Tested by:**	VLI
Boring Id:	EB-4	**Unit Weight, pcf:**	186.5	**Reviewed by:**	NRR
Sample No:	RC-17	**Moisture Content, %:**	0.0		
Depth (ft):	55.5 - 55.9	**Load Rate, psi/sec:**	74		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-43	TNR	2,000	649	15.09	TNR	
3	-79	TNR	4,000	1,299	16.44	TNR	
4	-115	TNR	6,000	1,948	16.94	TNR	
5	-152	TNR	8,000	2,597	17.09	TNR	
6	-193	TNR	10,000	3,247	16.82	TNR	
7	-231	TNR	12,000	3,896	16.87	TNR	
8	-269	TNR	14,000	4,545	16.90	TNR	
9	-309	TNR	16,000	5,195	16.81	TNR	
10	-346	TNR	18,000	5,844	16.89	TNR	
11	-386	TNR	20,000	6,494	16.82	TNR	
12	-464	TNR	24,000	7,792	16.79	TNR	
13	-541	TNR	28,000	9,091	16.80	TNR	
14	-622	TNR	32,000	10,390	16.70	TNR	
15	-699	TNR	36,000	11,688	16.72	TNR	
16	-780	TNR	40,000	12,987	16.65	TNR	
17	-861	TNR	44,000	14,286	16.59	TNR	
18	-944	TNR	48,000	15,584	16.51	TNR	
19	-1,024	TNR	52,000	16,883	16.49	TNR	
20	-1,188	TNR	60,000	19,481	16.40	TNR	
21	-1,353	TNR	68,000	22,078	16.32	TNR	
22	-1,521	TNR	76,000	24,675	16.22	TNR	
23	-1,688	TNR	84,000	27,273	16.16	TNR	
24	-1,857	TNR	92,000	29,870	16.09	TNR	
25	-2,028	TNR	100,000	32,468	16.01	TNR	
26	-2,203	TNR	108,000	35,065	15.92	TNR	
27	-2,378	TNR	116,000	37,662	15.84	TNR	
28	-2,559	TNR	124,000	40,260	15.73	TNR	
29	-2,752	TNR	132,000	42,857	15.57	TNR	
30	-2,930	TNR	140,000	45,455	15.51	TNR	
31			140,391	45,581			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

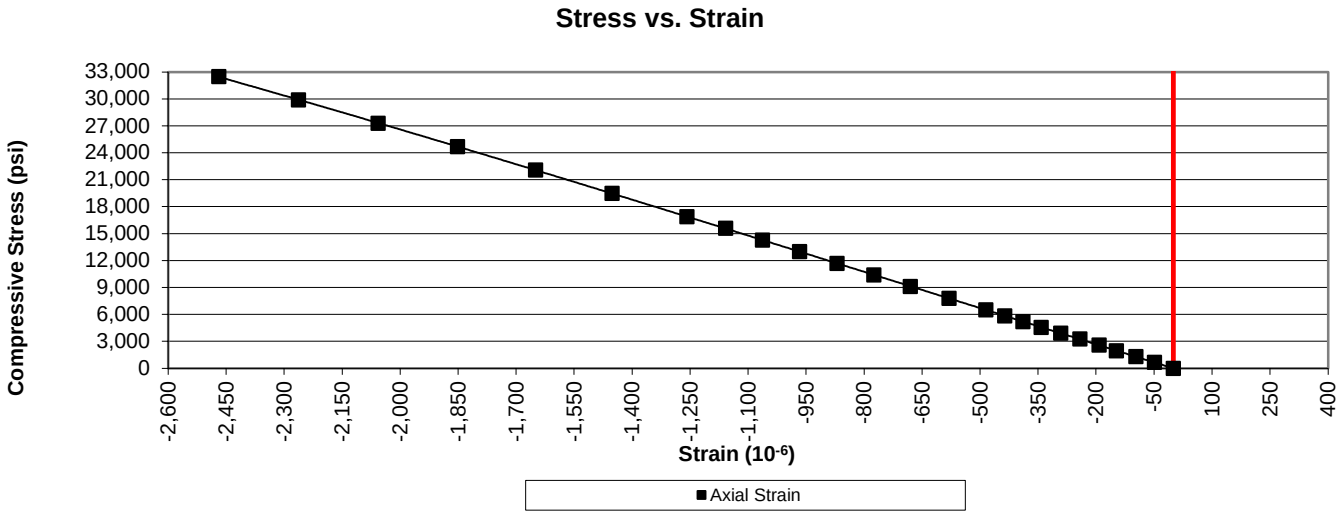
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.34	**Tested by:**	VLI
Boring Id:	IB-1	**Unit Weight, pcf:**	191.4	**Reviewed by:**	NRR
Sample No:	RC-5	**Moisture Content, %:**	0.1		
Depth (ft):	45.7 - 46.2	**Load Rate, psi/sec:**	69		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-49	TNR	2,000	649	13.24	TNR	
3	-97	TNR	4,000	1,299	13.39	TNR	
4	-147	TNR	6,000	1,948	13.25	TNR	
5	-192	TNR	8,000	2,597	13.53	TNR	
6	-242	TNR	10,000	3,247	13.42	TNR	
7	-291	TNR	12,000	3,896	13.39	TNR	
8	-342	TNR	14,000	4,545	13.29	TNR	
9	-389	TNR	16,000	5,195	13.35	TNR	
10	-436	TNR	18,000	5,844	13.40	TNR	
11	-485	TNR	20,000	6,494	13.39	TNR	
12	-580	TNR	24,000	7,792	13.43	TNR	
13	-680	TNR	28,000	9,091	13.37	TNR	
14	-775	TNR	32,000	10,390	13.41	TNR	
15	-870	TNR	36,000	11,688	13.43	TNR	
16	-967	TNR	40,000	12,987	13.43	TNR	
17	-1,063	TNR	44,000	14,286	13.44	TNR	
18	-1,158	TNR	48,000	15,584	13.46	TNR	
19	-1,258	TNR	52,000	16,883	13.42	TNR	
20	-1,452	TNR	60,000	19,481	13.42	TNR	
21	-1,650	TNR	68,000	22,078	13.38	TNR	
22	-1,852	TNR	76,000	24,675	13.32	TNR	
23	-2,057	TNR	84,000	27,273	13.26	TNR	
24	-2,263	TNR	92,000	29,870	13.20	TNR	
25	-2,469	TNR	100,000	32,468	13.15	TNR	
26			100,469	32,620			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

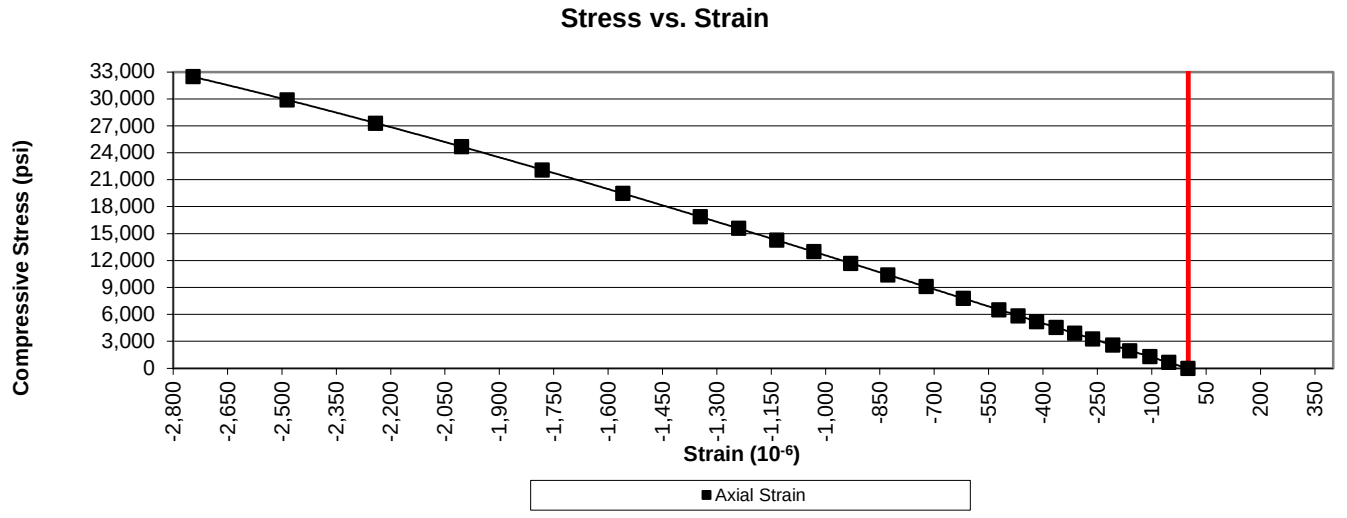
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.21	**Tested by:**	VLI
Boring Id:	IB-1	**Unit Weight, pcf:**	192.8	**Reviewed by:**	NRR
Sample No:	RC-6	**Moisture Content, %:**	0.1		
Depth (ft):	65.0 - 65.5	**Load Rate, psi/sec:**	67		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-53	TNR	2,000	649	12.25	TNR	
3	-105	TNR	4,000	1,299	12.37	TNR	
4	-161	TNR	6,000	1,948	12.10	TNR	
5	-208	TNR	8,000	2,597	12.49	TNR	
6	-263	TNR	10,000	3,247	12.35	TNR	
7	-313	TNR	12,000	3,896	12.45	TNR	
8	-364	TNR	14,000	4,545	12.49	TNR	
9	-418	TNR	16,000	5,195	12.43	TNR	
10	-469	TNR	18,000	5,844	12.46	TNR	
11	-522	TNR	20,000	6,494	12.44	TNR	
12	-620	TNR	24,000	7,792	12.57	TNR	
13	-722	TNR	28,000	9,091	12.59	TNR	
14	-828	TNR	32,000	10,390	12.55	TNR	
15	-931	TNR	36,000	11,688	12.55	TNR	
16	-1,032	TNR	40,000	12,987	12.58	TNR	
17	-1,135	TNR	44,000	14,286	12.59	TNR	
18	-1,240	TNR	48,000	15,584	12.57	TNR	
19	-1,346	TNR	52,000	16,883	12.54	TNR	
20	-1,559	TNR	60,000	19,481	12.50	TNR	
21	-1,782	TNR	68,000	22,078	12.39	TNR	
22	-2,004	TNR	76,000	24,675	12.31	TNR	
23	-2,242	TNR	84,000	27,273	12.16	TNR	
24	-2,486	TNR	92,000	29,870	12.02	TNR	
25	-2,745	TNR	100,000	32,468	11.83	TNR	
26			101,164	32,845			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

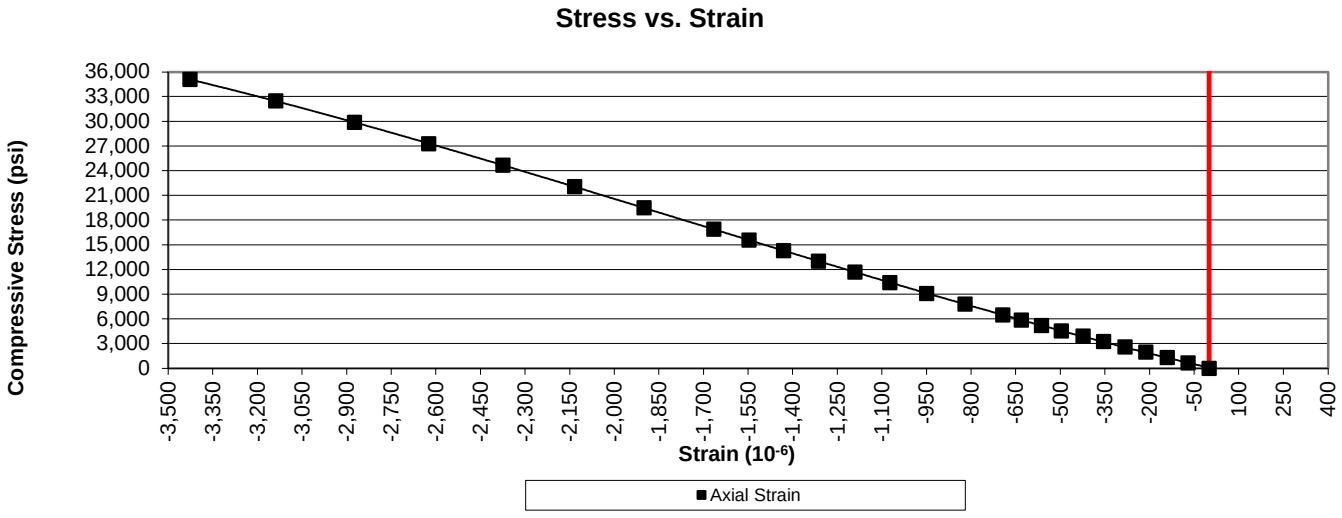
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.38	**Tested by:**	VLI
Boring Id:	IB-1	**Unit Weight, pcf:**	189.7	**Reviewed by:**	NRR
Sample No:	RC-7	**Moisture Content, %:**	0.0		
Depth (ft):	43.3 - 43.8	**Load Rate, psi/sec:**	68		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-71	TNR	2,000	649	9.14	TNR	
3	-140	TNR	4,000	1,299	9.28	TNR	
4	-212	TNR	6,000	1,948	9.19	TNR	
5	-283	TNR	8,000	2,597	9.18	TNR	
6	-355	TNR	10,000	3,247	9.15	TNR	
7	-423	TNR	12,000	3,896	9.21	TNR	
8	-497	TNR	14,000	4,545	9.14	TNR	
9	-563	TNR	16,000	5,195	9.23	TNR	
10	-631	TNR	18,000	5,844	9.26	TNR	
11	-694	TNR	20,000	6,494	9.36	TNR	
12	-820	TNR	24,000	7,792	9.50	TNR	
13	-950	TNR	28,000	9,091	9.57	TNR	
14	-1,073	TNR	32,000	10,390	9.68	TNR	
15	-1,191	TNR	36,000	11,688	9.81	TNR	
16	-1,313	TNR	40,000	12,987	9.89	TNR	
17	-1,431	TNR	44,000	14,286	9.98	TNR	
18	-1,547	TNR	48,000	15,584	10.07	TNR	
19	-1,665	TNR	52,000	16,883	10.14	TNR	
20	-1,900	TNR	60,000	19,481	10.25	TNR	
21	-2,133	TNR	68,000	22,078	10.35	TNR	
22	-2,374	TNR	76,000	24,675	10.39	TNR	
23	-2,624	TNR	84,000	27,273	10.39	TNR	
24	-2,874	TNR	92,000	29,870	10.39	TNR	
25	-3,138	TNR	100,000	32,468	10.35	TNR	
26	-3,427	TNR	108,000	35,065	10.23	TNR	
27			109,764	35,638	#DIV/0!		Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

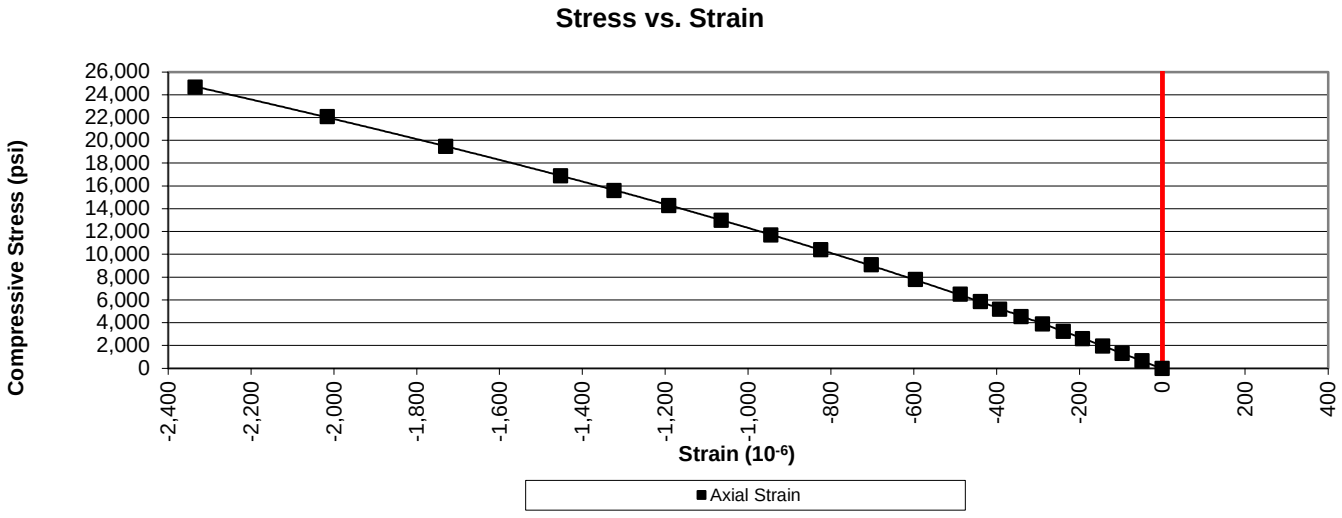
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.38	**Tested by:**	VLI
Boring Id:	IB-2B	**Unit Weight, pcf:**	194.9	**Reviewed by:**	NRR
Sample No:	RC-8	**Moisture Content, %:**	0.0		
Depth (ft):	57.5 - 57.9	**Load Rate, psi/sec:**	64		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-49	TNR	2,000	649	13.24	TNR	
3	-97	TNR	4,000	1,299	13.39	TNR	
4	-144	TNR	6,000	1,948	13.53	TNR	
5	-193	TNR	8,000	2,597	13.46	TNR	
6	-239	TNR	10,000	3,247	13.59	TNR	
7	-289	TNR	12,000	3,896	13.48	TNR	
8	-341	TNR	14,000	4,545	13.33	TNR	
9	-393	TNR	16,000	5,195	13.22	TNR	
10	-439	TNR	18,000	5,844	13.31	TNR	
11	-488	TNR	20,000	6,494	13.31	TNR	
12	-596	TNR	24,000	7,792	13.07	TNR	
13	-703	TNR	28,000	9,091	12.93	TNR	
14	-825	TNR	32,000	10,390	12.59	TNR	
15	-945	TNR	36,000	11,688	12.37	TNR	
16	-1,065	TNR	40,000	12,987	12.19	TNR	
17	-1,192	TNR	44,000	14,286	11.98	TNR	
18	-1,324	TNR	48,000	15,584	11.77	TNR	
19	-1,453	TNR	52,000	16,883	11.62	TNR	
20	-1,730	TNR	60,000	19,481	11.26	TNR	
21	-2,016	TNR	68,000	22,078	10.95	TNR	
22	-2,335	TNR	76,000	24,675	10.57	TNR	
23			88,279	28,662			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

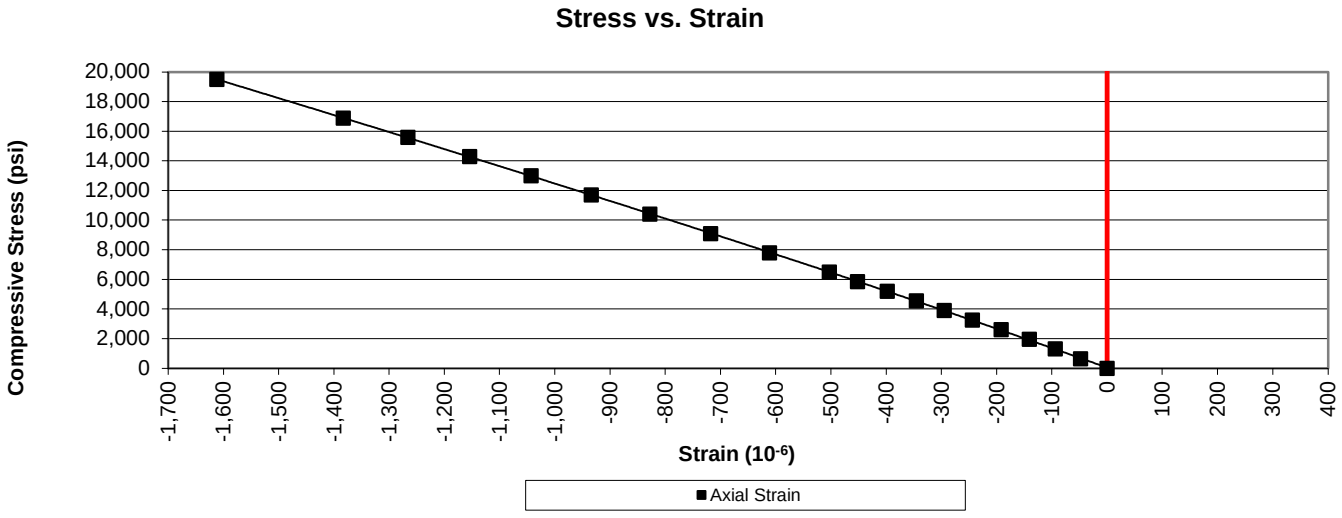
Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.45	**Tested by:**	VLI
Boring Id:	IB-3	**Unit Weight, pcf:**	181.8	**Reviewed by:**	NRR
Sample No:	RC-9	**Moisture Content, %:**	0.2		
Depth (ft):	53.7 - 54.1	**Load Rate, psi/sec:**	63		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-48	TNR	2,000	649	13.52	TNR	
3	-94	TNR	4,000	1,299	13.82	TNR	
4	-141	TNR	6,000	1,948	13.82	TNR	
5	-192	TNR	8,000	2,597	13.53	TNR	
6	-244	TNR	10,000	3,247	13.31	TNR	
7	-295	TNR	12,000	3,896	13.21	TNR	
8	-345	TNR	14,000	4,545	13.17	TNR	
9	-398	TNR	16,000	5,195	13.05	TNR	
10	-452	TNR	18,000	5,844	12.93	TNR	
11	-503	TNR	20,000	6,494	12.91	TNR	
12	-611	TNR	24,000	7,792	12.75	TNR	
13	-718	TNR	28,000	9,091	12.66	TNR	
14	-828	TNR	32,000	10,390	12.55	TNR	
15	-934	TNR	36,000	11,688	12.51	TNR	
16	-1,043	TNR	40,000	12,987	12.45	TNR	
17	-1,154	TNR	44,000	14,286	12.38	TNR	
18	-1,266	TNR	48,000	15,584	12.31	TNR	
19	-1,383	TNR	52,000	16,883	12.21	TNR	
20	-1,612	TNR	60,000	19,481	12.08	TNR	
21			64,809	21,042			Failure

TNR - Test Not Requested

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

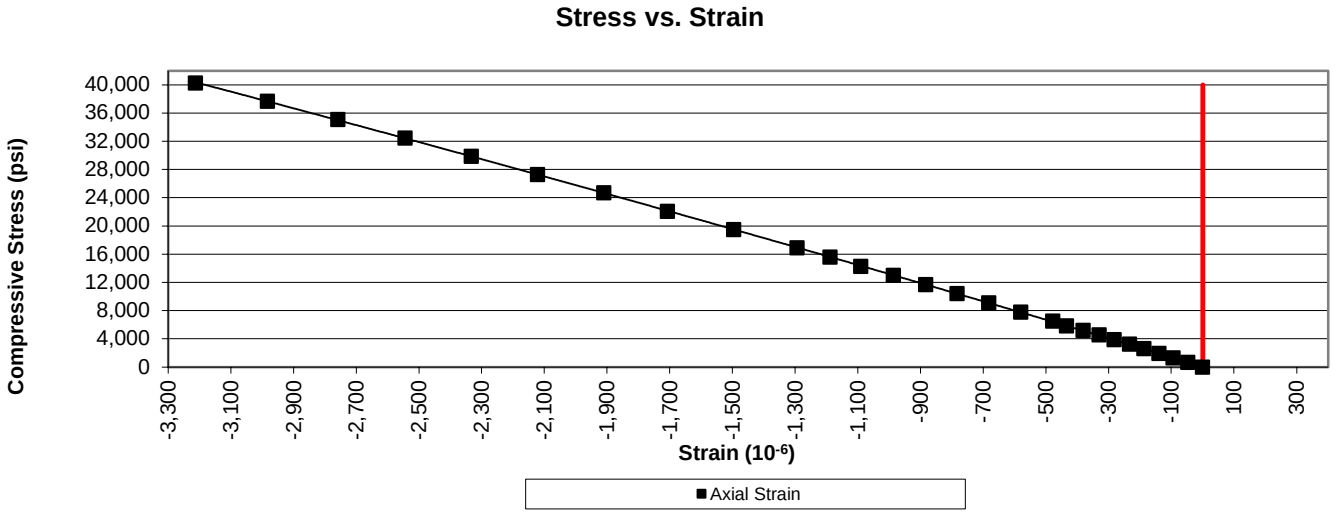
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/10/2020
Project No.:	1461-19-069	**Length, in.:**	4.30	**Tested by:**	VLI
Boring Id:	IB-3	**Unit Weight, pcf:**	187.8	**Reviewed by:**	NRR
Sample No:	RC-10	**Moisture Content, %:**	0.1		
Depth (ft):	60.5 - 60.9	**Load Rate, psi/sec:**	71		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-47	TNR	2,000	649	13.81	TNR	
3	-94	TNR	4,000	1,299	13.82	TNR	
4	-139	TNR	6,000	1,948	14.01	TNR	
5	-187	TNR	8,000	2,597	13.89	TNR	
6	-233	TNR	10,000	3,247	13.94	TNR	
7	-282	TNR	12,000	3,896	13.82	TNR	
8	-330	TNR	14,000	4,545	13.77	TNR	
9	-381	TNR	16,000	5,195	13.64	TNR	
10	-434	TNR	18,000	5,844	13.47	TNR	
11	-478	TNR	20,000	6,494	13.59	TNR	
12	-580	TNR	24,000	7,792	13.43	TNR	
13	-682	TNR	28,000	9,091	13.33	TNR	
14	-783	TNR	32,000	10,390	13.27	TNR	
15	-884	TNR	36,000	11,688	13.22	TNR	
16	-987	TNR	40,000	12,987	13.16	TNR	
17	-1,091	TNR	44,000	14,286	13.09	TNR	
18	-1,189	TNR	48,000	15,584	13.11	TNR	
19	-1,294	TNR	52,000	16,883	13.05	TNR	
20	-1,496	TNR	60,000	19,481	13.02	TNR	
21	-1,707	TNR	68,000	22,078	12.93	TNR	
22	-1,911	TNR	76,000	24,675	12.91	TNR	
23	-2,122	TNR	84,000	27,273	12.85	TNR	
24	-2,333	TNR	92,000	29,870	12.80	TNR	
25	-2,545	TNR	100,000	32,468	12.76	TNR	
26	-2,759	TNR	108,000	35,065	12.71	TNR	
27	-2,983	TNR	116,000	37,662	12.63	TNR	
28	-3,213	TNR	124,000	40,260	12.53	TNR	
29			124,042	40,273			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

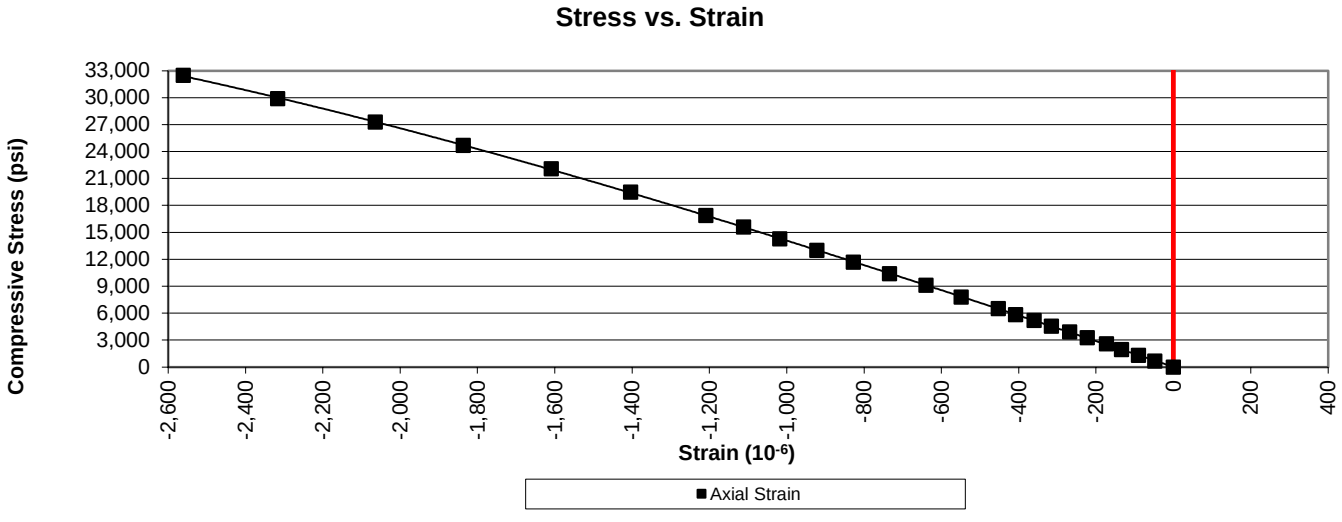
1413 Topside Road, Louisville, TN 37777

Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	4.38	**Tested by:**	VLI
Boring Id:	IB-4A	**Unit Weight, pcf:**	186.3	**Reviewed by:**	NRR
Sample No:	RC-11	**Moisture Content, %:**	0.4		
Depth (ft):	24.7 - 25.1	**Load Rate, psi/sec:**	71		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-48	TNR	2,000	649	13.52	TNR	
3	-90	TNR	4,000	1,299	14.43	TNR	
4	-134	TNR	6,000	1,948	14.54	TNR	
5	-173	TNR	8,000	2,597	15.01	TNR	
6	-223	TNR	10,000	3,247	14.56	TNR	
7	-268	TNR	12,000	3,896	14.54	TNR	
8	-315	TNR	14,000	4,545	14.43	TNR	
9	-360	TNR	16,000	5,195	14.43	TNR	
10	-408	TNR	18,000	5,844	14.32	TNR	
11	-453	TNR	20,000	6,494	14.34	TNR	
12	-549	TNR	24,000	7,792	14.19	TNR	
13	-640	TNR	28,000	9,091	14.20	TNR	
14	-734	TNR	32,000	10,390	14.16	TNR	
15	-828	TNR	36,000	11,688	14.12	TNR	
16	-922	TNR	40,000	12,987	14.09	TNR	
17	-1,018	TNR	44,000	14,286	14.03	TNR	
18	-1,112	TNR	48,000	15,584	14.01	TNR	
19	-1,209	TNR	52,000	16,883	13.96	TNR	
20	-1,404	TNR	60,000	19,481	13.88	TNR	
21	-1,609	TNR	68,000	22,078	13.72	TNR	
22	-1,837	TNR	76,000	24,675	13.43	TNR	
23	-2,064	TNR	84,000	27,273	13.21	TNR	
24	-2,317	TNR	92,000	29,870	12.89	TNR	
25	-2,561	TNR	100,000	32,468	12.68	TNR	
26			103,284	33,534			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

1413 Topside Road, Louisville, TN 37777

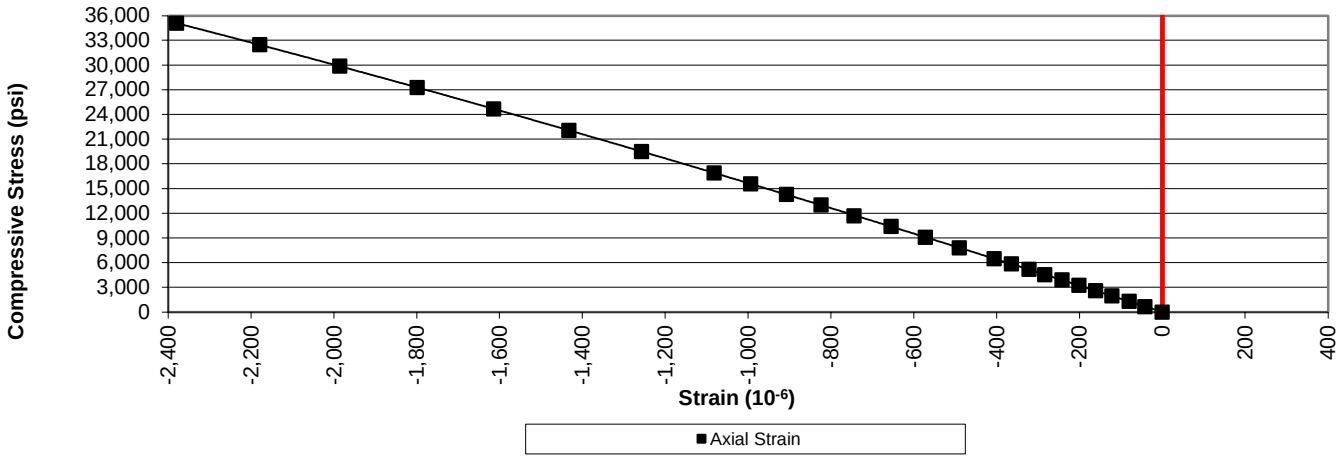
Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	4.35	**Tested by:**	VLI
Boring Id:	IB-4A	**Unit Weight, pcf:**	187.5	**Reviewed by:**	NRR
Sample No:	RC-12	**Moisture Content, %:**	0.0		
Depth (ft):	34.8 - 35.2	**Load Rate, psi/sec:**	75		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-42	TNR	2,000	649	15.45	TNR	
3	-80	TNR	4,000	1,299	16.24	TNR	
4	-122	TNR	6,000	1,948	15.97	TNR	
5	-161	TNR	8,000	2,597	16.13	TNR	
6	-201	TNR	10,000	3,247	16.15	TNR	
7	-242	TNR	12,000	3,896	16.10	TNR	
8	-284	TNR	14,000	4,545	16.00	TNR	
9	-322	TNR	16,000	5,195	16.13	TNR	
10	-364	TNR	18,000	5,844	16.05	TNR	
11	-406	TNR	20,000	6,494	16.00	TNR	
12	-490	TNR	24,000	7,792	15.90	TNR	
13	-572	TNR	28,000	9,091	15.89	TNR	
14	-655	TNR	32,000	10,390	15.86	TNR	
15	-744	TNR	36,000	11,688	15.71	TNR	
16	-824	TNR	40,000	12,987	15.76	TNR	
17	-907	TNR	44,000	14,286	15.75	TNR	
18	-994	TNR	48,000	15,584	15.68	TNR	
19	-1,082	TNR	52,000	16,883	15.60	TNR	
20	-1,257	TNR	60,000	19,481	15.50	TNR	
21	-1,433	TNR	68,000	22,078	15.41	TNR	
22	-1,614	TNR	76,000	24,675	15.29	TNR	
23	-1,799	TNR	84,000	27,273	15.16	TNR	
24	-1,986	TNR	92,000	29,870	15.04	TNR	
25	-2,179	TNR	100,000	32,468	14.90	TNR	
26	-2,380	TNR	108,000	35,065	14.73	TNR	
			112,693	36,589			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)

Stress vs. Strain



UNCONFINED COMPRESSION WITH YOUNG'S MODULUS AND POISSON'S RATIO
(ASTM D7012 Method C and D)

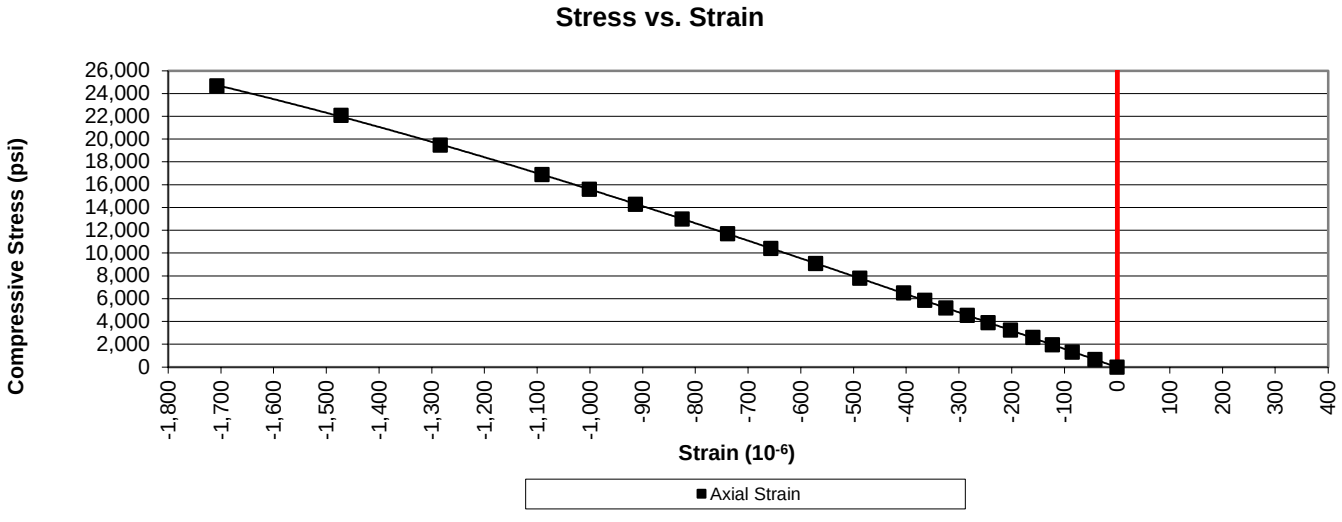
1413 Topside Road, Louisville, TN 37777

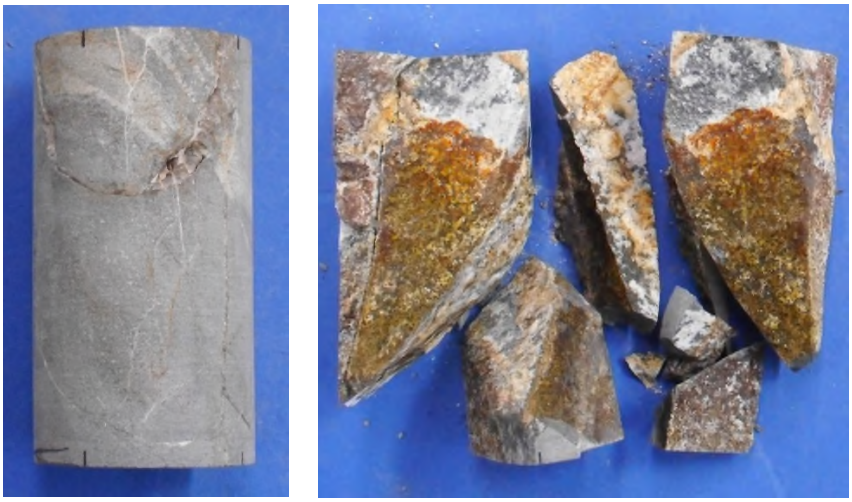
Project:	I-77 Panthers Interchange	**Diameter, in.:**	1.98	**Date:**	2/11/2020
Project No.:	1461-19-069	**Length, in.:**	4.37	**Tested by:**	VLI
Boring Id:	IB-4A	**Unit Weight, pcf:**	187.7	**Reviewed by:**	NRR
Sample No:	RC-13	**Moisture Content, %:**	0.0		
Depth (ft):	54.3 - 54.7	**Load Rate, psi/sec:**	67		

Data Point	Strain (10^{-6})		Load (lb)	Compressive Stress (psi)	Secant Modulus x 10^6 (psi)	Poisson's Ratio	Remarks Failure
	axial	radial					
1	0	TNR	0	0	0.00	TNR	
2	-42	TNR	2,000	649	15.45	TNR	
3	-85	TNR	4,000	1,299	15.28	TNR	
4	-123	TNR	6,000	1,948	15.84	TNR	
5	-160	TNR	8,000	2,597	16.23	TNR	
6	-202	TNR	10,000	3,247	16.07	TNR	
7	-245	TNR	12,000	3,896	15.90	TNR	
8	-284	TNR	14,000	4,545	16.00	TNR	
9	-325	TNR	16,000	5,195	15.98	TNR	
10	-365	TNR	18,000	5,844	16.01	TNR	
11	-405	TNR	20,000	6,494	16.03	TNR	
12	-488	TNR	24,000	7,792	15.97	TNR	
13	-572	TNR	28,000	9,091	15.89	TNR	
14	-657	TNR	32,000	10,390	15.81	TNR	
15	-739	TNR	36,000	11,688	15.82	TNR	
16	-825	TNR	40,000	12,987	15.74	TNR	
17	-914	TNR	44,000	14,286	15.63	TNR	
18	-1,001	TNR	48,000	15,584	15.57	TNR	
19	-1,091	TNR	52,000	16,883	15.47	TNR	
20	-1,284	TNR	60,000	19,481	15.17	TNR	
21	-1,472	TNR	68,000	22,078	15.00	TNR	
22	-1,708	TNR	76,000	24,675	14.45	TNR	
23			79,955	25,959			Failure

TNR - Test Not Requested

Comments: Loading rate was selected to target reaching failure between 2 and 15 minutes.
Test specimen measurements met the desired shape tolerances of ASTM D4543-19 (side straightness, end flatness & parallelism, and end perpendicularity to axis)





Date: 2/3 & 10/2020

Photographer: Stan Helton

1	**Location / Orientation**	EB-1, RC-1 (42.6' – 43.0')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

2	**Location / Orientation**	EB-1, RC-2 (57.5' – 57.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

3	**Location / Orientation**	EB-2, RC-3 (25.3' – 25.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

4	**Location / Orientation**	EB-2, RC-4 (46.7' – 47.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

5	**Location / Orientation**	IB-1, RC-5 (45.7' – 46.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

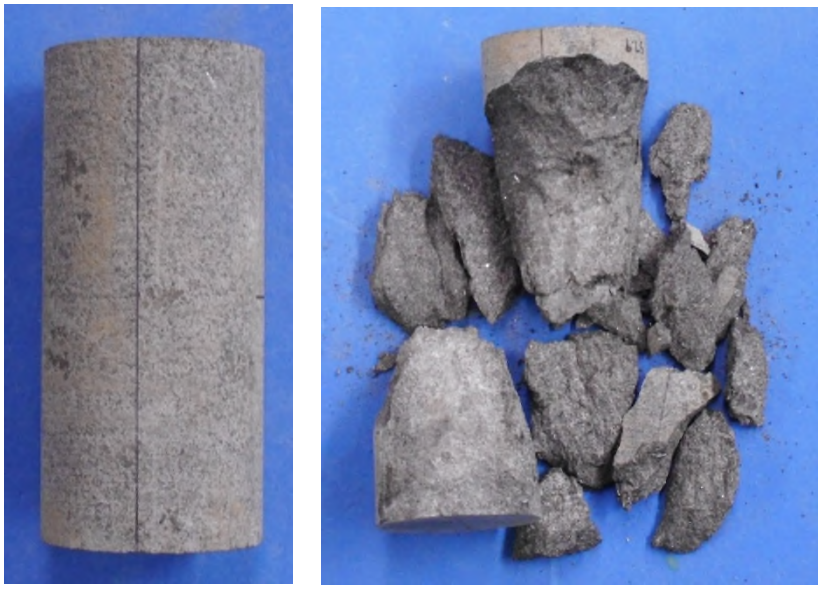
Photographer: Stan Helton

6	**Location / Orientation**	IB-1, RC-6 (65.0' – 65.5')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

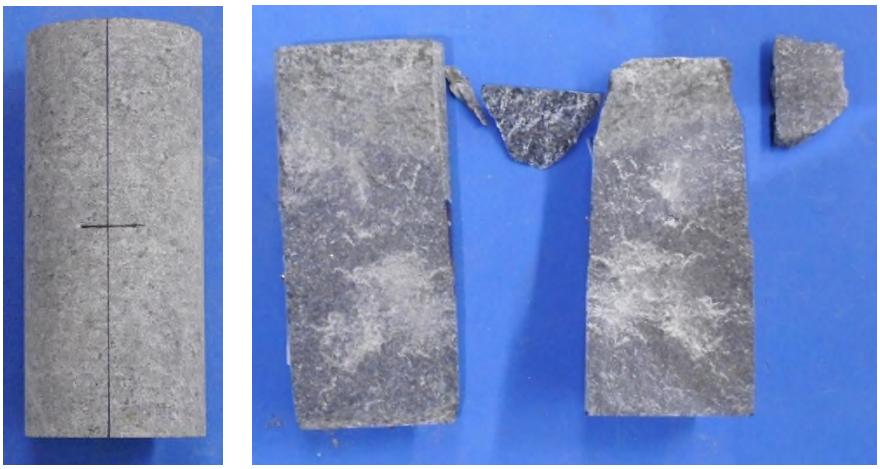
7	**Location / Orientation**	IB-2B, RC-7 (43.3' – 43.8')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)



Date: 2/3 & 10/2020

Photographer: Stan Helton

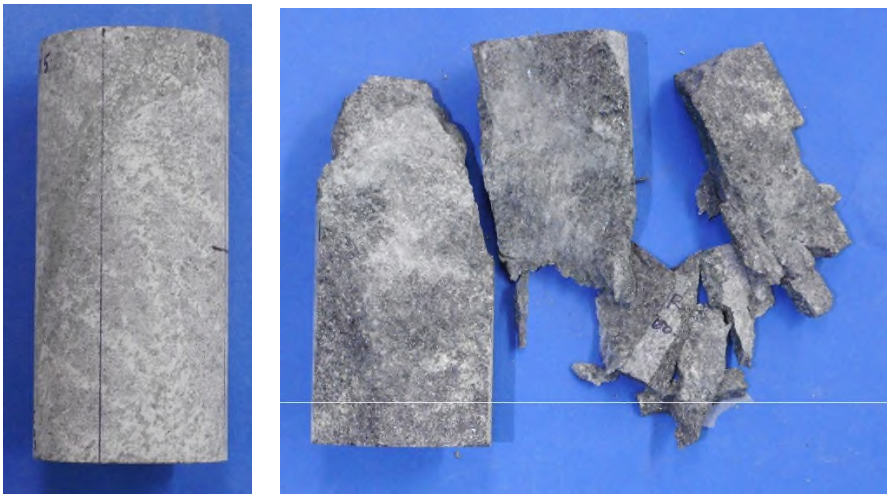
8	**Location / Orientation**	IB-2B, RC-8 (57.5' – 57.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)



Date: 2/3 & 10/2020

Photographer: Stan Helton

9	**Location / Orientation**	IB-3, RC-9 (53.7' – 54.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)



Date: 2/3 & 10/2020

Photographer: Stan Helton

10	**Location / Orientation**	IB-3, RC-10 (60.5' – 60.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

11	**Location / Orientation**	IB-4A, RC-11 (24.7' – 25.1')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

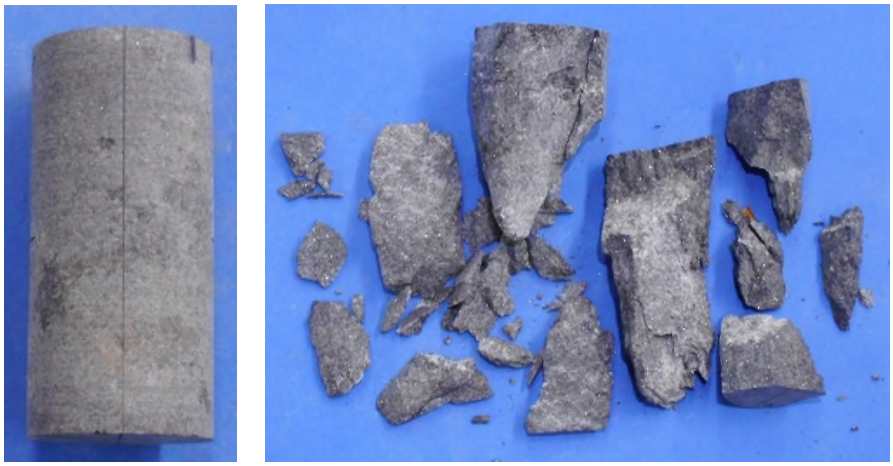
Photographer: Stan Helton

12	**Location / Orientation**	IB-4A, RC-12 (34.8' – 35.2')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

13	**Location / Orientation**	IB-4A, RC-13 (54.3' – 54.7')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)



Date: 2/3 & 10/2020

Photographer: Stan Helton

14	**Location / Orientation**	EB-3, RC-14 (55.0' – 55.35')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

15	**Location / Orientation**	EB-3, RC-15 (62.6' – 62.95')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

16	**Location / Orientation**	EB-4, RC-16 (44.0' – 44.4')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Date: 2/3 & 10/2020

Photographer: Stan Helton

17	**Location / Orientation**	EB-4, RC-17 (55.5' – 55.9')
	Remarks	Unconfined Compressive Strength of Rock Core Specimen Before/After (ASTM D7012 Method D)

Appendix X – Bulk Sample Laboratory Test Results

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/20 - 1/21/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME	Sample Date(s):	1/7/2020
Sampling Method:	Bulk	Drill Rig :	CME 550X

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-2A	BS-1	0 - 5	222	153.16	317.73	276.55	41.18	33.4%

Notes / Deviations / References

Matthew Wolfe
Technician Name

NICET 123218
Certification Type / No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

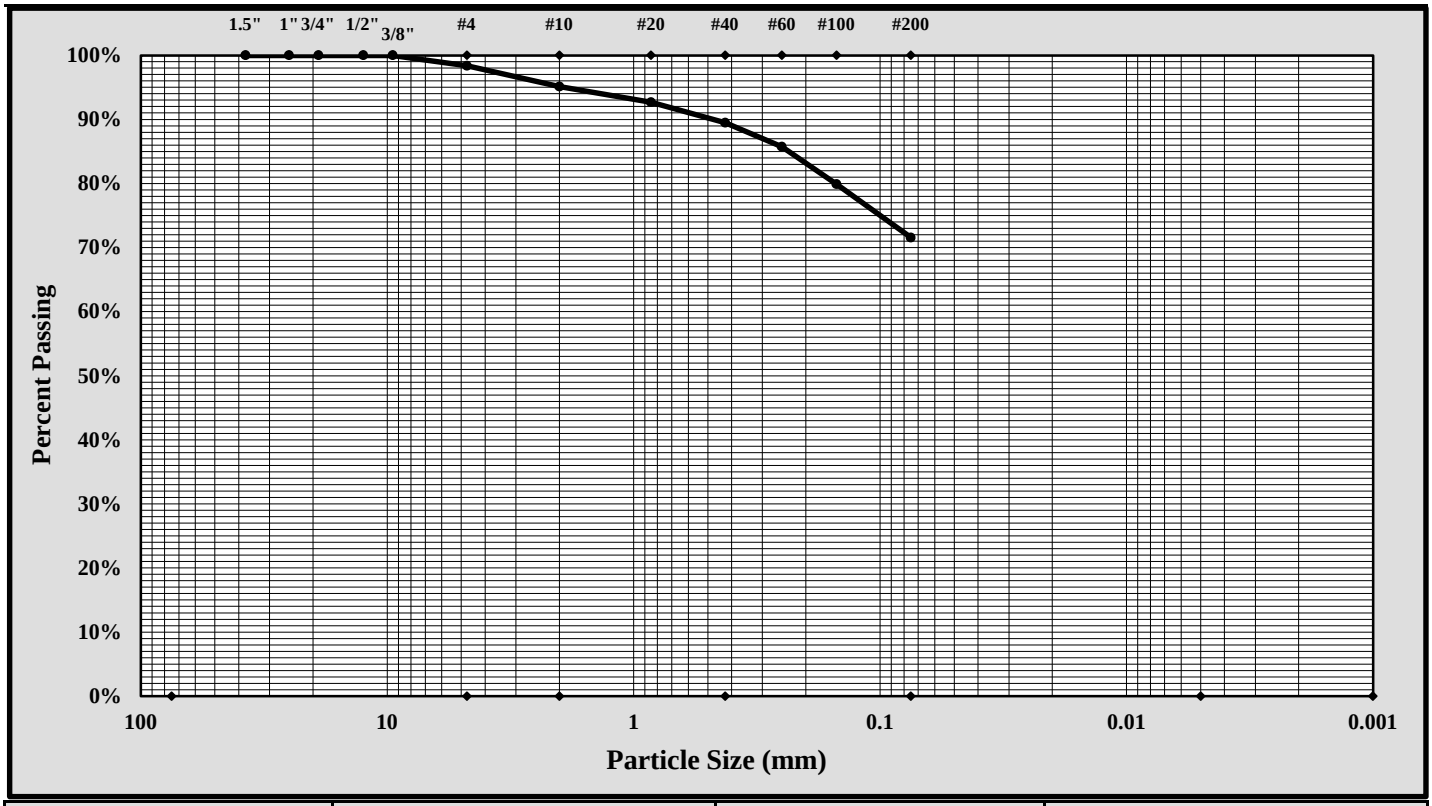
5/5/2020
Date

Mechanical Analysis of Soils (Elutriation Method)

SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/20 - 1/22/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	IB-2A	Sample #: BS-1	Sample Date: 1/7/2020
Station:	36+74.0 (paragon)	Offset: 42.24RT	
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		



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

Maximum Particle Size:	#4	Gravel:	2%	Silt:	18%
Silt & Clay (% Passing #200):	72%	Total Sand:	27%	Clay by Elutriation:	53%
				Passing #10 & Retained #60:	9%
Liquid Limit	57	Plastic Limit	27	Plastic Index	30
Coarse Sand:	9%			Fine Sand:	18%

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

References / Comments / Deviations: SC-T-34, AASHTO T89, T90.

Material passing the #200 sieve not shown on the graph. NP: Non-plastic.

Robert C. Bruorton, P.E.	Senior Engineer	5/5/2020
Technical Responsibility	*Position*	*Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

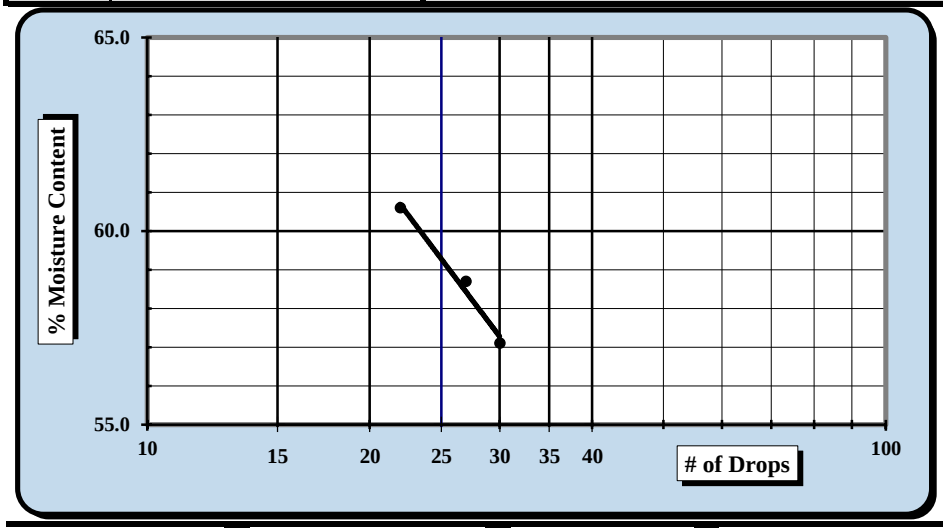
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/21 - 1/24/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #: BS-1	Sample Date: 1/7/2020
Station:	36+74.0 (paragon)	Offset: 42.24RT	Depth: 0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 603		Liquid Limit						Plastic Limit		
	Tare #:	36	214	1				243	43	
A	Tare Weight	20.94	20.81	20.64				20.75	20.82	
B	Wet Soil Weight + A	26.50	25.73	25.89				27.66	30.15	
C	Dry Soil Weight + A	24.48	23.91	23.91				26.19	28.14	
D	Water Weight (B-C)	2.02	1.82	1.98				1.47	2.01	
E	Dry Soil Weight (C-A)	3.54	3.10	3.27				5.44	7.32	
F	% Moisture (D/E)*100	57.1%	58.7%	60.6%				27.0%	27.5%	
N	# OF DROPS	30	27	22				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**27.3%**		



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

NP, Non-Plastic ☐

Liquid Limit	**57**
Plastic Limit	**27**
Plastic Index	**30**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 72%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	1/28/2020	Robert C. Bruorton, P.E.	5/5/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE - DENSITY REPORT

Quality Assurance

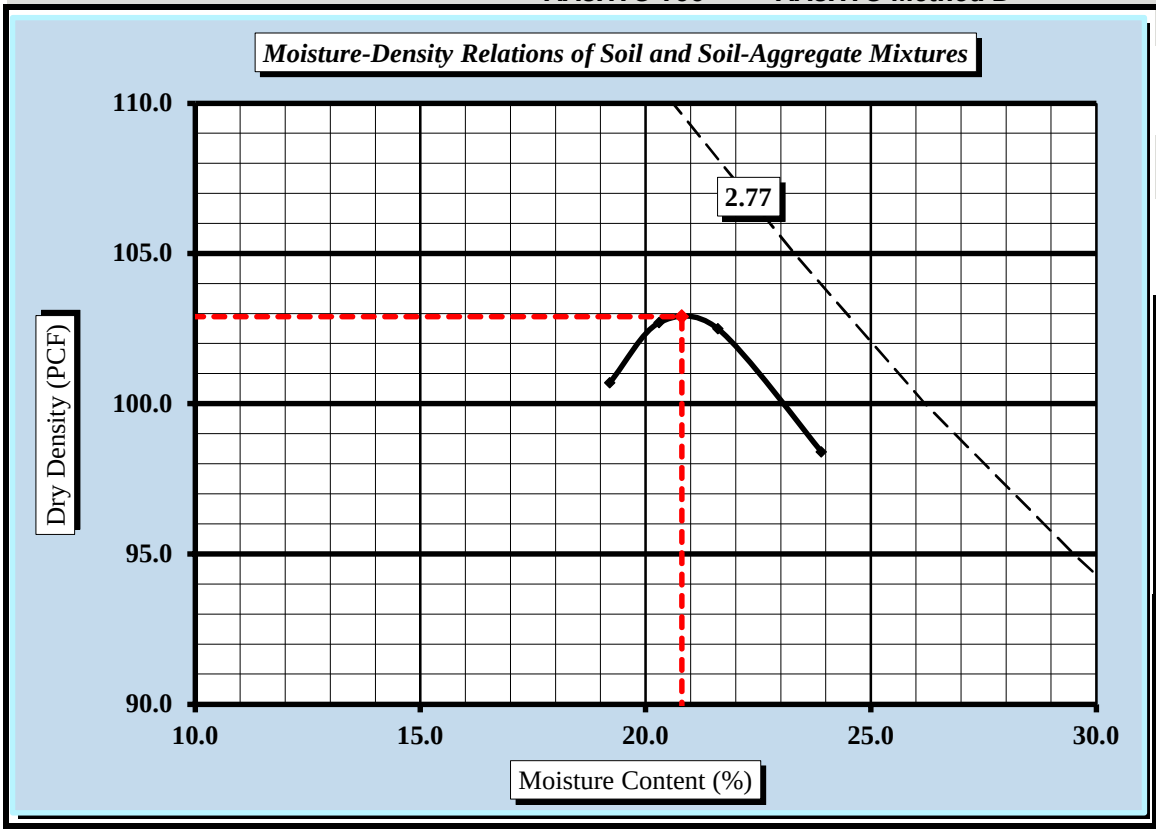
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

S&ME Project #:	1461-19-069	Report Date:	1/22/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/21 - 1/22/2020
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	IB-2A	Sample #:	BS-1	Sample Date:	1/7/2020
Station:	36+74.0 (paragon)	Offset:	42.24RT	Depth:	0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])				

Maximum Dry Density 102.9 PCF. Optimum Moisture Content 20.8%

AASHTO T99 - - AASHTO Method D



Soil Properties

Natural Moisture Content	33.4%
Liquid Limit	57
Plastic Limit	27
Plastic Index	30

% Passing	
3/4"	100.0%
3/8"	100.0%
#4	98.4%
#10	95.1%
#40	89.5%
#60	85.7%
#200	71.6%

Oversize Fraction	
Bulk Gravity	
% Absorption	
% Oversize	0.0%
MDD	
Opt. MC	

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☐ 3/8 inch Sieve ☐ 3/4 inch Sieve ☒

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

AASHTO T265: Laboratory Determination of Moisture Content of Soils

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

Robert C. Bruorton, P.E.	Senior Engineer	5/5/2020
Technical Responsibility	*Position*	*Date*

Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T 193

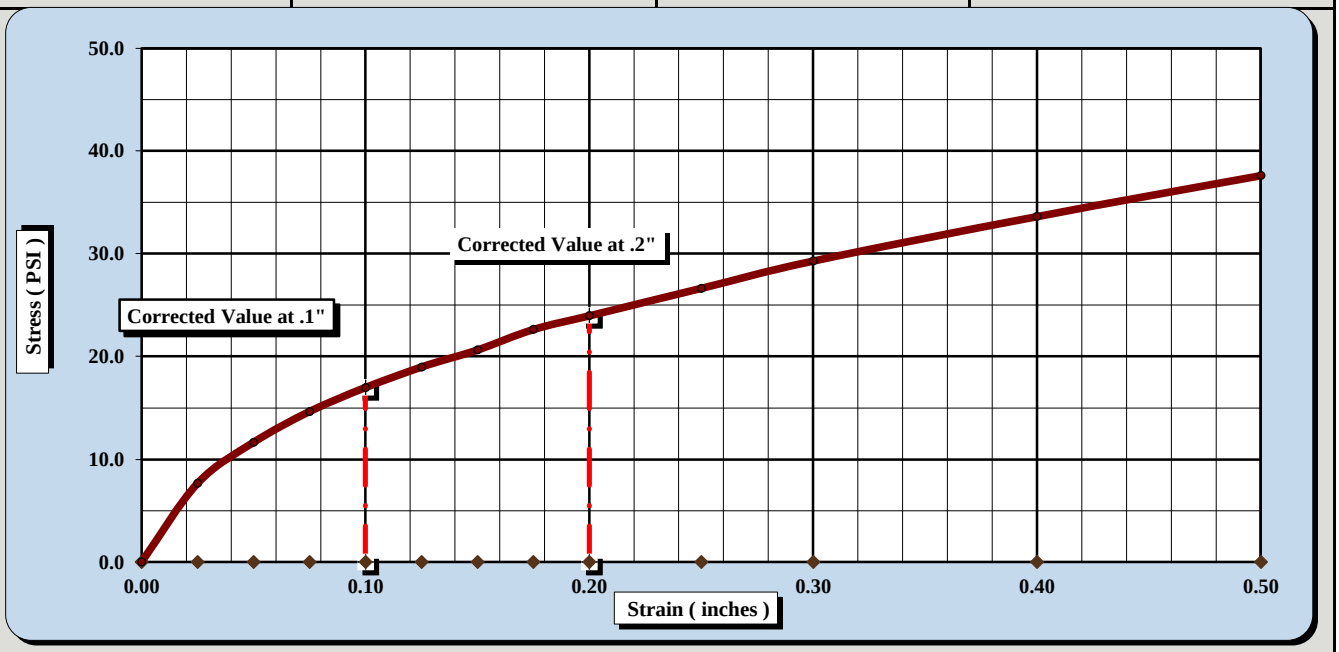
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #: BS-1	Sample Date: 1/7/20
Station:	36+74.0 (paragon)	Offset: 42.24RT	Depth: 0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		

AASHTO T99 *Method D* Maximum Dry Density: 102.9 PCF Optimum Moisture Content: 20.8%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: *

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	1.7	CBR at 0.2 in.	1.6	CBR at 0.1 in.	1.7	CBR at 0.2 in.	1.6



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	27		
Initial Dry Density (PCF)	94.3	Final Dry Density (PCF)	89.6
Moisture Content of the Compacted Specimen	21.0%	Moisture Content (top 1" after soaking)	37.2%
Percent Compaction	91.6%	Percent Swell	5.2%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.8
Liquid Limit	57	Plastic Index	30		

Notes/Deviations/References: *Organics.

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer
5/5/2020 — *Date*

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

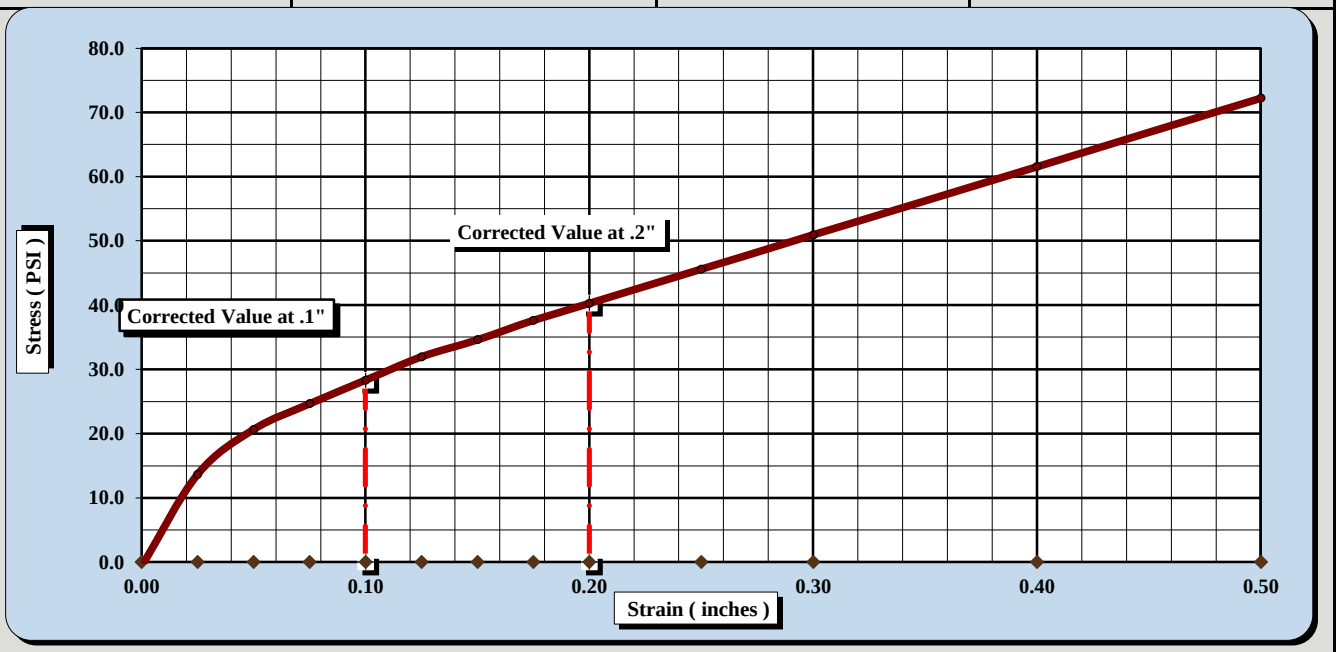
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-9-069	Report Date:	1/28/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-2A	Sample #: BS-1	Sample Date: 1/7/20
Station:	36+74.0 (paragon)	Offset: 42.24RT	Depth: 0 - 5 ft.
Sample Description:	Fat CLAY with Sand (CH, A-7-6[22])		

AASHTO T99 *Method D* Maximum Dry Density: 102.9 PCF Optimum Moisture Content: 20.8%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: *

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	2.8	CBR at 0.2 in.	2.7	CBR at 0.1 in.	2.8	CBR at 0.2 in.	2.7



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with *AASHTO T 193, Section 5.1.1*

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	50		
Initial Dry Density (PCF)	100.7	Final Dry Density (PCF)	96.1
Moisture Content of the Compacted Specimen	20.0%	Moisture Content (top 1" after soaking)	34.3%
Percent Compaction	97.9%	Percent Swell	4.7%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.8
Liquid Limit	57	Plastic Index	30		

Notes/Deviations/References: *Organics.

Robert C. Bruorton, P.E. — *Technical Responsibility*

Senior Engineer

5/5/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	1/29/20
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME	Sample Date(s):	1/17/20
Sampling Method:	Bulk	Drill Rig :	CME-550X

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
IB-3	BS-2	0 - 5	12	150.77	388.25	338.04	50.21	27%

Notes / Deviations / References

Matthew Wolfe — *Technician Name*

NICET 123218 — *Certification Type / No.*

Robert C. Bruorton, P.E. — *Technical Responsibility*

Senior Engineer — *Position*

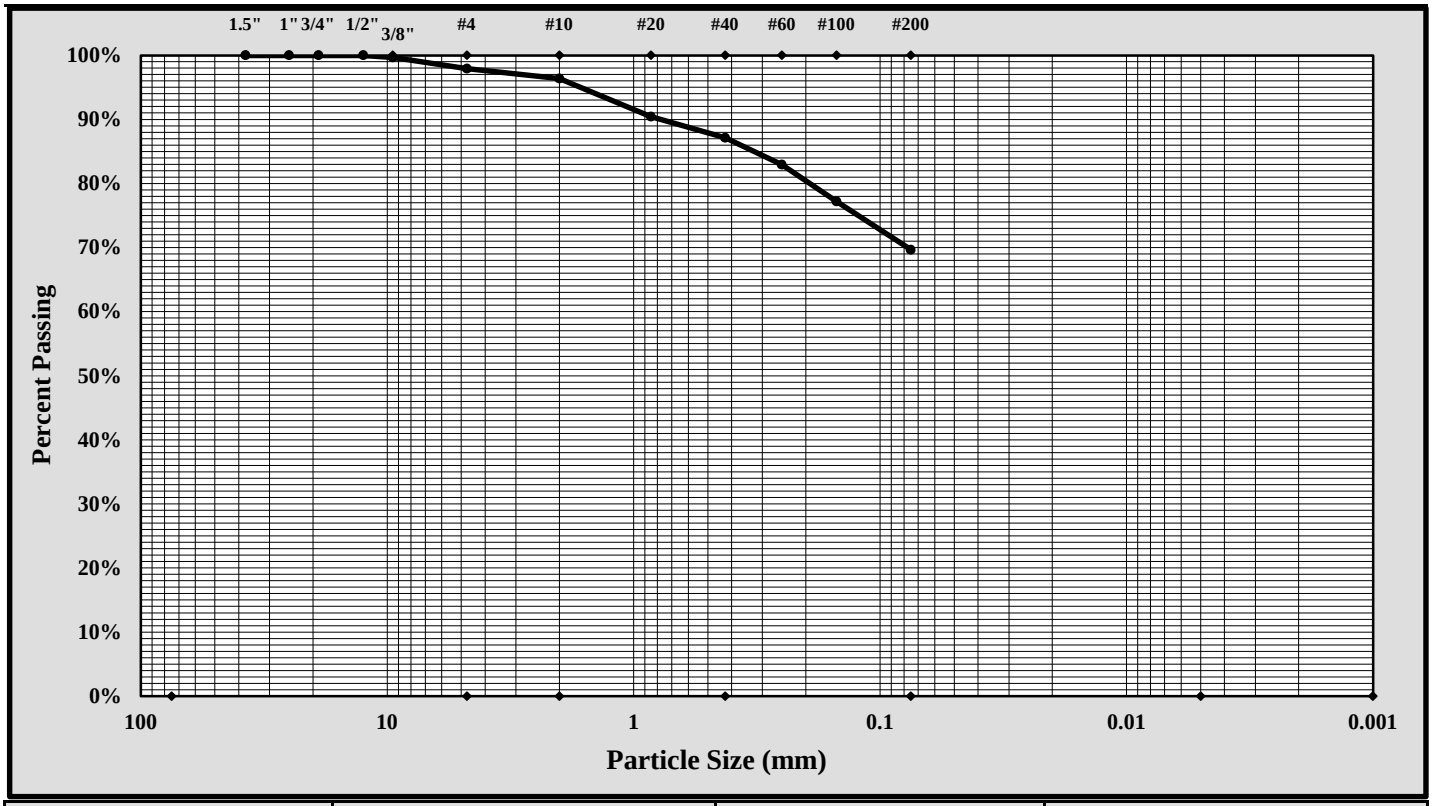
5/5/2020 — *Date*

Mechanical Analysis of Soils (Elutriation Method)

SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/29/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	IB-3	Sample #: BS-2	Sample Date: 1/17/20
Station:	35+19.5 (paragon)	Offset: 72.23LT	
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		



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

Maximum Particle Size:	3/8"	Gravel:	2%	Silt:	TNP
Silt & Clay (% Passing #200):	70%	Total Sand:	28%	Clay by Elutriation:	TNP
				Passing #10 & Retained #60:	13%
Liquid Limit	61	Plastic Limit	32	Plastic Index	29
Coarse Sand:	11%			Fine Sand:	17%

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

References / Comments / Deviations: SC-T-34, AASHTO T89, T90.

Material passing the #200 sieve not shown on the graph. NP: Non-plastic.

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/24 - 1/31/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: NBS-2	Sample Date: 1/17/20
Station:	35+19.5 (paragon)	Offset: 72.23LT	Depth: 0 - 5 ft.
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 606		Liquid Limit						Plastic Limit		
	Tare #:	6	45	39				40		
A	Tare Weight	20.69	20.76	20.82				20.85		
B	Wet Soil Weight + A	26.32	26.64	27.23				30.94		
C	Dry Soil Weight + A	24.23	24.43	24.75				28.47		
D	Water Weight (B-C)	2.09	2.21	2.48				2.47		
E	Dry Soil Weight (C-A)	3.54	3.67	3.93				7.62		
F	% Moisture (D/E)*100	59.0%	60.2%	63.1%				32.4%		
N	# OF DROPS	35	25	20				*Moisture Contents determined by AASHTO T 245*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**32.4%**		

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

NP, Non-Plastic ☐

Liquid Limit	**61**
Plastic Limit	**32**
Plastic Index	**29**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:*

Notes / Deviations / References: Group Symbol refers only to material passing the No. 40 sieve.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/3/2020	Robert C. Bruorton, P.E.	5/5/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE - DENSITY REPORT

Quality Assurance

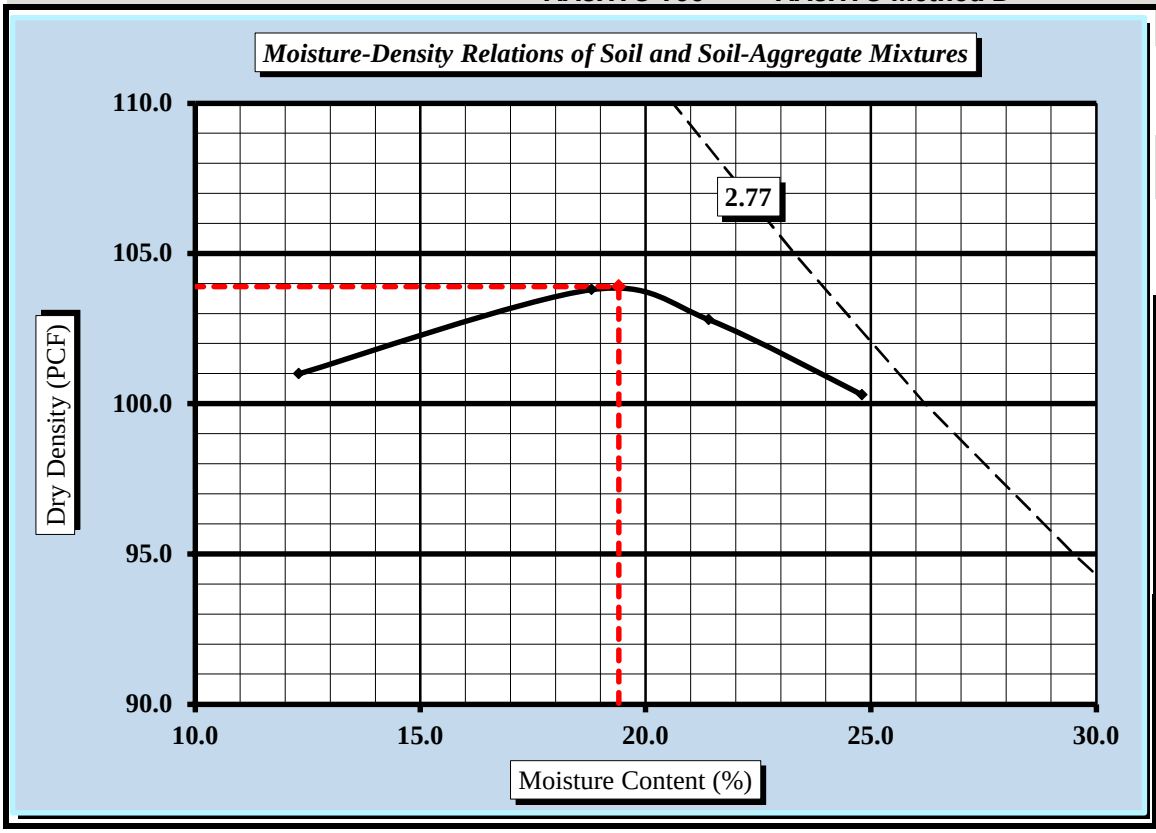
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/29/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	IB-3	Sample #:	BS-2	Sample Date:	1/17/2020
Station:	35+19.5 (paragon)	Offset:	72.23LT	Depth:	0 - 5 ft.
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])				

Maximum Dry Density 103.9 PCF. Optimum Moisture Content 19.4%

AASHTO T99 - - AASHTO Method D



Soil Properties

Natural Moisture Content	27%
Liquid Limit	61
Plastic Limit	32
Plastic Index	29

% Passing	
3/4"	100.0%
3/8"	99.7%
#4	97.9%
#10	96.4%
#40	87.1%
#60	82.9%
#200	69.7%

Oversize Fraction	
% Oversize	0.0%

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☐ 3/8 inch Sieve ☐ 3/4 inch Sieve ☒

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

AASHTO T265: Laboratory Determination of Moisture Content of Soils

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

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T 193

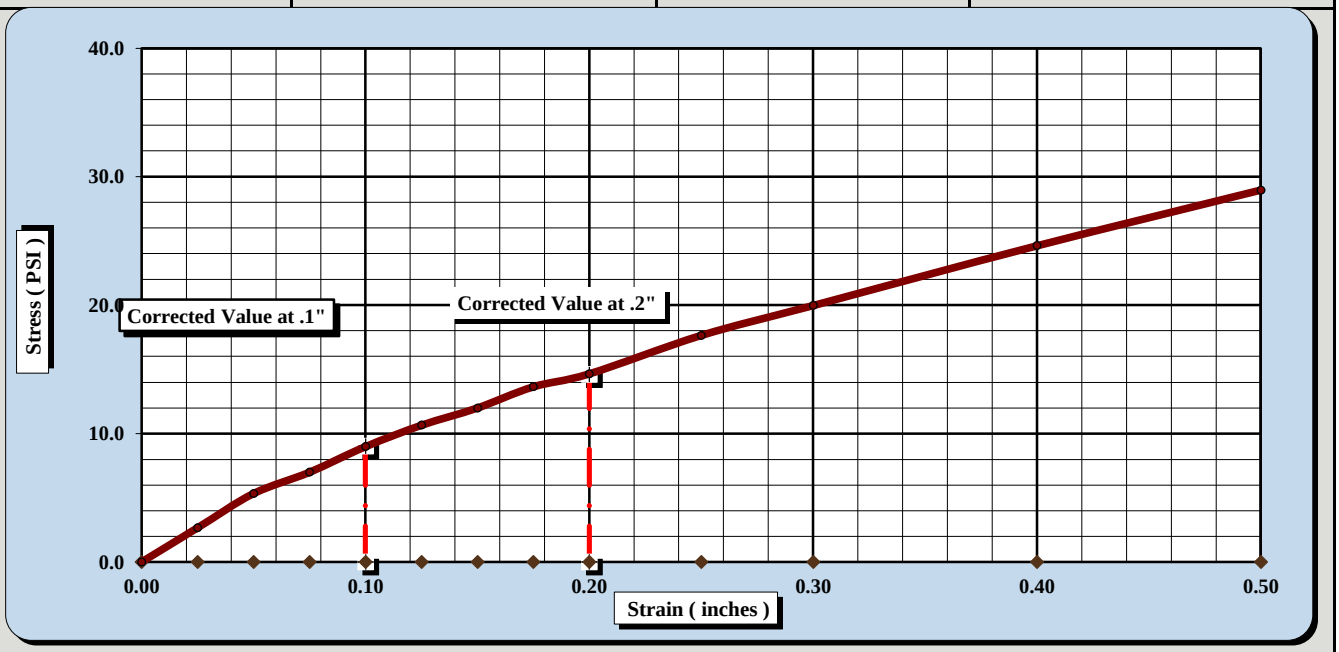
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: BS-2	Sample Date: 1/17/20
Station:	35+19.5 (paragon)	Offset: 72.23LT	Depth: 0 - 5 ft.
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		

AASHTO T99 *Method D* Maximum Dry Density: 103.9 PCF Optimum Moisture Content: 19.4%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	0.9	CBR at 0.2 in.	1.0	CBR at 0.1 in.	0.9	CBR at 0.2 in.	1.0



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	25		
Initial Dry Density (PCF)	96.4	Final Dry Density (PCF)	89.8
Moisture Content of the Compacted Specimen	20.8%	Moisture Content (top 1" after soaking)	37.5%
Percent Compaction	92.8%	Percent Swell	7.3%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.8
Liquid Limit	61	Plastic Index	20	Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T 193

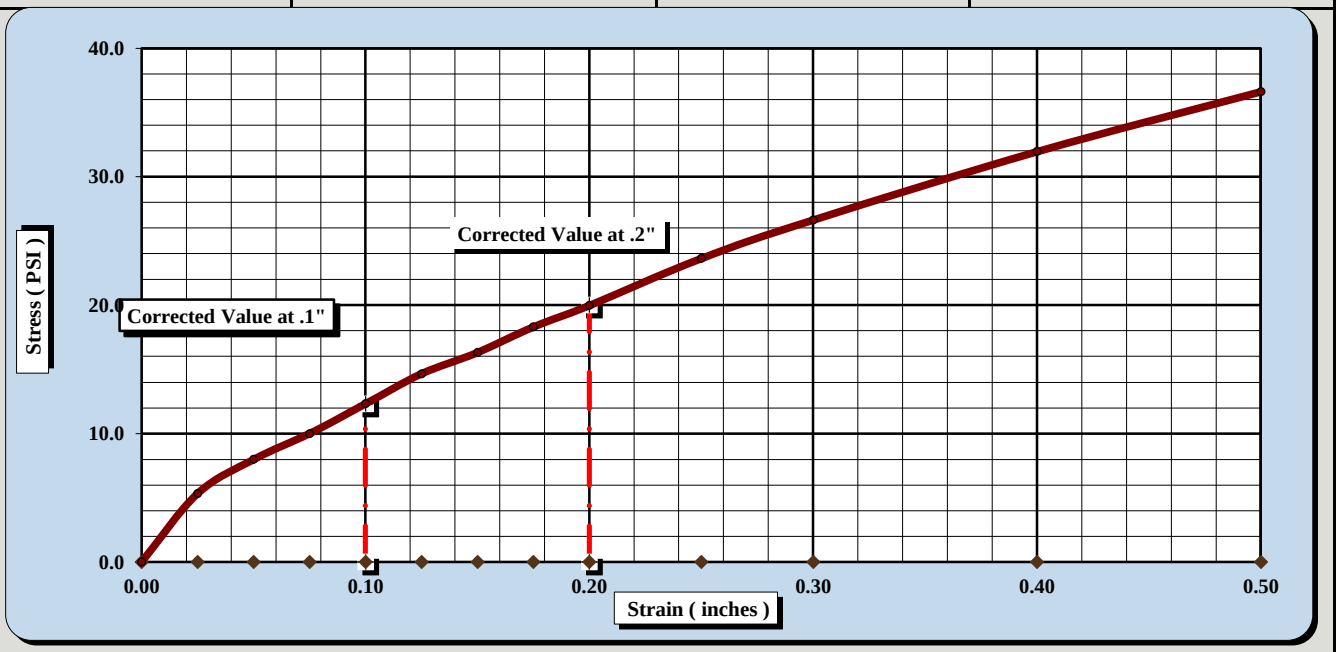
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/23 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	IB-3	Sample #: BS-2	Sample Date: 1/17/20
Station:	35+19.5 (paragon)	Offset: 72.23LT	Depth: 0 - 5 ft.
Sample Description:	Sandy Elastic SILT (MH, A-7-5[21])		

AASHTO T99 *Method D* Maximum Dry Density: 103.9 PCF Optimum Moisture Content: 19.4%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	1.2	CBR at 0.2 in.	1.3	CBR at 0.1 in.	1.2	CBR at 0.2 in.	1.3



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	50		
Initial Dry Density (PCF)	103.4	Final Dry Density (PCF)	97.3
Moisture Content of the Compacted Specimen	18.2%	Moisture Content (top 1" after soaking)	36.8%
Percent Compaction	99.5%	Percent Swell	6.2%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.8
Liquid Limit	61	Plastic Index	20	Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

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

LABORATORY DETERMINATION OF WATER CONTENT

ASTM D 2216 ☐ *AASHTO T 265* ☑

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/27/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Sample by:	S&ME	Sample Date(s):	1/10/20
Sampling Method:	Bulk	Drill Rig :	CME-550X

Method: **A (1%)** ☑ **B (0.1%)** ☐ Balance ID. 28686 Calibration Date: 10/1/19 Oven ID. 25722 Calibration Date: 8/5/19

Boring No.	Sample No.	Sample Depth	Tare #	Tare Weight	Tare Wt.+ Wet Wt	Tare Wt. + Dry Wt	Water Weight	Percent Moisture
		ft.		grams	grams	grams	grams	%
EM-11	BS-3	0 - 5	158	151.37	339.14	291.54	47.60	34.0%

Notes / Deviations / References

Matthew Wolfe
Technician Name

NICET 123218
Certification Type / No.

Robert C. Bruorton, P.E.
Technical Responsibility

Senior Engineer
Position

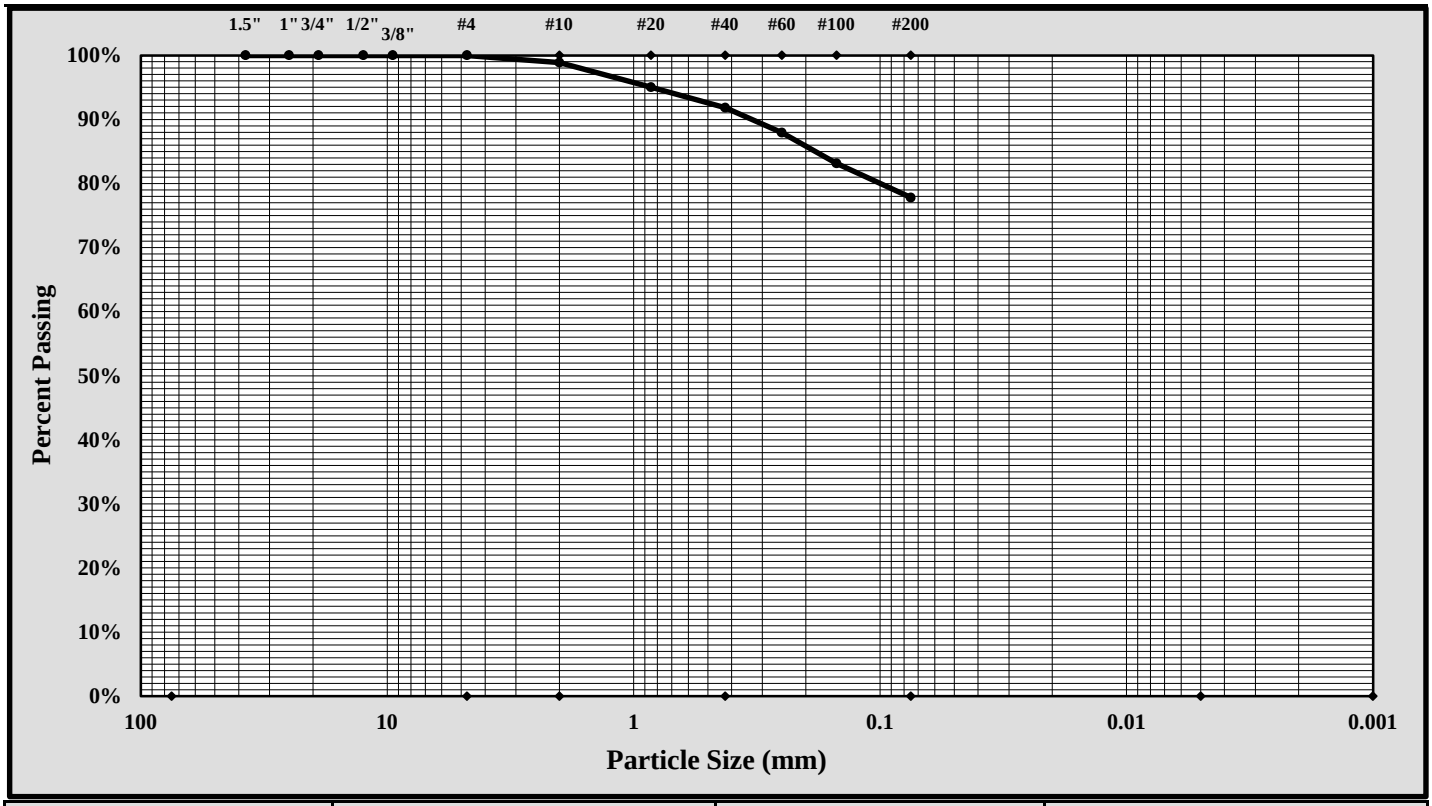
5/5/2020
Date

Mechanical Analysis of Soils (Elutriation Method)

SC-T-34

S&ME, Inc. Columbia Office, 134 Suber Road Columbia SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/30/20
Client Name:	RS&H		
Address:	4000 Faber Pl. Dr., Ste. 130, N. Char.		
Boring #:	EM-11 Sample #: BS-3	Sample Date:	1/10/20
Station:	555+77.0 (ramp 1) Offset: 10.05RT		
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		



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

Maximum Particle Size:	#10	Gravel:	0%	Silt:	TNP
Silt & Clay (% Passing #200):	78%	Total Sand:	22%	Clay by Elutriation:	TNP
				Passing #10 & Retained #60:	11%
Liquid Limit	58	Plastic Limit	31	Plastic Index	27
Coarse Sand:	8%			Fine Sand:	14%

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

References / Comments / Deviations: SC-T-34, AASHTO T89, T90.

Material passing the #200 sieve not shown on the graph. NP: Non-plastic.

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

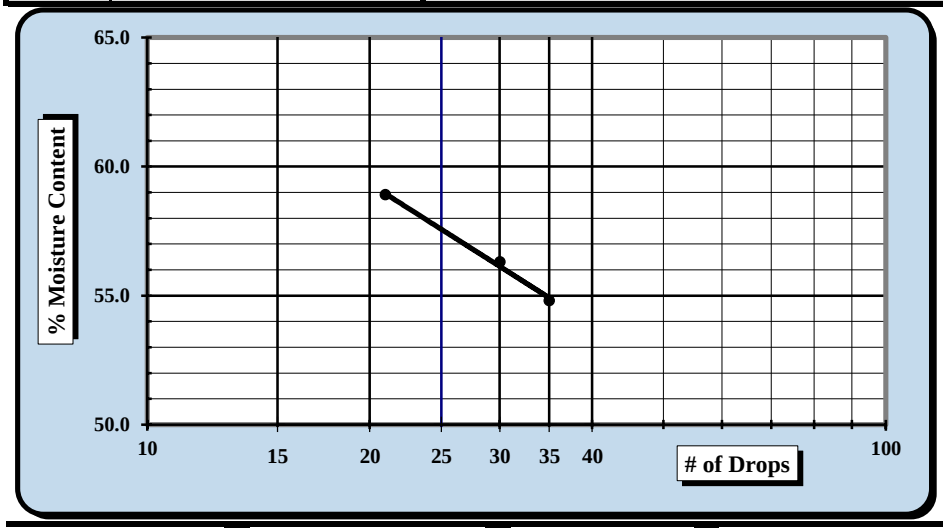
ASTM D 4318 ☐ AASHTO T 89 ☒ AASHTO T 90 ☒

S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/24 - 1/31/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		
Boring #:	EM-11	Sample #: BS-3	Sample Date: 1/7/2020
Station:	555+77.0 (ramp 1)	Offset: 10.05RT	Depth: 0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	15425	8/5/2019	Flat Grooving tool	28648	3/19/2019
LL Apparatus	28651	5/9/2019			
Oven	25722	8/5/2019	No. 40 Sieve	21775	1/2/2020

Pan # 600		Liquid Limit						Plastic Limit		
	Tare #:	32	235	204				216		
A	Tare Weight	20.44	20.78	20.86				20.68		
B	Wet Soil Weight + A	25.78	27.11	26.96				32.09		
C	Dry Soil Weight + A	23.89	24.83	24.70				29.40		
D	Water Weight (B-C)	1.89	2.28	2.26				2.69		
E	Dry Soil Weight (C-A)	3.45	4.05	3.84				8.72		
F	% Moisture (D/E)*100	54.8%	56.3%	58.9%				30.8%		
N	# OF DROPS	35	30	21				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**30.8%**		



One Point Liquid Limit

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

NP, Non-Plastic ☐

Liquid Limit	**58**
Plastic Limit	**31**
Plastic Index	**27**
Group Symbol	**MH**

Multipoint Method ☑
One-point Method ☐

Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 78%

Notes / Deviations / References: Group Symbol refers only to material passing the No. 40 sieve.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Matthew Wolfe	2/3/2020	Robert C. Bruorton, P.E.	5/5/2020
Technician Name	*Date*	*Technical Responsibility*	*Date*

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

MOISTURE - DENSITY REPORT

Quality Assurance

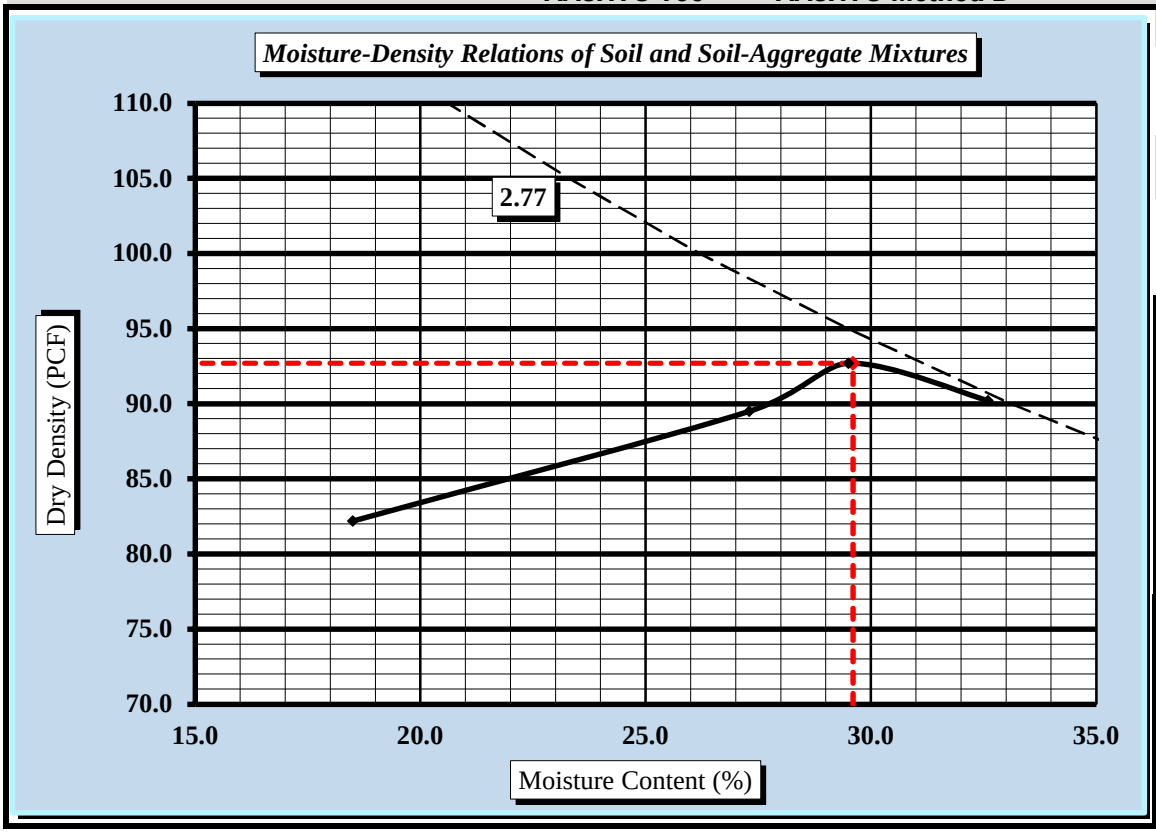
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

S&ME Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s):	1/24 - 1/29/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	EM-11	Sample #:	BS-3	Sample Date:	1/10/2020
Station:	555+77.0 (ramp 1)	Offset:	10.05RT	Depth:	0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])				

Maximum Dry Density 92.7 PCF. Optimum Moisture Content 29.6%

AASHTO T99 - - AASHTO Method D



Soil Properties

Natural Moisture Content	34.0%
Liquid Limit	58
Plastic Limit	31
Plastic Index	27

% Passing	
3/4"	100.0%
3/8"	100.0%
#4	100.0%
#10	98.9%
#40	91.8%
#60	87.9%
#200	77.8%

Oversize Fraction	
Bulk Gravity	
% Absorption	
% Oversize	0.0%
MDD	92.7
Opt. MC	29.6%

Moisture-Density Curve Displayed: Fine Fraction ☒ Corrected for Oversize Fraction (ASTM D 4718) ☐

Sieve Size used to separate the Oversize Fraction: #4 Sieve ☐ 3/8 inch Sieve ☐ 3/4 inch Sieve ☒

Mechanical Rammer ☐ Manual Rammer ☒ Moist Preparation ☐ Dry Preparation ☒

References / Comments / Deviations:

AASHTO T265: Laboratory Determination of Moisture Content of Soils

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

Robert C. Bruorton, P.E.	Senior Engineer	5/5/2020
Technical Responsibility	*Position*	*Date*

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

AASHTO T 193

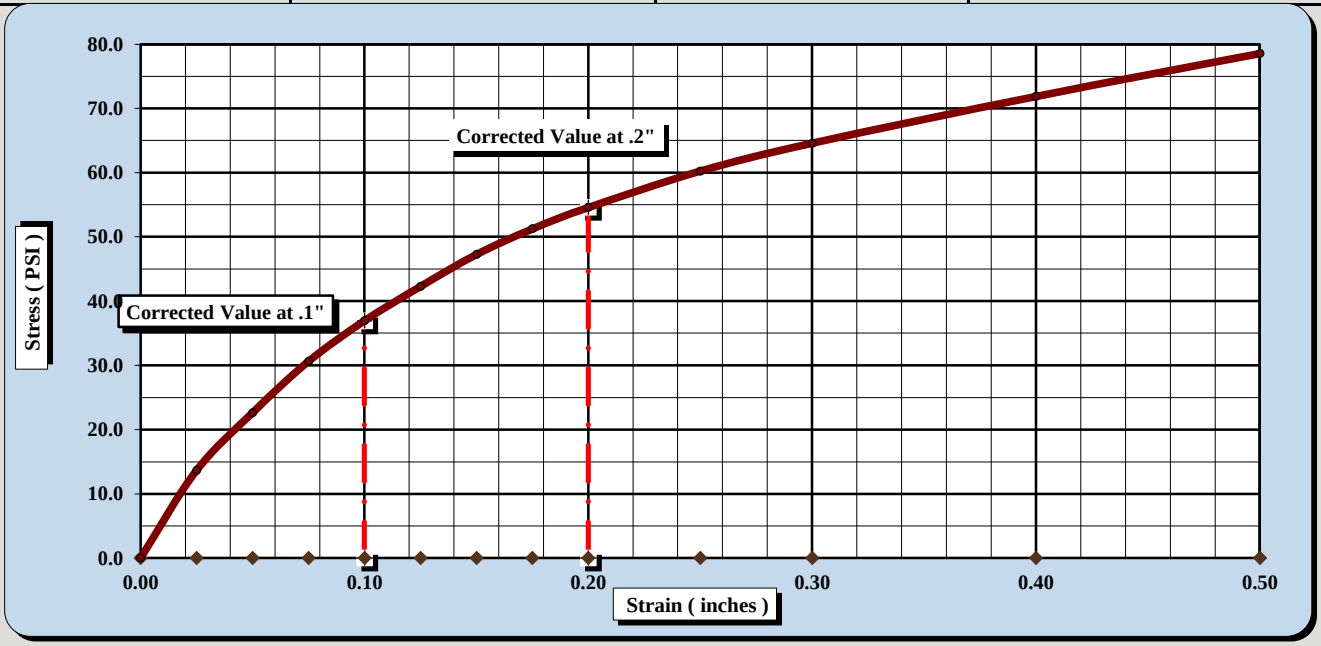
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-19-069	Report Date:	2/3/2020
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	EM-11	Sample #: BS-3	Sample Date: 1/10/20
Station:	555+77.0 (ramp 1)	Offset: 10.05RT	Depth: 0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		

AASHTO T99 *Method D* Maximum Dry Density: 92.7 PCF Optimum Moisture Content: 29.6%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	3.7	CBR at 0.2 in.	3.6	CBR at 0.1 in.	3.7	CBR at 0.2 in.	3.6



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	18		
Initial Dry Density (PCF)	85.0	Final Dry Density (PCF)	84.3
Moisture Content of the Compacted Specimen	28.9%	Moisture Content (top 1" after soaking)	39.5%
Percent Compaction	91.7%	Percent Swell	0.9%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.8
Liquid Limit	58	Plastic Index	27	Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

Form No. TR-D1883-T193-3
Revision No. 2
Revision Date: 08/11/17

CBR (CALIFORNIA BEARING RATIO) OF LABORATORY COMPACTED SOIL

ASTM D 1883

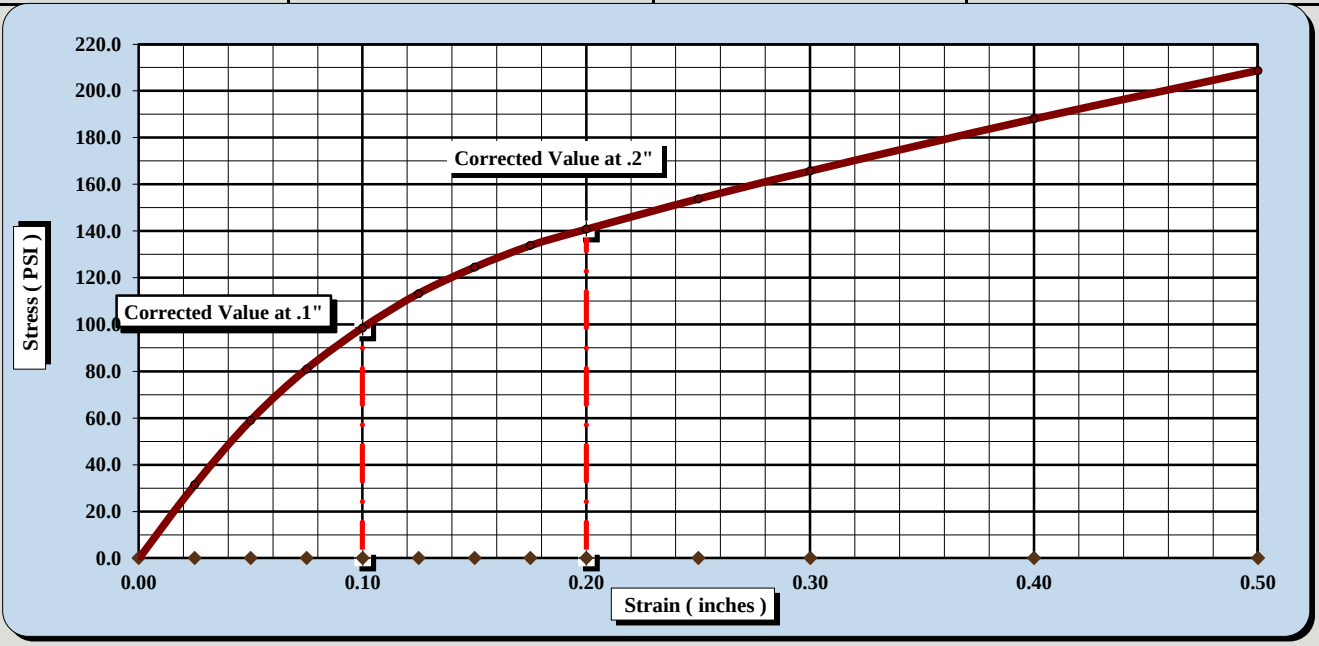
S&ME, Inc. - Columbia: 134 Suber Road, Columbia, SC 29210

Project #:	1461-9-069	Report Date:	2/3/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	1/30 - 2/3/20
Client Name:	RS&H		
Client Address:	4000 Faber place Drive, Ste. 130, N. Charleston, SC		
Boring #:	EM-11	Sample #: BS-3	Sample Date: 1/10/20
Station:	555+77.0 (ramp 1)	Offset: 10.05RT	Depth: 0 - 5 ft.
Sample Description:	Elastic SILT with Sand (MH, A-7-5[23])		

AASHTO T99 *Method D* Maximum Dry Density: 92.7 PCF Optimum Moisture Content: 29.6%

Compaction Test performed on grading complying with CBR spec. % Retained on the 3/4" sieve: 0.0%

Uncorrected CBR Values				Corrected CBR Values			
CBR at 0.1 in.	9.9	CBR at 0.2 in.	9.4	CBR at 0.1 in.	9.9	CBR at 0.2 in.	9.4



CBR Sample Preparation:

The entire gradation was used and compacted in a 6" CBR mold in accordance with AASHTO T 193, Section 5.1.1

Before Soaking		*After Soaking*	
Compactive Effort (Blows per Layer)	50		
Initial Dry Density (PCF)	91.7	Final Dry Density (PCF)	91.3
Moisture Content of the Compacted Specimen	29.3%	Moisture Content (top 1" after soaking)	34.8%
Percent Compaction	98.9%	Percent Swell	0.5%

Soak Time:	96 hrs	Surcharge Weight	10.0	Surcharge Wt. per sq. Ft.	50.9
Liquid Limit	58	Plastic Index	27	Apparent Relative Density	TNP

Notes/Deviations/References:

Robert C. Bruorton , P.E. — *Technical Responsibility*
Senior Engineer — *Position*
5/5/2020 — *Date*

Appendix XI – Undisturbed Sample Laboratory Test Results

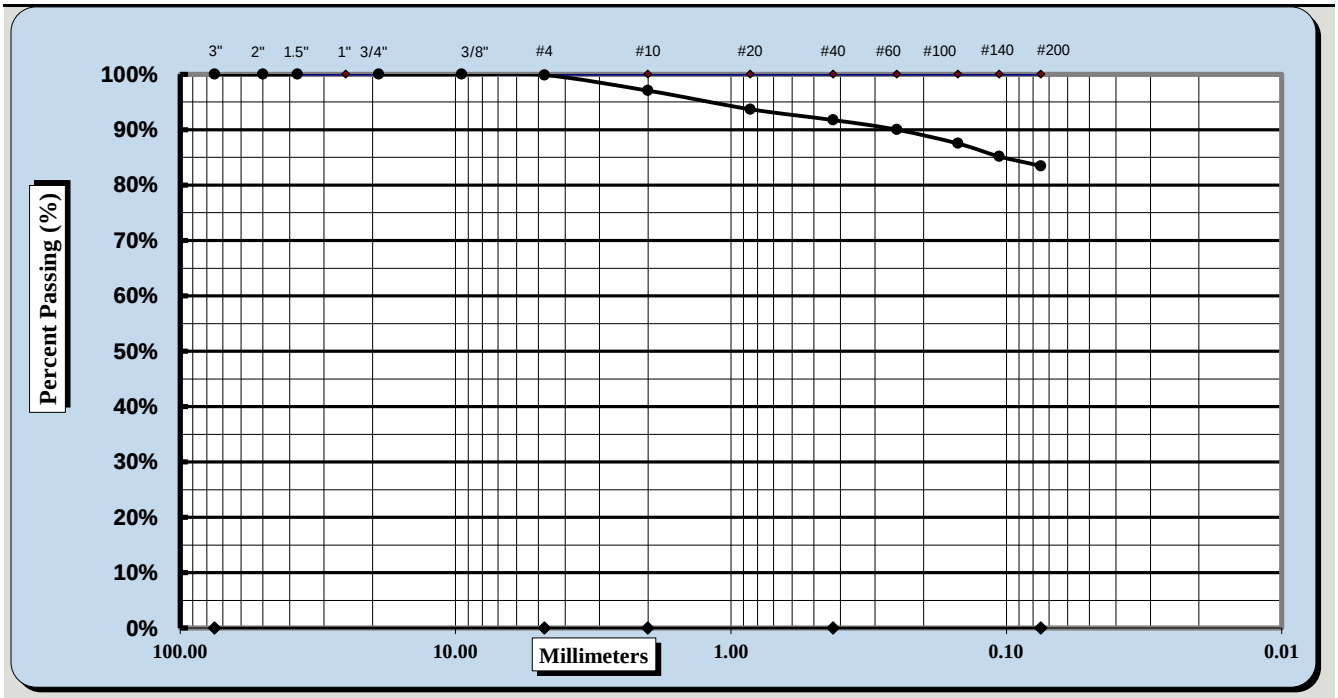
Form No TR-D6913-GR-01
Revision No. 1
Revision Date: 9/5/17

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1461-19-069			Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange			Test Date:	2/04 - 2/13/20
Client Name:	RS&H				
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC				
Boring #:	RW-10	Sample #:	UD-1	Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed	Depth:	4 - 6'
Sample Description:	Fat Clay with Sand (CH / A-7-5)				



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

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

Maximum Particle Size	4.75 mm	Coarse Sand	2.8%	Fine Sand	8.3%
Gravel	0.1%	Medium Sand	5.3%	Silt & Clay	83.5%
Liquid Limit	79	Plastic Limit	31	Plastic Index	48

Notes / Deviations / References:

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
2/14/20 — *Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

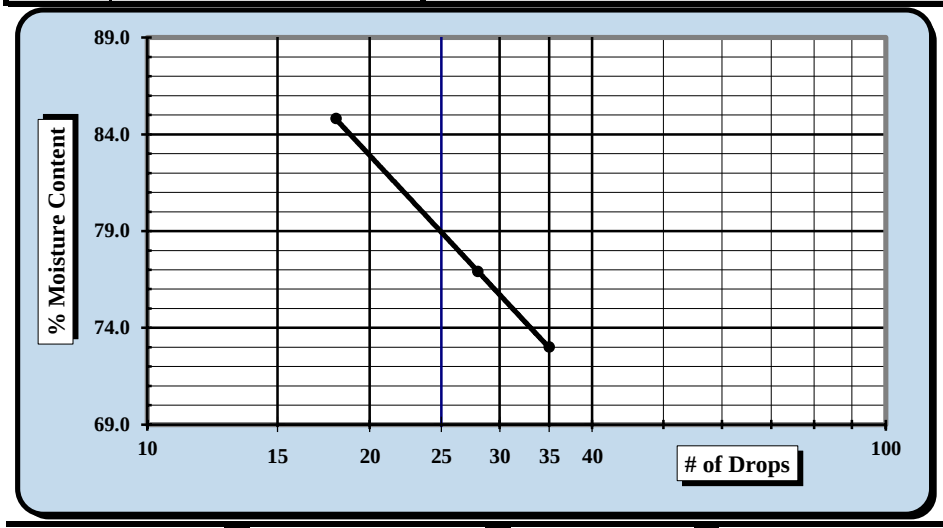
S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/13/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	RW-10	Sample #:	UD-1	Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed	Depth:	4 - 6'
Sample Description:	Fat Clay with Sand (CH / A-7-5)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/10/2019	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/7/2019			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:	6	7	8				9		
A	Tare Weight	27.79	26.30	27.31				26.84		
B	Wet Soil Weight + A	41.13	40.68	43.02				39.92		
C	Dry Soil Weight + A	35.50	34.43	35.81				36.85		
D	Water Weight (B-C)	5.63	6.25	7.21				3.07		
E	Dry Soil Weight (C-A)	7.71	8.13	8.50				10.01		
F	% Moisture (D/E)*100	73.0%	76.9%	84.8%				30.7%		
N	# OF DROPS	35	28	18				*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*							**30.7%**		



One Point Liquid Limit

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

NP, Non-Plastic ☐

Liquid Limit	**79**
Plastic Limit	**31**
Plastic Index	**48**
Group Symbol	**CH**

Multipoint Method ☑
One-point Method ☐

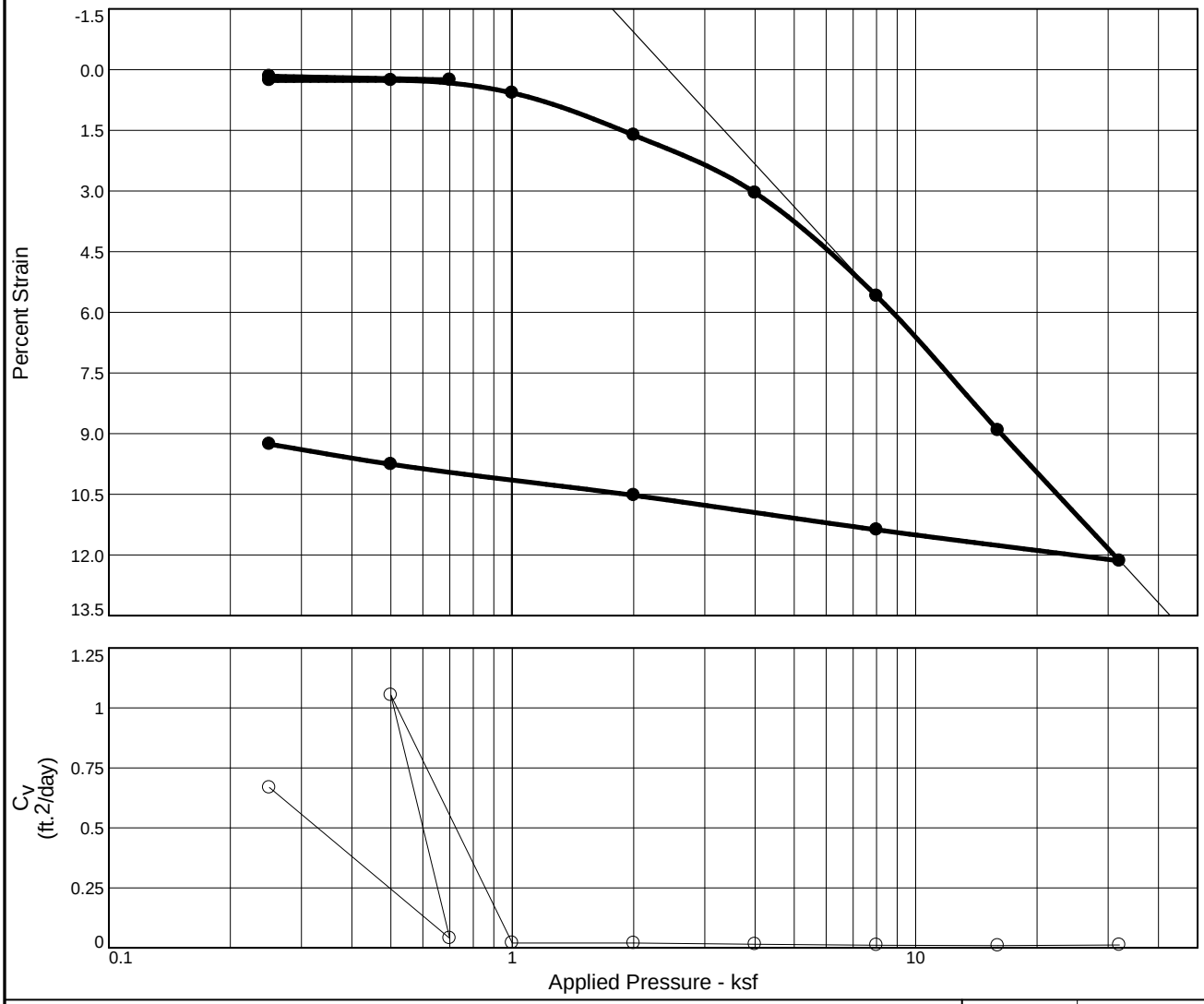
Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 83.5%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	2/14/20	Robert C. Bruorton, P.E.	2/14/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Fat Clay with Sand (CH / A-7-5)	CH	A-7-5

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
79	48	2.784	0.7	87.8	96.9	35.1 %	31.9 %	99.9 %	100.0 %	0.979	0.796	3.2	0.21

Preparation Process: ASTM D2435 - Sec. 9

Condition of Test: Unsaturated

D2435 Method	C_r	Swell Press. (ksf)	Swell %
B	0.05		

Project No. 1461-19-069 **Client:** RS&H

Project: I-77 Panthers Interchange

Loc.: Retaining Walls - UD-1 **Depth:** 4 - 6' **Sample No.:** RW-10

S&ME, Inc.

Greenville, SC

Remarks:

Checked By: Robert C. Bruorton, P.E.

Title: Senior Engineer

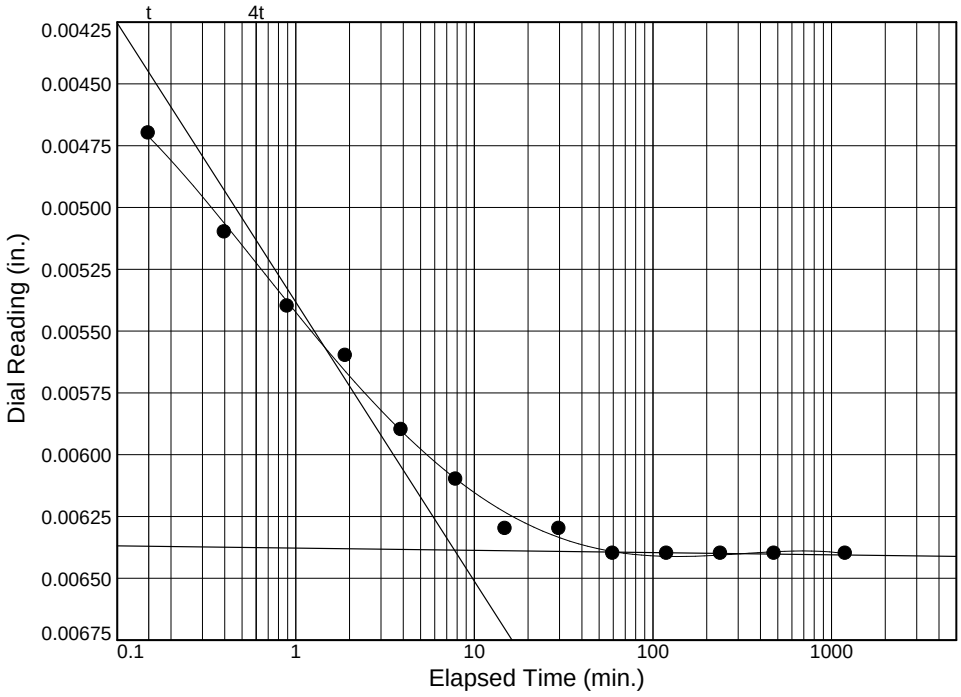
Figure 1

Tested By: Benjamin Kovaleski 2/16/20

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

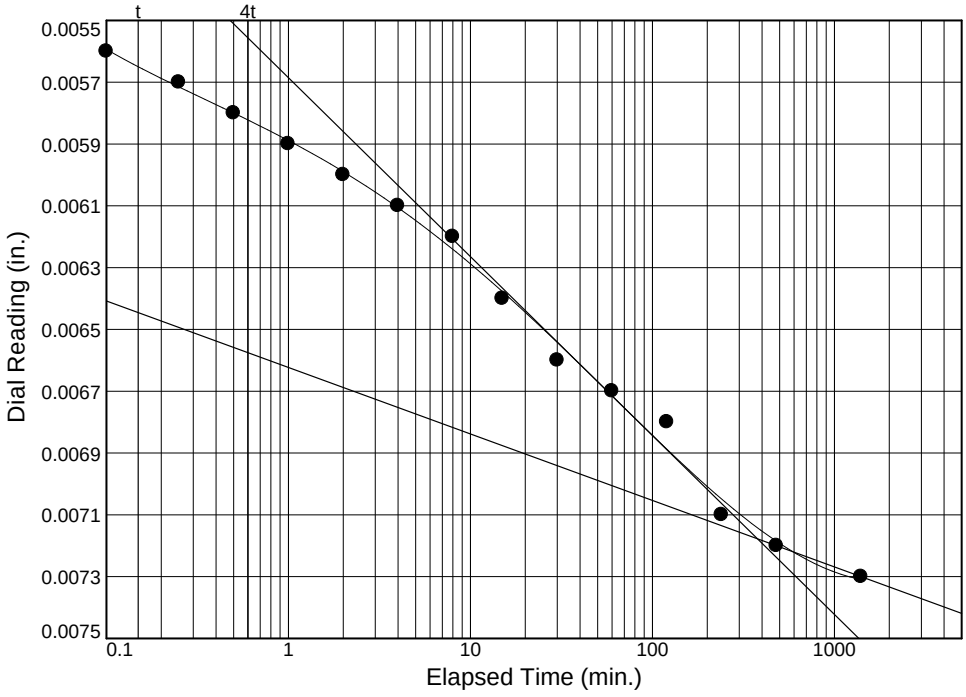
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 1
Load= 0.25 ksf
D_0 = 0.0042
D_{50} = 0.0053
D_{100} = 0.0064
T_{50} = 0.72 min.

C_v @ T_{50}
0.668 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.70 ksf
D_0 = 0.0055
D_{50} = 0.0063
D_{100} = 0.0072
T_{50} = 12.01 min.

C_v @ T_{50}
0.040 ft.^{2}/day

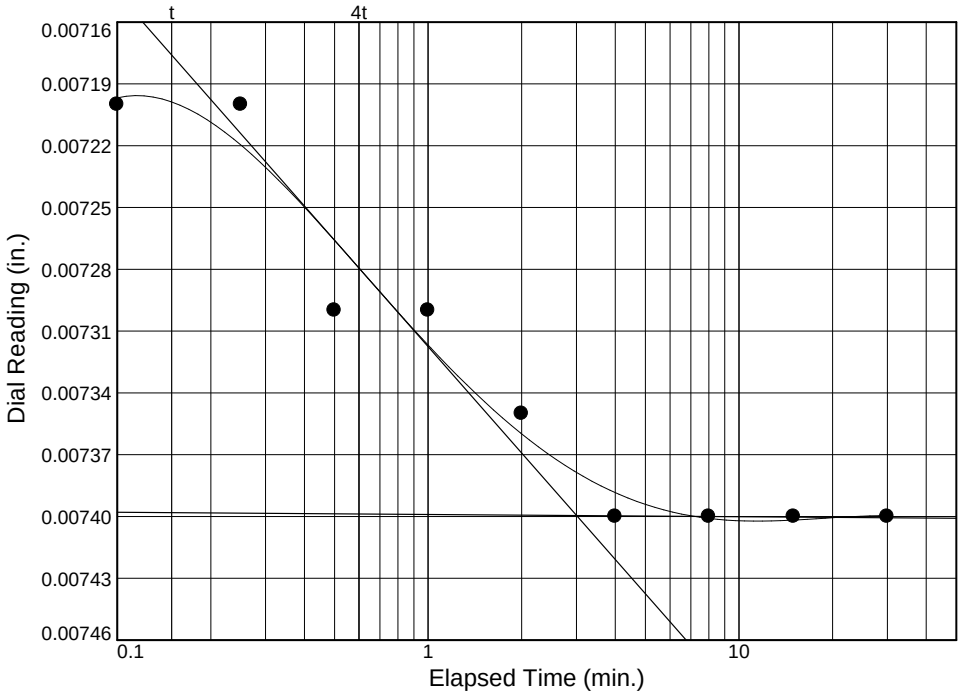
C_α = 0.000

Figure 2

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

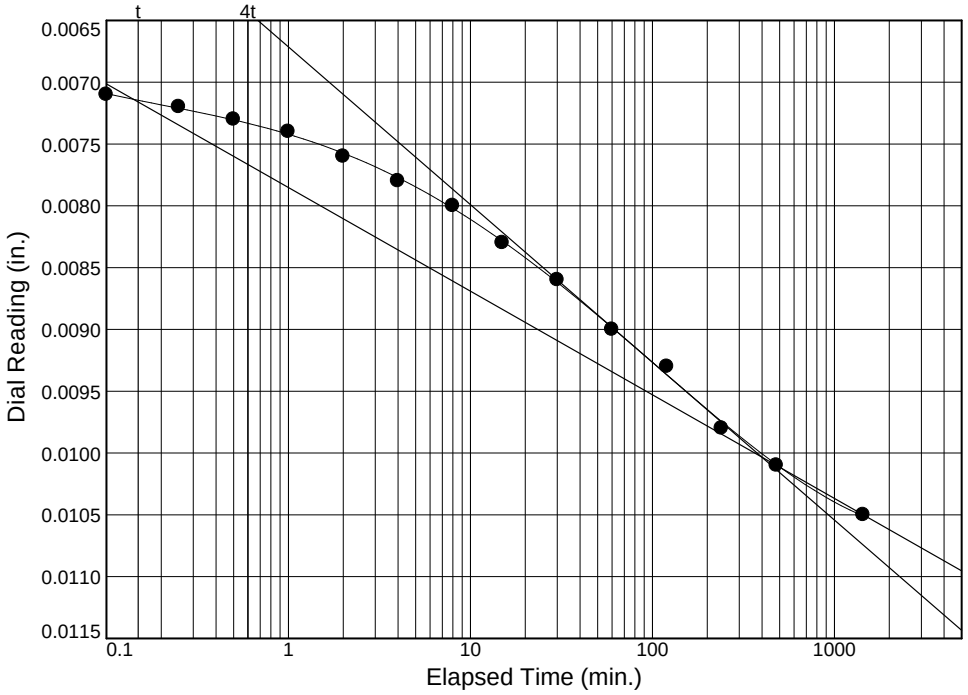
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 4
Load= 0.50 ksf
D_0 = 0.0071
D_{50} = 0.0073
D_{100} = 0.0074
T_{50} = 0.45 min.

C_v @ T_{50}
1.053 ft.^{2}/day

C_α = 0.000



Load No.= 5
Load= 1.00 ksf
D_0 = 0.0070
D_{50} = 0.0085
D_{100} = 0.0100
T_{50} = 23.45 min.

C_v @ T_{50}
0.020 ft.^{2}/day

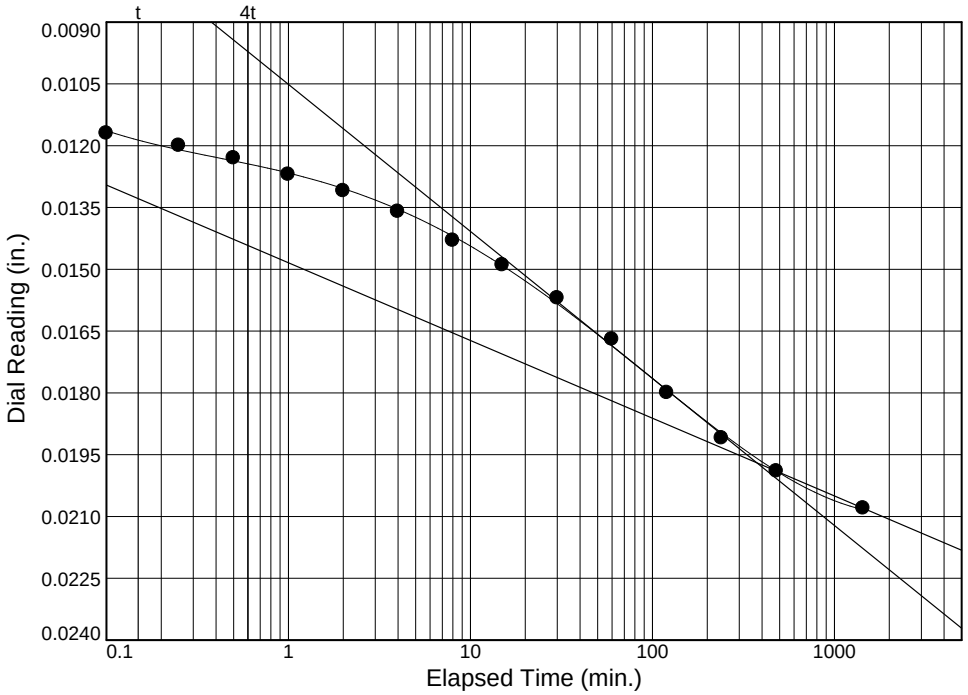
C_α = 0.001

Figure 3

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

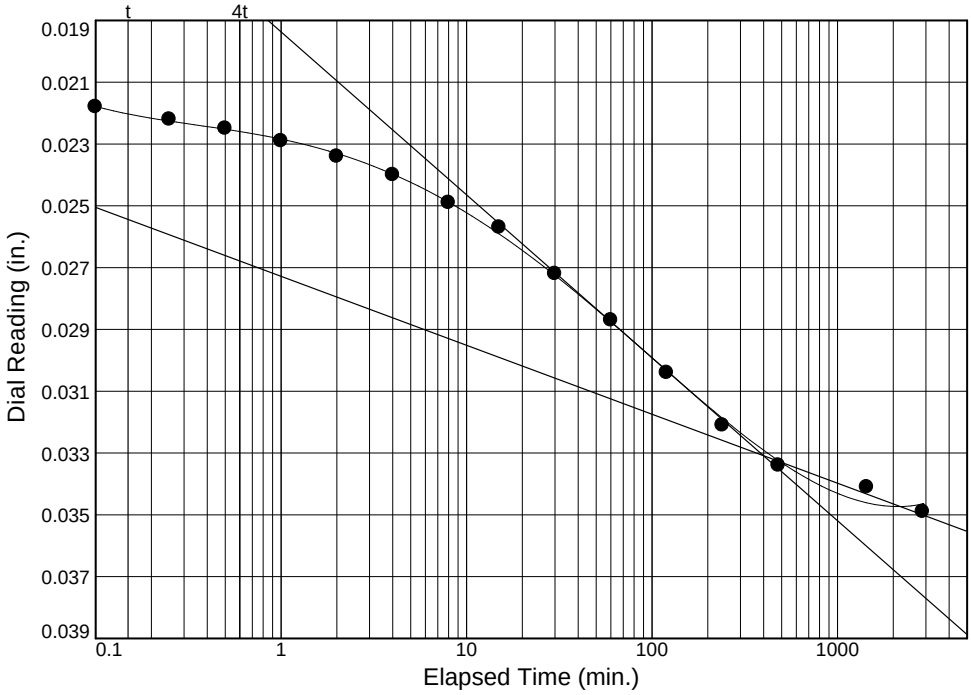
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 6
Load= 2.00 ksf
D_0 = 0.0113
D_{50} = 0.0155
D_{100} = 0.0197
T_{50} = 23.43 min.

C_v @ T_{50}
0.020 ft.^{2}/day

C_α = 0.002



Load No.= 7
Load= 4.00 ksf
D_0 = 0.0215
D_{50} = 0.0273
D_{100} = 0.0331
T_{50} = 30.32 min.

C_v @ T_{50}
0.015 ft.^{2}/day

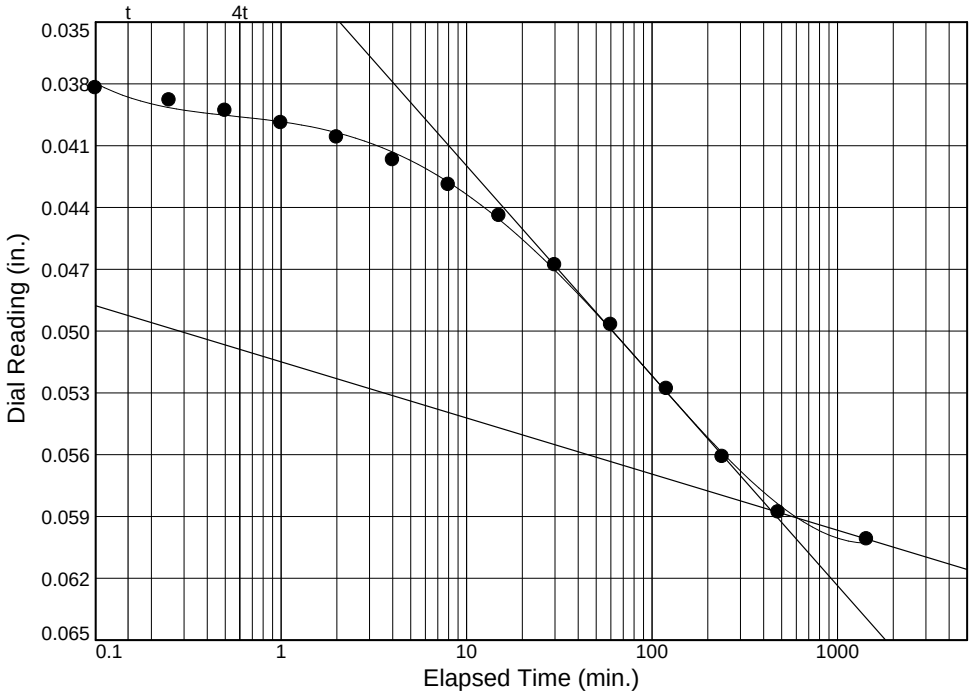
C_α = 0.002

Figure 4

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

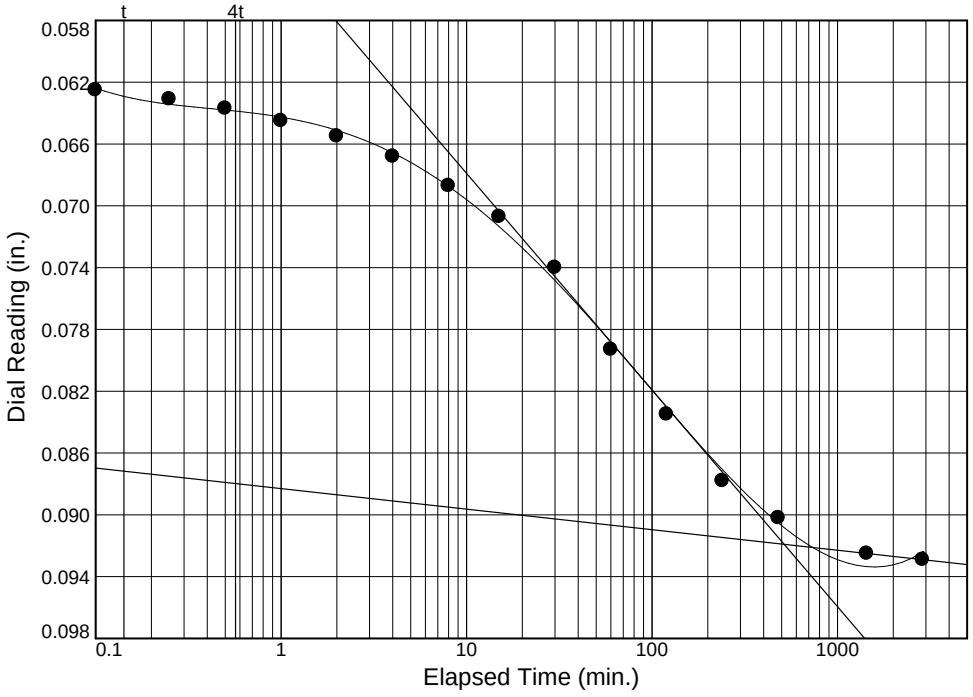
Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 8
Load= 8.00 ksf
D_0 = 0.0377
D_{50} = 0.0482
D_{100} = 0.0587
T_{50} = 39.80 min.

C_v @ T_{50}
0.011 ft.^{2}/day

C_α = 0.003



Load No.= 9
Load= 16.00 ksf
D_0 = 0.0620
D_{50} = 0.0769
D_{100} = 0.0919
T_{50} = 43.57 min.

C_v @ T_{50}
0.009 ft.^{2}/day

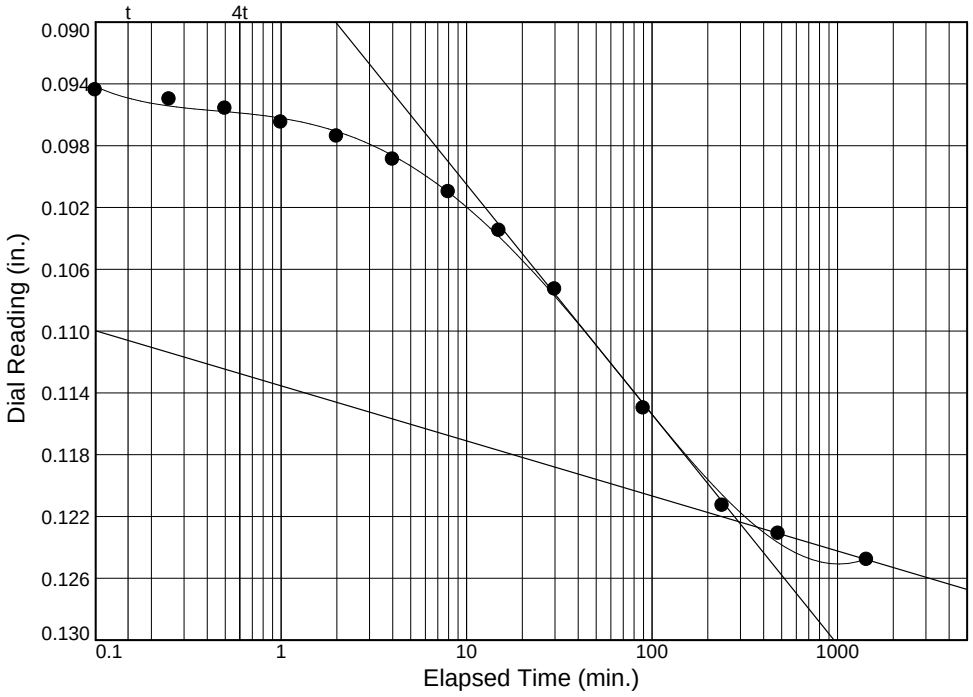
C_α = 0.001

Figure 5

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-1 Depth: 4 - 6' Sample Number: RW-10



Load No.= 10
Load= 32.00 ksf
D_0 = 0.0940
D_{50} = 0.1081
D_{100} = 0.1223
T_{50} = 32.00 min.

C_v @ T_{50}
0.012 ft.^{2}/day

C_α = 0.004

Figure 6

CONSOLIDATION TEST DATA

8/11/2020

Client: RS&H
Project: I-77 Panthers Interchange
Project Number: 1461-19-069
Location: Retaining Walls - UD-1
Depth: 4 - 6' **Sample Number:** RW-10
Material Description: Fat Clay with Sand (CH / A-7-5)
Sample Date: 1/09 & 1/14/20 **Liquid Limit:** 79 **Plasticity Index:** 48
USCS: CH **AASHTO:** A-7-5
Preparation Process: ASTM D2435 - Sec. 9
Condition of Test: Unsaturated
Test Method: B **Final Density:** 96.9 **Figure No.:** 1
Tested By: Benjamin Kovaleski 2/16/20 **Checked by:** Robert C. Bruorton, P.E. **Title:** Senior Engineer

Test Specimen Data

NATURAL MOISTURE

Wet w+t	=	155.28 g.
Dry w+t	=	114.92 g.
Tare Wt.	=	0.00 g.
Moisture	=	35.1 %

VOID RATIO

Spec. Gr.	=	2.784
Est. Ht. Solids	=	0.499 in.
Init. V.R.	=	0.979
Init. Sat.	=	99.9 %

AFTER TEST

Wet w+t	=	293.67 g.
Dry w+t	=	257.95 g.
Tare Wt.	=	146.03 g.
Moisture	=	31.9 %

UNIT WEIGHT

Height	=	0.988 in.
Diameter	=	2.499 in.
Weight	=	151.00 g.
Dry Dens.	=	87.8 pcf

TEST START

Height	=	0.988 in.
Diameter	=	2.499 in.

Dry Wt.	=	111.92 g.

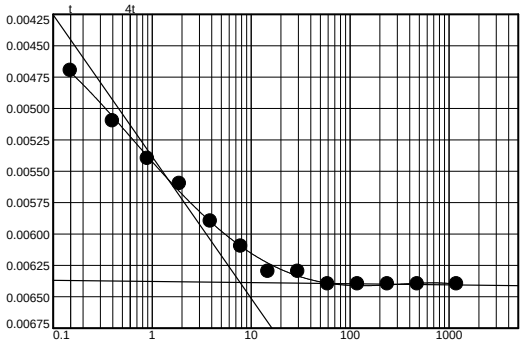
End-Of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	0.00480		0.00000			0.979	
0.25	0.00680	0.00040	0.00160	0.668	0.000	0.976	0.2 Comprs.
0.70	0.00870	0.00140	0.00250	0.040	0.000	0.974	0.3 Comprs.
0.25	0.00830	0.00090	0.00260			0.974	0.3 Comprs.
0.50	0.00880	0.00140	0.00260	1.053	0.000	0.974	0.3 Comprs.
1.00	0.01290	0.00240	0.00570	0.020	0.001	0.968	0.6 Comprs.
2.00	0.02400	0.00320	0.01600	0.020	0.002	0.947	1.6 Comprs.
4.00	0.03900	0.00410	0.03010	0.015	0.002	0.919	3.0 Comprs.
8.00	0.06530	0.00520	0.05530	0.011	0.003	0.868	5.6 Comprs.
16.00	0.09920	0.00630	0.08810	0.009	0.001	0.803	8.9 Comprs.
32.00	0.13230	0.00750	0.12000	0.012	0.004	0.739	12.1 Comprs.
8.00	0.12340	0.00620	0.11240			0.754	11.4 Comprs.
2.00	0.11360	0.00480	0.10400			0.771	10.5 Comprs.
0.50	0.10470	0.00350	0.09640			0.786	9.8 Comprs.
0.25	0.09840	0.00210	0.09150			0.796	9.3 Comprs.

Compression index (C_c), ksf = 0.21 **Preconsolidation pressure (P_p), ksf =** 3.2 **Void ratio at P_p (e_m) =** 0.930
Overburden (σ_{vo}), ksf = 0.7 **Void ratio at σ_{vo} (e_o) =** 0.974 **Recompression index (C_r) =** 0.05

Pressure: 0.25 ksf | **TEST READINGS** | **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	.1	0.00480	11	120	0.00680
2	.25	0.00510	12	240	0.00680
3	.5	0.00550	13	480	0.00680
4	1	0.00580	14	1200	0.00680
5	2	0.00600			
6	4	0.00630			
7	8	0.00650			
8	15	0.00670			
9	30	0.00670			
10	60	0.00680			

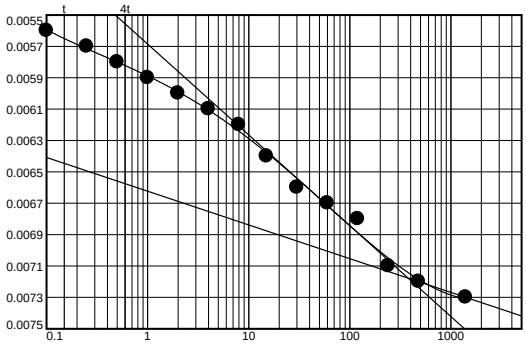


Void Ratio = 0.976 **Compression =** 0.2%

D_0 = 0.0042 **D_{50} =** 0.0053 **D_{100} =** 0.0064 **C_v at 0.72 min. =** 0.668 ft.^{2}/day **C_α =** 0.000

Pressure: 0.70 ksf | **TEST READINGS** | **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00680	11	60	0.00810
2	.1	0.00700	12	120	0.00820
3	.25	0.00710	13	240	0.00850
4	.5	0.00720	14	480	0.00860
5	1	0.00730	15	1400	0.00870
6	2	0.00740			
7	4	0.00750			
8	8	0.00760			
9	15	0.00780			
10	30	0.00800			



Void Ratio = 0.974 **Compression =** 0.3%

D_0 = 0.0055 **D_{50} =** 0.0063 **D_{100} =** 0.0072 **C_v at 12.01 min. =** 0.040 ft.^{2}/day **C_α =** 0.000

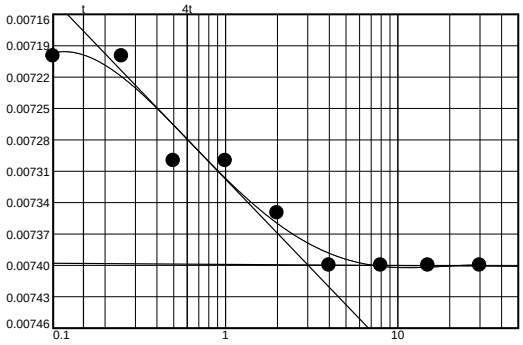
Pressure: 0.25 ksf | **TEST READINGS** | **Load No. 3**

No.	Elapsed Time	Dial Reading
1	0	0.00870
2	(final)	0.00830

Void Ratio = 0.974 **Compression =** 0.3%

Pressure: 0.50 ksf | **TEST READINGS** | **Load No. 4**

No.	Elapsed Time	Dial Reading
1	0	0.00830
2	.1	0.00860
3	.25	0.00860
4	.5	0.00870
5	1	0.00870
6	2	0.00875
7	4	0.00880
8	8	0.00880
9	15	0.00880
10	30	0.00880

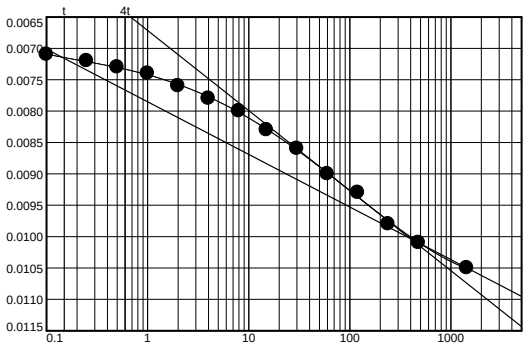


Void Ratio = 0.974 **Compression =** 0.3%

D_0 = 0.0071 **D_{50} =** 0.0073 **D_{100} =** 0.0074 **C_v at 0.45 min. =** 1.053 ft.^{2}/day **C_α =** 0.000

Pressure: 1.00 ksf | **TEST READINGS** | **Load No. 5**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00880	11	60	0.01140
2	.1	0.00950	12	120	0.01170
3	.25	0.00960	13	240	0.01220
4	.5	0.00970	14	480	0.01250
5	1	0.00980	15	1440	0.01290
6	2	0.01000			
7	4	0.01020			
8	8	0.01040			
9	15	0.01070			
10	30	0.01100			

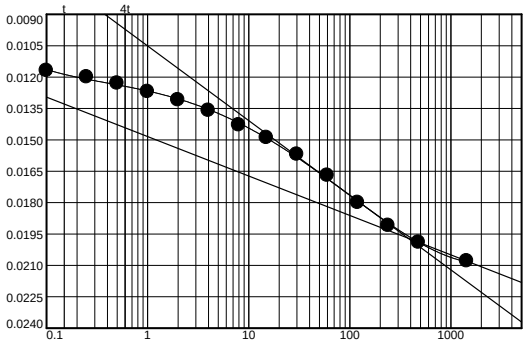


Void Ratio = 0.968 **Compression =** 0.6%

D_0 = 0.0070 **D_{50} =** 0.0085 **D_{100} =** 0.0100 **C_v at 23.45 min. =** 0.020 ft.^{2}/day **C_α =** 0.001

Pressure: 2.00 ksf **TEST READINGS** **Load No. 6**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.01290	11	60	0.01990
2	.1	0.01490	12	120	0.02120
3	.25	0.01520	13	240	0.02230
4	.5	0.01550	14	480	0.02310
5	1.0	0.01590	15	1440	0.02400
6	2	0.01630			
7	4	0.01680			
8	8	0.01750			
9	15	0.01810			
10	30	0.01890			

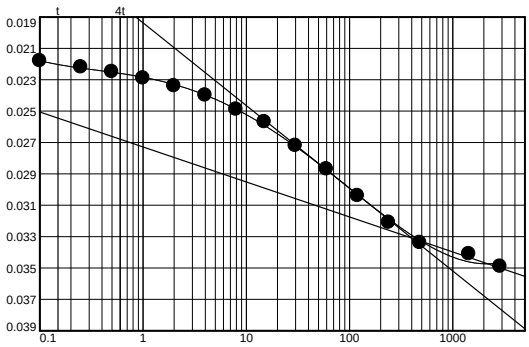


Void Ratio = 0.947 **Compression =** 1.6%

D_0 = 0.0113 **D_{50} =** 0.0155 **D_{100} =** 0.0197 **C_v at 23.43 min. =** 0.020 ft.^{2}/day **C_α =** 0.002

Pressure: 4.00 ksf **TEST READINGS** **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02400	11	60	0.03280
2	.1	0.02590	12	120	0.03450
3	.25	0.02630	13	240	0.03620
4	.5	0.02660	14	480	0.03750
5	1.0	0.02700	15	1440	0.03820
6	2.0	0.02750	16	2880	0.03900
7	4	0.02810			
8	8.0	0.02900			
9	15	0.02980			
10	30	0.03130			

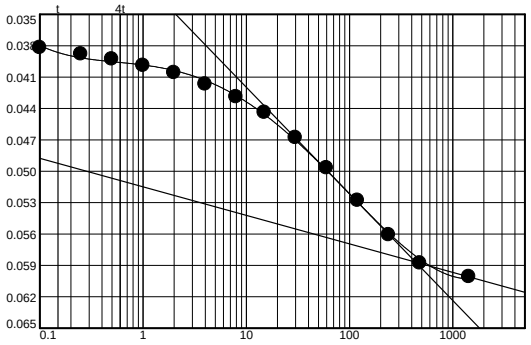


Void Ratio = 0.919 **Compression =** 3.0%

D_0 = 0.0215 **D_{50} =** 0.0273 **D_{100} =** 0.0331 **C_v at 30.32 min. =** 0.015 ft.^{2}/day **C_α =** 0.002

Pressure: 8.00 ksf **TEST READINGS** **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.03900	11	60	0.05490
2	.1	0.04340	12	120	0.05800
3	.25	0.04400	13	240	0.06130
4	.5	0.04450	14	480	0.06400
5	1.0	0.04510	15	1440	0.06530
6	2.0	0.04580			
7	4	0.04690			
8	8	0.04810			
9	15	0.04960			
10	30	0.05200			

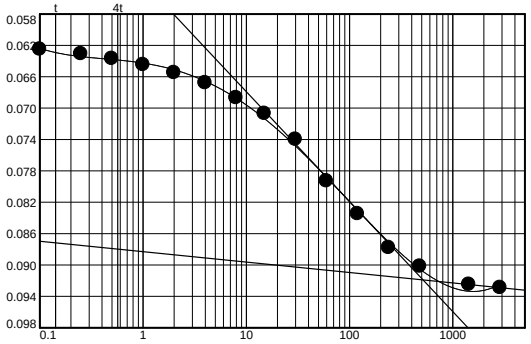


Void Ratio = 0.868 **Compression =** 5.6%

D_0 = 0.0377 **D_{50} =** 0.0482 **D_{100} =** 0.0587 **C_v at 39.80 min. =** 0.011 ft.^{2}/day **C_α =** 0.003

Pressure: 16.00 ksf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.06530	11	60	0.08560
2	.1	0.06880	12	120	0.08980
3	.25	0.06940	13	240	0.09410
4	.5	0.07000	14	480	0.09650
5	1	0.07080	15	1440	0.09880
6	2	0.07180	16	2880	0.09920
7	4	0.07310			
8	8	0.07500			
9	15	0.07700			
10	30	0.08030			

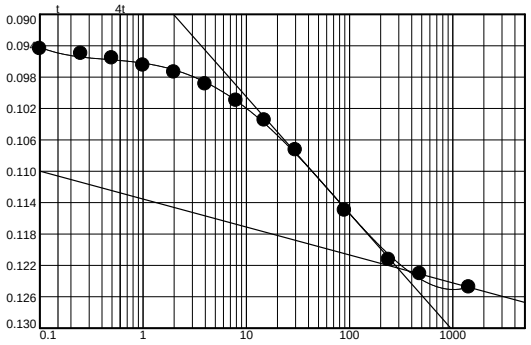


Void Ratio = 0.803 **Compression =** 8.9%

D_0 = 0.0620 **D_{50} =** 0.0769 **D_{100} =** 0.0919 **C_v at 43.57 min. =** 0.009 ft.^{2}/day **C_α =** 0.001

Pressure: 32.00 ksf | **TEST READINGS** | **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.09920	11	90	0.12250
2	.1	0.10190	12	240	0.12880
3	.25	0.10250	13	480	0.13060
4	.5	0.10310	14	1440	0.13230
5	1.0	0.10400			
6	2.0	0.10490			
7	4.0	0.10640			
8	8.0	0.10850			
9	15	0.11100			
10	30	0.11480			



Void Ratio = 0.739 **Compression =** 12.1%

D_0 = 0.0940 **D_{50} =** 0.1081 **D_{100} =** 0.1223 **C_v at 32.00 min. =** 0.012 ft.^{2}/day **C_α =** 0.004

Pressure: 8.00 ksf | **TEST READINGS** | **Load No. 11**

No.	Elapsed Time	Dial Reading
1	0	0.13230
2	(final)	0.12340

Void Ratio = 0.754 **Compression =** 11.4%

Pressure: 2.00 ksf | **TEST READINGS** | **Load No. 12**

No.	Elapsed Time	Dial Reading
1	0	0.12340
2	(final)	0.11360

Void Ratio = 0.771 **Compression =** 10.5%

Pressure: 0.50 ksf | **TEST READINGS** | **Load No. 13**

No.	Elapsed Time	Dial Reading
1	0	0.11360
2	(final)	0.10470

Void Ratio = 0.786 **Compression =** 9.8%

Pressure: 0.25 ksf | **TEST READINGS** | **Load No. 14**

No.	Elapsed Time	Dial Reading
1	0	0.10470
2	(final)	0.09840

Void Ratio = 0.796 **Compression =** 9.3%

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

SIEVE ANALYSIS OF SOIL

Single sieve set ASTM D6913

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

Project #:	1461-19-069			Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange			Test Date:	2/04 - 2/13/20
Client Name:	RS&H				
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC				
Boring #:	RW-10	Sample #:	UD-2	Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed	Depth:	10 - 11.2'
Sample Description:	Silty Sand (SM / A-2-4)				

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

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

Maximum Particle Size	4.75 mm	Coarse Sand	2.0%	Fine Sand	47.1%
Gravel	0.1%	Medium Sand	20.6%	Silt & Clay	30.2%
Liquid Limit	-	Plastic Limit	NP	Plastic Index	NP

Notes / Deviations / References:

Robert C. Bruorton, P.E. — *Technical Responsibility*
Senior Engineer — *Position*
2/14/20 — *Date*

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

LIQUID LIMIT, PLASTIC LIMIT, & PLASTIC INDEX

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

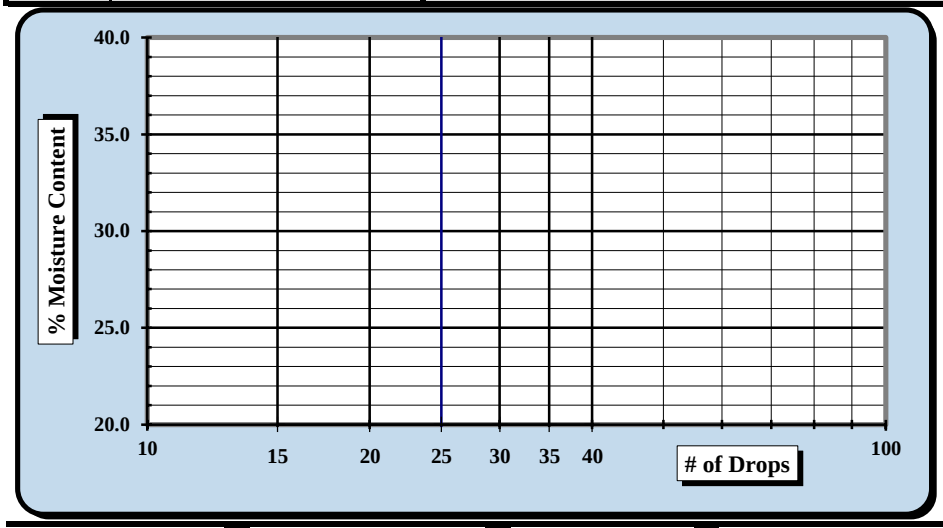
S&ME, Inc. - Greenville: 48 Brookfield Oaks Dr., Suite F Greenville, SC 29607

Project #:	1461-19-069	Report Date:	2/14/20
Project Name:	I-77 Panthers Interchange	Test Date(s)	2/13/20
Client Name:	RS&H		
Client Address:	4000 Faber Place Dr., Suite 130, N. Charleston, SC		

Boring #:	RW-10	Sample #:	UD-2	Sample Date:	1/09 & 1/14/20
Location:	Retaining Walls	Type:	Undisturbed	Depth:	10 - 11.2'
Sample Description:	Silty Sand (SM / A-2-4)				

Type and Specification	*S&ME ID #*	*Cal Date:*	*Type and Specification*	*S&ME ID #*	*Cal Date:*
Balance (0.01 g)	13942	9/10/2019	Grooving tool	23306	3/30/2019
LL Apparatus	23158	2/1/2019			
Oven	13978	10/7/2019			

Pan #		Liquid Limit						Plastic Limit		
	Tare #:									
A	Tare Weight									
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							*Moisture Contents determined by AASHTO T 265*		
LL	LL = **F** * FACTOR									
Ave.	*Average*									



One Point Liquid Limit

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

NP, Non-Plastic ☒

Liquid Limit	---
Plastic Limit	**NP**
Plastic Index	**NP**
Group Symbol	**ML**

Multipoint Method ☑
One-point Method ☐

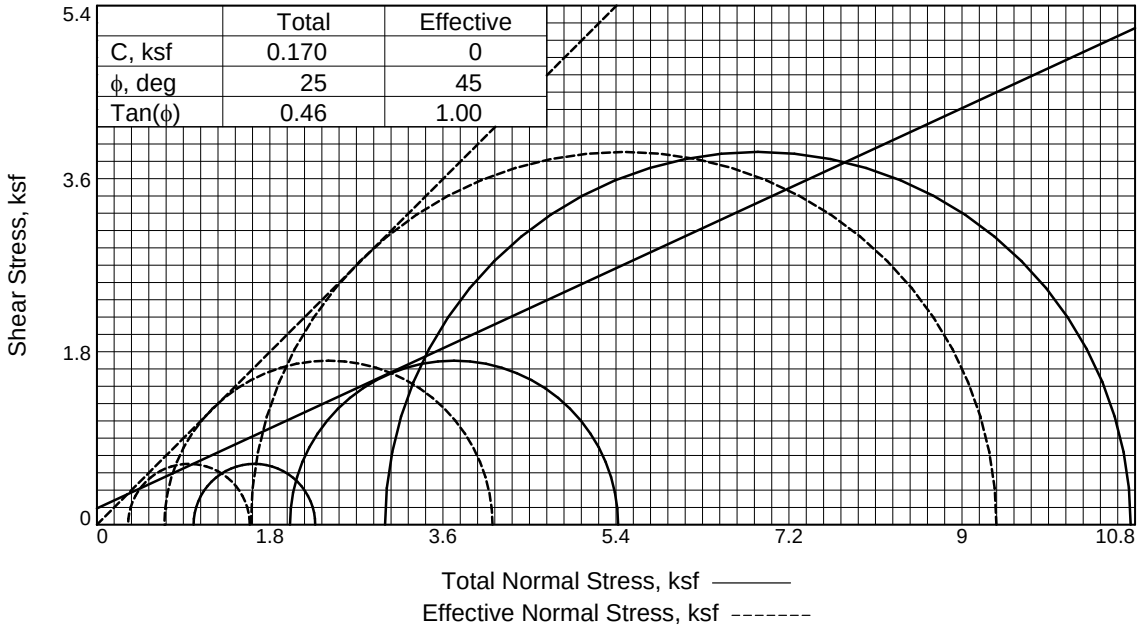
Wet Preparation ☐ Dry Preparation ☑ Air Dried ☑ *Percent Passing the No. 200 sieve:* 30.2%

Notes / Deviations / References: Group symbol for minus #40 sieve portion only.

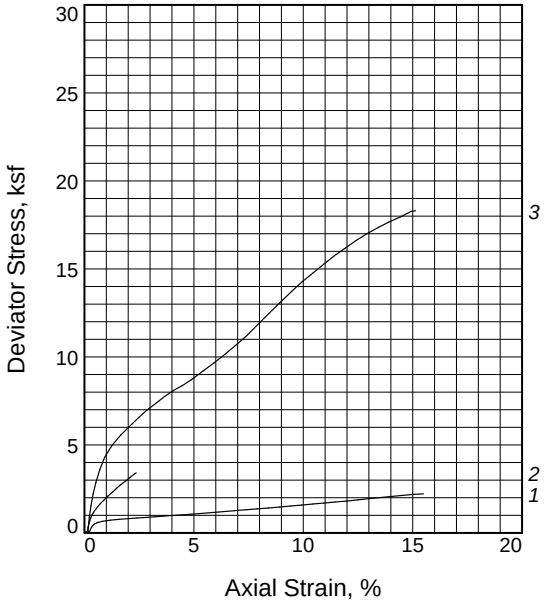
AASHTO T90: Determining the Plastic Limit & Plastic Index of Soils *AASHTO T89: Determining the Liquid Limit of Soils*

Benjamin Kovaleski	2/14/20	Robert C. Bruorton, P.E.	2/14/20
Technician Name	*Date*	*Technical Responsibility*	*Date*

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.



	Total	Effective
C, ksf	0.170	0
ϕ, deg	25	45
Tan(ϕ)	0.46	1.00



Specimen No.		1	2	3
Initial	Water Content, %	15.8	15.2	15.2
	Dry Density, pcf	111.1	120.4	120.1
	Saturation, %	78.7	96.6	95.8
	Void Ratio	0.5555	0.4357	0.4392
	Diameter, in.	2.852	2.863	2.900
	Height, in.	5.562	5.650	5.520
At Test	Water Content, %	18.0	13.8	13.8
	Dry Density, pcf	115.4	124.9	123.6
	Saturation, %	100.5	99.6	96.0
	Void Ratio	0.4970	0.3835	0.3978
	Diameter, in.	2.817	2.831	2.858
	Height, in.	5.485	5.570	5.520
Strain rate, %/min.		0.34	0.35	0.33
Eff. Cell Pressure, ksf		1.007	2.009	2.998
Fail. Stress, ksf		1.265	3.414	7.757
Total Pore Pr., ksf		8.601	9.226	9.317
Strain, %		6.9	2.4	3.7
Ult. Stress, ksf		2.225	3.414	18.303
Total Pore Pr., ksf		8.291	9.226	5.623
Strain, %		15.5	2.4	15.1
$\bar{\sigma}_1$ Failure, ksf		1.590	4.116	9.358
$\bar{\sigma}_3$ Failure, ksf		0.325	0.702	1.601

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Silty Sand (SM / A-2-4)

LL= N/A **PI=** NP
Specific Gravity= 2.768
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767. Due to lack of recovery, a staged specimen was performed on specimen #2. See **Figure** 1

Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-2

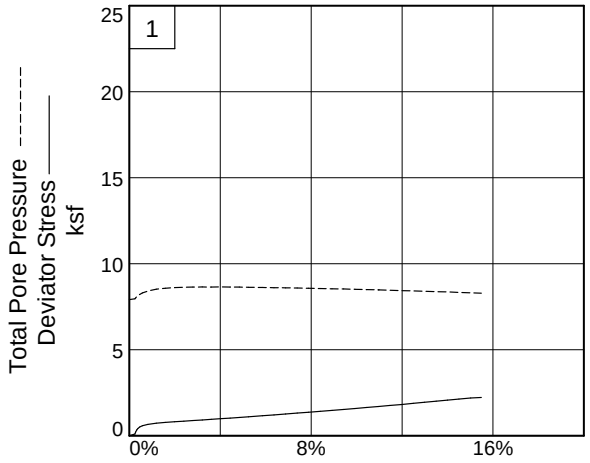
Sample Number: RW-10 **Depth:** 10 - 11.2'

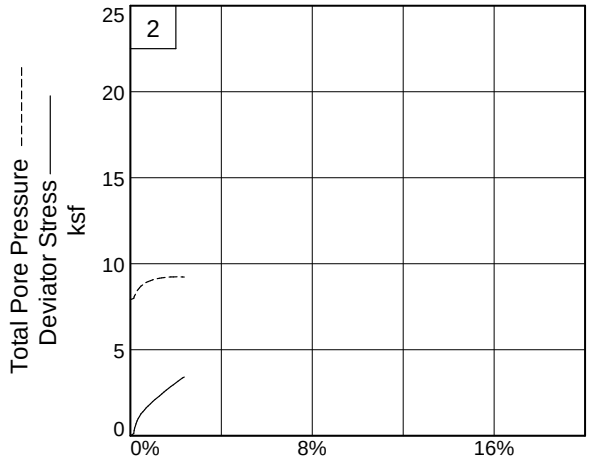
Proj. No.: 1461-19-069 **Date Sampled:** 1/09 & 1/14/20

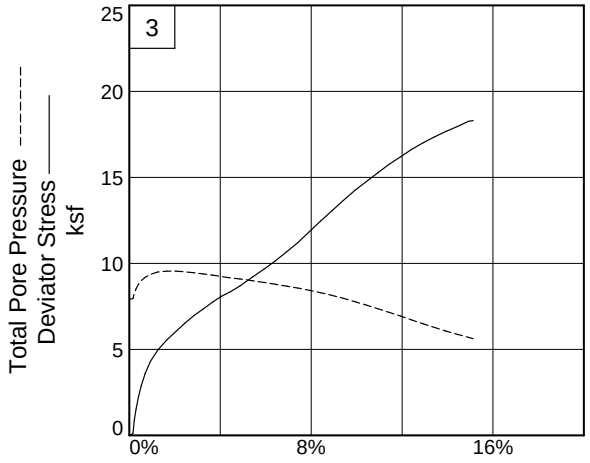
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

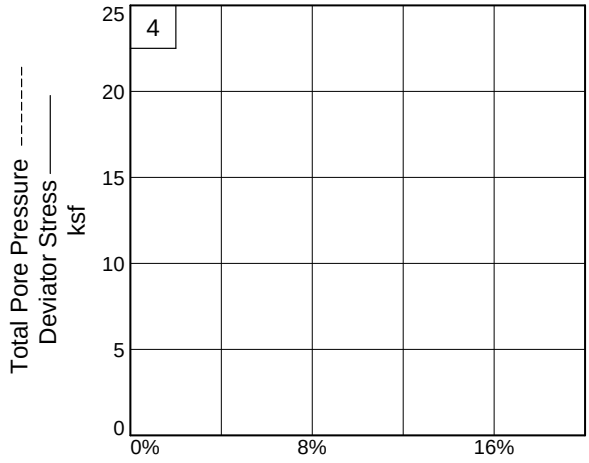
Tested By: Benjamin Kovaleski - 2/14/20 **Checked By:** Robert C. Bruorton, P.E.

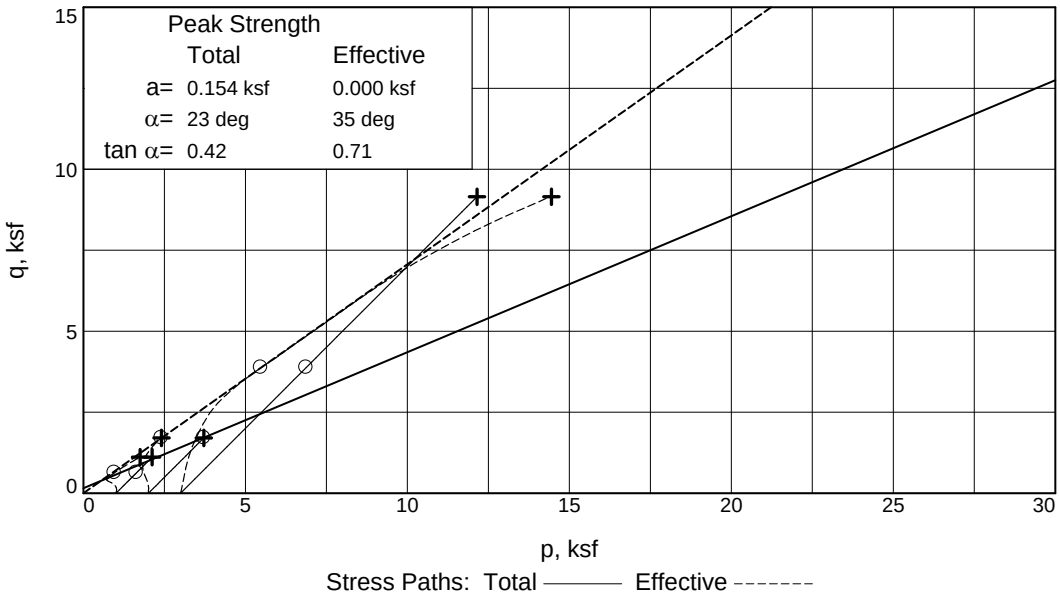
C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.











Client: RS&H
Project: I-77 Panthers Interchange
Location: Retaining Walls - UD-2 **Depth:** 10 - 11.2' **Sample Number:** RW-10
Project No.: 1461-19-069 **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski - 2/14/20 **Checked By:** Robert C. Bruorton, P.E.

TRIAXIAL COMPRESSION TEST 8/11/2020

CU with Pore Pressures 9:16 AM

Date: 1/09 & 1/14/20
Client: RS&H
Project: I-77 Panthers Interchange
Project No.: 1461-19-069
Location: Retaining Walls - UD-2
Depth: 10 - 11.2' **Sample Number:** RW-10
Description: Silty Sand (SM / A-2-4)
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767. Due to lack of recovery, a staged specimen was performed on specimen #2. See photographs.
Type of Sample: Undisturbed
Specific Gravity=2.768 **LL=**N/A **PL=** **PI=**NP
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	22.940			1214.580
Moisture content: Dry soil+tare, gms.	19.810			1028.960
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.8	18.7	18.0	18.0
Moist specimen weight, gms.	1199.87			
Diameter, in.	2.852	2.827	2.817	
Area, in.²	6.388	6.275	6.235	
Height, in.	5.562	5.513	5.485	
Net decrease in height, in.		0.049	0.028	
Net decrease in water volume, cc.			6.500	
Wet density, pcf	128.6	135.4	136.3	
Dry density, pcf	111.1	114.1	115.4	
Void ratio	0.5555	0.5144	0.4970	
Saturation, %	78.7	100.5	100.5	

Test Readings for Specimen No. 1

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 61.990 psi (8.927 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 1.007 ksf
Strain rate, %/min. = 0.34
Fail. Stress = 1.265 ksf **at reading no.** 21
Ult. Stress = 2.225 ksf **at reading no.** 38

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.007	1.007	1.00	55.000	1.007	0.000
1	0.0135	4.440	4.4	0.2	0.102	0.966	1.068	1.11	55.284	1.017	0.051
2	0.0153	9.316	9.3	0.3	0.215	0.916	1.131	1.23	55.626	1.024	0.107
3	0.0179	14.929	14.9	0.3	0.344	0.841	1.185	1.41	56.150	1.013	0.172
4	0.0208	18.375	18.4	0.4	0.423	0.782	1.205	1.54	56.557	0.994	0.211
5	0.0247	21.870	21.9	0.5	0.503	0.712	1.215	1.71	57.044	0.964	0.251
6	0.0316	25.453	25.5	0.6	0.585	0.624	1.208	1.94	57.660	0.916	0.292
7	0.0447	28.957	29.0	0.8	0.663	0.515	1.179	2.29	58.411	0.847	0.332
8	0.0652	32.038	32.0	1.2	0.731	0.408	1.139	2.79	59.157	0.773	0.366
9	0.0869	34.212	34.2	1.6	0.778	0.349	1.127	3.23	59.564	0.738	0.389
10	0.1095	36.020	36.0	2.0	0.815	0.314	1.130	3.59	59.806	0.722	0.408
11	0.1317	37.726	37.7	2.4	0.850	0.294	1.145	3.89	59.947	0.719	0.425
12	0.1534	39.351	39.4	2.8	0.883	0.283	1.166	4.12	60.026	0.725	0.442
13	0.1761	41.065	41.1	3.2	0.918	0.278	1.196	4.30	60.060	0.737	0.459
14	0.1977	43.037	43.0	3.6	0.958	0.279	1.237	4.44	60.054	0.758	0.479
15	0.2209	44.852	44.9	4.0	0.994	0.275	1.269	4.61	60.079	0.772	0.497
16	0.2434	46.589	46.6	4.4	1.028	0.282	1.311	4.64	60.029	0.797	0.514
17	0.2655	48.429	48.4	4.8	1.064	0.286	1.350	4.73	60.007	0.818	0.532
18	0.2878	50.450	50.5	5.2	1.104	0.294	1.398	4.75	59.947	0.846	0.552
19	0.3211	53.456	53.5	5.9	1.162	0.309	1.471	4.77	59.846	0.890	0.581
20	0.3490	55.995	56.0	6.4	1.211	0.320	1.531	4.78	59.767	0.926	0.606
21	0.3771	58.817	58.8	6.9	1.265	0.325	1.590	4.89	59.731	0.958	0.633
22	0.4053	61.642	61.6	7.4	1.319	0.339	1.658	4.89	59.634	0.999	0.659
23	0.4326	64.390	64.4	7.9	1.370	0.354	1.724	4.87	59.532	1.039	0.685
24	0.4608	67.144	67.1	8.4	1.421	0.369	1.790	4.85	59.426	1.079	0.710
25	0.4891	70.086	70.1	8.9	1.474	0.385	1.860	4.83	59.315	1.122	0.737
26	0.5172	73.110	73.1	9.4	1.529	0.394	1.923	4.89	59.256	1.158	0.765
27	0.5445	76.049	76.0	9.9	1.582	0.410	1.992	4.86	59.144	1.201	0.791
28	0.5726	79.417	79.4	10.4	1.643	0.428	2.071	4.84	59.020	1.249	0.821
29	0.6004	82.753	82.8	10.9	1.702	0.445	2.147	4.83	58.900	1.296	0.851
30	0.6284	85.987	86.0	11.5	1.759	0.466	2.224	4.78	58.755	1.345	0.879
31	0.6570	89.351	89.4	12.0	1.817	0.487	2.304	4.73	58.605	1.396	0.908
32	0.6851	93.192	93.2	12.5	1.884	0.502	2.385	4.75	58.506	1.444	0.942
33	0.7124	96.988	97.0	13.0	1.949	0.526	2.476	4.70	58.334	1.501	0.975
34	0.7404	100.539	100.5	13.5	2.009	0.550	2.559	4.65	58.172	1.554	1.004
35	0.7679	104.217	104.2	14.0	2.070	0.566	2.636	4.66	58.059	1.601	1.035
36	0.7953	107.999	108.0	14.5	2.133	0.595	2.728	4.58	57.857	1.662	1.066
37	0.8239	111.749	111.7	15.0	2.193	0.613	2.806	4.58	57.735	1.709	1.097
38	0.8496	113.988	114.0	15.5	2.225	0.636	2.861	4.50	57.573	1.749	1.113

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	53.280			1362.300
Moisture content: Dry soil+tare, gms.	46.250			1197.140
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.2	14.7	13.8	13.8
Moist specimen weight, gms.	1323.80			
Diameter, in.	2.863	2.845	2.831	
Area, in.²	6.438	6.357	6.293	
Height, in.	5.650	5.615	5.570	
Net decrease in height, in.		0.035	0.045	
Net decrease in water volume, cc.			10.600	
Wet density, pcf	138.6	140.7	142.1	
Dry density, pcf	120.4	122.6	124.9	
Void ratio	0.4357	0.4091	0.3835	
Saturation, %	96.6	99.6	99.6	

Test Readings for Specimen No. 2

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 68.950 psi (9.929 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 2.009 ksf
Strain rate, %/min. = 0.35
Fail. Stress = 3.414 ksf **at reading no.** 26
Ult. Stress = 3.414 ksf **at reading no.** 26

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.009	2.009	1.00	55.000	2.009	0.000
1	0.0082	5.558	5.6	0.1	0.127	1.943	2.070	1.07	55.460	2.006	0.064
2	0.0091	13.479	13.5	0.2	0.308	1.858	2.166	1.17	56.048	2.012	0.154
3	0.0104	19.855	19.9	0.2	0.454	1.779	2.232	1.25	56.599	2.005	0.227
4	0.0123	25.575	25.6	0.2	0.584	1.700	2.284	1.34	57.142	1.992	0.292
5	0.0136	30.454	30.5	0.2	0.695	1.630	2.325	1.43	57.633	1.977	0.348
6	0.0163	37.976	38.0	0.3	0.866	1.511	2.378	1.57	58.455	1.944	0.433
7	0.0191	44.182	44.2	0.3	1.008	1.412	2.420	1.71	59.143	1.916	0.504
8	0.0220	49.249	49.2	0.4	1.123	1.329	2.452	1.84	59.719	1.891	0.561
9	0.0258	55.819	55.8	0.5	1.271	1.227	2.498	2.04	60.432	1.862	0.636
10	0.0306	61.513	61.5	0.5	1.400	1.144	2.544	2.22	61.008	1.844	0.700
11	0.0348	66.748	66.7	0.6	1.518	1.074	2.592	2.41	61.493	1.833	0.759
12	0.0387	71.593	71.6	0.7	1.627	1.015	2.642	2.60	61.899	1.829	0.813
13	0.0433	76.208	76.2	0.8	1.730	0.965	2.696	2.79	62.246	1.831	0.865
14	0.0494	82.020	82.0	0.9	1.860	0.909	2.769	3.05	62.637	1.839	0.930
15	0.0546	87.692	87.7	1.0	1.987	0.862	2.849	3.30	62.961	1.856	0.994
16	0.0603	93.122	93.1	1.1	2.108	0.824	2.932	3.56	63.226	1.878	1.054
17	0.0711	102.338	102.3	1.3	2.312	0.773	3.085	3.99	63.582	1.929	1.156
18	0.0767	107.566	107.6	1.4	2.428	0.751	3.179	4.23	63.732	1.965	1.214
19	0.0819	112.625	112.6	1.5	2.539	0.734	3.273	4.46	63.853	2.004	1.270
20	0.0877	117.668	117.7	1.6	2.650	0.720	3.370	4.68	63.952	2.045	1.325
21	0.0932	122.541	122.5	1.7	2.757	0.707	3.464	4.90	64.040	2.086	1.379
22	0.0990	127.238	127.2	1.8	2.860	0.699	3.558	5.09	64.099	2.129	1.430

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.1052	132.063	132.1	1.9	2.965	0.693	3.658	5.28	64.137	2.176	1.483
24	0.1163	141.193	141.2	2.1	3.164	0.689	3.853	5.59	64.163	2.271	1.582
25	0.1275	150.140	150.1	2.3	3.357	0.694	4.052	5.83	64.127	2.373	1.679
26	0.1319	152.785	152.8	2.4	3.414	0.702	4.116	5.86	64.072	2.409	1.707

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	53.280			1362.300
Moisture content: Dry soil+tare, gms.	46.250			1197.140
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	15.2	15.3	13.8	13.8
Moist specimen weight, gms.	1323.80			
Diameter, in.	2.900	2.900	2.858	
Area, in.²	6.605	6.605	6.415	
Height, in.	5.520	5.520	5.520	
Net decrease in height, in.		0.000	0.000	
Net decrease in water volume, cc.			17.200	
Wet density, pcf	138.3	138.4	140.7	
Dry density, pcf	120.1	120.1	123.6	
Void ratio	0.4392	0.4392	0.3978	
Saturation, %	95.8	96.4	96.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 75.820 psi (10.918 ksf)
Consolidation back pressure = 55.000 psi (7.920 ksf)
Consolidation effective confining stress = 2.998 ksf
Strain rate, %/min. = 0.33
Fail. Stress = 7.757 ksf **at reading no.** 14
Ult. Stress = 18.303 ksf **at reading no.** 38

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	2.998	2.998	1.00	55.000	2.998	0.000
1	0.0089	4.361	4.4	0.2	0.098	2.964	3.061	1.03	55.239	3.013	0.049
2	0.0121	38.899	38.9	0.2	0.871	2.656	3.527	1.33	57.374	3.092	0.436
3	0.0164	69.291	69.3	0.3	1.551	2.383	3.934	1.65	59.268	3.159	0.775
4	0.0219	99.550	99.5	0.4	2.226	2.134	4.360	2.04	61.001	3.247	1.113
5	0.0289	128.786	128.8	0.5	2.876	1.921	4.797	2.50	62.477	3.359	1.438
6	0.0386	161.644	161.6	0.7	3.603	1.722	5.325	3.09	63.860	3.524	1.802
7	0.0511	193.474	193.5	0.9	4.303	1.551	5.854	3.77	65.046	3.703	2.151
8	0.0698	224.744	224.7	1.3	4.981	1.416	6.397	4.52	65.988	3.906	2.491
9	0.0912	251.539	251.5	1.7	5.553	1.363	6.916	5.07	66.354	4.140	2.777
10	0.1133	275.230	275.2	2.1	6.051	1.369	7.420	5.42	66.313	4.395	3.026
11	0.1351	298.042	298.0	2.4	6.526	1.405	7.932	5.64	66.061	4.669	3.263
12	0.1571	319.809	319.8	2.8	6.974	1.461	8.435	5.77	65.675	4.948	3.487
13	0.1795	338.345	338.3	3.3	7.348	1.527	8.875	5.81	65.217	5.201	3.674
14	0.2024	358.706	358.7	3.7	7.757	1.601	9.358	5.84	64.700	5.480	3.878

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
15	0.2236	375.500	375.5	4.0	8.088	1.682	9.770	5.81	64.138	5.726	4.044
16	0.2464	389.931	389.9	4.5	8.362	1.761	10.123	5.75	63.593	5.942	4.181
17	0.2688	407.179	407.2	4.9	8.695	1.824	10.519	5.77	63.153	6.172	4.347
18	0.2990	433.352	433.4	5.4	9.201	1.921	11.122	5.79	62.479	6.521	4.600
19	0.3267	457.324	457.3	5.9	9.658	2.023	11.681	5.77	61.771	6.852	4.829
20	0.3542	482.838	482.8	6.4	10.143	2.127	12.270	5.77	61.046	7.199	5.071
21	0.3817	510.455	510.5	6.9	10.666	2.238	12.904	5.77	60.276	7.571	5.333
22	0.4096	539.730	539.7	7.4	11.216	2.352	13.569	5.77	59.484	7.961	5.608
23	0.4373	573.153	573.2	7.9	11.847	2.479	14.326	5.78	58.604	8.402	5.923
24	0.4648	606.295	606.3	8.4	12.464	2.620	15.084	5.76	57.624	8.852	6.232
25	0.4922	638.779	638.8	8.9	13.060	2.776	15.836	5.71	56.544	9.306	6.530
26	0.5198	671.923	671.9	9.4	13.663	2.948	16.611	5.63	55.345	9.780	6.831
27	0.5479	704.893	704.9	9.9	14.252	3.140	17.393	5.54	54.012	10.267	7.126
28	0.5757	733.975	734.0	10.4	14.757	3.344	18.101	5.41	52.599	10.722	7.379
29	0.6034	763.487	763.5	10.9	15.265	3.553	18.818	5.30	51.143	11.186	7.632
30	0.6309	792.620	792.6	11.4	15.759	3.764	19.523	5.19	49.681	11.643	7.879
31	0.6589	819.596	819.6	11.9	16.202	3.982	20.184	5.07	48.168	12.083	8.101
32	0.6856	845.651	845.7	12.4	16.625	4.205	20.830	4.95	46.616	12.518	8.312
33	0.7138	870.758	870.8	12.9	17.019	4.431	21.449	4.84	45.052	12.940	8.509
34	0.7420	893.854	893.9	13.4	17.368	4.648	22.016	4.74	43.540	13.332	8.684
35	0.7689	914.720	914.7	13.9	17.673	4.850	22.523	4.64	42.137	13.687	8.836
36	0.7963	934.571	934.6	14.4	17.952	5.037	22.990	4.56	40.838	14.013	8.976
37	0.8238	956.313	956.3	14.9	18.263	5.219	23.482	4.50	39.577	14.351	9.132
38	0.8350	960.700	960.7	15.1	18.303	5.295	23.598	4.46	39.049	14.446	9.151

Project Name: I-77 Panthers Interchange

Project #: 1461-19-069

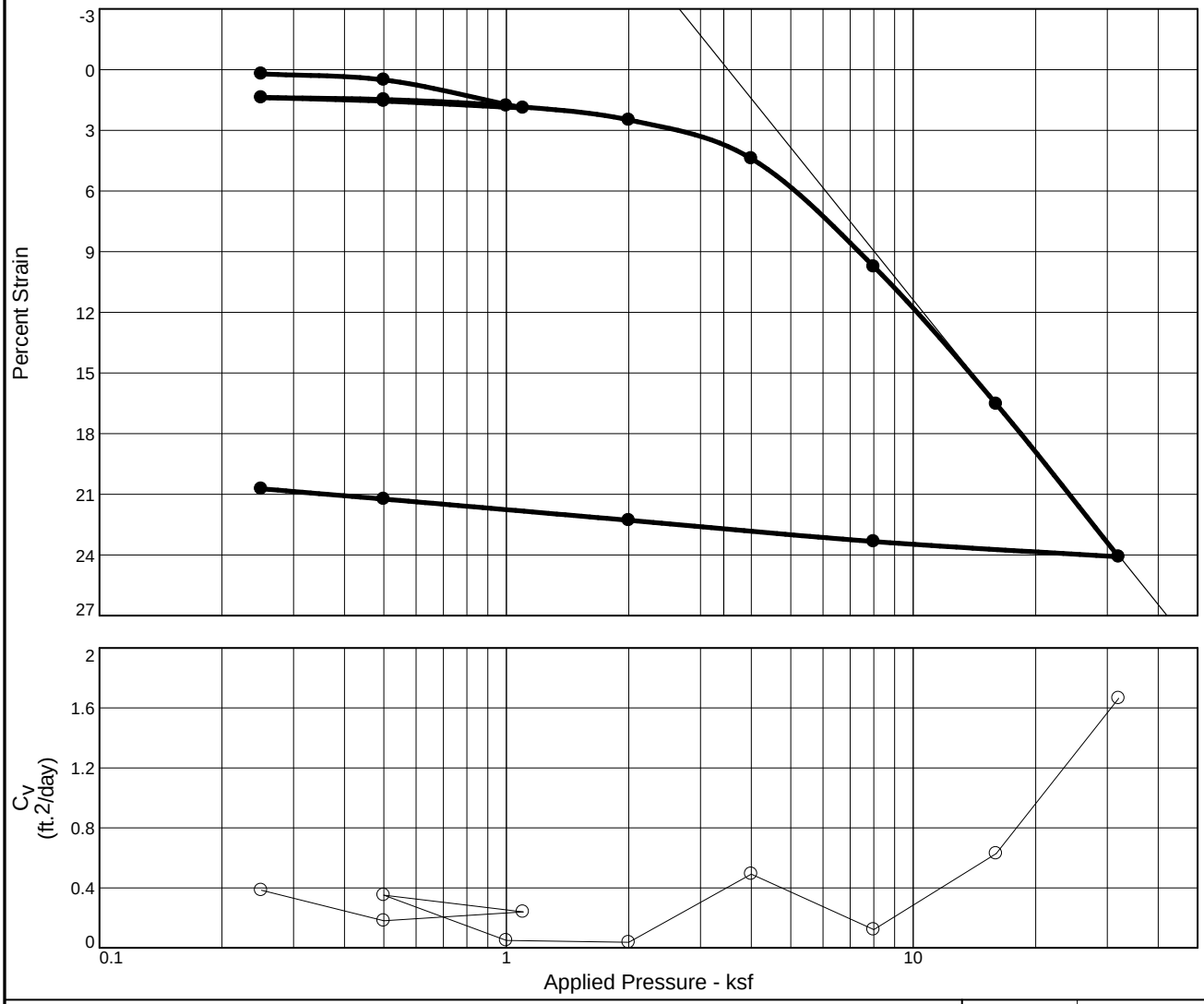
Boring #: RW-10

Depth: 10.0' – 11.2' (UD-2)

Sample Date: 1/09 & 1/14/20

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)

CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Sandy Silt (ML)	ML	N/A

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
N/A	N/A	2.653	1.1	76.6	96.2	43.1 %	36.6 %	98.4 %	100.0 %	1.161	0.713	5.3	0.54

Preparation Process: ASTM D2435 - Sec. 9	D2435 Method	C_r	Swell Press. (ksf)	Swell %
Condition of Test: Unsaturated	B	0.09		

Project No. 1461-19-069 **Client:** RS&H

Project: I-77 Panthers Interchange

Loc.: Retaining Walls - UD-3 **Depth:** 8 - 10' **Sample No.:** RW-12

S&ME, Inc.

Greenville, SC

Remarks:

Checked By: Robert C. Bruorton, P.E.

Title: Senior Engineer

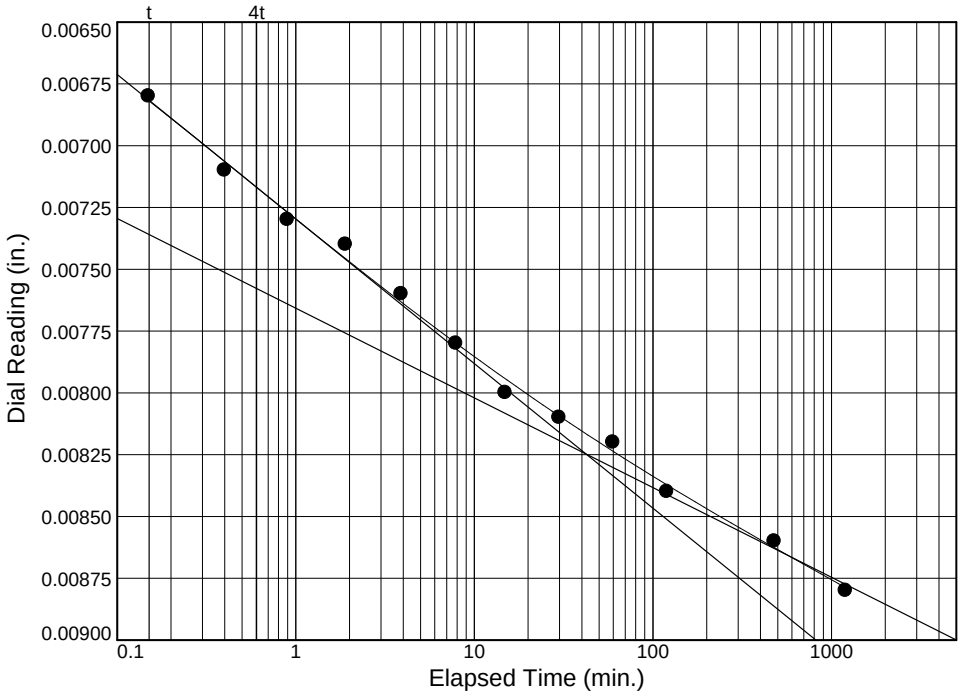
Figure 1

Tested By: Benjamin Kovaleski 2/16/20

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

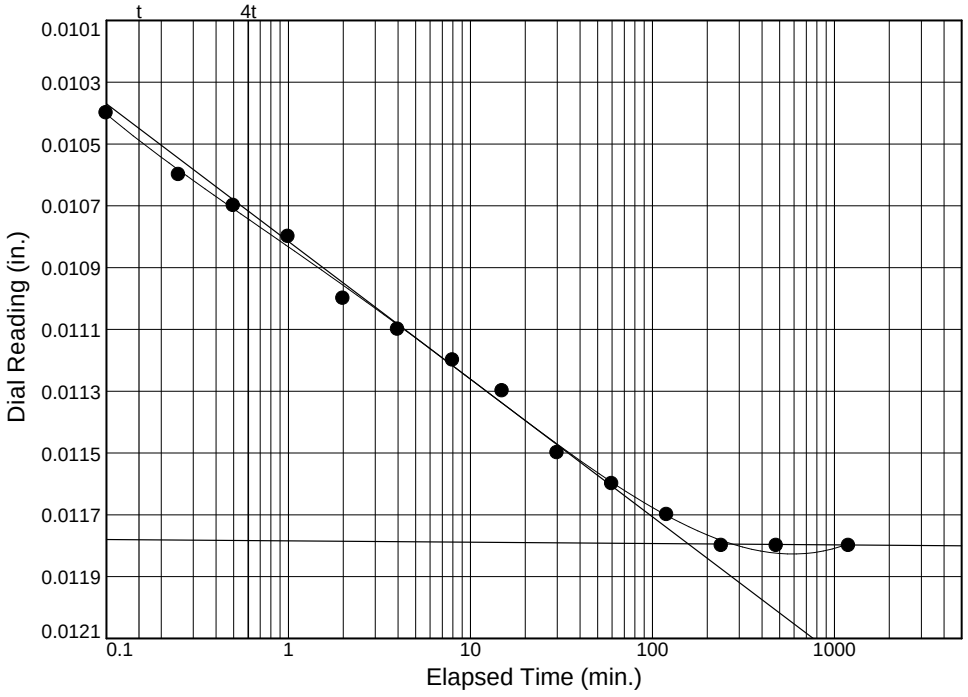
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 1
Load= 0.25 ksf
D_0 = 0.0065
D_{50} = 0.0074
D_{100} = 0.0082
T_{50} = 1.28 min.

C_v @ T_{50}
0.385 ft.^{2}/day

C_α = 0.000



Load No.= 2
Load= 0.50 ksf
D_0 = 0.0102
D_{50} = 0.0110
D_{100} = 0.0118
T_{50} = 2.71 min.

C_v @ T_{50}
0.181 ft.^{2}/day

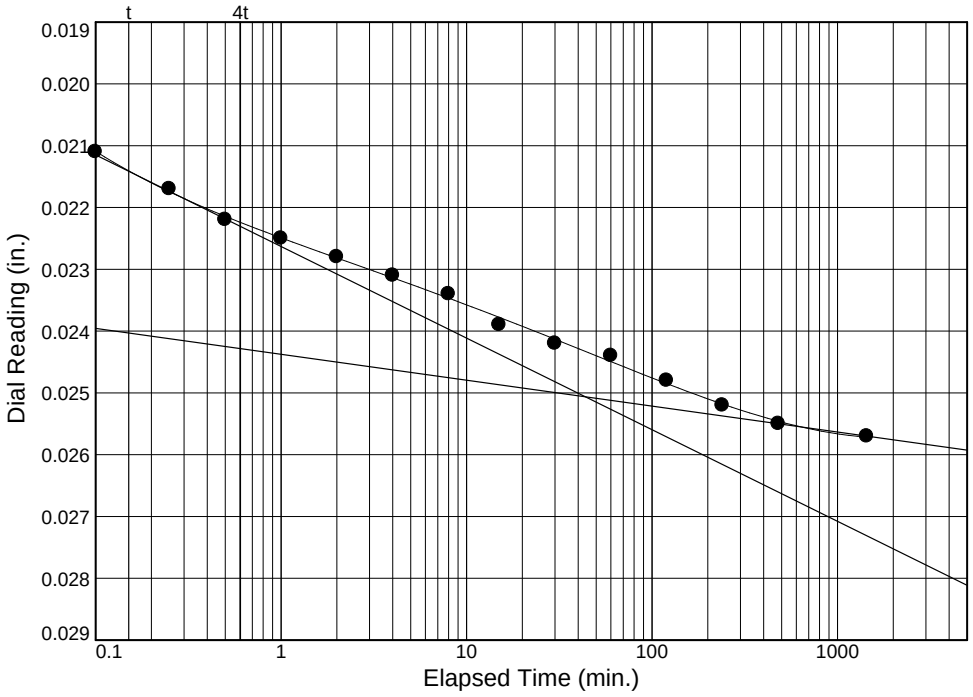
C_α = 0.000

Figure 2

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

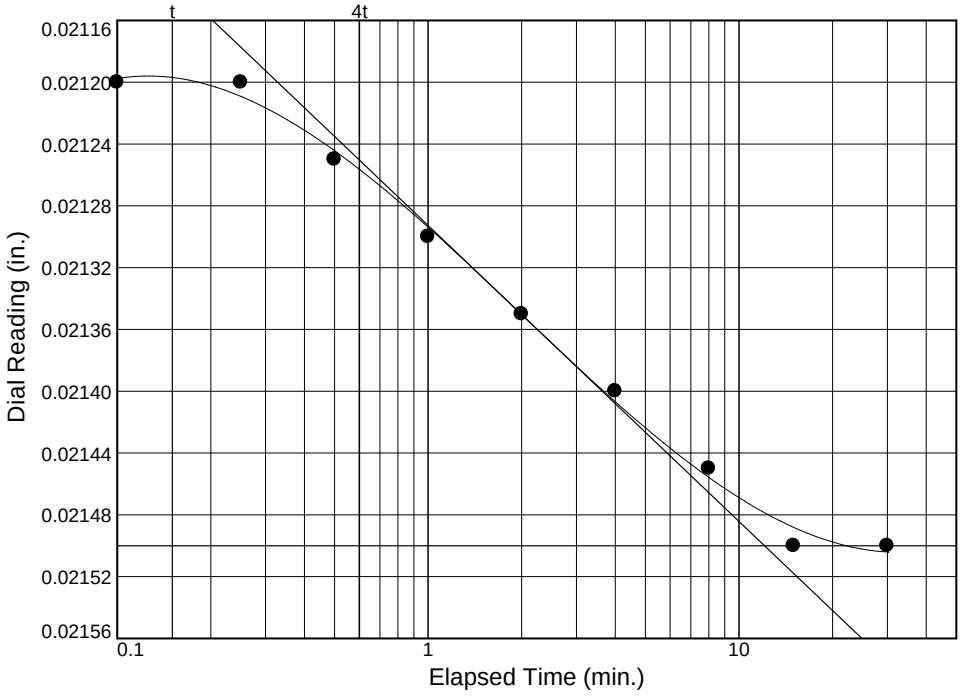
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 3
Load= 1.10 ksf
D_0 = 0.0206
D_{50} = 0.0228
D_{100} = 0.0251
T_{50} = 2.01 min.

C_v @ T_{50}
0.240 ft.^{2}/day

C_α = 0.000



Load No.= 6
Load= 0.50 ksf
D_0 = 0.0211
D_{50} = 0.0213
D_{100} = 0.0215
T_{50} = 1.36 min.

C_v @ T_{50}
0.352 ft.^{2}/day

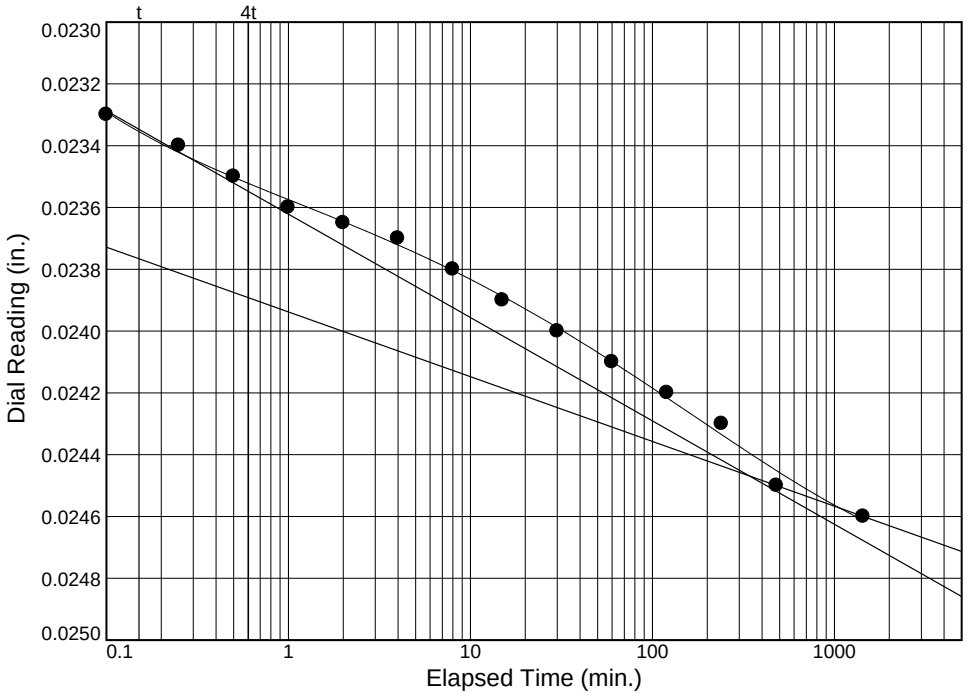
C_α = 0.000

Figure 3

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

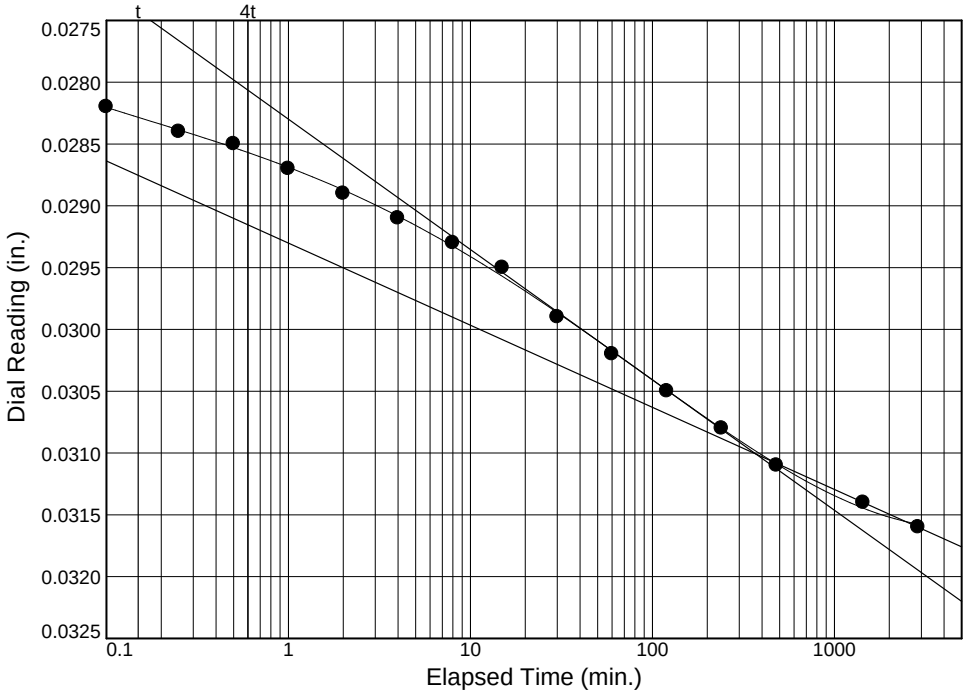
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 7
Load= 1.00 ksf
D_0 = 0.0232
D_{50} = 0.0238
D_{100} = 0.0245
T_{50} = 9.65 min.

C_v @ T_{50}
0.049 ft.^{2}/day

C_α = 0.000



Load No.= 8
Load= 2.00 ksf
D_0 = 0.0280
D_{50} = 0.0295
D_{100} = 0.0310
T_{50} = 12.72 min.

C_v @ T_{50}
0.037 ft.^{2}/day

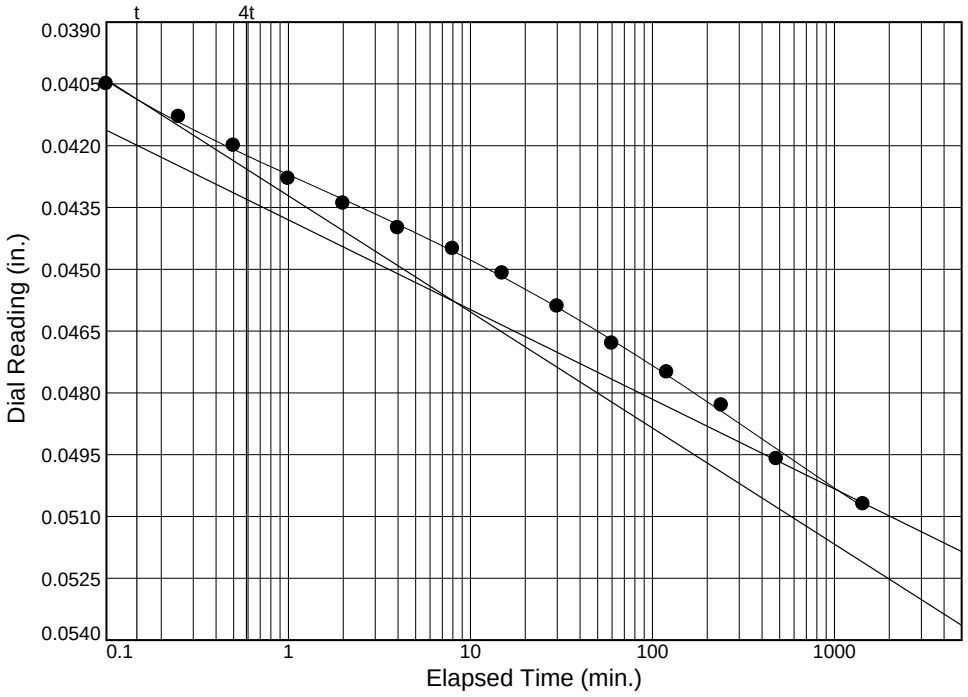
C_α = 0.001

Figure 4

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

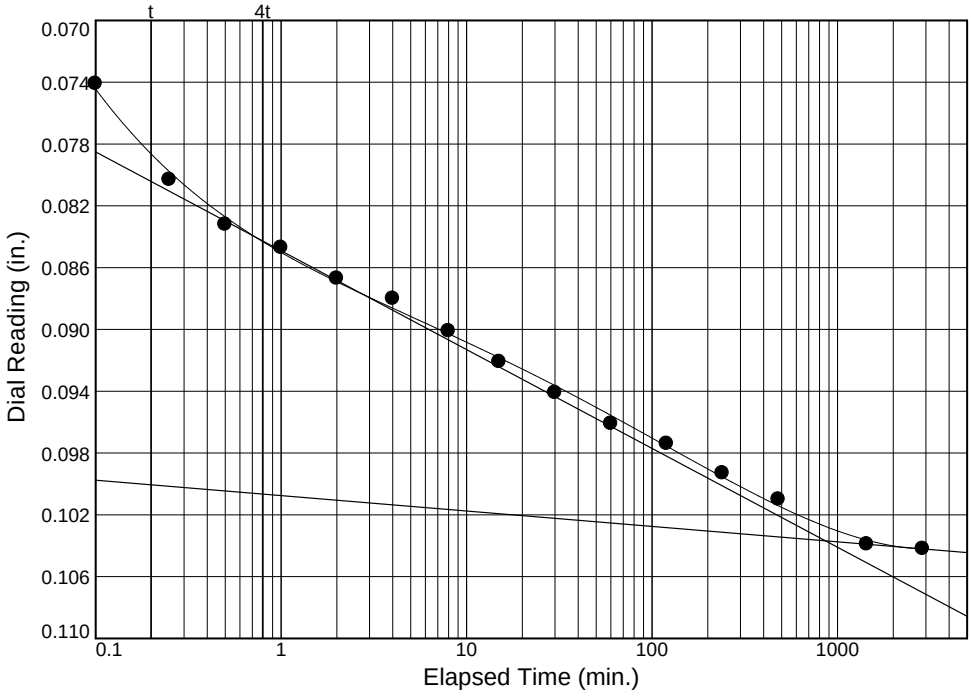
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 9
Load= 4.00 ksf
D_0 = 0.0395
D_{50} = 0.0426
D_{100} = 0.0458
T_{50} = 0.94 min.

C_v @ T_{50}
0.492 ft.^{2}/day

C_α = 0.002



Load No.= 10
Load= 8.00 ksf
D_0 = 0.0729
D_{50} = 0.0883
D_{100} = 0.1037
T_{50} = 3.51 min.

C_v @ T_{50}
0.122 ft.^{2}/day

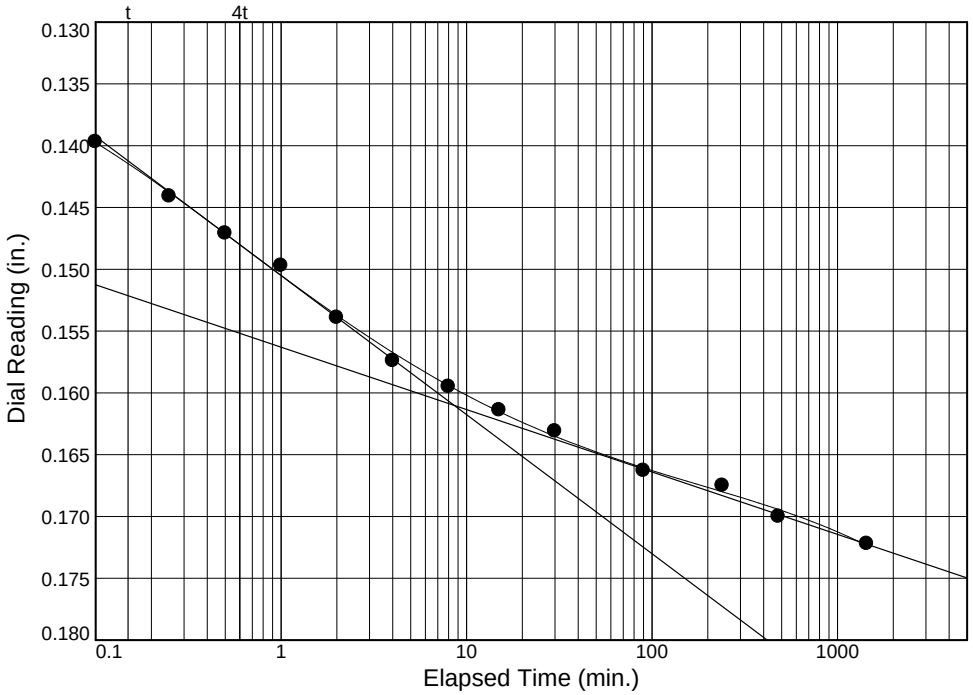
C_α = 0.001

Figure 5

Dial Reading vs. Time

Project No.: 1461-19-069
Project: I-77 Panthers Interchange

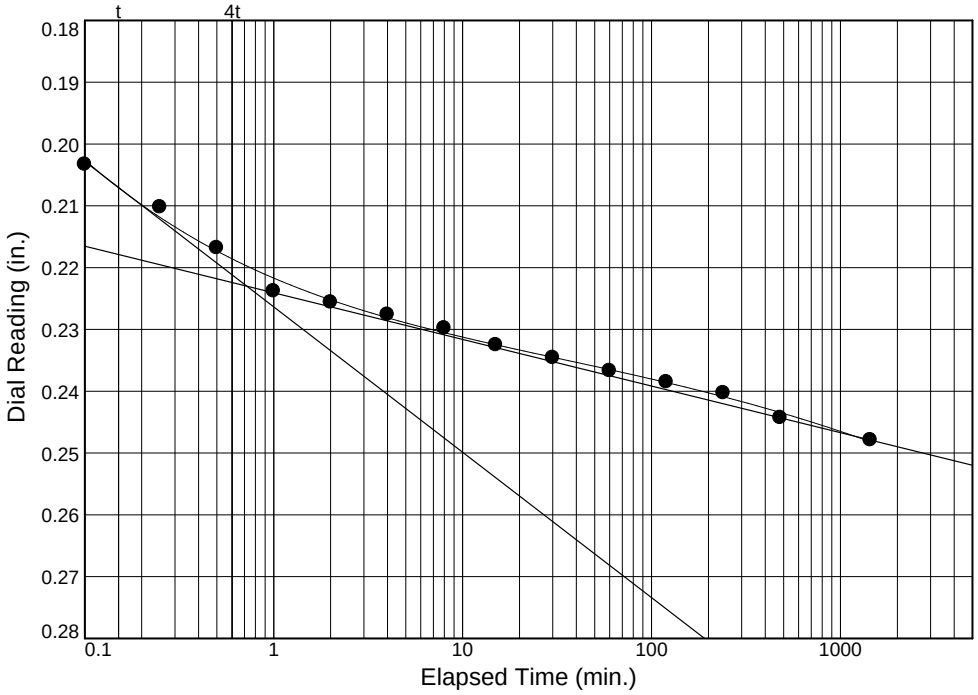
Location: Retaining Walls - UD-3 Depth: 8 - 10' Sample Number: RW-12



Load No.= 11
Load= 16.00 ksf
D_0 = 0.1349
D_{50} = 0.1479
D_{100} = 0.1610
T_{50} = 0.59 min.

C_v @ T_{50}
0.629 ft.^{2}/day

C_α = 0.005



Load No.= 12
Load= 32.00 ksf
D_0 = 0.1956
D_{50} = 0.2093
D_{100} = 0.2230
T_{50} = 0.19 min.

C_v @ T_{50}
1.665 ft.^{2}/day

C_α = 0.008

Figure 6

CONSOLIDATION TEST DATA

8/11/2020

Client: RS&H
Project: I-77 Panthers Interchange
Project Number: 1461-19-069
Location: Retaining Walls - UD-3
Depth: 8 - 10' **Sample Number:** RW-12
Material Description: Sandy Silt (ML)
Sample Date: 1/09 & 1/14/20 **Liquid Limit:** N/A **Plasticity Index:** N/A
USCS: ML **AASHTO:** N/A
Preparation Process: ASTM D2435 - Sec. 9
Condition of Test: Unsaturated
Test Method: B **Final Density:** 96.2 **Figure No.:** 1
Tested By: Benjamin Kovaleski 2/16/20 **Checked by:** Robert C. Bruorton, P.E. **Title:** Senior Engineer

Test Specimen Data

NATURAL MOISTURE

Wet w+t	=	163.37 g.
Dry w+t	=	114.17 g.
Tare Wt.	=	0.00 g.
Moisture	=	43.1 %

VOID RATIO

Spec. Gr.	=	2.653
Est. Ht. Solids	=	0.463 in.
Init. V.R.	=	1.161
Init. Sat.	=	98.4 %

AFTER TEST

Wet w+t	=	282.89 g.
Dry w+t	=	246.98 g.
Tare Wt.	=	148.81 g.
Moisture	=	36.6 %

UNIT WEIGHT

Height	=	1.001 in.
Diameter	=	2.498 in.
Weight	=	141.16 g.
Dry Dens.	=	76.6 pcf

TEST START

Height	=	1.001 in.
Diameter	=	2.498 in.

Dry Wt.	=	98.17 g.

End-Of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	Deformation (in.)	C_v (ft.^{2}/day)	C_α	Void Ratio	% Strain
start	0.00670		0.00000			1.161	
0.25	0.00900	0.00020	0.00210	0.385	0.000	1.157	0.2 Comprs.
0.50	0.01240	0.00060	0.00510	0.181	0.000	1.150	0.5 Comprs.
1.10	0.02720	0.00150	0.01900	0.240	0.000	1.120	1.9 Comprs.
0.50	0.02320	0.00090	0.01560			1.128	1.6 Comprs.
0.25	0.02080	0.00030	0.01380			1.132	1.4 Comprs.
0.50	0.02240	0.00090	0.01480	0.352	0.000	1.129	1.5 Comprs.
1.00	0.02610	0.00150	0.01790	0.049	0.000	1.123	1.8 Comprs.
2.00	0.03400	0.00240	0.02490	0.037	0.001	1.108	2.5 Comprs.
4.00	0.05410	0.00340	0.04400	0.492	0.002	1.066	4.4 Comprs.
8.00	0.10870	0.00450	0.09750	0.122	0.001	0.951	9.7 Comprs.
16.00	0.17780	0.00560	0.16550	0.629	0.005	0.804	16.5 Comprs.
32.00	0.25460	0.00670	0.24120	1.665	0.008	0.641	24.1 Comprs.
8.00	0.24480	0.00450	0.23360			0.657	23.3 Comprs.
2.00	0.23300	0.00320	0.22310			0.680	22.3 Comprs.
0.50	0.22140	0.00210	0.21260			0.702	21.2 Comprs.
0.25	0.21540	0.00120	0.20750			0.713	20.7 Comprs.

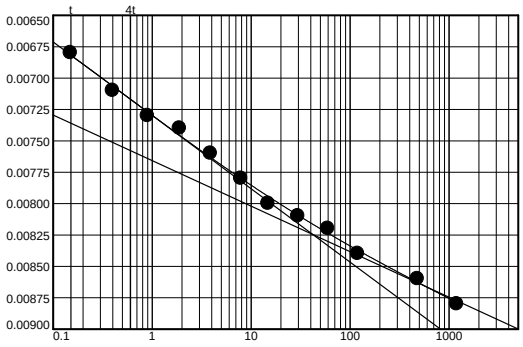
TEST RESULTS SUMMARY

Compression index (C_c), ksf = 0.54 **Preconsolidation pressure (P_p), ksf =** 5.3 **Void ratio at P_p (e_m) =** 1.026

Overburden (σ_{vo}), ksf = 1.1 **Void ratio at σ_{vo} (e_o) =** 1.120 **Recompression index (C_r) =** 0.09

Pressure: 0.25 ksf **TEST READINGS** **Load No. 1**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	.1	0.00670	11	120	0.00860
2	.25	0.00700	12	480	0.00880
3	.5	0.00730	13	1200	0.00900
4	1	0.00750			
5	2	0.00760			
6	4	0.00780			
7	8	0.00800			
8	15	0.00820			
9	30	0.00830			
10	60	0.00840			

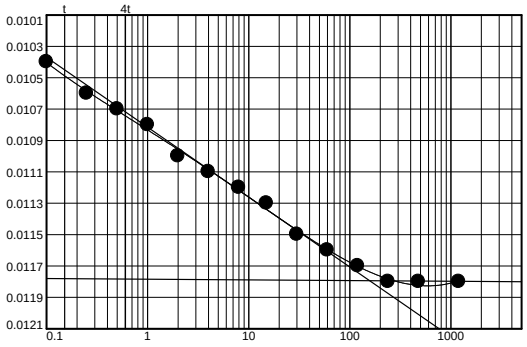


Void Ratio = 1.157 **Compression =** 0.2%

D_0 = 0.0065 **D_{50} =** 0.0074 **D_{100} =** 0.0082 **C_v at 1.28 min. =** 0.385 ft.^{2}/day **C_α =** 0.000

Pressure: 0.50 ksf **TEST READINGS** **Load No. 2**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.00900	11	60	0.01220
2	.1	0.01100	12	120	0.01230
3	.25	0.01120	13	240	0.01240
4	.5	0.01130	14	480	0.01240
5	1	0.01140	15	1200	0.01240
6	2	0.01160			
7	4	0.01170			
8	8	0.01180			
9	15	0.01190			
10	30	0.01210			

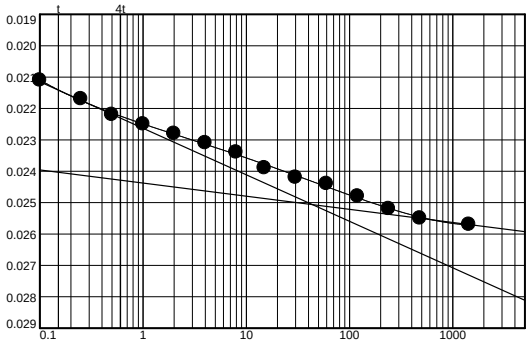


Void Ratio = 1.150 **Compression =** 0.5%

D_0 = 0.0102 **D_{50} =** 0.0110 **D_{100} =** 0.0118 **C_v at 2.71 min. =** 0.181 ft.^{2}/day **C_α =** 0.000

Pressure: 1.10 ksf — **TEST READINGS** — **Load No. 3**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.01240	11	60	0.02590
2	.1	0.02260	12	120	0.02630
3	.25	0.02320	13	240	0.02670
4	.5	0.02370	14	480	0.02700
5	1.0	0.02400	15	1440	0.02720
6	2.0	0.02430			
7	4	0.02460			
8	8	0.02490			
9	15	0.02540			
10	30	0.02570			



Void Ratio = 1.120 **Compression =** 1.9%

D_0 = 0.0206 **D_{50} =** 0.0228 **D_{100} =** 0.0251 **C_v at 2.01 min. =** 0.240 ft.^{2}/day **C_α =** 0.000

Pressure: 0.50 ksf — **TEST READINGS** — **Load No. 4**

No.	Elapsed Time	Dial Reading
1	0	0.02720
2	(final)	0.02320

Void Ratio = 1.128 **Compression =** 1.6%

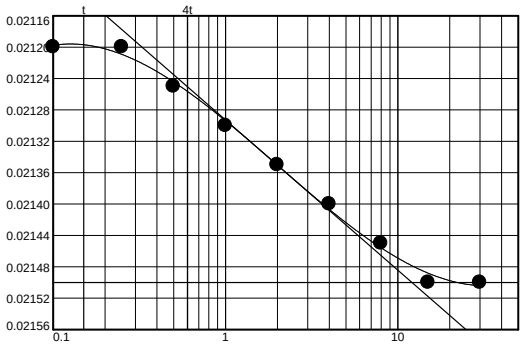
Pressure: 0.25 ksf — **TEST READINGS** — **Load No. 5**

No.	Elapsed Time	Dial Reading
1	0	0.02320
2	(final)	0.02080

Void Ratio = 1.132 **Compression =** 1.4%

Pressure: 0.50 ksf — **TEST READINGS** — **Load No. 6**

No.	Elapsed Time	Dial Reading
1	0	0.02080
2	.1	0.02210
3	.25	0.02210
4	.5	0.02215
5	1	0.02220
6	2	0.02225
7	4	0.02230
8	8	0.02235
9	15	0.02240
10	30	0.02240

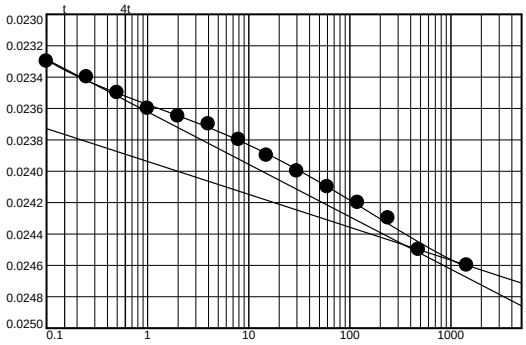


Void Ratio = 1.129 **Compression =** 1.5%

D_0 = 0.0211 **D_{50} =** 0.0213 **D_{100} =** 0.0215 **C_v at 1.36 min. =** 0.352 ft.^{2}/day **C_α =** 0.000

Pressure: 1.00 ksf | **TEST READINGS** | **Load No. 7**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02240	11	60	0.02560
2	.1	0.02480	12	120	0.02570
3	.25	0.02490	13	240	0.02580
4	.5	0.02500	14	480	0.02600
5	1.0	0.02510	15	1440	0.02610
6	2.0	0.02515			
7	4	0.02520			
8	8	0.02530			
9	15	0.02540			
10	30	0.02550			

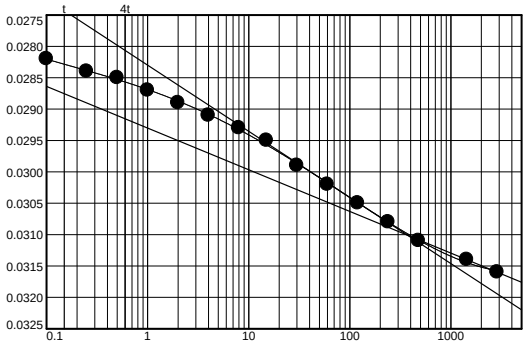


Void Ratio = 1.123 **Compression =** 1.8%

D_0 = 0.0232 **D_{50} =** 0.0238 **D_{100} =** 0.0245 **C_v at 9.65 min. =** 0.049 ft.^{2}/day **C_α =** 0.000

Pressure: 2.00 ksf | **TEST READINGS** | **Load No. 8**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.02610	11	60	0.03260
2	.1	0.03060	12	120	0.03290
3	.25	0.03080	13	240	0.03320
4	.5	0.03090	14	480	0.03350
5	1	0.03110	15	1440	0.03380
6	2	0.03130	16	2880	0.03400
7	4	0.03150			
8	8	0.03170			
9	15	0.03190			
10	30	0.03230			

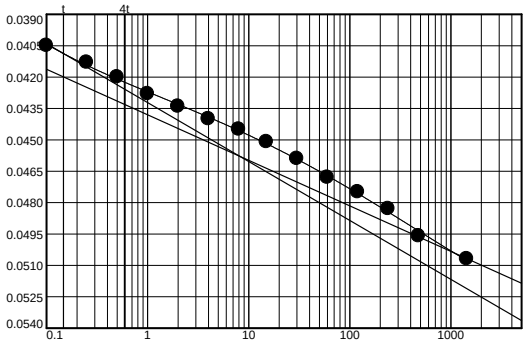


Void Ratio = 1.108 **Compression =** 2.5%

D_0 = 0.0280 **D_{50} =** 0.0295 **D_{100} =** 0.0310 **C_v at 12.72 min. =** 0.037 ft.^{2}/day **C_α =** 0.001

Pressure: 4.00 ksf **TEST READINGS** **Load No. 9**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.03400	11	60	0.05020
2	.1	0.04390	12	120	0.05090
3	.25	0.04470	13	240	0.05170
4	.5	0.04540	14	480	0.05300
5	1.0	0.04620	15	1440	0.05410
6	2.0	0.04680			
7	4.0	0.04740			
8	8	0.04790			
9	15	0.04850			
10	30	0.04930			

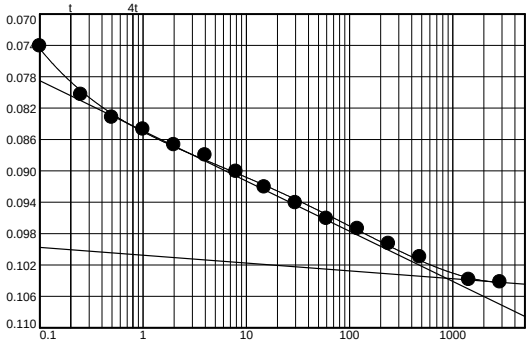


Void Ratio = 1.066 **Compression =** 4.4%

D_0 = 0.0395 **D_{50} =** 0.0426 **D_{100} =** 0.0458 **C_v at 0.94 min. =** 0.492 ft.^{2}/day **C_α =** 0.002

Pressure: 8.00 ksf **TEST READINGS** **Load No. 10**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.05410	11	60	0.10060
2	.1	0.07860	12	120	0.10190
3	.25	0.08480	13	240	0.10380
4	.5	0.08770	14	480	0.10550
5	1.0	0.08920	15	1440	0.10840
6	2	0.09120	16	2880	0.10870
7	4	0.09250			
8	8	0.09460			
9	15	0.09660			
10	30	0.09860			

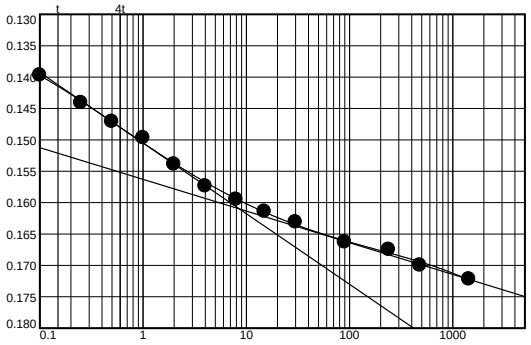


Void Ratio = 0.951 **Compression =** 9.7%

D_0 = 0.0729 **D_{50} =** 0.0883 **D_{100} =** 0.1037 **C_v at 3.51 min. =** 0.122 ft.^{2}/day **C_α =** 0.001

Pressure: 16.00 ksf | **TEST READINGS** | **Load No. 11**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.10870	11	90	0.17190
2	.1	0.14530	12	240	0.17310
3	.25	0.14970	13	480	0.17560
4	.5	0.15270	14	1440	0.17780
5	1	0.15530			
6	2	0.15950			
7	4	0.16300			
8	8	0.16510			
9	15	0.16700			
10	30	0.16870			

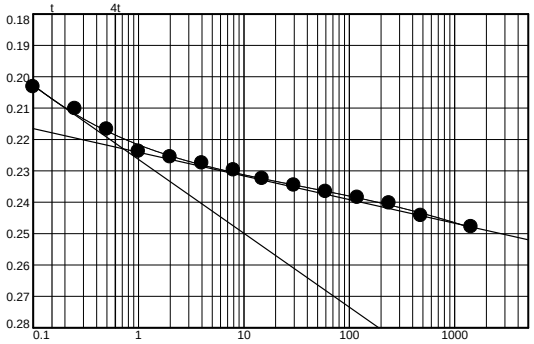


Void Ratio = 0.804 **Compression =** 16.5%

D_0 = 0.1349 **D_{50} =** 0.1479 **D_{100} =** 0.1610 **C_v at 0.59 min. =** 0.629 ft.^{2}/day **C_α =** 0.005

Pressure: 32.00 ksf | **TEST READINGS** | **Load No. 12**

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0	0.17780	11	60	0.24340
2	.1	0.21000	12	120	0.24520
3	.25	0.21690	13	240	0.24700
4	.5	0.22350	14	480	0.25100
5	1	0.23050	15	1440	0.25460
6	2	0.23230			
7	4	0.23430			
8	8	0.23650			
9	15	0.23920			
10	30	0.24130			



Void Ratio = 0.641 **Compression =** 24.1%

D_0 = 0.1956 **D_{50} =** 0.2093 **D_{100} =** 0.2230 **C_v at 0.19 min. =** 1.665 ft.^{2}/day **C_α =** 0.008

Pressure: 8.00 ksf | **TEST READINGS** | **Load No. 13**

No.	Elapsed Time	Dial Reading
1	0	0.25460
2	(final)	0.24480

Void Ratio = 0.657 **Compression =** 23.3%

Pressure: 2.00 ksf | **TEST READINGS** | **Load No. 14**

No.	Elapsed Time	Dial Reading
1	0	0.24480
2	(final)	0.23300

Void Ratio = 0.680 **Compression =** 22.3%

Pressure: 0.50 ksf	TEST READINGS	Load No. 15

No.	Elapsed Time	Dial Reading
1	0	0.23300
2	(final)	0.22140

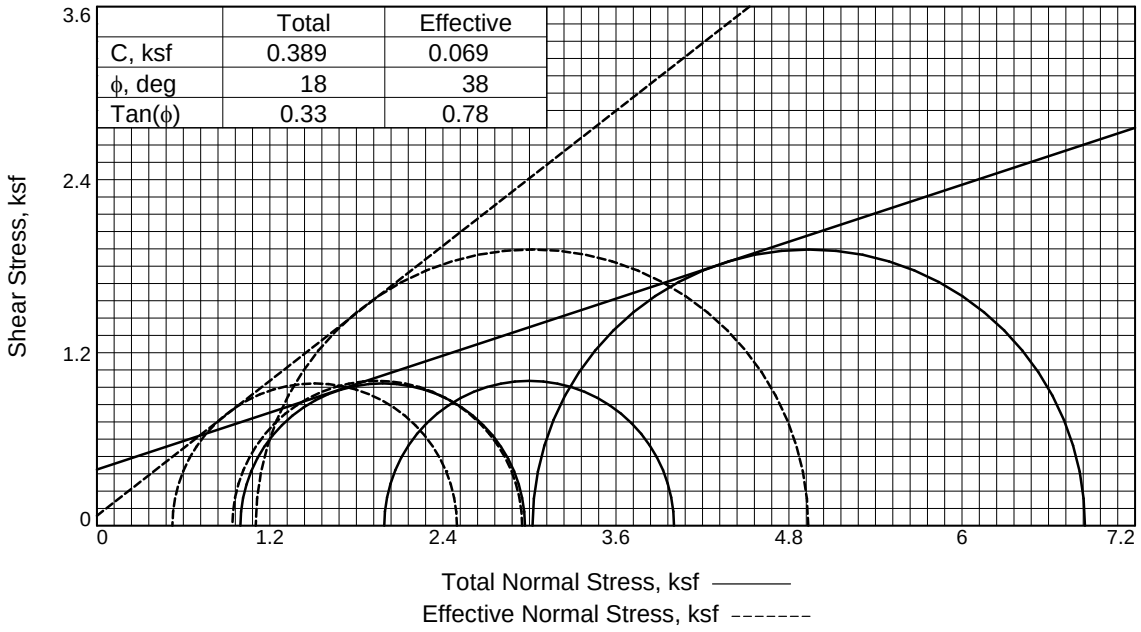
Void Ratio = 0.702 **Compression =** 21.2%

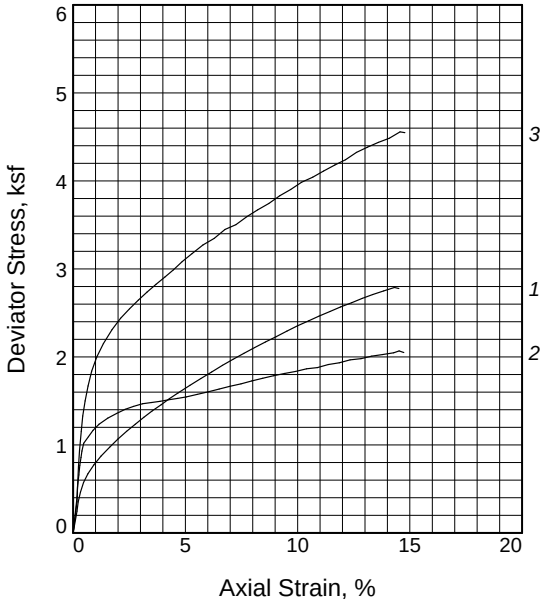
Pressure: 0.25 ksf	TEST READINGS	Load No. 16

No.	Elapsed Time	Dial Reading
1	0	0.22140
2	(final)	0.21540

Void Ratio = 0.713 **Compression =** 20.7%

C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.





Specimen No.		1	2	3
Initial	Water Content, %	30.3	27.2	27.0
	Dry Density, pcf	93.9	98.3	98.5
	Saturation, %	99.1	98.4	98.3
	Void Ratio	0.8524	0.7700	0.7652
	Diameter, in.	2.867	2.865	2.869
	Height, in.	5.984	5.989	5.995
At Test	Water Content, %	29.5	25.9	24.8
	Dry Density, pcf	95.0	101.4	102.9
	Saturation, %	99.0	100.8	100.3
	Void Ratio	0.8301	0.7155	0.6895
	Diameter, in.	2.856	2.839	2.831
	Height, in.	5.957	5.913	5.895
Strain rate, %/min.		0.44	0.44	0.44
Eff. Cell Pressure, ksf		0.995	1.993	3.021
Fail. Stress, ksf		1.973	2.010	3.832
Total Pore Pr., ksf		6.231	6.813	7.679
Strain, %		7.1	13.3	9.2
Ult. Stress, ksf		2.778	2.051	4.549
Total Pore Pr., ksf		5.929	6.779	7.394
Strain, %		14.5	14.7	14.8
$\bar{\sigma}_1$ Failure, ksf		2.497	2.949	4.933
$\bar{\sigma}_3$ Failure, ksf		0.524	0.940	1.102

Type of Test:
CU with Pore Pressures
Sample Type: Undisturbed
Description: Silty Sand (SM)

LL= N/A **PI=** N/A
Specific Gravity= 2.786
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767,

Figure 1

Client: RS&H

Project: I-77 Panthers Interchange

Location: Retaining Walls - UD-4

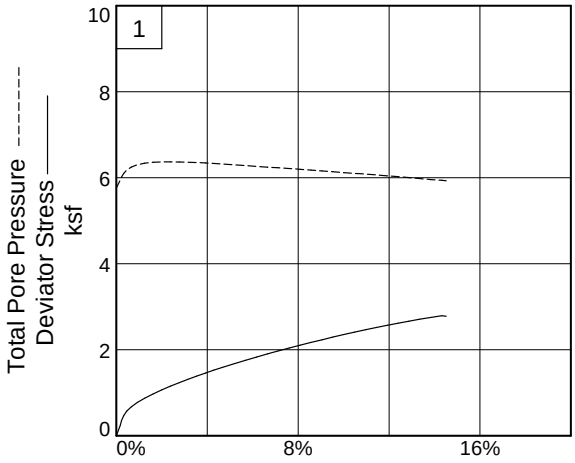
Sample Number: RW-12 **Depth:** 19 - 21'

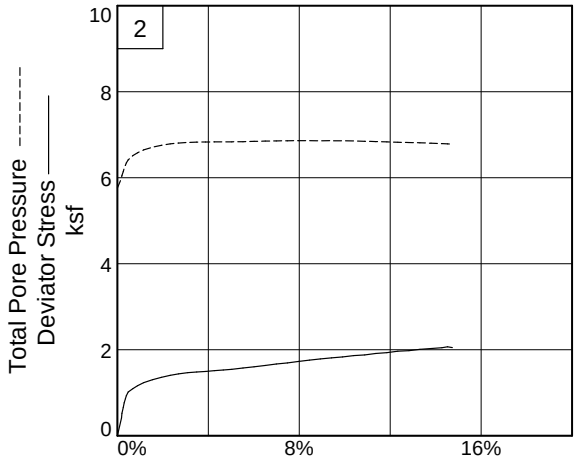
Proj. No.: 1461-19-069 **Date Sampled:** 1/09 & 1/14/20

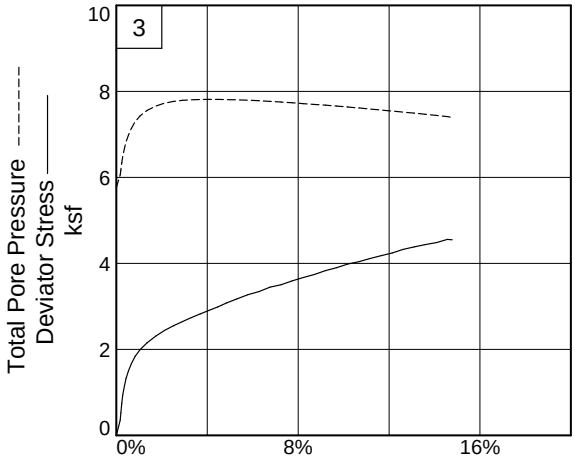
TRIAXIAL SHEAR TEST REPORT
S&ME, Inc.
Greenville, SC

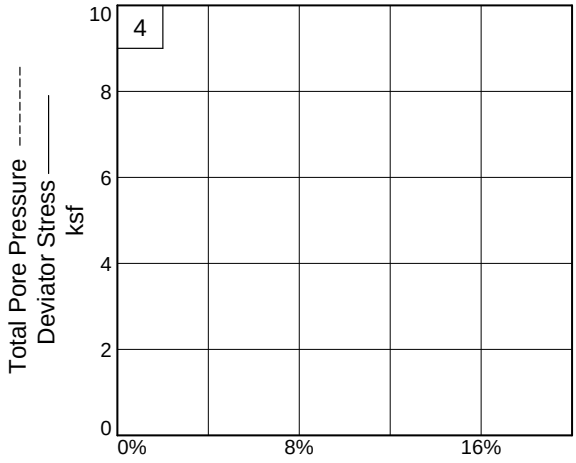
Tested By: Benjamin Kovaleski - 2/15/20 **Checked By:** Robert C. Bruorton, P.E.

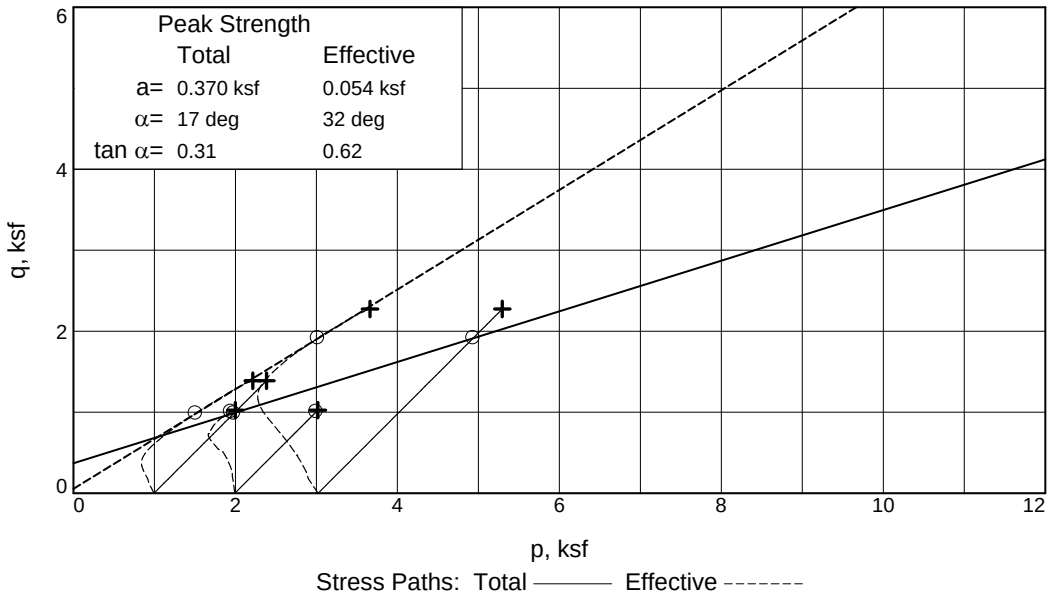
C & phi are not test results but an interpretation of the test results. The designer is responsible for interpreting test data as provided by S&ME.











Client: RS&H
Project: I-77 Panthers Interchange
Location: Retaining Walls - UD-4 **Depth:** 19 - 21' **Sample Number:** RW-12
Project No.: 1461-19-069 **Figure** 2

S&ME, Inc.

Tested By: Benjamin Kovaleski - 2/15/20 **Checked By:** Robert C. Bruorton, P.E.

TRIAXIAL COMPRESSION TEST 8/11/2020

CU with Pore Pressures 9:17 AM

Date: 1/09 & 1/14/20
Client: RS&H
Project: I-77 Panthers Interchange
Project No.: 1461-19-069
Location: Retaining Walls - UD-4
Depth: 19 - 21' **Sample Number:** RW-12
Description: Silty Sand (SM)
Remarks: The specimens failed with bulging and shearing. Failure selected at peak stress ratio. ASTM D4767,
Type of Sample: Undisturbed
Specific Gravity=2.786 **LL=**N/A **PL=** **PI=**N/A
Test Method: ASTM D 4767 Method A

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	65.270			1232.080
Moisture content: Dry soil+tare, gms.	50.080			951.530
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	30.3	30.2	29.5	29.5
Moist specimen weight, gms.	1240.87			
Diameter, in.	2.867	2.866	2.856	
Area, in.²	6.456	6.451	6.407	
Height, in.	5.984	5.982	5.957	
Net decrease in height, in.		0.002	0.025	
Net decrease in water volume, cc.			7.000	
Wet density, pcf	122.4	122.4	123.1	
Dry density, pcf	93.9	94.0	95.0	
Void ratio	0.8524	0.8506	0.8301	
Saturation, %	99.1	99.0	99.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 46.910 psi (6.755 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 0.995 ksf
Strain rate, %/min. = 0.44
Fail. Stress = 1.973 ksf **at reading no.** 21
Ult. Stress = 2.778 ksf **at reading no.** 37

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	0.995	0.995	1.00	40.000	0.995	0.000
1	0.0104	11.035	11.0	0.2	0.248	0.808	1.055	1.31	41.302	0.931	0.124
2	0.0136	15.787	15.8	0.2	0.354	0.740	1.094	1.48	41.772	0.917	0.177
3	0.0194	20.741	20.7	0.3	0.465	0.655	1.120	1.71	42.361	0.887	0.232
4	0.0274	25.627	25.6	0.5	0.573	0.574	1.147	2.00	42.923	0.861	0.287
5	0.0395	30.151	30.2	0.7	0.673	0.507	1.180	2.33	43.392	0.843	0.337
6	0.0552	34.797	34.8	0.9	0.775	0.452	1.227	2.71	43.770	0.840	0.387
7	0.0740	39.360	39.4	1.2	0.874	0.417	1.290	3.10	44.017	0.853	0.437
8	0.0969	44.108	44.1	1.6	0.975	0.395	1.370	3.47	44.168	0.882	0.488
9	0.1191	48.503	48.5	2.0	1.068	0.386	1.455	3.77	44.228	0.920	0.534
10	0.1419	52.616	52.6	2.4	1.154	0.385	1.540	4.00	44.234	0.962	0.577
11	0.1649	56.543	56.5	2.8	1.236	0.390	1.625	4.17	44.204	1.007	0.618
12	0.1876	60.358	60.4	3.1	1.314	0.396	1.710	4.31	44.157	1.053	0.657
13	0.2103	64.030	64.0	3.5	1.388	0.402	1.791	4.45	44.116	1.097	0.694
14	0.2338	67.527	67.5	3.9	1.458	0.412	1.870	4.54	44.052	1.141	0.729
15	0.2556	70.979	71.0	4.3	1.527	0.424	1.951	4.60	43.967	1.187	0.763
16	0.2785	74.277	74.3	4.7	1.591	0.437	2.028	4.64	43.876	1.233	0.796
17	0.3101	78.728	78.7	5.2	1.677	0.455	2.133	4.68	43.748	1.294	0.839
18	0.3389	82.814	82.8	5.7	1.755	0.473	2.228	4.71	43.625	1.351	0.878
19	0.3676	86.752	86.8	6.2	1.830	0.491	2.321	4.72	43.498	1.406	0.915
20	0.3963	90.788	90.8	6.7	1.905	0.510	2.415	4.73	43.367	1.463	0.952
21	0.4241	94.531	94.5	7.1	1.973	0.524	2.497	4.77	43.274	1.510	0.987
22	0.4532	98.299	98.3	7.6	2.041	0.540	2.581	4.78	43.159	1.561	1.021
23	0.4817	101.980	102.0	8.1	2.107	0.559	2.666	4.77	43.030	1.612	1.053
24	0.5101	105.605	105.6	8.6	2.170	0.578	2.748	4.76	42.898	1.663	1.085
25	0.5390	109.133	109.1	9.0	2.231	0.597	2.828	4.74	42.767	1.712	1.115
26	0.5674	112.801	112.8	9.5	2.294	0.616	2.910	4.72	42.632	1.763	1.147
27	0.5960	116.390	116.4	10.0	2.354	0.636	2.991	4.70	42.491	1.813	1.177
28	0.6244	119.742	119.7	10.5	2.409	0.654	3.063	4.69	42.371	1.858	1.205
29	0.6531	123.187	123.2	11.0	2.465	0.670	3.135	4.68	42.260	1.902	1.233
30	0.6819	126.489	126.5	11.4	2.518	0.690	3.207	4.65	42.121	1.948	1.259
31	0.7099	129.728	129.7	11.9	2.568	0.710	3.278	4.62	41.978	1.994	1.284
32	0.7389	132.883	132.9	12.4	2.616	0.731	3.347	4.58	41.835	2.039	1.308
33	0.7672	136.126	136.1	12.9	2.666	0.753	3.418	4.54	41.684	2.085	1.333
34	0.7949	139.141	139.1	13.3	2.710	0.774	3.484	4.50	41.533	2.129	1.355
35	0.8241	141.982	142.0	13.8	2.750	0.797	3.547	4.45	41.375	2.172	1.375
36	0.8527	144.860	144.9	14.3	2.790	0.814	3.604	4.43	41.254	2.209	1.395
37	0.8644	144.578	144.6	14.5	2.778	0.826	3.604	4.37	41.177	2.215	1.389

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	57.430			1247.420
Moisture content: Dry soil+tare, gms.	45.150			990.800
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	27.2	27.7	25.9	25.9
Moist specimen weight, gms.	1266.72			
Diameter, in.	2.865	2.863	2.839	
Area, in.²	6.447	6.438	6.329	
Height, in.	5.989	5.985	5.913	
Net decrease in height, in.		0.004	0.072	
Net decrease in water volume, cc.			18.200	
Wet density, pcf	125.0	125.8	127.6	
Dry density, pcf	98.3	98.5	101.4	
Void ratio	0.7700	0.7665	0.7155	
Saturation, %	98.4	100.8	100.8	

Test Readings for Specimen No. 2

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 53.840 psi (7.753 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 1.993 ksf
Strain rate, %/min. = 0.44
Fail. Stress = 2.010 ksf **at reading no.** 37
Ult. Stress = 2.051 ksf **at reading no.** 41

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.993	1.993	1.00	40.000	1.993	0.000
1	0.0107	18.276	18.3	0.2	0.415	1.756	2.171	1.24	41.647	1.963	0.208
2	0.0117	23.049	23.0	0.2	0.523	1.699	2.222	1.31	42.043	1.960	0.262
3	0.0153	29.039	29.0	0.3	0.659	1.609	2.268	1.41	42.665	1.939	0.330
4	0.0177	33.827	33.8	0.3	0.767	1.532	2.299	1.50	43.202	1.916	0.384
5	0.0207	37.875	37.9	0.3	0.859	1.465	2.324	1.59	43.668	1.894	0.429
6	0.0233	41.075	41.1	0.4	0.931	1.408	2.339	1.66	44.062	1.873	0.465
7	0.0278	44.950	44.9	0.5	1.018	1.337	2.355	1.76	44.555	1.846	0.509
8	0.0403	48.456	48.5	0.7	1.095	1.237	2.332	1.88	45.247	1.785	0.548
9	0.0522	51.663	51.7	0.9	1.165	1.172	2.338	1.99	45.698	1.755	0.583
10	0.0683	54.915	54.9	1.2	1.235	1.106	2.342	2.12	46.156	1.724	0.618
11	0.0912	58.239	58.2	1.5	1.305	1.043	2.348	2.25	46.595	1.696	0.652
12	0.1145	60.895	60.9	1.9	1.359	1.000	2.359	2.36	46.894	1.680	0.679
13	0.1371	63.200	63.2	2.3	1.405	0.966	2.371	2.45	47.131	1.669	0.702
14	0.1591	64.956	65.0	2.7	1.438	0.945	2.384	2.52	47.275	1.665	0.719
15	0.1830	66.626	66.6	3.1	1.469	0.932	2.401	2.58	47.370	1.666	0.735
16	0.2063	67.505	67.5	3.5	1.482	0.925	2.408	2.60	47.414	1.666	0.741
17	0.2291	68.378	68.4	3.9	1.496	0.922	2.418	2.62	47.435	1.670	0.748
18	0.2521	69.492	69.5	4.3	1.514	0.920	2.434	2.65	47.453	1.677	0.757
19	0.2753	70.481	70.5	4.7	1.529	0.919	2.448	2.66	47.458	1.684	0.765
20	0.2977	71.558	71.6	5.0	1.546	0.918	2.464	2.68	47.465	1.691	0.773
21	0.3265	73.274	73.3	5.5	1.575	0.914	2.490	2.72	47.490	1.702	0.788
22	0.3553	74.968	75.0	6.0	1.603	0.907	2.510	2.77	47.540	1.709	0.802

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.3846	76.864	76.9	6.5	1.635	0.901	2.536	2.81	47.581	1.719	0.818
24	0.4133	78.801	78.8	7.0	1.668	0.896	2.564	2.86	47.618	1.730	0.834
25	0.4420	80.473	80.5	7.5	1.694	0.893	2.587	2.90	47.637	1.740	0.847
26	0.4707	82.472	82.5	8.0	1.727	0.890	2.617	2.94	47.658	1.754	0.864
27	0.4993	84.387	84.4	8.4	1.758	0.891	2.648	2.97	47.656	1.769	0.879
28	0.5280	86.222	86.2	8.9	1.787	0.893	2.680	3.00	47.635	1.787	0.893
29	0.5569	87.967	88.0	9.4	1.813	0.892	2.705	3.03	47.643	1.799	0.907
30	0.5859	89.512	89.5	9.9	1.835	0.894	2.729	3.05	47.632	1.811	0.917
31	0.6149	91.470	91.5	10.4	1.865	0.899	2.764	3.08	47.599	1.831	0.932
32	0.6435	92.640	92.6	10.9	1.878	0.905	2.784	3.08	47.555	1.844	0.939
33	0.6723	94.886	94.9	11.4	1.914	0.912	2.825	3.10	47.507	1.869	0.957
34	0.7010	96.435	96.4	11.9	1.934	0.920	2.854	3.10	47.449	1.887	0.967
35	0.7295	98.590	98.6	12.3	1.967	0.928	2.894	3.12	47.398	1.911	0.983
36	0.7584	99.839	99.8	12.8	1.980	0.935	2.915	3.12	47.348	1.925	0.990
37	0.7869	101.885	101.9	13.3	2.010	0.940	2.949	3.14	47.315	1.944	1.005
38	0.8157	103.363	103.4	13.8	2.027	0.951	2.978	3.13	47.239	1.964	1.014
39	0.8443	104.942	104.9	14.3	2.047	0.961	3.008	3.13	47.169	1.984	1.023
40	0.8589	106.334	106.3	14.5	2.068	0.966	3.034	3.14	47.129	2.000	1.034
41	0.8711	105.714	105.7	14.7	2.051	0.974	3.025	3.11	47.074	2.000	1.026

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	45.580			1240.380
Moisture content: Dry soil+tare, gms.	35.890			993.620
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	27.0	27.1	24.8	24.8
Moist specimen weight, gms.	1272.98			
Diameter, in.	2.869	2.863	2.831	
Area, in.²	6.465	6.437	6.293	
Height, in.	5.995	5.982	5.895	
Net decrease in height, in.		0.013	0.087	
Net decrease in water volume, cc.			23.100	
Wet density, pcf	125.1	126.1	128.5	
Dry density, pcf	98.5	99.2	102.9	
Void ratio	0.7652	0.7537	0.6895	
Saturation, %	98.3	100.3	100.3	

Test Readings for Specimen No. 3

Membrane modulus = 0.14 kN/cm²
Membrane thickness = 0.03 cm
Consolidation cell pressure = 60.980 psi (8.781 ksf)
Consolidation back pressure = 40.000 psi (5.760 ksf)
Consolidation effective confining stress = 3.021 ksf
Strain rate, %/min. = 0.44
Fail. Stress = 3.832 ksf **at reading no.** 29
Ult. Stress = 4.549 ksf **at reading no.** 41

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	3.021	3.021	1.00	40.000	3.021	0.000
1	0.0100	15.499	15.5	0.2	0.354	2.725	3.079	1.13	42.058	2.902	0.177
2	0.0116	22.961	23.0	0.2	0.524	2.613	3.138	1.20	42.832	2.876	0.262
3	0.0142	32.884	32.9	0.2	0.751	2.440	3.191	1.31	44.032	2.816	0.375
4	0.0168	41.179	41.2	0.3	0.940	2.288	3.228	1.41	45.089	2.758	0.470
5	0.0212	50.673	50.7	0.4	1.155	2.104	3.259	1.55	46.369	2.682	0.578
6	0.0251	58.321	58.3	0.4	1.329	1.954	3.283	1.68	47.413	2.618	0.664
7	0.0315	65.910	65.9	0.5	1.500	1.797	3.297	1.83	48.501	2.547	0.750
8	0.0391	73.439	73.4	0.7	1.669	1.643	3.313	2.02	49.567	2.478	0.835
9	0.0486	80.999	81.0	0.8	1.838	1.487	3.326	2.24	50.650	2.407	0.919
10	0.0619	88.265	88.3	1.0	1.999	1.348	3.346	2.48	51.622	2.347	0.999
11	0.0795	95.344	95.3	1.3	2.152	1.225	3.377	2.76	52.474	2.301	1.076
12	0.1024	102.794	102.8	1.7	2.312	1.121	3.432	3.06	53.197	2.277	1.156
13	0.1248	108.909	108.9	2.1	2.440	1.055	3.495	3.31	53.651	2.275	1.220
14	0.1482	114.215	114.2	2.5	2.548	1.015	3.563	3.51	53.932	2.289	1.274
15	0.1713	119.083	119.1	2.9	2.646	0.991	3.637	3.67	54.101	2.314	1.323
16	0.1941	123.680	123.7	3.3	2.737	0.976	3.713	3.80	54.200	2.345	1.369
17	0.2174	128.168	128.2	3.7	2.825	0.969	3.793	3.92	54.254	2.381	1.412
18	0.2408	132.478	132.5	4.1	2.908	0.966	3.874	4.01	54.269	2.420	1.454
19	0.2634	136.730	136.7	4.5	2.989	0.967	3.957	4.09	54.262	2.462	1.495
20	0.2864	141.658	141.7	4.9	3.084	0.972	4.056	4.17	54.231	2.514	1.542
21	0.3124	146.454	146.5	5.3	3.174	0.978	4.152	4.25	54.190	2.565	1.587
22	0.3411	151.814	151.8	5.8	3.273	0.985	4.259	4.32	54.137	2.622	1.637

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
23	0.3704	156.083	156.1	6.3	3.347	0.998	4.346	4.35	54.049	2.672	1.674
24	0.3988	161.642	161.6	6.8	3.449	1.013	4.462	4.40	53.946	2.737	1.724
25	0.4274	165.079	165.1	7.2	3.504	1.029	4.533	4.40	53.831	2.781	1.752
26	0.4562	170.207	170.2	7.7	3.594	1.046	4.640	4.43	53.713	2.843	1.797
27	0.4847	174.826	174.8	8.2	3.672	1.066	4.737	4.45	53.580	2.901	1.836
28	0.5139	179.241	179.2	8.7	3.744	1.085	4.829	4.45	53.447	2.957	1.872
29	0.5426	184.404	184.4	9.2	3.832	1.102	4.933	4.48	53.329	3.018	1.916
30	0.5715	188.853	188.9	9.7	3.903	1.122	5.025	4.48	53.189	3.073	1.951
31	0.5999	193.860	193.9	10.2	3.985	1.144	5.129	4.48	53.037	3.136	1.992
32	0.6293	197.740	197.7	10.7	4.042	1.167	5.209	4.46	52.878	3.188	2.021
33	0.6575	202.277	202.3	11.2	4.113	1.190	5.303	4.45	52.713	3.247	2.056
34	0.6869	206.743	206.7	11.7	4.180	1.215	5.395	4.44	52.542	3.305	2.090
35	0.7155	210.941	210.9	12.1	4.241	1.239	5.481	4.42	52.373	3.360	2.121
36	0.7440	216.274	216.3	12.6	4.325	1.263	5.587	4.43	52.212	3.425	2.162
37	0.7728	220.480	220.5	13.1	4.384	1.286	5.670	4.41	52.048	3.478	2.192
38	0.8014	224.472	224.5	13.6	4.439	1.313	5.752	4.38	51.861	3.532	2.219
39	0.8303	228.118	228.1	14.1	4.485	1.341	5.826	4.35	51.670	3.583	2.243
40	0.8586	233.107	233.1	14.6	4.558	1.369	5.926	4.33	51.476	3.647	2.279
41	0.8712	233.271	233.3	14.8	4.549	1.387	5.936	4.28	51.348	3.662	2.275

Project Name: I-77 Panthers Interchange

Project #: 1461-19-069

Boring #: RW-12

Depth: 19.0’ – 21.0’ (UD-4)

Sample Date: 1/09 & 1/14/20

Test Type: Consolidated Undrained Triaxial Shear (ASTM D4767)

Appendix XII – Corrosion Series Laboratory Test Results

Results Only Soil Testing for I-77 Panthers Interchange

February 7, 2020

Prepared for:
Chad Bruorton
S&ME, Inc.
134 Suber Road
Columbia, SC 29210
CBruorton@smeinc.com

Project X Job#: S200204F
Client Job or PO#: 1461-19-069

Respectfully Submitted,

Eduardo Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

REGISTERED PROFESSIONAL ENGINEER
EDUARDO HERNANDEZ
No. M37102
MECHANICAL
STATE OF CALIFORNIA

Soil Analysis Lab Results

Client: S&ME, Inc.
Job Name: I-77 Panthers Interchange
Client Job Number: 1461-19-069
Project X Job Number: S200204F
February 7, 2020

	Method	ASTM D4327		ASTM D4327		ASTM G187		ASTM G51
Bore# / Description	**Depth**	**Sulfates** SO_4^{2-}		**Chlorides** Cl^-		**Resistivity** As Rec'd	Minimum	**pH**
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(Ohm-cm)	(Ohm-cm)	
EB-2 to SS-3	4.0-6.0	66.8	0.0067	76.2	0.0076	12,730	5,025	7.3
IB-4 to SS-5	8.0-10.0	3.0	0.0003	28.4	0.0028	5,360	4,824	6.7

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract

Project X
Corrosion Engineering
Corrosion Control - Soil, Water, and Metallurgy Lab

Lab Request Sheet Chain of Custody
Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com
Ship Samples To: 29990 Technology Dr, #13, Murrieta, CA 92563

Project X Job Number S200204F S&ME 1461-19-069 I-77 2 Quad

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Company Name:	S&ME	**Contact Name:**	Chad Bruorton
Mailing Address:	134 Suber Road, Columbia, SC, 29210	**Contact Email:**	cbruorton@smeinc.com
Accounting Contact:		**Invoice Email:**	
Project Name:	I-77 Interchange near Exit 80	**Client Project No:**	1461-19-069
P.O. #:		**Phone No. :**	8039209738

Turn Around Time: 5 Day Normal ✔ | 3 Day RUSH 75% mark-up | 2 Day RUSH 100% mark-up

Results By: ☐ Phone ☐ Fax ☑ Email ☐ Mail ☐ Overnight Mail (charges apply)

Date & Received by : **Default Method**

SPECIAL INSTRUCTIONS:

ANALYSIS REQUESTED (Please circle)

	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	CORROSION SERIES	Soil Resistivity	pH	Sulfate	Chloride	Redox Potential	BiCarbonate	Alkalinity	Acidity	Nitrate	Ammonia	Sulfide	Moisture Content	Soil Corrosivity Evaluation Report	Metallurgical Analysis	NOTES
	Min. Resistivity, Sulfate, Chloride, Sulfide, Redox, pH, Ammonia, Nitrate.					ASTM G187	ASTM G 51	ASTM D516	ASTM D512B	SM 2580B	SM 2320B	SM 2520B	SM 2510B	Hach 835	Hach 830	SM 4500-S2	ASTM D2216			
						AASHTO T2888	AASHTO T 289	AASHTO T 290	AASHTO T 291					SM 4500-NO3	SM 4500-NH3	SM 4500-S2				
						Caltrans CTM64	Caltrans CTM64	Caltrans CTM41	Caltrans CTM42											
1	EB-2 - SS-3	silty fine sand	4-6	01/07/20		✔	✔	✔	✔											
2	IB-4 - SS-5	lean clay	8-10	01/16/20		✔	✔	✔	✔											
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
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