

GEOTECHNICAL BASE LINE REPORT

US 15 Bridge Replacement over Indian Field Swamp
Dorchester County, South Carolina



PREPARED FOR

SCDOT
955 Park Street
Columbia, South Carolina 29201



PREPARED BY

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SCDOT Project ID: P037127
FME Project No.: G6100.12

OCTOBER 31, 2019

October 31, 2019

Mr. Trapp Harris, P.E.
Design-Build Group Geotechnical Engineer
South Carolina Department of Transportation
955 Park Street
Columbia, South Carolina 29201

Re.: Geotechnical Base Line Report
US 15 Bridge Replacement over Indian Field Swamp
Dorchester County, South Carolina
SCDOT Project ID P037127
F&ME File No. G6100.12

Mr. Harris:

Submitted herein is the geotechnical base line report for the above referenced project. Included is a summary of the subsurface investigation, the subsurface findings, the soil laboratory test results, and our preliminary evaluation for the conceptual bridge foundation systems and bridge/roadway embankments.

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

Respectfully Submitted,

F&ME CONSULTANTS



John F. Hamilton, P.E.
Geotechnical Design Manager

A handwritten signature in black ink, appearing to read 'Alex P. Ross'.

Alex P. Ross, E.I.T
Geotechnical Associate

Attachments

APR:JFH/jfh



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1. PROJECT DESCRIPTION

The project is located approximately three (3) miles northeast of the Town of Saint George, South Carolina. A site location plan is presented in Section 1 of the Appendix.

We understand that the project consists of replacing the existing bridge over Indian Field Swamp with a new bridge structure. An existing box culvert may also be replaced as part of this project. We anticipate the proposed roadway grade will be less than five (5) feet relative to the centerline of the existing embankment. Embankment widenings will result in embankment side slopes extending over natural ground soils.

The geotechnical field investigation was performed by F&ME in general accordance with the SCDOT Geotechnical Design Manual and the SCDOT Scope of Services work order, dated July 17, 2019.

2. SUBSURFACE INVESTIGATION

From September 19-26, 2019, four (4) bridge soil test borings (designated as B-1 through B-4), five (5) cone penetrometer soundings (designated as CPT-1 through CPT-4, and CPT-3A), four (4) roadway embankment soil test borings (designated as R-1 through R-4), four (4) bulk soil samples (designated as BS-1 through BS-4), and two (2) multi-channel analysis of surface waves (MASW) tests were performed in the vicinity of the project.

The soil test borings were advanced utilizing a trailer-mounted CME 45B drill rig. The borings utilized rotary wash drilling techniques to maintain a stable borehole. Standard Penetration Tests (SPT) were continuously obtained in the top ten (10) feet of each test boring. Following the continuous sampling, SPT samples were obtained at regular, five (5) foot intervals throughout the remaining depths of the borings. SPT samples were performed in general accordance with ASTM D-1586 to determine the relative densities and consistencies of the subsurface soils and to collect subsurface soil samples. An automatic hammer was used to perform the SPT's. The measured energy ratio for the CME 45B hammer is 92%.

The bridge and roadway borings were advanced to target depths and were subsequently terminated. In general, the bridge and roadway borings extended to depths of 100 feet and thirty (30) feet below the top of the existing embankments, respectively. CPT soundings extended to a depth where the maximum reaction force of the rig was observed. In general, the CPT's extended to depths ranging from twenty (20) to thirty (30) feet below the top of the existing embankments.

Bulk soil samples were collected for laboratory testing to provide either soil strength parameters for the existing embankment soils or soil parameters for pavement subgrades. The bulk soil samples were collected and composited from an approximate depth of one (1) to five (5) feet below the existing ground surface.

The locations, depths, and elevations of the borings performed for the subsurface investigation are provided in the following table.

Subsurface Investigation Summary Table					
Boring I.D.	Test Hole Locale	Station (US 15)	Offset from CL (ft)	Boring Elevation (ft-MSL)	Test Depth (ft)
B-1	Bridge	90+58	8'-RT	78.8	100
B-2	Bridge	91+29	8'-LT	78.9	100
B-3	Bridge	98+06	8'-RT	79.9	100
B-4	Bridge	98+86	6'-LT	79.9	100
R-1	Road	88+01	7'-RT	79.7	30
R-2	Road	93+00	8'-LT	79.0	28.8
R-3	Road	96+01	7'-RT	79.5	30
R-4	Road	102+01	7'-RT	81.0	30
CPT-1	Bridge	90+57	13'-LT	78.4	28.25
CPT-2	Bridge	91+29	13'-RT	79.1	27.83
CPT-3	Bridge	97+94	12'-LT	79.4	18
CPT-3A	Bridge	97+79	12'-LT	79.4	18.05
CPT-4	Bridge	98+92	14'-RT	78.2	18.58
BS-1	Bridge	91+15	14'-LT	78.1	5
BS-2	Road	95+95	14'-RT	78.9	5
BS-3	Bridge	98+98	15'-RT	80.2	5
BS-4	Road	101+98	13'-RT	81.6	5

The collected soil samples were examined and logged in the field by F&ME personnel, sealed in plastic bags, and transported to our laboratory for further examination and analyses. The soils were visually classified in the field based upon the Unified Soil Classification System.

We have provided a boring location plan in Section 3 of the Appendix displaying the locations of the borings performed during the subsurface investigation.

3. LABORATORY TESTING PROGRAM

Select soil samples from the borings were tested in F&ME’s AASHTO certified laboratory to determine physical and engineering soil properties. These tests were used to identify the strength and behavioral characteristics of the soils as well as to verify the field classifications by the AASHTO classification system and the Unified Soil Classification System (USCS). The laboratory testing program is summarized in the following table.

Table 3.1 – Split-Spoon Laboratory Testing Summary Table

Laboratory Soil Testing (Split-Spoon Samples)		
Type of Test	Quantity	Procedure
Natural Moisture Content	53	AASHTO T265 (ASTM D2216)
Atterberg Limits	53	AASHTO T89/T90 (ASTM D4318)
Wash #200	45	AASHTO T11 (ASTM D1140)
Grain Size Analysis with Hydrometer	8	ASTM D7928
Organic Content	2	AASHTO T267 (ASTM D2974)
pH	1	AASHTO T289 (ASTM G51)
Resistivity	1	AASHTO T288
Sulfate Content	1	AASHTO T290 (ASTM C1580)
Chloride Content	1	AASHTO T291

The laboratory testing performed for the bulk soil samples is detailed in the table below, and the data sheets containing the results are provided in the Appendix of this report.

Table 3.2 – Bulk Sample Laboratory Testing Summary Table

Laboratory Soil Testing (Bulk Samples)		
Type of Test	Quantity	Procedure
Natural Moisture Content	4	AASHTO T265 (ASTM D2216)
Atterberg Limits	4	AASHTO T89/T90 (ASTM D4318)
Grain Size Analysis with Wash #200	4	AASHTO D6913
Standard Proctor	4	AASHTO T99 (ASTM D698)
CBR	2	AASHTO T193 (ASTM D1883)
Direct Shear	2	AASHTO T236 (ASTM D3080)
pH	1	AASHTO T289 (ASTM G51)
Resistivity	1	AASHTO T288
Sulfate Content	1	AASHTO T290 (ASTM C1580)
Chloride Content	1	AASHTO T291

All soil testing was conducted in general accordance with applicable ASTM/AASHTO standards. Data sheets presenting the results of the laboratory test program are provided in Section 9 of the Appendix.

4. GENERAL SITE GEOLOGY

The project site is located within the Middle Coastal Plain Physiographic Province of South Carolina. In descending order, the site subsurface conditions generally consist of existing embankment fill, Holocene-aged alluvium, oligocene-aged Ashley Formation soils, and eocene-aged Santee Limestone.

The Holocene-aged soils, of primarily alluvial origin, represent natural grade soils below the existing embankment fill material. The thickness of the Holocene soils ranged from approximately five (5) to ten (10) feet. The recovered samples within the Holocene layer were generally classified as loose, medium plasticity, clayey sands with fines contents between 20% and 40%.

Below the Holocene deposits, the encountered soils are consistent with the Oligocene-aged Ashley Formation (a member of the Cooper geologic group and formerly referred to as Cooper Marl). At this site, the Ashley Formation soils were generally classified as dark colored, non-plastic to low-plasticity silty sands or sandy silt. Typically, relative densities in the marl increase based on the age of the marl. The bridge site appears to be in an area of moderately-aged marl, and the observed SPT N-values are generally between ten (10) and twenty (20) blows per foot (bpf). These blow counts suggest medium dense sands and stiff to very stiff silts.

Underlying the Ashley Formation is the Santee Limestone. Silty and/or clayey calcareous sand was primarily identified in this formation. The identifying characteristic of this stratum is the “caprock” feature located at the top of the stratum. This feature is relatively thin (<1 ft thick) and may likely be a containment mechanism for the artesian water contained within the limestone. A majority of the stratum contained soils with appreciable calcium carbonate content. N-values typically ranged between twenty (20) and forty (40) bpf with interbedded thin, cemented layers having N-values of greater than 100 bpf. The Santee Limestone was encountered to a boring termination depth of 100 feet.

5. SUBSURFACE CONDITIONS

The below soil descriptions, strata depths, and consistencies are generalized and were interpreted by F&ME based on the subsurface conditions as encountered in the test borings. We have included the soil test boring logs in the Appendix for detailed descriptions of the encountered soil conditions. As with any geologic formation, the depth and thickness of the soil strata will vary across the site. Although the test borings designate strata changes at specific depths in the description of the soil stratigraphy on the soil test boring logs, transitions between soil strata are generally gradual. Therefore, the outlined subsurface profile shown on the soil test boring logs should only be considered general, on-site soil conditions and should not be utilized as an absolute indicator.

5.1 Soil Stratigraphy

The following table summarizes the soil stratification along the proposed roadway alignment.

Soil Stratification Table					
Geologic Formation	Elevation of Top of Layer (ft-MSL)	Depth to Top of Layer (ft)	USCS Soil Type	Avg. SPT N-Value (bpf)	Comments
Existing Embankment Fill	+80	0	SM/SC/SP-SM	12	Existing Fill
Alluvium	+74	6	SM/SC	6	Holocene
Ashley Formation (Marl)	+68	12	SM/ML	15	Oligocene
Santee Limestone	+51	29	SC-SM/SM GP/SP	36	Eocene

5.2 Subsurface Shear Wave Velocity

Geophysical testing consisting of two (2) Multi-channel Analysis of Surface Waves (MASW) tests were performed from the approximate top of the existing embankment areas, between the existing bridge and box culvert. The MASW array locations are provided on the Boring Location Plan in Section 3 of the Appendix. From the geophysical testing, two (2) subsurface shear wave velocity profiles were developed. Based on the shear wave velocity profile, the shear wave velocities begin to approximate 2,500 ft/sec at a depth of approximately forty (40) feet. The depth at which the subsurface shear wave velocity consistently exceeds 2,500 ft/sec is considered the B-C Boundary. Based on available geologic data and other deep boreholes in the general vicinity of the site, we do not believe that the B-C Boundary exists within the top 100 feet. We believe the limestone caprock and the cemented sand layers are dominating the shear wave velocity characteristics at the site. The graphical shear wave velocity profiles are provided in Section 7 of the Appendix.

The shear wave velocity information was submitted to SCDOT for development of the project seismic design data. The provided ADRS curves from the SCDOT are provided in Section 8 of the Appendix.

5.3 Groundwater Conditions

Groundwater table measurements were recorded immediately following completion of the borings and/or 24-hours following completion of the borings. The depth to the groundwater table ranged from approximately two (2) feet to ten (10) feet. These depths correspond to a groundwater elevation ranging from approximately +77 ft-MSL to +69 ft-MSL.

Groundwater elevations at this site will fluctuate with climactic events. During and following periods of rainfall, the water table may be encountered at higher elevations than identified on the field testing logs. During the field investigation, an artesian water condition was encountered in each of the deeper bridge borings. The artesian condition is believed to originate from the Santee Limestone formation. The artesian water pressure is believed to be contained by the caprock feature at the top of the limestone stratum. The observed water pressure head was approximately one (1) to four (4) feet above the water table measured at the time of boring. This may not be an accurate indicator of the artesian pressure as some of the artesian water may be moving laterally in the alluvial sands. No water was observed above the existing pavement elevations at the time of our field investigation. The Design-Build team should evaluate the groundwater conditions at the site and exercise engineering judgement when selecting foundation types.

6. CONCEPTUAL GEOTECHNICAL ASSESSMENT

The geotechnical information, provided herein, is conceptual and is based on limited geotechnical data. The information provided should be supplemented and evaluated relative to the SCDOT GDM and Team specific design and construction requirements for preliminary and final design purposes. Following the collection of additional subsurface data, these recommendations may change or become invalid. We have provided very general and conceptual geotechnical information based on the subsurface information collected by F&ME during this phase of the project.

6.1. Site Preparation

Based on the subsurface conditions encountered during the field investigation, the soil subgrades below the planned embankment areas appear to be adequate for embankment construction. The embankment subgrade soils are generally comprised of saturated, clay-like sands that may perform unsatisfactorily. At areas where new fill will be placed over these soils, localized mucking, bridge lifts, and/or soil reinforcement may be required to achieve acceptable performance. During and following periods of rainfall, mucking operations may be more prevalent.

6.2. Geotechnical Seismic Hazard Potential

Geotechnical seismic hazards consist of a loss in a soil's shear strength through cyclic ground motions induced by earthquakes. In sand-like soils, this phenomenon is typically referred to as soil liquefaction. Cyclic-softening is the typical terminology for fine grained soils. Liquefaction of sand-like soils is considered the most devastating seismically induced geotechnical hazard.

Liquefaction is the loss of a soil's shear strength due to a rapid increase in pore water pressure resulting from soil particle dilation induced by seismic vibrations. Soils most susceptible to liquefaction generally consist of saturated, loose, "clean" (i.e., Plasticity Indexes less than 7), fine (10% particle size ranging from 0.07 millimeters to 0.25 millimeters) sands. Soil softening occurs in moderate to high plasticity silts and clays.

Based on a qualitative review of the collected subsurface information, seismic soil Shear Strength Loss (SSL) is expected at the site. At locations where SSL triggering may be present, a seismic deformation analysis should be performed to calculate the vertical settlement from the sand-like soil particle re-distribution. In addition, the lateral displacements should also be calculated from lateral spreading of the liquefied soils and their impact on foundations should be addressed.

Following the acquisition of additional subsurface information, the Design-Build Team should carefully evaluate the liquefaction potential at the site and determine if ground improvement is necessary to accommodate seismically induced deformations.

6.3. Static Settlement

In general, the proposed bridge and roadway embankment subgrade soils consist of low density/consistency sandy soils below the static, groundwater table. Fill placement along the project will result in deformation of the subgrade soils. We anticipate that any problematic soils near the ground surface, would be removed and replaced prior to fill placement, since these soils would be difficult to stabilize prior to embankment construction. We anticipate that a majority of the settlement across the project would occur rapidly with fill placement. The potential for extensive, long-term consolidation settlements appears to be low at the site.

6.4. Embankment Slope Stability

Static and seismic embankment slope stability analyses are required at the bridge embankments. Only static stability analyses are required at the roadway embankment locations as defined in the GDM. From reviewing the boring logs, we anticipate that ground improvement and/or modification will be required at the bridge and roadway embankments to generate resistance factors that meet the GDM design criteria.

6.5. Pile Corrosion and Deterioration Potential

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

1. Resistivity less than 2,000 ohm-cm;
2. pH less than 5.5;
3. pH between 5.5 and 8.5 in soils with high organic content;
4. Sulfate concentrations greater than 1,000 ppm;
5. Landfills and cinder fills;
6. Soils subject to mine or industrial discharge; and,
7. Areas with a mixture of high resistivity soils and low resistivity high alkaline soils.

Corrosion series laboratory testing consisting of pH, resistivity, sulfate content, and chloride content testing was performed on select soils within soil boring B-3 and bulk sample BS-1. The results from the corrosion series laboratory testing are provided in Section 9 of the Appendix. Based on the results from the corrosion series testing, the potential for subsurface steel corrosion or concrete degradation at this site is low. Following additional subsurface testing, the D-B team should carefully evaluate the geotechnical conditions relative to steel corrosion and concrete degradation and provide mitigation measures, as necessary.

6.6. Pile Foundations

Pile foundations are anticipated for support of the bridge. We anticipate that most locations can utilize driven pile techniques. Predrilling or drilled pile techniques may be required to advance the piles below the Santee Limestone caprock. Specific pile foundation design issues are discussed in the following sections.

6.6.1. Axial Resistance

The Strength limit state axial loading conditions will likely govern the geotechnical pile foundation design.

Non-displacement, driven piles will develop a majority of the required driving resistance through a combination of skin friction and tip resistance in the Santee Limestone. The Santee Limestone caprock feature is relatively thin. The Design-Build team should carefully evaluate the structural integrity of this feature before utilizing this layer as a resisting element. We expect that medium to large sized pile hammers will be required to advance the piles through the cemented sand lenses and mobilize the required driving resistance.

Based on the subsurface conditions, displacement piles are suitable at the site. If displacement piles are utilized, we anticipate a composite pile section would be preferred. The composite pile would consist of a larger top of pile section that would develop a majority of the axial resistance and smaller, shorter bottom of pile section that would improve drivability.

We anticipate the pile driving termination criteria will be based on either a wave equation analysis or Pile Dynamic Analyses (PDA) with capacity verification analyses (ie. CAPWAP). If the required driving resistance is not attained during initial drive, then a wait period may be implemented to allow for pile freeze. Following the wait period, pile driving re-strikes should be performed. Continuous PDA testing should be considered during both the initial drive and the re-strikes, if necessary. The number of required PDA tests shall be in accordance with the GDM.

6.6.2. Lateral Resistance

For the Strength limit state, Service limit state, and the Extreme Event limit state, we anticipate that the driven piles will develop the required lateral stability primarily in the Ashley Formation soils and the Santee Limestone soils. The 100-yr and 500-yr scour depths should be implemented in the lateral analyses. The interior bent pile point-of-fixity depths will likely occur below the limestone caprock elevations, and predrilling or drilled pile techniques may be required to advance the piles below the caprock. Seismic SSL should also be evaluated to determine if foundation tip elevations should be extended below the depths needed to satisfy the Strength and Service limit states. At the end bents, the seismic bridge abutment backwall passive pressure shall be calculated in accordance with Chapter 14 of the GDM for the existing embankment fill material or the selected embankment fill material.

6.6.3. Drivability

Driven piles will likely use a diesel pile hammer. We anticipate that non-displacement piles (ie. steel H-piles or steel open-ended pipe piles) will be utilized at the end bents. Pre-stressed concrete (PSC) piles are likely suitable at the interior bents.

Based on the anticipated pile lengths, we expect that most steel pile foundations will require a pile splice and will be driven in two (2) or more sequences. When pile driving in the denser Coastal Plain soils and when pile tip elevations are above the minimum tip elevations, the Contractor should be careful to minimize the time between driving sequences to avoid substantial pile freeze such that the piles cannot be further advanced to the minimum tip elevation requirement.

If PSC piles are utilized, we anticipate that a composite PSC section will be implemented. We anticipate the composite PSC section will include a short steel extension for the primary purposes of improving drivability. The steel section may also be used for lateral stability. Additional pre-stress and/or concrete strength may be required to accommodate hard driving conditions.

We expect that medium to large sized pile hammers will be required to advance the piles through the limestone caprock and beyond the minimum pile tip elevation required for lateral stability. If driving through the caprock is deemed unreliable, then predrilling or drilled pile techniques may be employed to provide a conduit to the underlying medium dense soils. Due to the proximity of residential structures relative to the proposed construction, the Contractor should address earth-borne vibrations in their pile installation plan.

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

6.7. Drilled Shaft Foundations

Drilled shaft foundations are also an option at the site. We anticipate that drilled shaft sizes could range from 36 inch to 48 inch diameter shafts. Specific drilled shaft design issues are discussed in the following sections.

6.7.1. Axial Resistance

The Strength limit state axial loading conditions are expected to govern the geotechnical design of drilled shafts.

Depending on the approach taken by the Design-Build team, we expect that a majority of the drilled shafts will develop the required axial resistance through a combination of skin friction and tip resistance in the Santee Limestone. Since drilled shafts mobilize shaft resistance and tip resistance at different displacements, it is difficult to predict the load transfer from skin resistance to tip resistance. The Design-Build Team should exercise caution when using a drilled shaft design including both skin friction and end bearing in the limestone.

Construction casing is required to facilitate drilled shaft construction. It is anticipated that the casing would be advanced a short distance from the ground surface, and the drilling slurry would provide stability for the excavation below the casing tip elevation. The drilled shaft design methodology does not allow for resistance development in the cased portion of the drilled shaft. As such, the drilled shaft design will generate the required resistance in the uncased portion below the casing tip elevation.

6.7.2. Lateral Resistance

For the Strength limit state and Extreme Event I limit state, the drilled shafts will develop most of the required lateral stability in the limestone. The 100-yr and 500-yr scour depths should be implemented in the lateral analyses. At this site, we expect the axial loading condition will govern the geotechnical drilled shaft design.

6.7.3. Constructability

Drilled shaft construction will likely require excavation of the caprock material and dense, cemented sand lenses (SPT N-values in excess of 100 bpf). The strength of the caprock was not determined during this investigation, but we anticipate that this material is fragile. Regardless, the Design-Build team should include provisions for this material in their drilled shaft installation plan. Specialized drilling equipment not typically used in the Coastal Plain may be required to excavate through the caprock and cemented sands.

As previously discussed, artesian groundwater conditions were observed at the time of our field investigation. The artesian conditions are believed to be contained by the caprock feature at the top of the limestone stratum. For a drilled shaft foundation, we assume that the shafts will penetrate the caprock, and the artesian groundwater may be allowed to move upwards through the annulus of the drilled shaft perimeter and the borehole wall. Artesian conditions can create a variety of design and constructability issues associated with a drilled foundation. The Contractor should address potential artesian groundwater conditions and their impacts on the constructability of the foundations in their drilled shaft installation plan.

6.8. Shallow Foundations

Shallow foundations are not typically utilized on SCDOT bridges due to the difficulty with balancing both settlement and bearing capacity requirements as well as constructability issues. At this site, shallow foundations are not deemed suitable as a bridge substructure element due to the depth required to meet the Strength Limit State and Extreme Event I Limit State bearing capacity and settlement requirements. In addition, the shallow foundation concept would likely require a cofferdam which is an additional prohibitive operation.

7. EXISTING PAVEMENTS AND SUBGRADE SOIL CONDITIONS

Eight (8) asphalt pavement cores were collected from the borings performed along the existing US 15 roadway. In general, the existing pavement section consists of a Hot Mix Asphalt (HMA) section overlying a concrete pavement section. The existing HMA thickness varied from five (5) to fourteen (14) inches, and the concrete pavement thickness varied from approximately seven (7) to eight (8) inches.

CBR testing was performed on material collected in two (2) bulk samples. The quality of the subgrade material near and below the existing pavements is considered “moderate”. A majority of the near surface soil material yielded an AASHTO soil classification of A-2-4 to A-2-7. At bulk sample BS-2 location (offset to soil boring B-2), a CBR value of approximately twenty (20) was recorded. At bulk sample BS-4 location (offset to soil boring R-4), a CBR value of approximately fourteen (14) was recorded.

8. LIMITATIONS OF REPORT

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

US 15 Bridge Replacement over Indian Field Swamp

Geotechnical Base Line Report

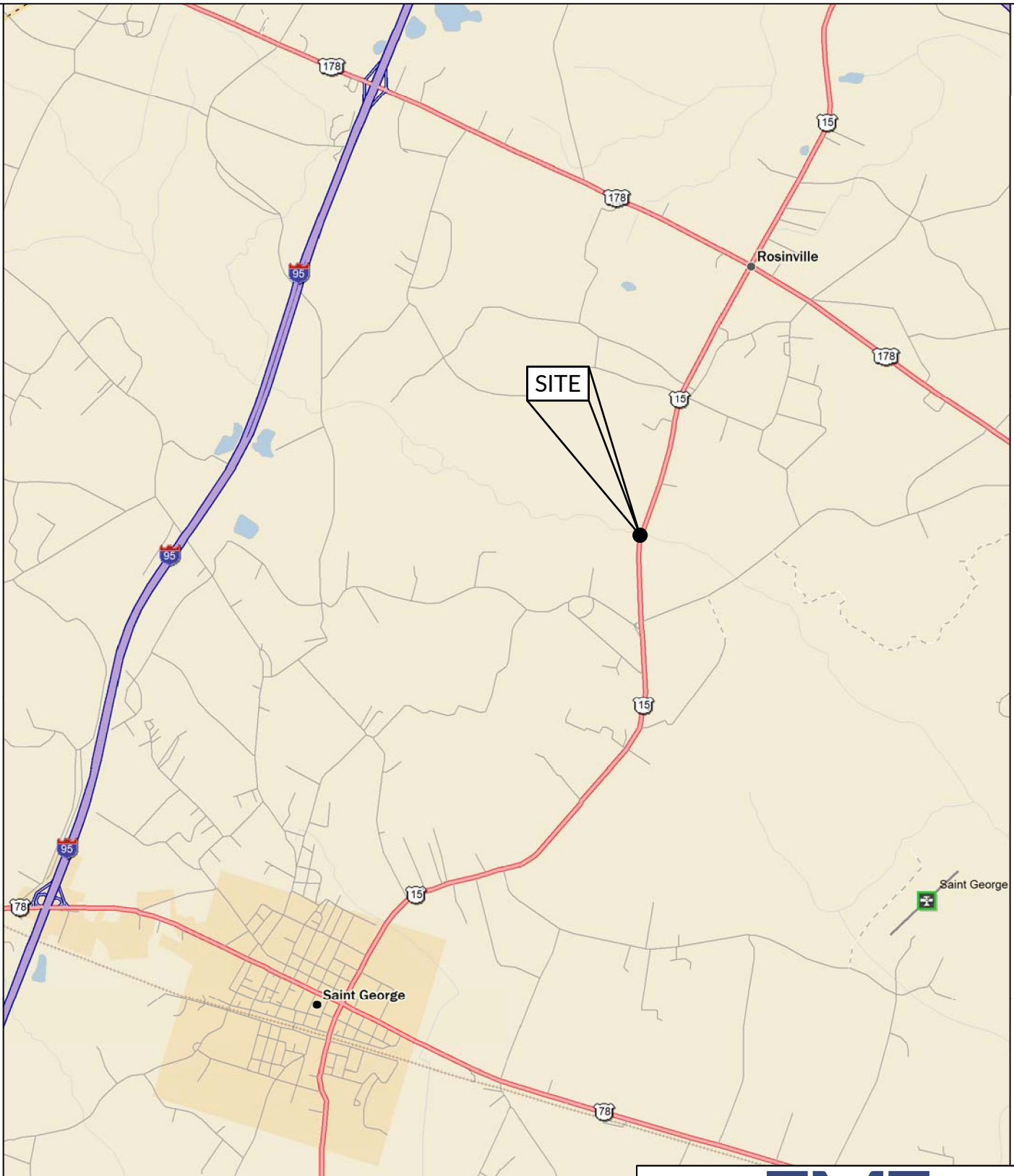
APPENDIX

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SECTION 2	GEOTECHNICAL INVESTIGATION SUMMARY
SECTION 3	BORING LOCATION PLAN
SECTION 4	GENERALIZED SUBSURFACE PROFILE
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SECTION 6	CPT LOGS
SECTION 7	GEOPHYSICAL TEST RESULTS
SECTION 8	ADRS CURVES
SECTION 9	LABORATORY TEST RESULTS

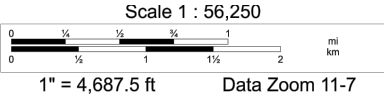
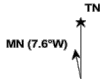
US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 1 SITE LOCATION PLAN



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REV. NO.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	JFH	DATE 10.11.19	GROUP - - -
R/W		DATE	



US 15 OVER INDIAN FIELD SWAMP

SITE LOCATION PLAN

HRZ SCALE = NTS	
VRT SCALE = NTS	

US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 2 GEOTECHNICAL INVESTIGATION SUMMARY

Field Investigation Summary

Boring ID	Test Hole Locale	Alignment	Station	Offset from CL	Northing	Easting	Latitude	Longitude	Elevation	Depth
B-1	Bridge/Road	Ex. US 15 CL	90+58	8 R	509103.420	2140967.296	33.23173	-80.53894	78.8	100.0
B-2	Bridge/Road	Ex. US 15 CL	91+29	8 L	509031.568	2140957.974	33.231532	-80.538971	78.9	100.0
B-3	Bridge/Road	Ex. US 15 CL	98+06	8 R	508400.611	2140710.372	33.229801	-80.53979	79.9	100.0
B-4	Bridge/Road	Ex. US 15 CL	98+86	6 L	508321.071	2140696.598	33.229583	-80.539836	79.9	100.0
R-1	Road	Ex. US 15 CL	88+01	7 R	509344.531	2141056.336	33.232391	-80.538645	79.7	30.0
R-2	Road	Ex. US 15 CL	93+00	8 L	508870.978	2140899.634	33.231092	-80.539164	79.0	28.8
R-3	Road	Ex. US 15 CL	96+01	7 R	508593.794	2140781.604	33.230331	-80.539554	79.5	30.0
R-4	Road	Ex. US 15 CL	102+01	7 R	508022.795	2140594.618	33.228764	-80.540174	81.0	30.0
CPT-1	Bridge/Road	Ex. US 15 CL	90+57	13 L	509097.209	2140987.878	33.231712	-80.538872	78.4	28.3
CPT-2	Bridge/Road	Ex. US 15 CL	91+29	13 R	509038.469	2140938.157	33.231552	-80.539036	79.1	27.8
CPT-3	Bridge/Road	Ex. US 15 CL	97+94	12 L	508401.498	2140733.040	33.229813	-80.539714	79.4	18.0
CPT-3A	Bridge/Road	Ex. US 15 CL	97+79	12 L	508419.288	2140738.775	33.229852	-80.539697	79.4	18.0
CPT-4	Bridge/Road	Ex. US 15 CL	98+92	14 R	508322.804	2140675.450	33.229588	-80.539905	78.2	18.6
BS-1	Road	Ex. US 15 CL	91+15	14 L	509042.669	2140968.827	33.231563	-80.538935	78.1	5.0
BS-2	Road	Ex. US 15 CL	95+95	14 R	508600.962	2140777.163	33.230351	-80.539569	78.9	5.0
BS-3	Road	Ex. US 15 CL	98+98	15 R	508317.064	2140672.743	33.229572	-80.539914	80.2	5.0
BS-4	Road	Ex. US 15 CL	101+98	13 R	508027.293	2140589.398	33.228777	-80.540191	81.6	5.0



US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 3 BORING LOCATION PLAN



US 15 OVER INDIAN FIELD SWAMP

SOIL BORING LOCATION PLAN

4			
3			
2			
1			
REV. NO.	BY	DATE	DESCRIPTION OF REVISION
TOPO.		DATE	
DWG.	JFH	DATE 10.10.19	GROUP - - -
R/W		DATE	

HRZ SCALE = NTS
 VRT SCALE = NTS

US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report















APPENDIX

SECTION 4 GENERALIZED SUBSURFACE PROFILE

KEY TO SYMBOLS

PROJECT NAME US 15 over Indian Field Swamp
 PROJECT COUNTY Dorchester

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)



-  ASPHALT
-  CH: USCS High Plasticity Clay
-  CL: USCS Low Plasticity Clay
-  CL-ML: USCS Low Plasticity Silty Clay
-  MH: USCS Elastic Silt
-  ML: USCS Silt
-  SP: USCS Poorly Graded Sand
-  SM: USCS Silty Sand
-  SC: USCS Clayey Sand
-  SP-SM: USCS Poorly Graded Sand w/ Silt
-  SC-SM: USCS Silty, Clayey Sand
-  SP-SC: USCS Poorly Graded Sand w/ Clay
-  Limestone
-  No Recovery

SOIL TEST ID'S

- B-# BRIDGE SOIL TEST BORING
- R-# ROADWAY SOIL TEST BORING
- CPT-# CONE PENETROMETER SOUNDING
- BS-# BULK SOIL SAMPLE

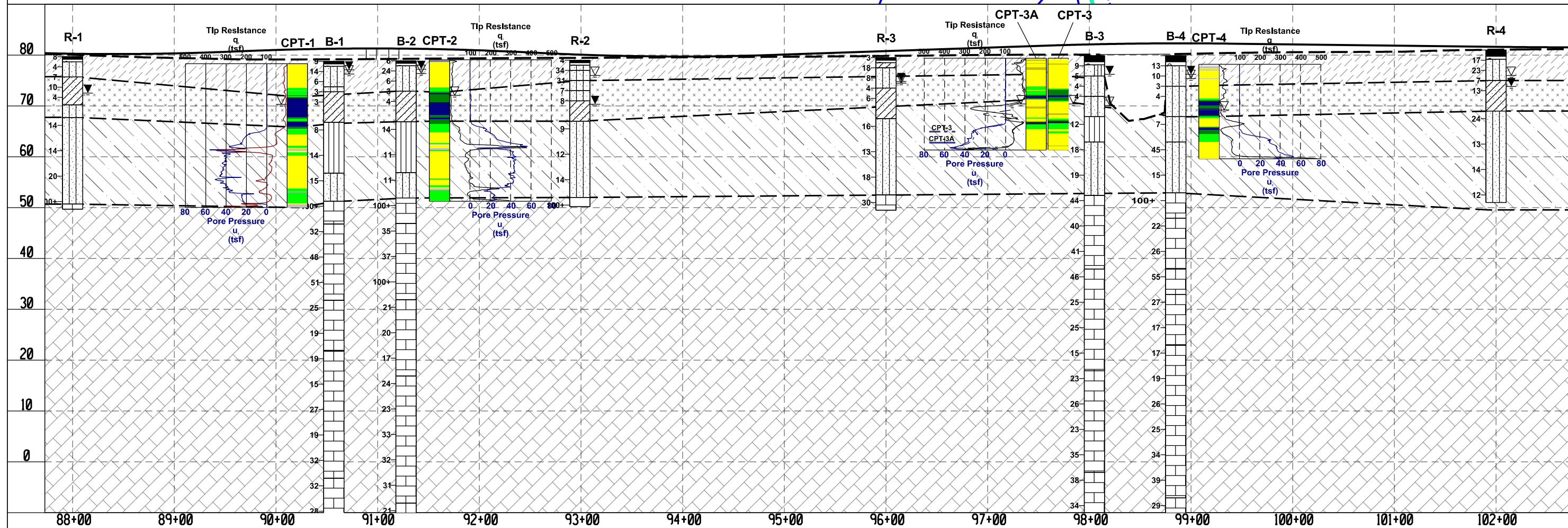
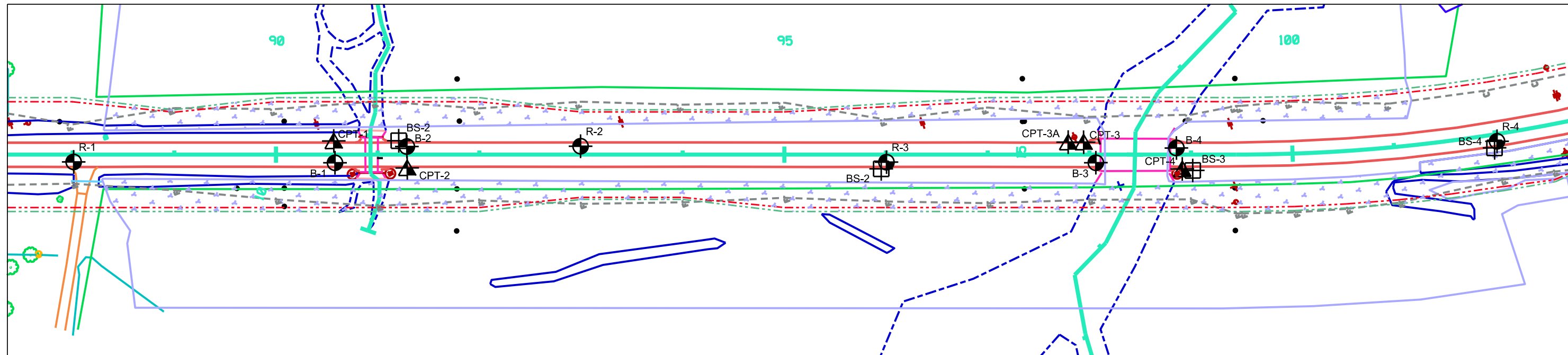
ABBREVIATIONS

- LL - LIQUID LIMIT (%)
- PL - PLASTIC LIMIT (%)
- PI - PLASTIC INDEX (%)
- NMC - MOISTURE CONTENT (%)
- NP - NON PLASTIC
- %#200 - PERCENT PASSING NO. 200 SIEVE





-  Water Level at Time Drilling, or as Shown
-  Water Level at End of Drilling, or as Shown

NOTES


1. THE GENERALIZED SUBSURFACE PROFILE IS PROVIDED ONLY FOR ILLUSTRATIVE PURPOSES. THE INTENT OF THIS DRAWING IS TO PROVIDE THE READER WITH VERY GENERAL INFORMATION ON SUBSURFACE CONDITIONS AT THE TIME OF THE INVESTIGATION. VARIATIONS IN THE INDICATED SUBSURFACE CONDITIONS WILL BECOME EVIDENT ONCE ADDITIONAL BORINGS ARE PERFORMED. THE INDICATED STRATIGRAPHY BETWEEN TESTING LOCATIONS WAS GENERATED USING STRAIGHT-LINE LINEAR INTERPOLATION, AND DOES NOT REPRESENT THE TRUE STRATIGRAPHY.



The generalized subsurface profile is provided for illustrative purposes only. The intent of this drawing is to provide the reader with very general information on the subsurface conditions at the site at the time of the investigation. Variations in the indicated subsurface conditions will become evident once additional borings are performed. The indicated stratigraphy between testing locations was generated using straight-line linear interpolation and does not represent the true stratigraphy.

-  EXISTING FILL
-  ALLUVIUM
-  ASHLEY FORMATION
-  SANTEE LIMESTONE

4				
3				
2				
1				
REV. NO.	BY	DATE	DESCRIPTION OF REVISION	
TOPO.		DATE		
DWG.	JFH	DATE 10.24.19	GROUP	- -
R/W		DATE		



US 15 OVER INDIAN FIELD SWAMP

GENERALIZED SUBSURFACE PROFILE

HRZ SCALE = NTS	
VRT SCALE = NTS	

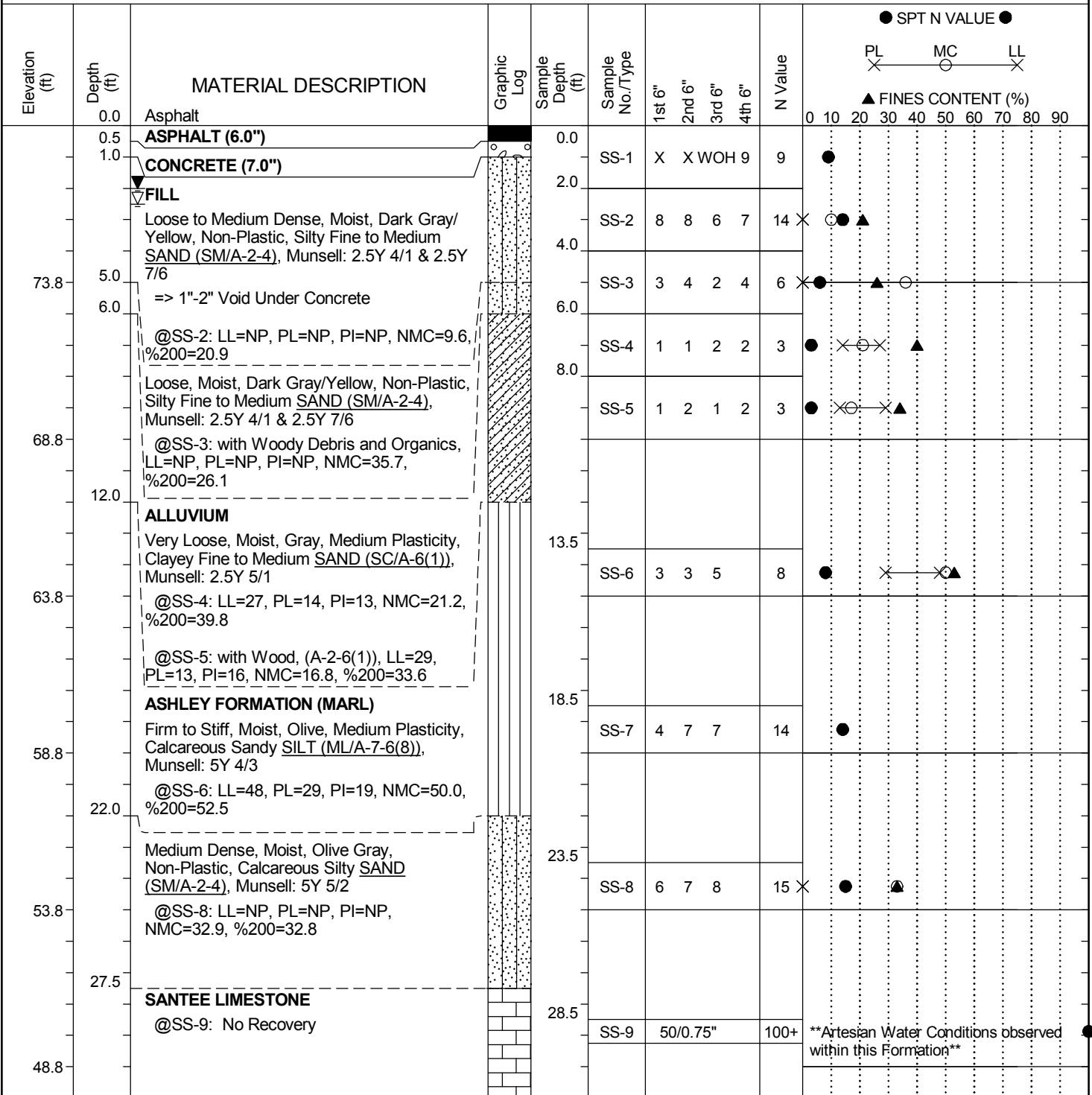
US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 5 BORING LOGS

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 90+58	Offset: 8'-RT
Alignment: Existing CL	Elev.: 78.8 ft	Latitude: 33.23173
Longitude: -80.53894	Date Started: 9/25/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/25/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	2.5 ft	24HR: 2 ft



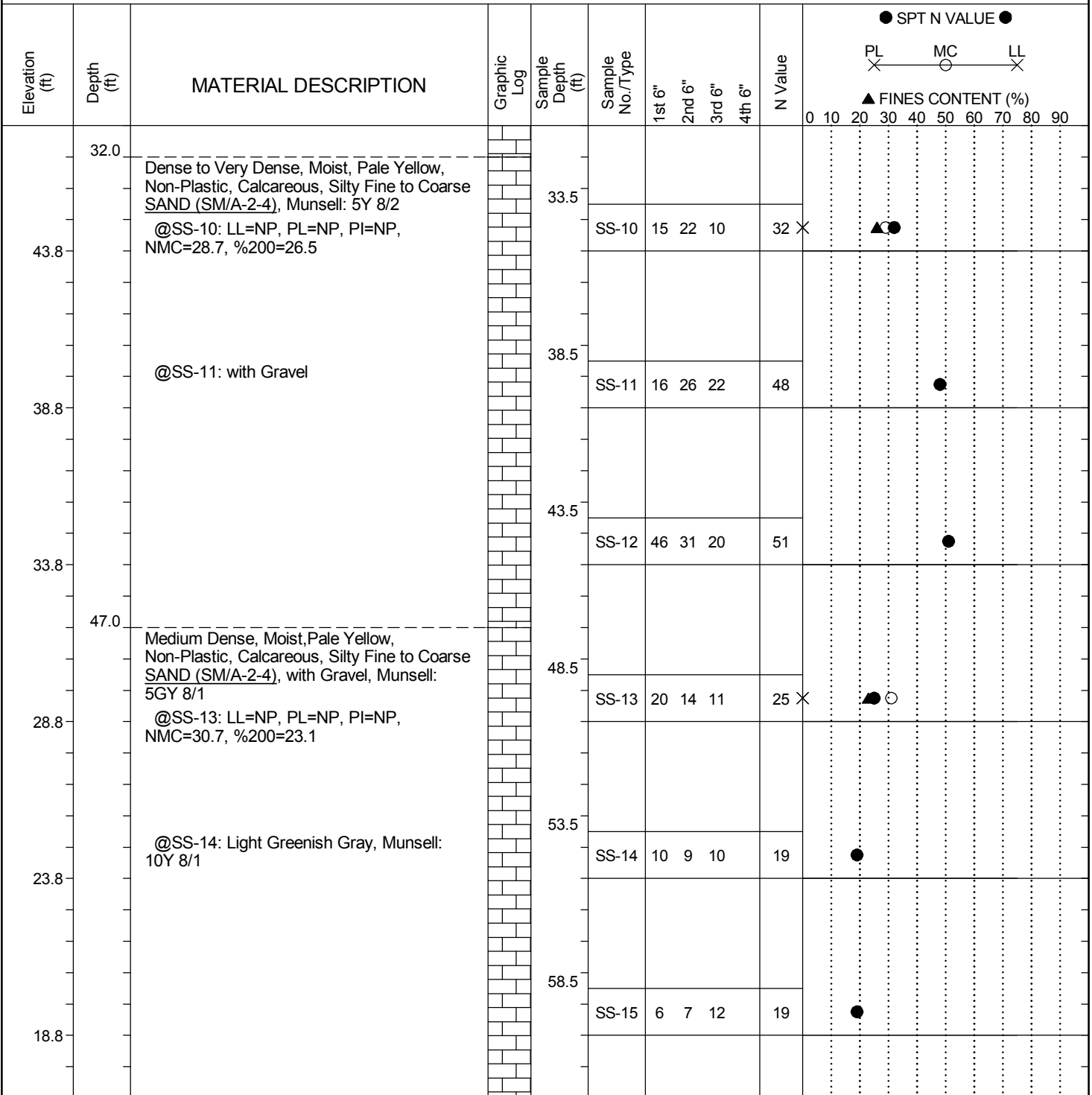
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 90+58	Offset: 8'-RT
Alignment: Existing CL	Date Started: 9/25/2019	
Elev.: 78.8 ft	Latitude: 33.23173	Longitude: -80.53894
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/25/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 2.5 ft
24HR: 2 ft		



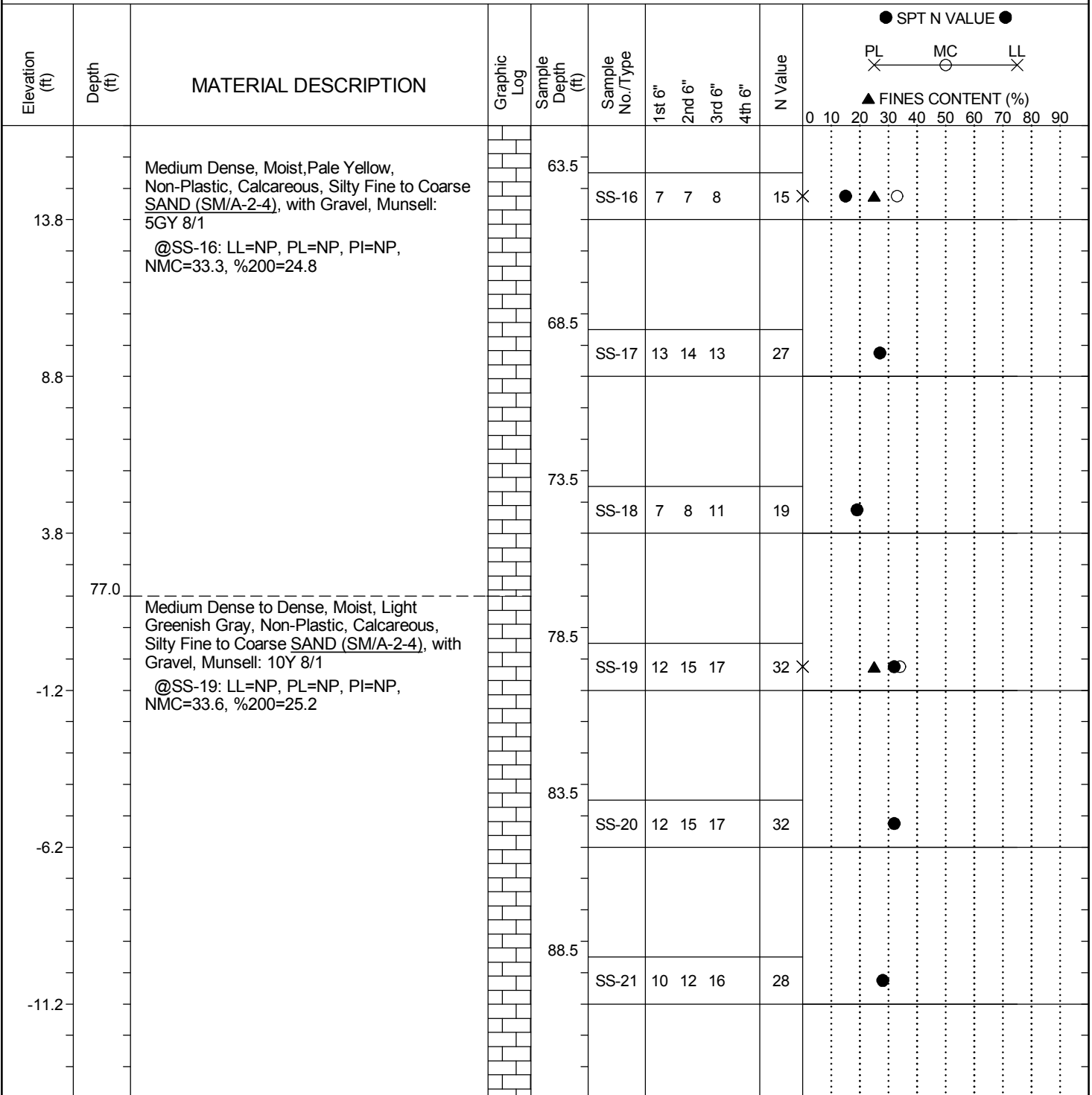
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 90+58	Offset: 8'-RT
Alignment: Existing CL	Elev.: 78.8 ft	Latitude: 33.23173
Longitude: -80.53894	Date Started: 9/25/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/25/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	2.5 ft	24HR: 2 ft



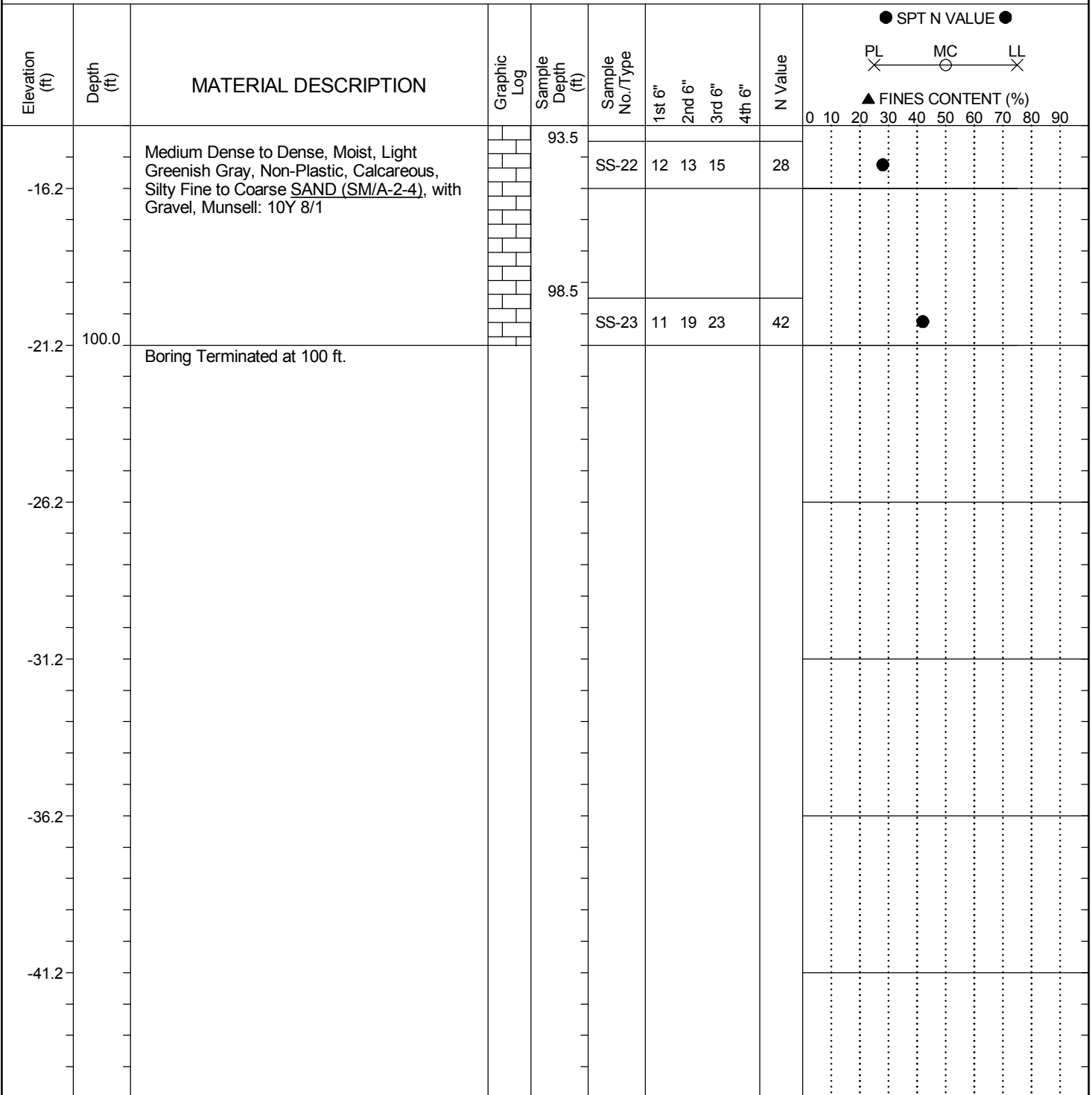
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 90+58	Offset: 8'-RT
Alignment: Existing CL	Elev.: 78.8 ft	Latitude: 33.23173
Longitude: -80.53894	Date Started: 9/25/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/25/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	24HR: 2 ft	

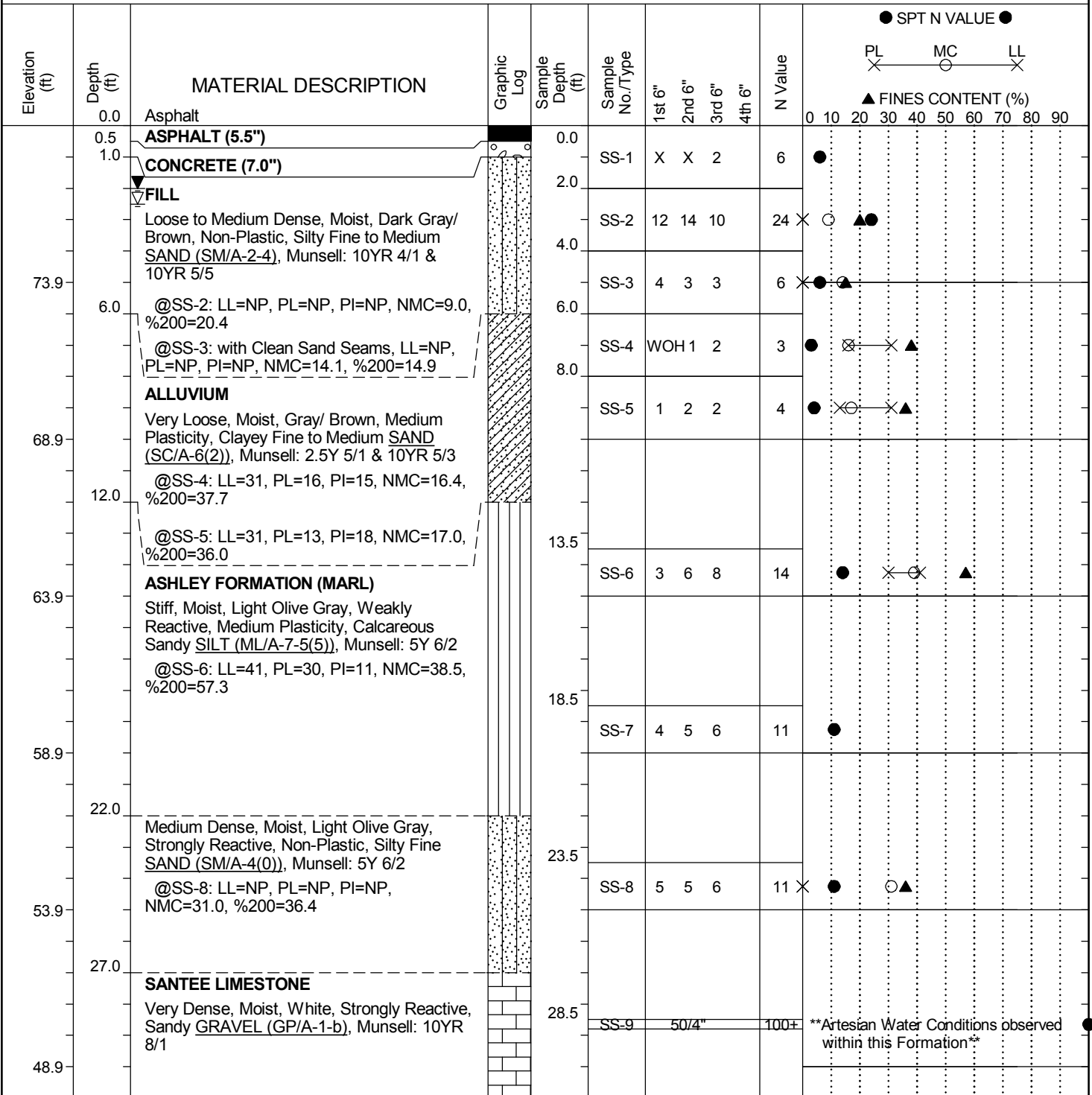


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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 91+29	Offset: 8'-LT
Alignment: Existing CL	Date Started: 9/26/2019	
Elev.: 78.9 ft	Latitude: 33.231532	Longitude: -80.538971
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/26/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 2.5 ft
24HR: 2 ft		



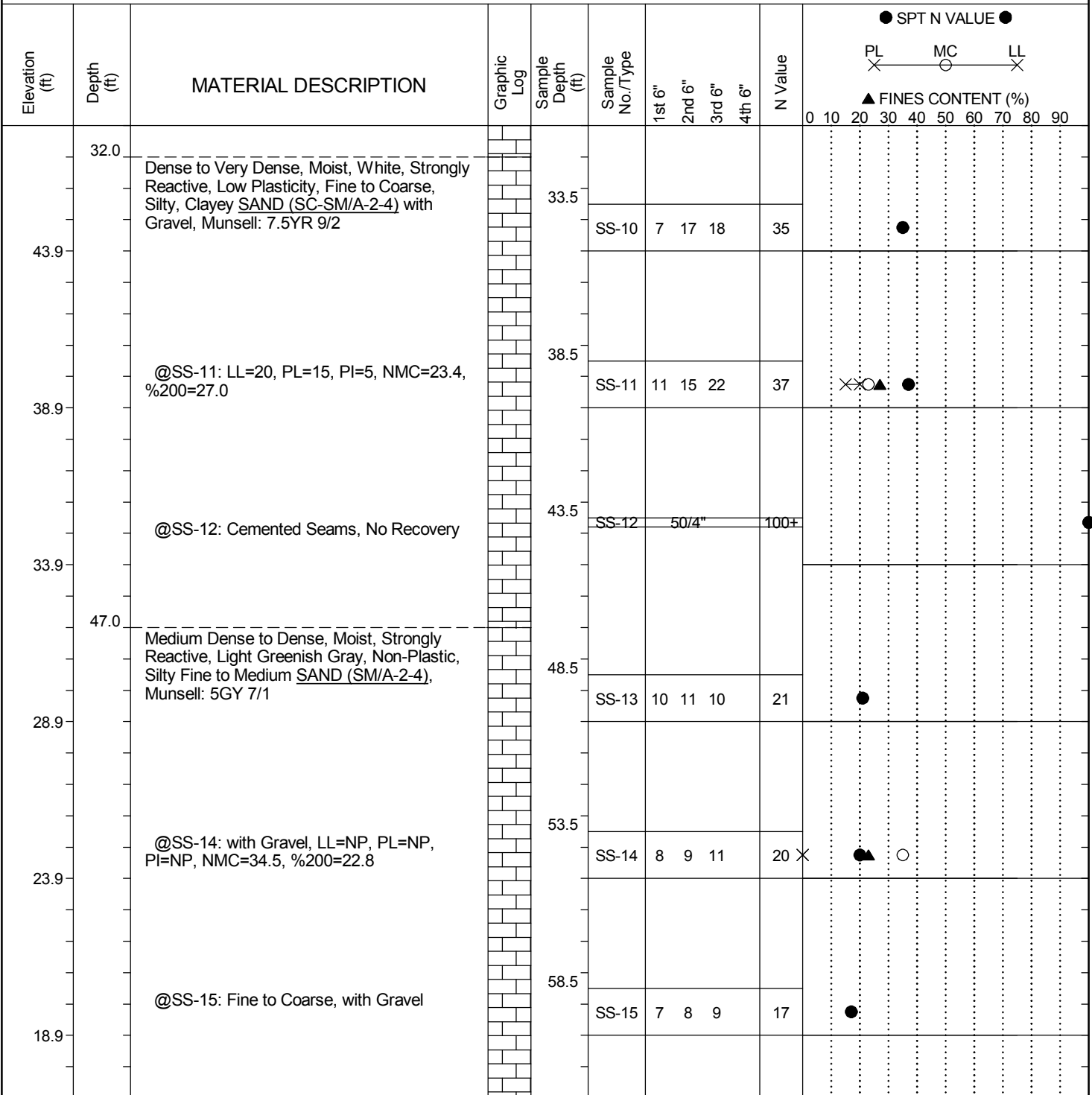
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 91+29	Offset: 8'-LT
Alignment: Existing CL	Date Started: 9/26/2019	Date Completed: 9/26/2019
Elev.: 78.9 ft	Latitude: 33.231532	Longitude: -80.538971
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Bore Hole Diameter (in): 4	Sampler Configuration:	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	Groundwater: TOB 2.5 ft
Core Size: N/A	Driller: L. Guempel	24HR: 2 ft



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: P037127	County: Dorchester	Boring No.: B-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 91+29	Offset: 8'-LT
Alignment: Existing CL	Date Started: 9/26/2019	Date Completed: 9/26/2019
Elev.: 78.9 ft	Latitude: 33.231532	Longitude: -80.538971
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	Core Size: N/A
Driller: L. Guempel	Groundwater: TOB 2.5 ft	24HR: 2 ft

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				FINES CONTENT (%)				
						1st 6"	2nd 6"	3rd 6"	4th 6"	N Value	PL	MC	LL	
13.9		Medium Dense to Dense, Moist, Strongly Reactive, Light Greenish Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), Munsell: 5GY 7/1		63.5	SS-16	8	11	13		24				
8.9		@SS-17: LL=NP, PL=NP, PI=NP, NMC=32.6, %200=27.5		68.5	SS-17	8	9	14		23	X	●	▲	○
3.9		@SS-19: Light Gray, Munsell: 5Y 7/1		73.5	SS-18	11	14	19		33				
-1.1		@SS-20: No Recovery		78.5	SS-19	13	18	19		32				
-6.1				83.5	SS-20	10	14	17		31				
-11.1				88.5	SS-21	9	9	12		21				

LEGEND

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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 91+29	Offset: 8'-LT
Alignment: Existing CL	Elev.: 78.9 ft	Latitude: 33.231532
Longitude: -80.538971	Date Started: 9/26/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/26/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	24HR: 2 ft	

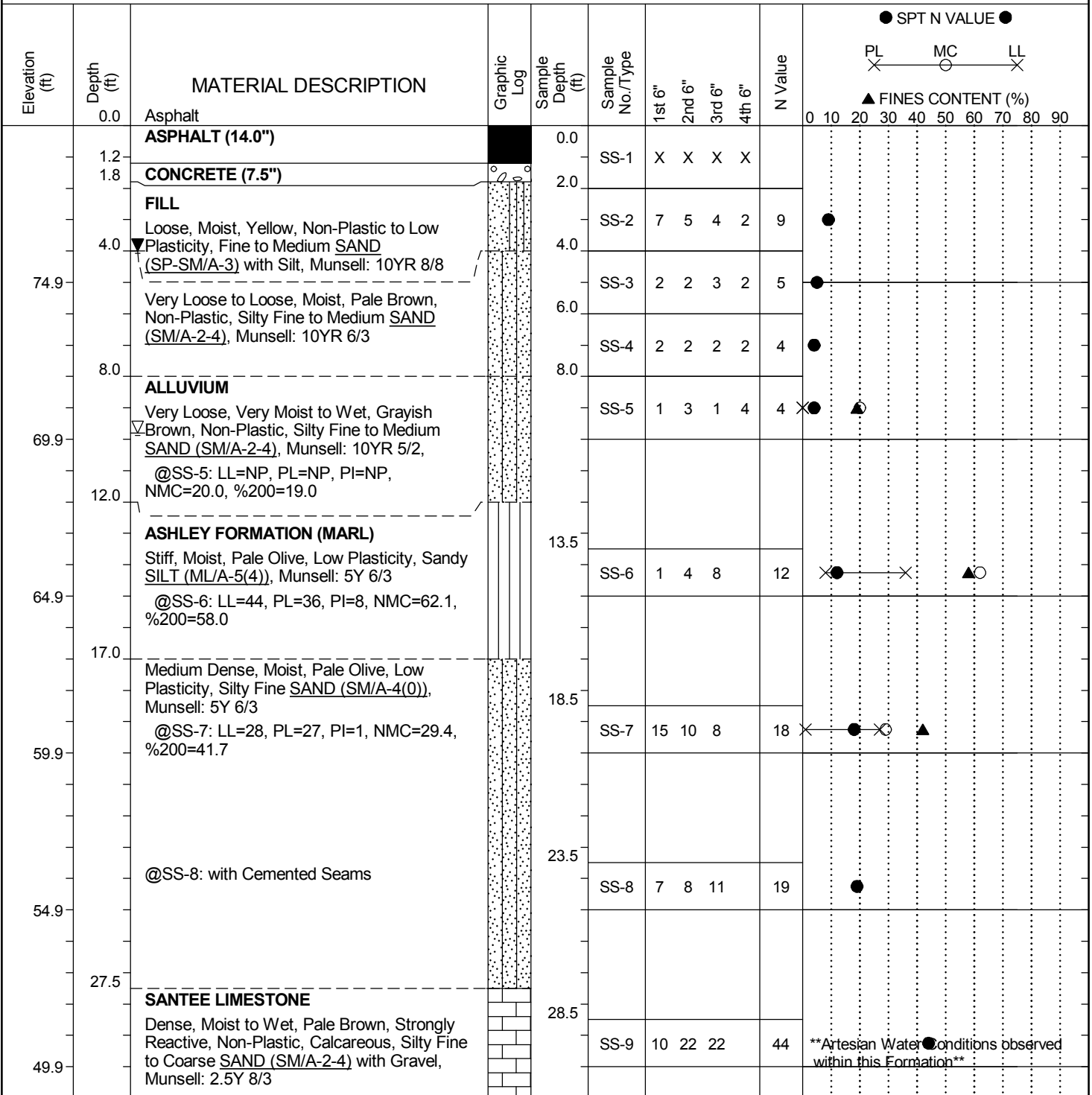
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N Value				FINES CONTENT (%)									
						1st 6"	2nd 6"	3rd 6"	4th 6"	0	10	20	30	40	50	60	70	80	90
-16.1		Dense, Moist, Strongly Reactive, Light Gray, Non-Plastic, Silty Fine to Medium SAND (SM/A-2-4), Munsell: 5Y 7/1 @SS-22: No Recovery		93.5	SS-22	10	12	23	34	● SPT N VALUE ● PL — MC — LL ▲ FINES CONTENT (%)									
-21.1	100.0	Boring Terminated at 100 ft.		98.5	SS-23	13	17	27	44										
-26.1																			
-31.1																			
-36.1																			
-41.1																			

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: P037127	County: Dorchester	Boring No.: B-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 98+06	Offset: 8'-RT
Alignment: Existing CL	Date Started: 9/23/2019	
Elev.: 79.9 ft	Latitude: 33.229801	Longitude: -80.53979
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/23/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 9.8 ft
24HR: 4 ft		



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: P037127	County: Dorchester	Boring No.: B-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 98+06	Offset: 8'-RT
Alignment: Existing CL	Date Started: 9/23/2019	
Elev.: 79.9 ft	Latitude: 33.229801	Longitude: -80.53979
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/23/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 9.8 ft
24HR: 4 ft		

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N Value				PL		MC		LL		FINES CONTENT (%)		
						1st 6"	2nd 6"	3rd 6"	4th 6"	0	10	20	30	40	50	60	70	80
44.9	33.5	Dense, Moist to Wet, Pale Brown, Strongly Reactive, Non-Plastic, Calcareous, Silty Fine to Coarse SAND (SM/A-2-4) with Gravel, Munsell: 2.5Y 8/3 @SS-10: LL=NP, PL=NP, PI=NP, NMC=27.5, %200=18.8	[Brick Pattern]	33.5	SS-10	15	18	22	40	X	▲	○	●					
39.9	38.5	@SS-11: White, Munsell: 2.5Y 8/1	[Brick Pattern]	38.5	SS-11	15	19	22	41				●					
34.9	42.0	Medium Dense to Dense, Moist to Wet, Light Greenish Gray, Strongly Reactive, Low Plasticity, Silty, Clayey Fine to Medium SAND (SC-SM/A-2-4) with Cemented Seams, Munsell: 5G 8/1 @SS-12: LL=21, PL=15, PI=6, NMC=22.7, %200=24.6	[Brick Pattern]	43.5	SS-12	34	23	23	46	X	X	▲	●					
29.9	48.5		[Brick Pattern]	48.5	SS-13	22	15	10	25			●						
24.9	53.5		[Brick Pattern]	53.5	SS-14	10	14	11	25			●						
19.9	58.5		[Brick Pattern]	58.5	SS-15	6	7	8	15			●						

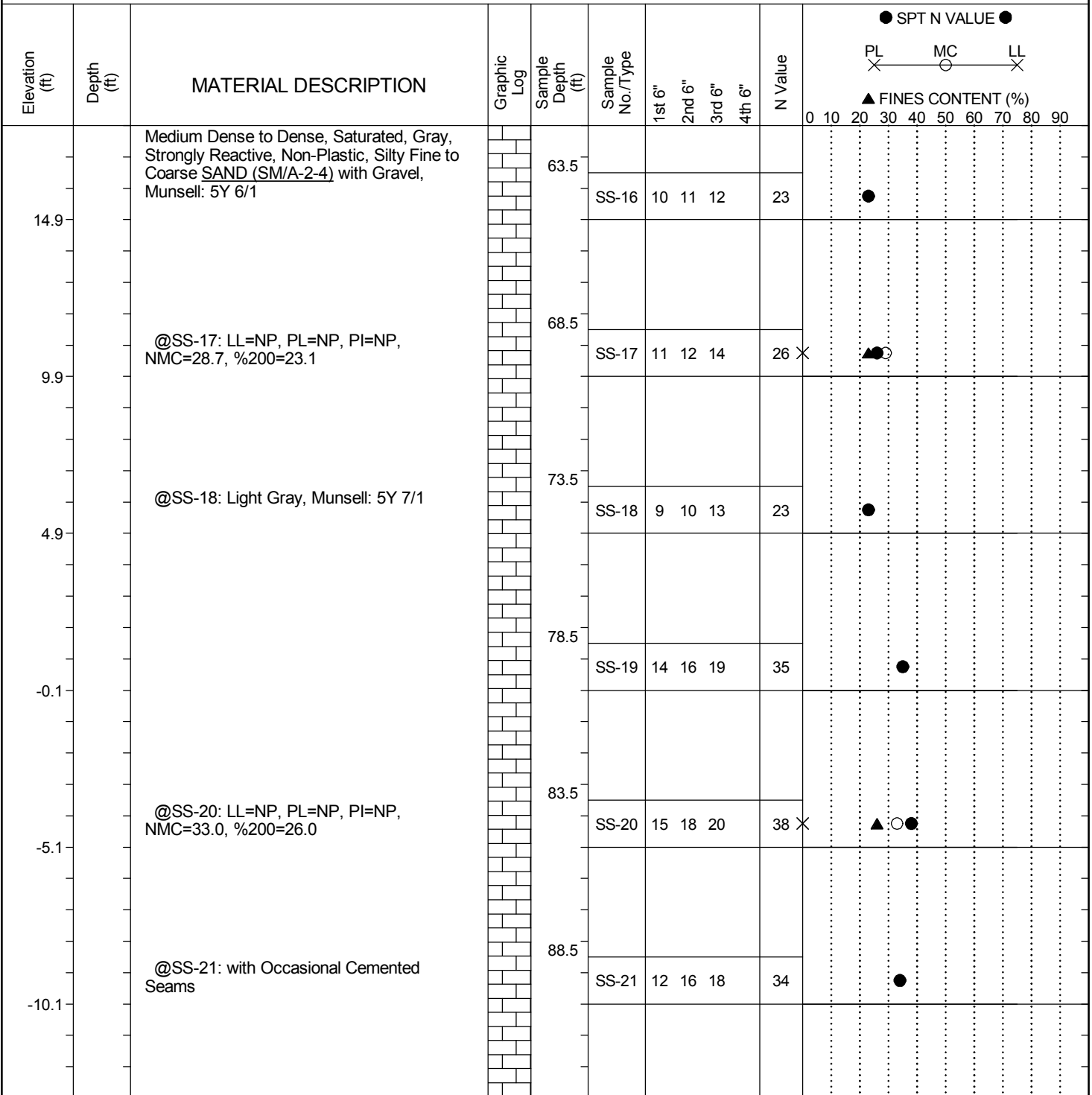
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SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
UD - Undisturbed Sample	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: B-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp	Route: US 15	
Eng./Geo.: R. Wessinger	Boring Location: 98+06	Offset: 8'-RT
Alignment: Existing CL		
Elev.: 79.9 ft	Latitude: 33.229801	Longitude: -80.53979
Date Started: 9/23/2019		
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/23/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 9.8 ft
24HR: 4 ft		



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: P037127	County: Dorchester	Boring No.: B-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 98+06	Offset: 8'-RT
Alignment: Existing CL	Date Started: 9/23/2019	
Elev.: 79.9 ft	Latitude: 33.229801	Longitude: -80.53979
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/23/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 9.8 ft
24HR: 4 ft		

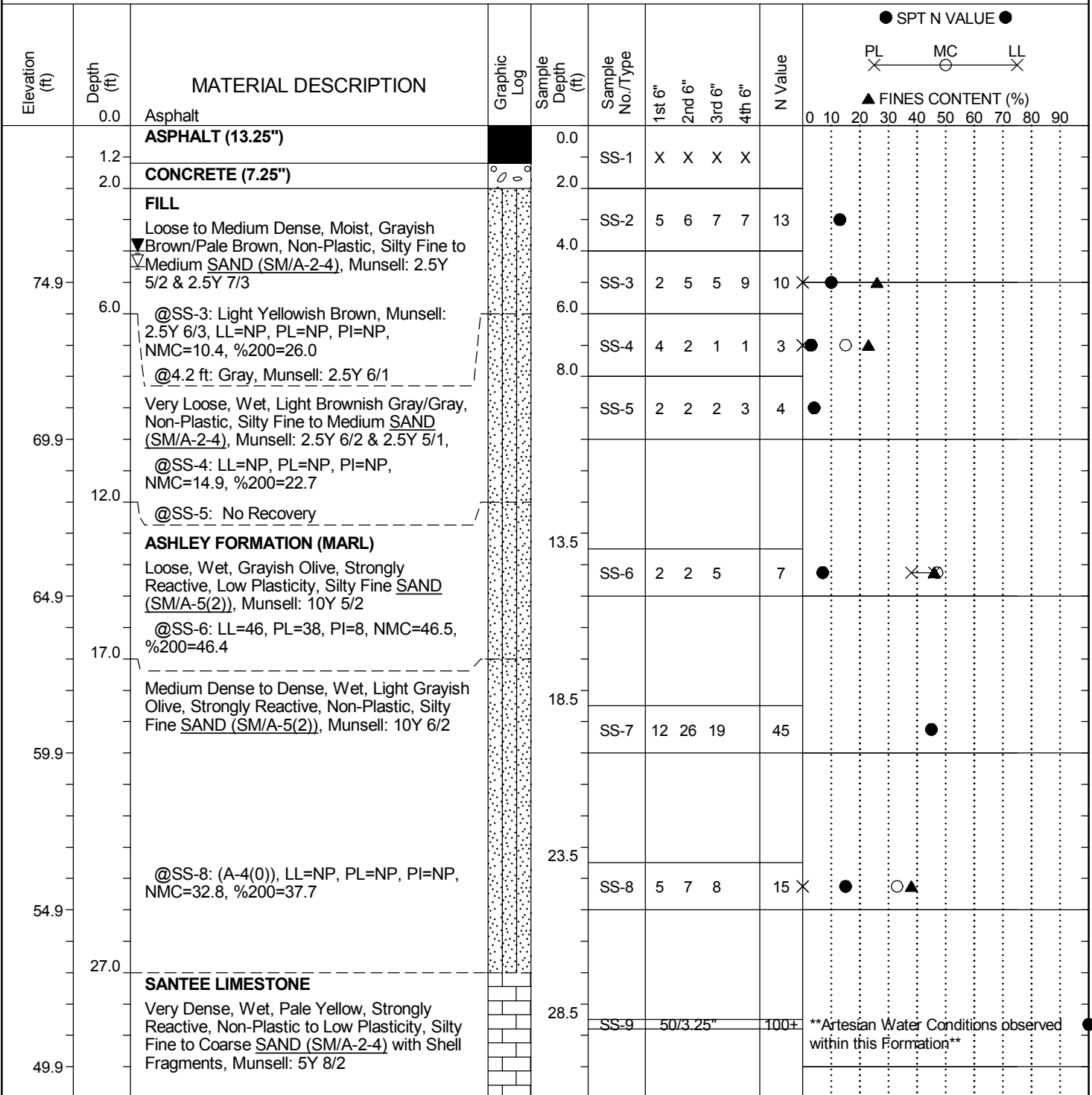
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N VALUE				N Value	FINES CONTENT (%)									
						1st 6"	2nd 6"	3rd 6"	4th 6"		PL	MC	LL	0	10	20	30	40	50	60
-15.1		Medium Dense to Dense, Saturated, Gray, Strongly Reactive, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4) with Gravel, Munsell: 5Y 6/1		93.5	SS-22	11	14	15		29										
-20.1	100.0			98.5	SS-23	8	12	14		26										
-20.1		Boring Terminated at 100 ft.																		
-25.1																				
-30.1																				
-35.1																				
-40.1																				

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: P037127	County: Dorchester	Boring No.: B-4
Site Description: US 15 Bridge Replacement over Indian Field Swamp	Route: US 15	
Eng./Geo.: C. Piercy	Boring Location: 98+86	Offset: 6'-LT
Alignment: Existing CL		
Elev.: 79.9 ft	Latitude: 33.229583	Longitude: -80.539836
Date Started: 9/24/2019		
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/24/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 4.5 ft
24HR: 4 ft		



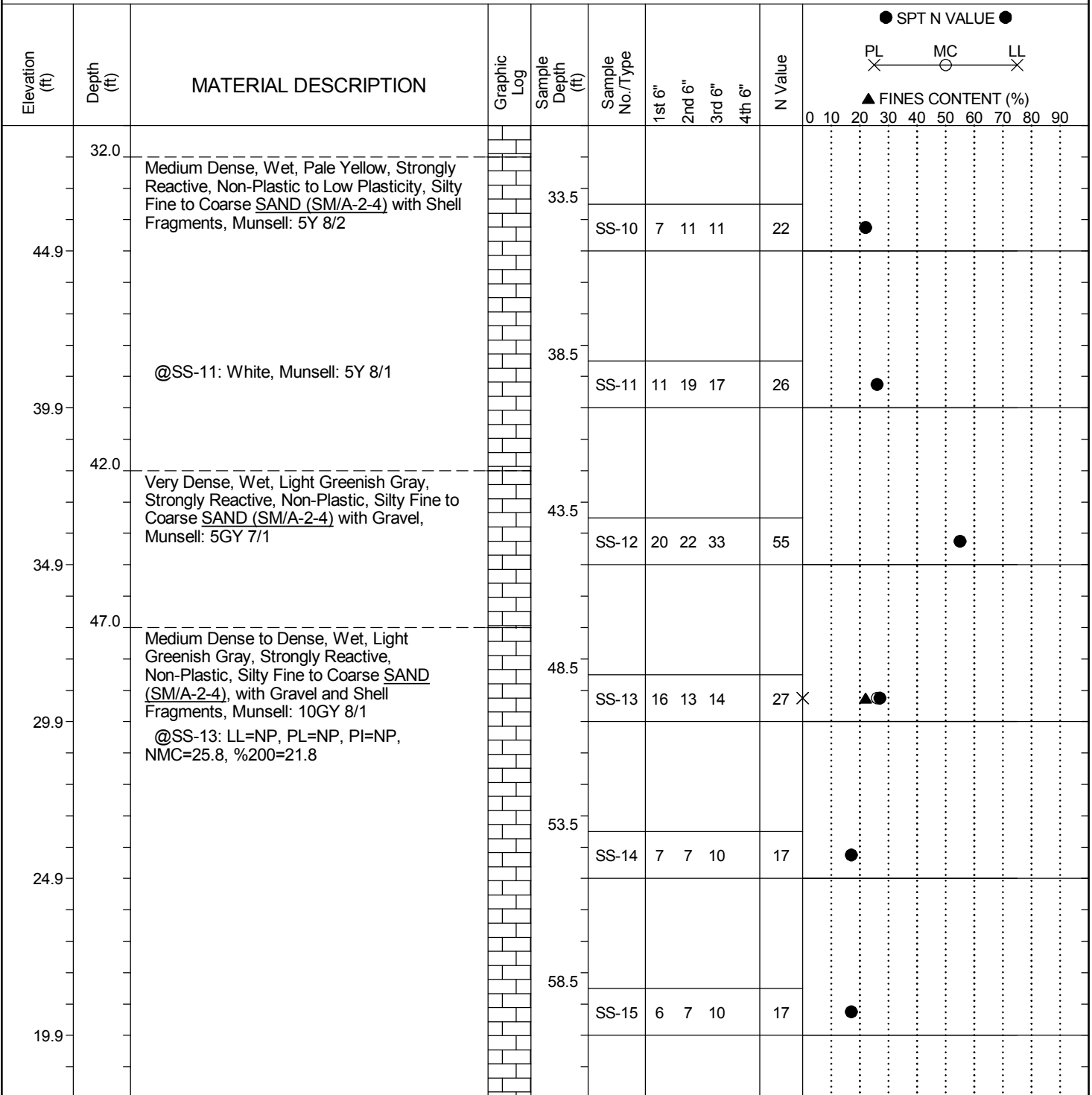
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Continued Next Page

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: P037127	County: Dorchester	Boring No.: B-4
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: C. Piercy	Boring Location: 98+86	Offset: 6'-LT
Alignment: Existing CL	Date Started: 9/24/2019	
Elev.: 79.9 ft	Latitude: 33.229583	Longitude: -80.539836
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/24/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: CME 45B	Drill Method: RW
Hammer Type: Automatic	Energy Ratio: 92%	
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 4.5 ft
24HR: 4 ft		



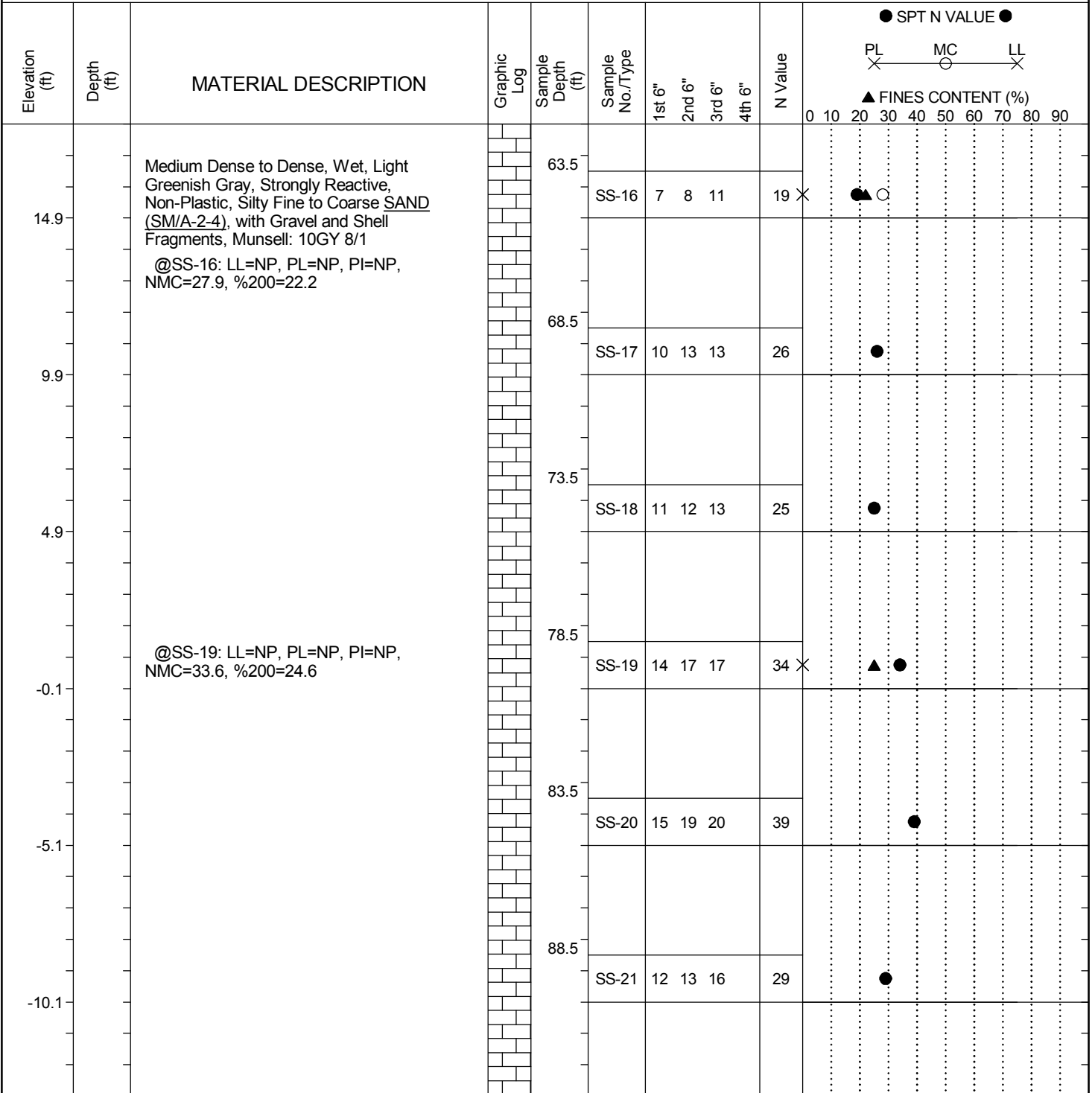
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Continued Next Page

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: P037127	County: Dorchester	Boring No.: B-4
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: C. Piercy	Boring Location: 98+86	Offset: 6'-LT
Alignment: Existing CL	Elev.: 79.9 ft	Latitude: 33.229583
Longitude: -80.539836	Date Started: 9/24/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/24/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB 4.5 ft	24HR: 4 ft	



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: P037127	County: Dorchester	Boring No.: B-4
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: C. Piercy	Boring Location: 98+86	Offset: 6'-LT
Alignment: Existing CL	Elev.: 79.9 ft	Latitude: 33.229583
Longitude: -80.539836	Date Started: 9/24/2019	
Total Depth: 100 ft	Soil Depth: 100 ft	Core Depth: 0 ft
Date Completed: 9/24/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	24HR: 4 ft	Groundwater: TOB 4.5 ft

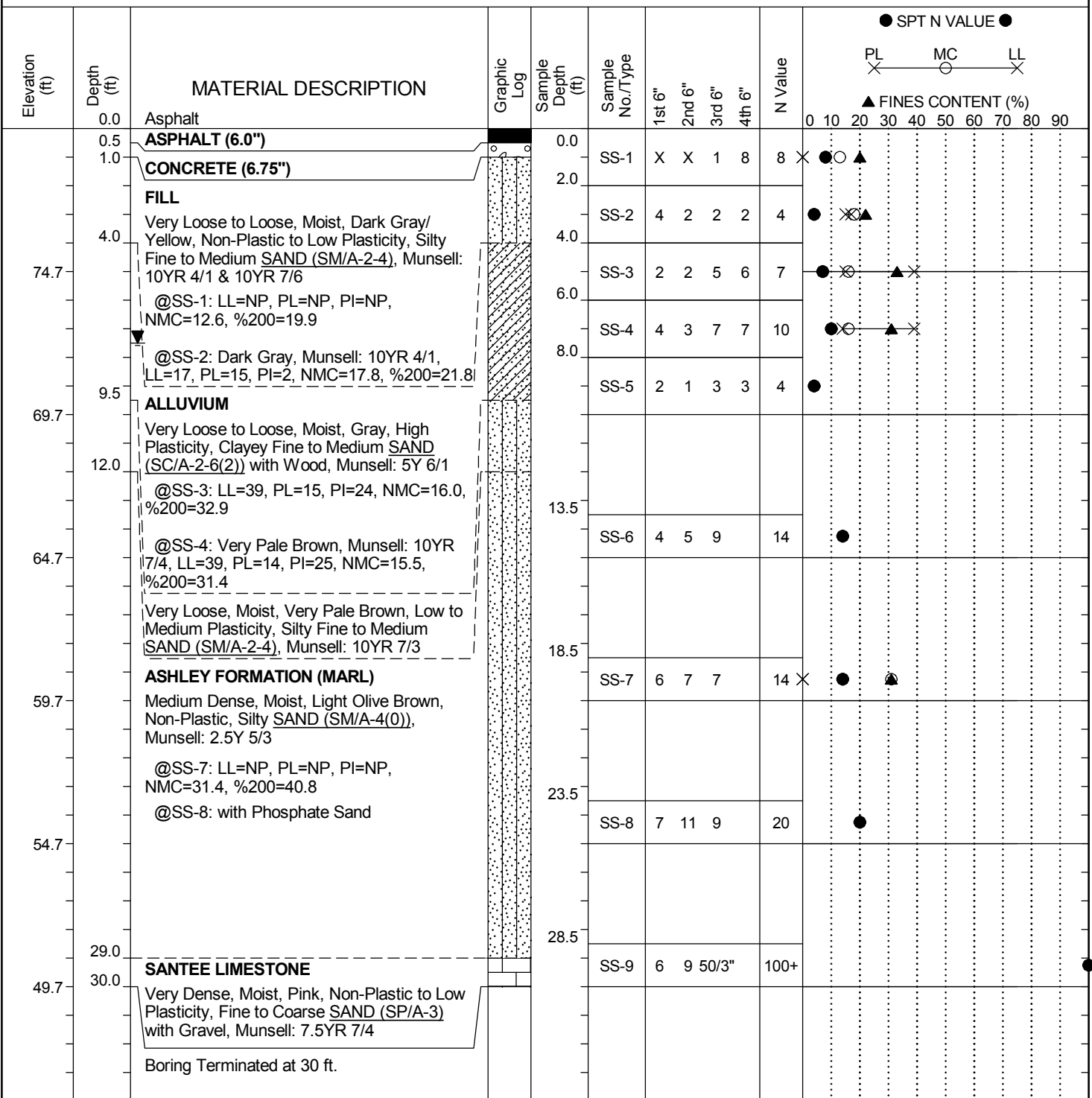
Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample No./Type	SPT N Value				N Value	FINES CONTENT (%)									
						1st 6"	2nd 6"	3rd 6"	4th 6"		0	10	20	30	40	50	60	70	80	90
-15.1		Medium Dense to Dense, Wet, Light Greenish Gray, Strongly Reactive, Non-Plastic, Silty Fine to Coarse SAND (SM/A-2-4), with Gravel and Shell Fragments, Munsell: 10GY 8/1	[Graphic Log]	93.5	SS-22	11	13	15		28	[Fines Content Chart]									
-20.1	100.0	Boring Terminated at 100 ft.	[Graphic Log]	98.5	SS-23	9	14	16		30	[Fines Content Chart]									
-25.1											[Fines Content Chart]									
-30.1											[Fines Content Chart]									
-35.1											[Fines Content Chart]									
-40.1											[Fines Content Chart]									

LEGEND

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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: R-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 88+01	Offset: 7'-RT
Alignment: Existing CL	Date Started: 9/25/2019	
Elev.: 79.7 ft	Latitude: 33.232391	Longitude: -80.538645
Total Depth: 30 ft	Soil Depth: 30 ft	Core Depth: 0 ft
Date Completed: 9/25/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB
24HR: 7.5 ft		

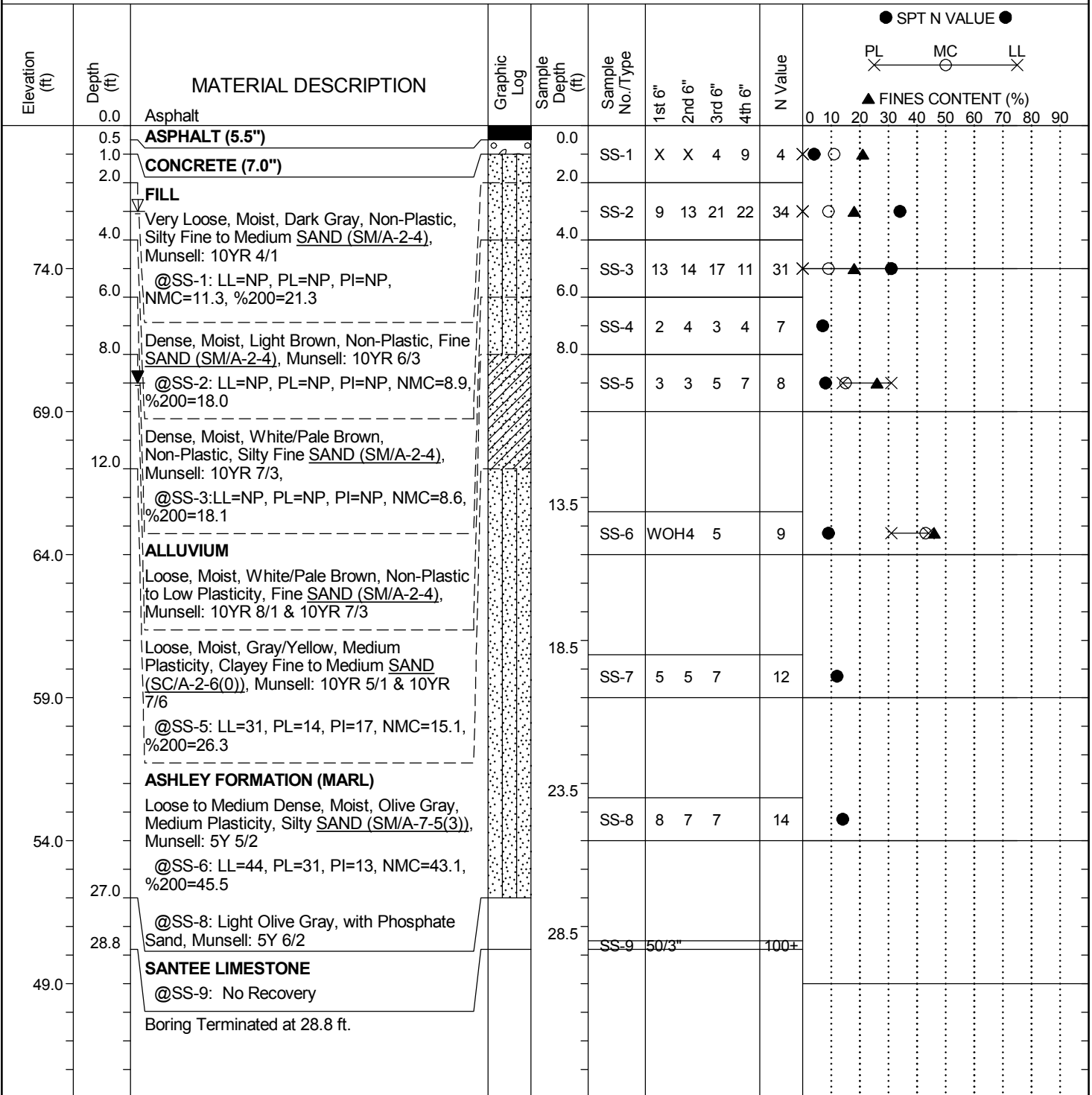


LEGEND

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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: R-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 93+00	Offset: 8'-LT
Alignment: Existing CL	Date Started: 9/26/2019	
Elev.: 79.0 ft	Latitude: 33.231092	Longitude: -80.539164
Total Depth: 28.8 ft	Soil Depth: 28.8 ft	Core Depth: 0 ft
Date Completed: 9/26/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 3 ft
24HR: 9 ft		

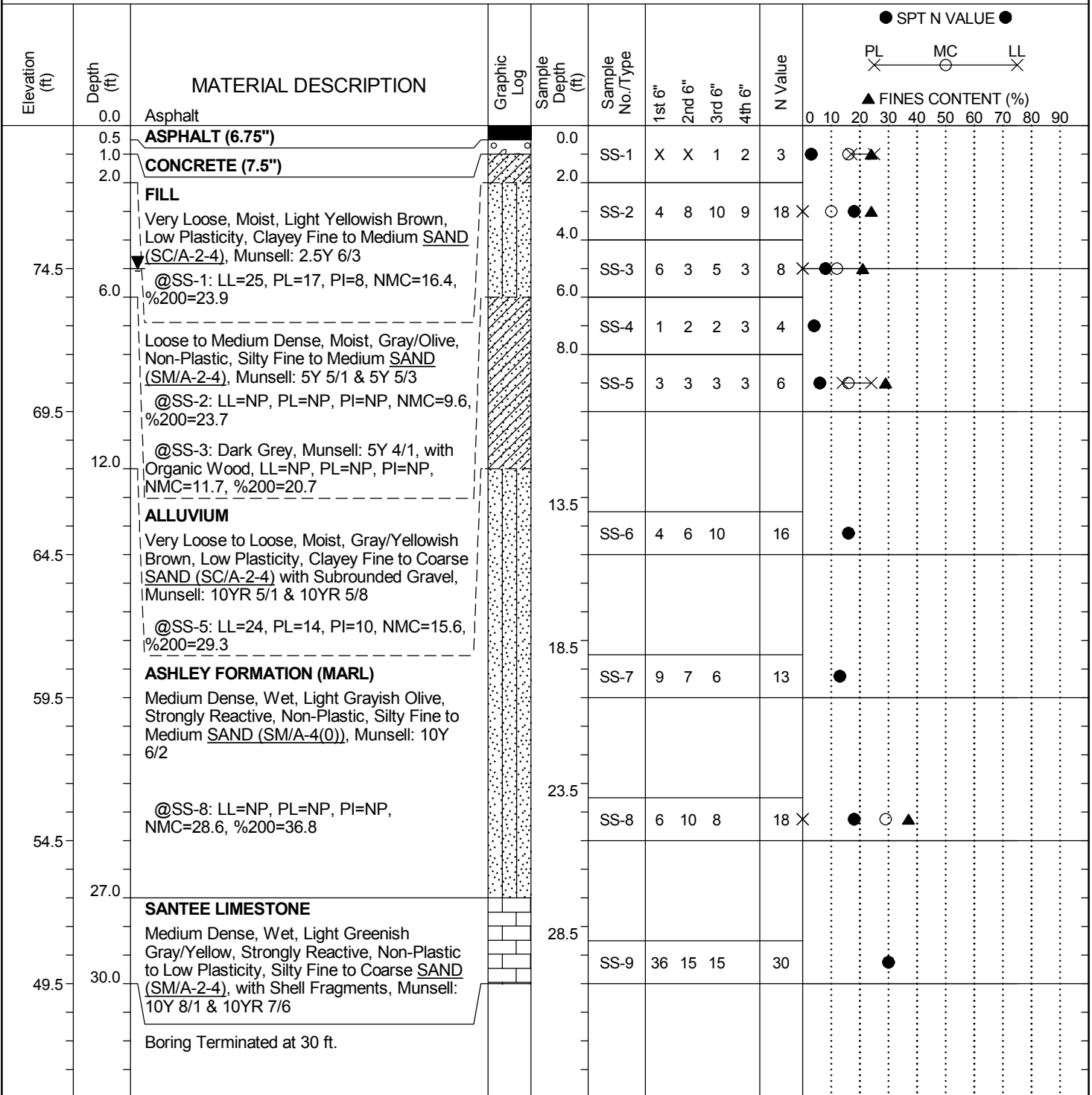


LEGEND

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

SCDOT Soil Test Log

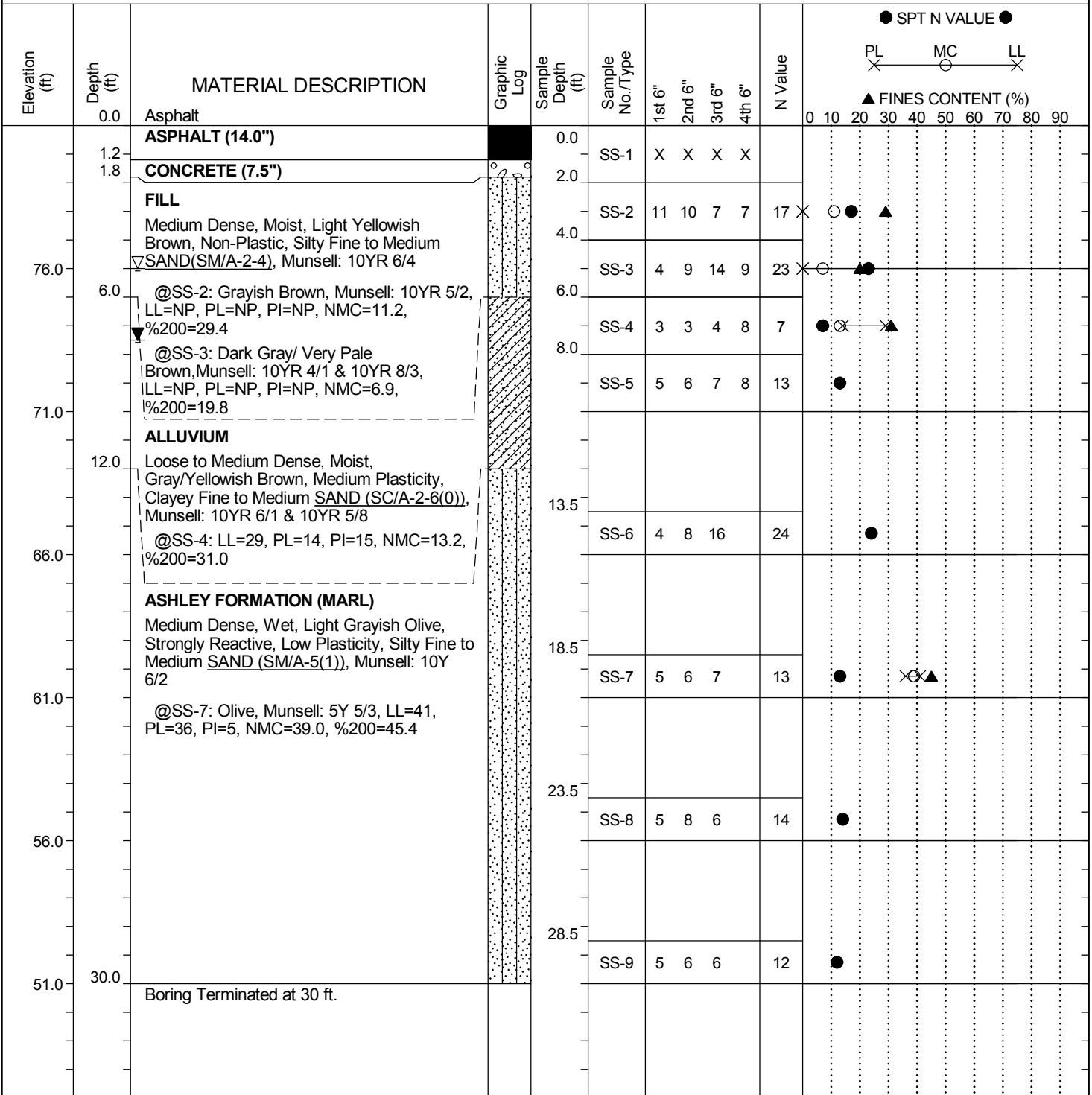
Project ID: P037127	County: Dorchester	Boring No.: R-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 96+01	Offset: 7'-RT
Alignment: Existing CL	Date Started: 9/24/2019	
Elev.: 79.5 ft	Latitude: 33.230331	Longitude: -80.539554
Total Depth: 30 ft	Soil Depth: 30 ft	Core Depth: 0 ft
Date Completed: 9/24/2019		
Bore Hole Diameter (in): 4	Sampler Configuration	Liner Required: Y (N)
Liner Used: Y (N)		
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%		
Core Size: N/A	Driller: L. Guempel	Groundwater: TOB 5 ft
24HR: 5 ft		



SC_DOT_G6100_120-US-15-RBO INDIAN FIELD SWAMP.GPJ_FME2017.GDT_10/31/19

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: R-4
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: R. Wessinger	Boring Location: 102+01	Offset: 7'-RT
Alignment: Existing CL	Elev.: 81.0 ft	Latitude: 33.228764
Longitude: -80.540174	Date Started: 9/24/2019	
Total Depth: 30 ft	Soil Depth: 30 ft	Core Depth: 0 ft
Date Completed: 9/24/2019	Bore Hole Diameter (in): 4	Sampler Configuration:
Liner Required: Y (N)	Liner Used: Y (N)	
Drill Machine: CME 45B	Drill Method: RW	Hammer Type: Automatic
Energy Ratio: 92%	Core Size: N/A	Driller: L. Guempel
Groundwater: TOB	5 ft	24HR: 7.5 ft

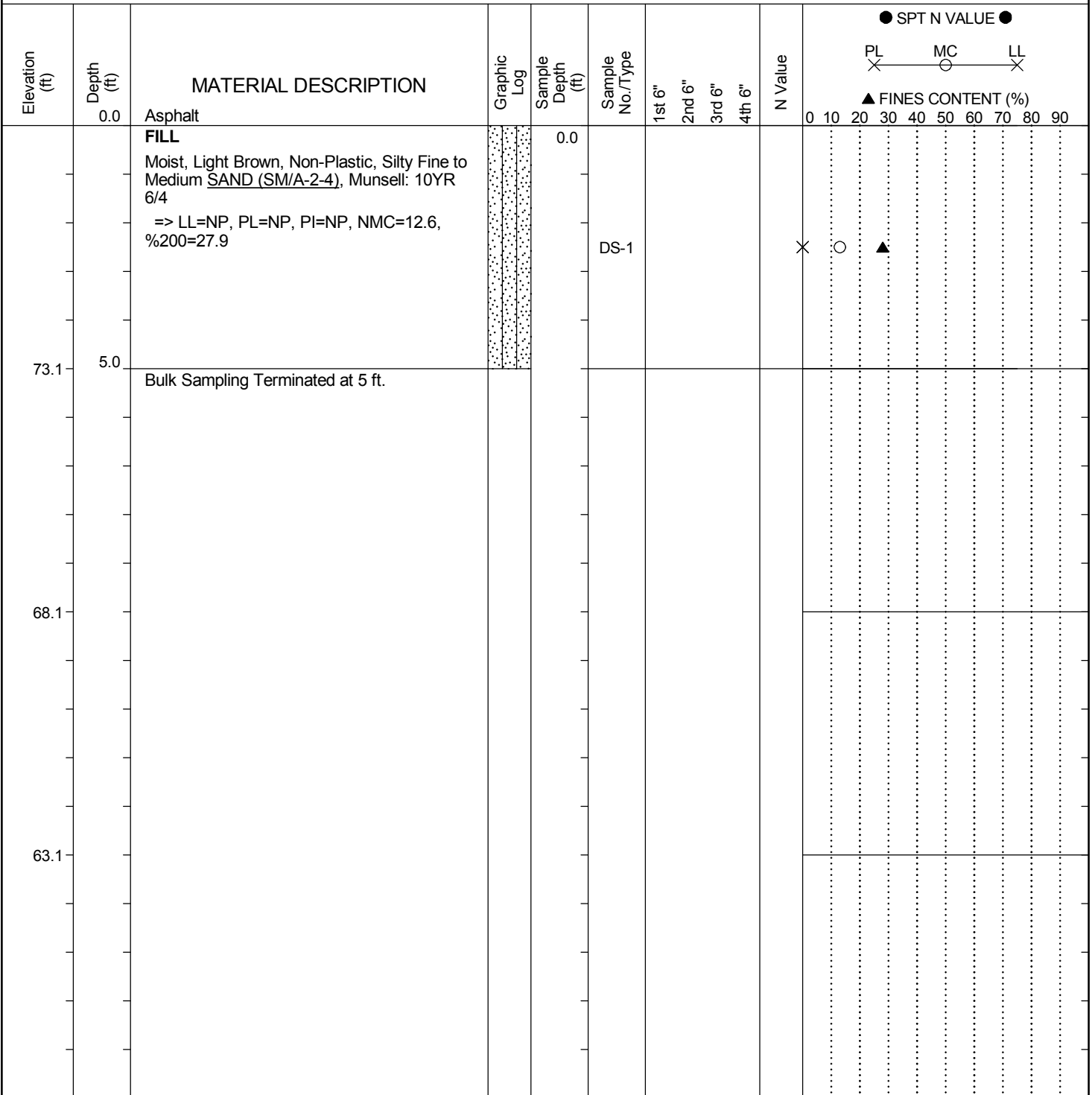


LEGEND

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

SCDOT Soil Test Log

Project ID: P037127	County: Dorchester	Boring No.: BS-1
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: M. Touchberry	Boring Location: 91+15	Offset: 14'-LT
Alignment: Existing CL	Date Started: 9/19/2019	
Elev.: 78.1 ft	Latitude: 33.231563	Longitude: -80.538935
Total Depth: 5 ft	Soil Depth: 5 ft	Core Depth: 0 ft
Date Completed: 9/19/2019		
Bore Hole Diameter (in): 6	Sampler Configuration:	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: Manual Auger	Drill Method: N/A
Hammer Type:	Energy Ratio: N/A%	
Core Size: N/A	Driller: M. Touchberry	Groundwater: TOB NR
24HR: NR		

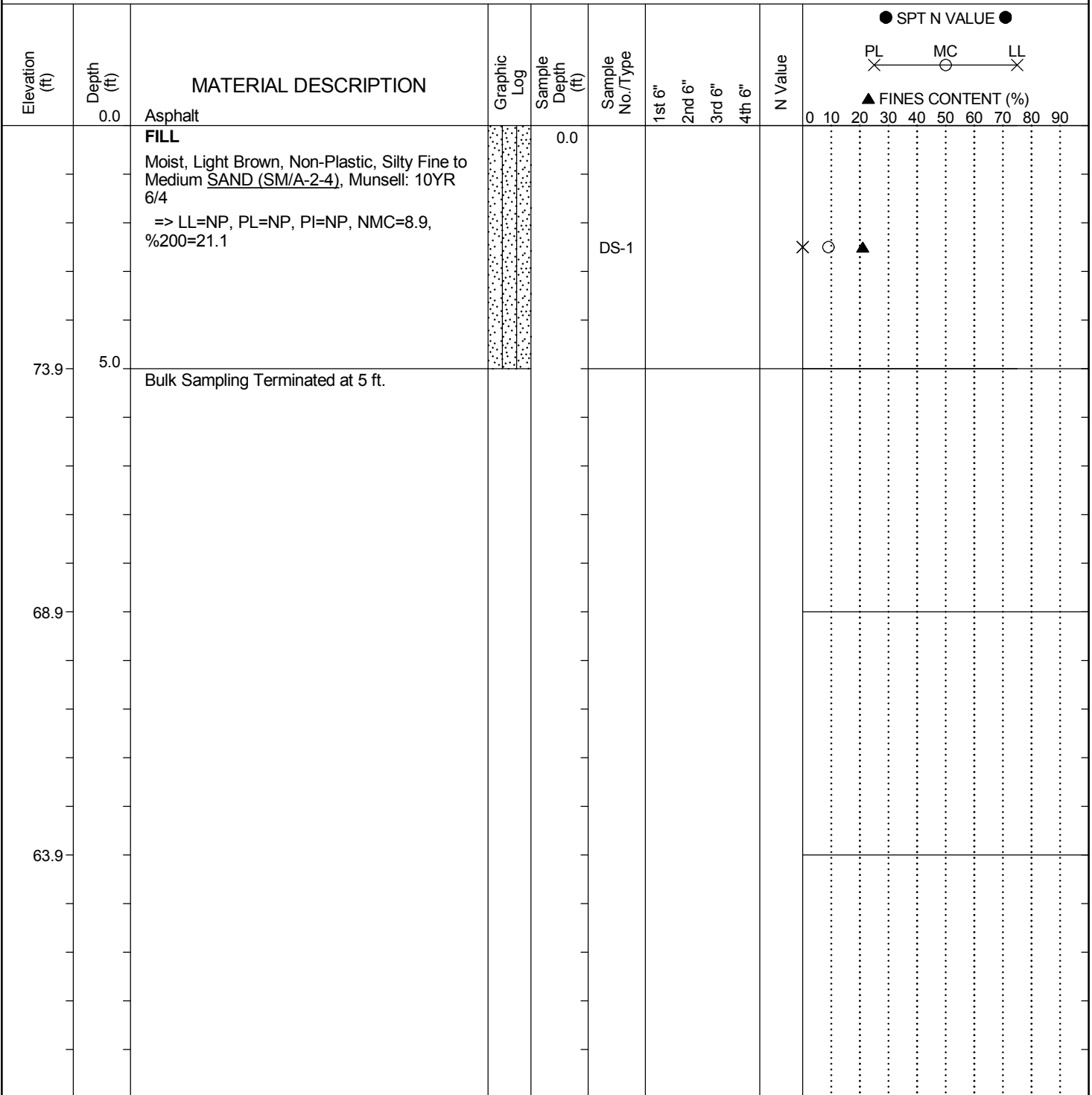


LEGEND

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: P037127	County: Dorchester	Boring No.: BS-2
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: M. Touchberry	Boring Location: 95+95	Offset: 14'-RT
Alignment: Existing CL	Date Started: 9/19/2019	
Elev.: 78.9 ft	Latitude: 33.230351	Longitude: -80.539569
Total Depth: 5 ft	Soil Depth: 5 ft	Core Depth: 0 ft
Date Completed: 9/19/2019		
Bore Hole Diameter (in): 6	Sampler Configuration:	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: Manual Auger	Drill Method: N/A
Hammer Type:	Energy Ratio: N/A%	
Core Size: N/A	Driller: M. Touchberry	Groundwater: TOB NR
24HR: NR		

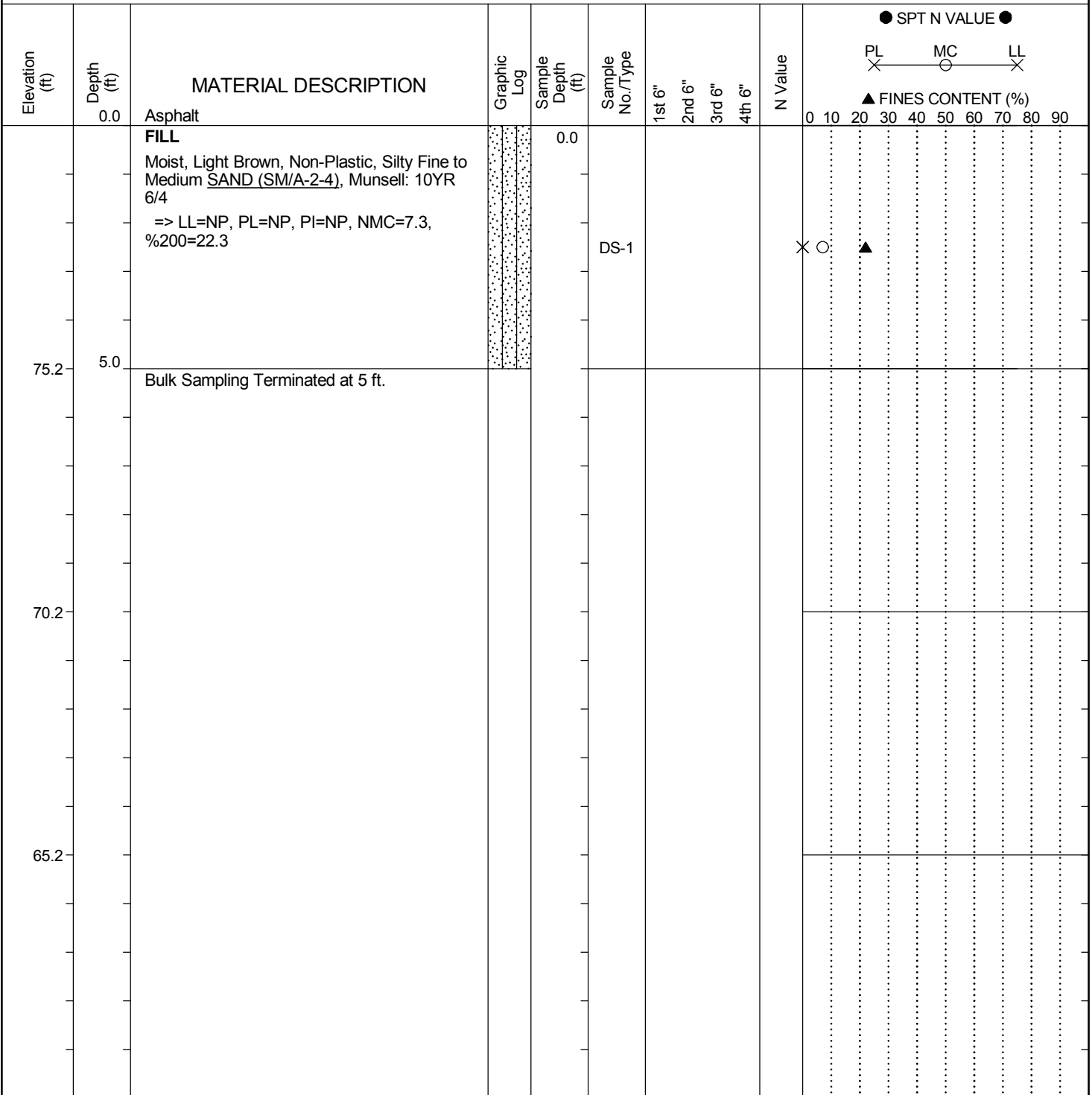


LEGEND

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: P037127	County: Dorchester	Boring No.: BS-3
Site Description: US 15 Bridge Replacement over Indian Field Swamp		Route: US 15
Eng./Geo.: M. Touchberry	Boring Location: 98+98	Offset: 15'-RT
Alignment: Existing CL	Date Started: 9/19/2019	
Elev.: 80.2 ft	Latitude: 33.229572	Longitude: -80.539914
Total Depth: 5 ft	Soil Depth: 5 ft	Core Depth: 0 ft
Date Completed: 9/19/2019		
Bore Hole Diameter (in): 6	Sampler Configuration:	Liner Required: Y (N)
Liner Used: Y (N)	Drill Machine: Manual Auger	Drill Method: N/A
Hammer Type:	Energy Ratio: N/A%	
Core Size: N/A	Driller: M. Touchberry	Groundwater: TOB NR
24HR: NR		



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	

US 15 Bridge Replacement over Indian Field Swamp

Geotechnical Base Line Report

APPENDIX

SECTION 6 CPT LOGS



US 15 Bridge Replacement over Indian Field Swamp
 (Dorchester County, South Carolina)
 Project Number : P037127

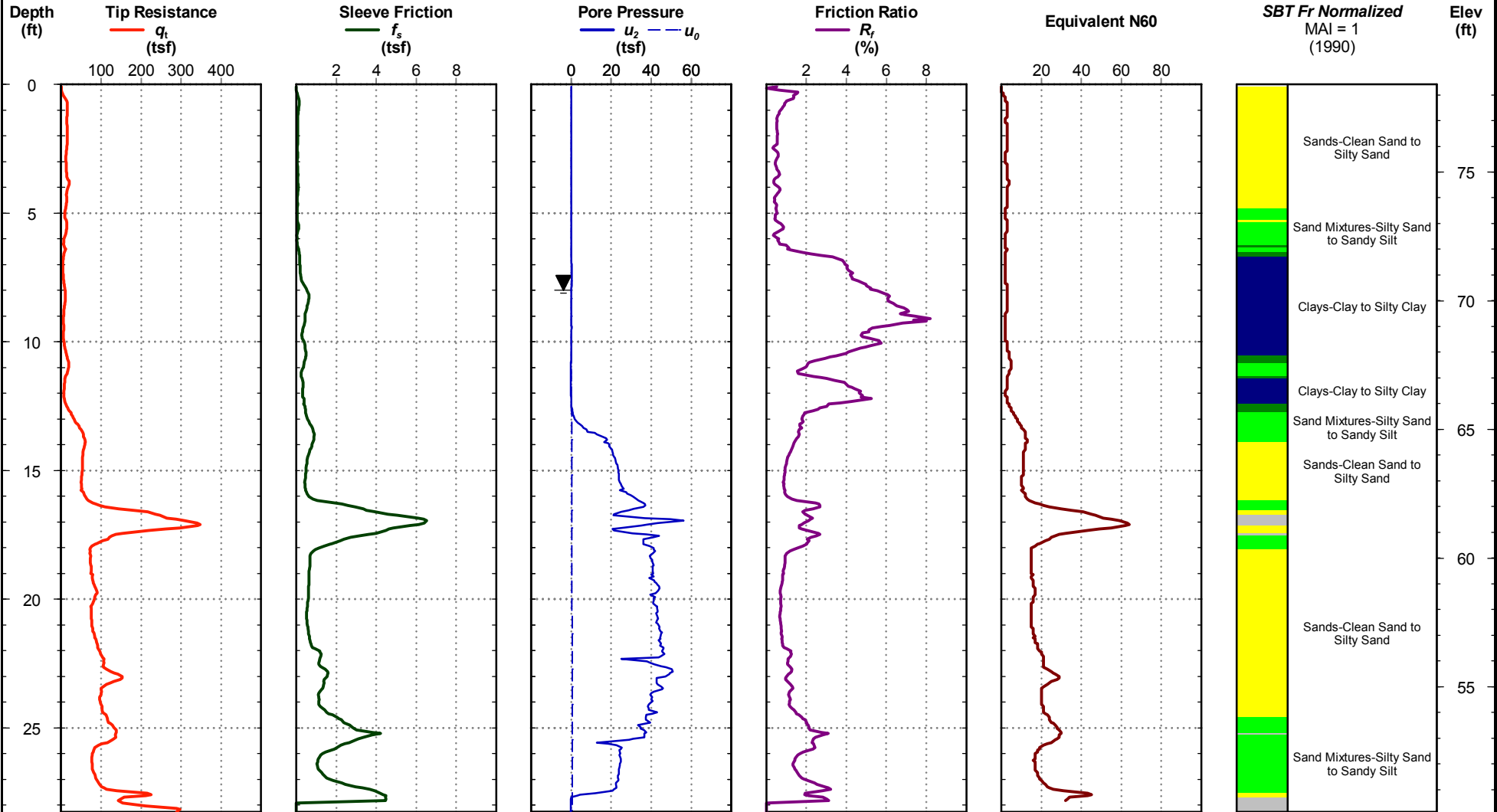
Cone Penetration Test

CPT-1

Date: Sep. 19, 2019
Estimated Water Depth: 8 ft
Rig/Operator: CME 45-B/L. Guempel

Station: 90+57
Offset: 13'-LT
Elevation: 78.4

Total Depth: 28.3 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/31/19

CPT-1



US 15 Bridge Replacement over Indian Field Swamp
 (Dorchester County, South Carolina)
 Project Number : P037127

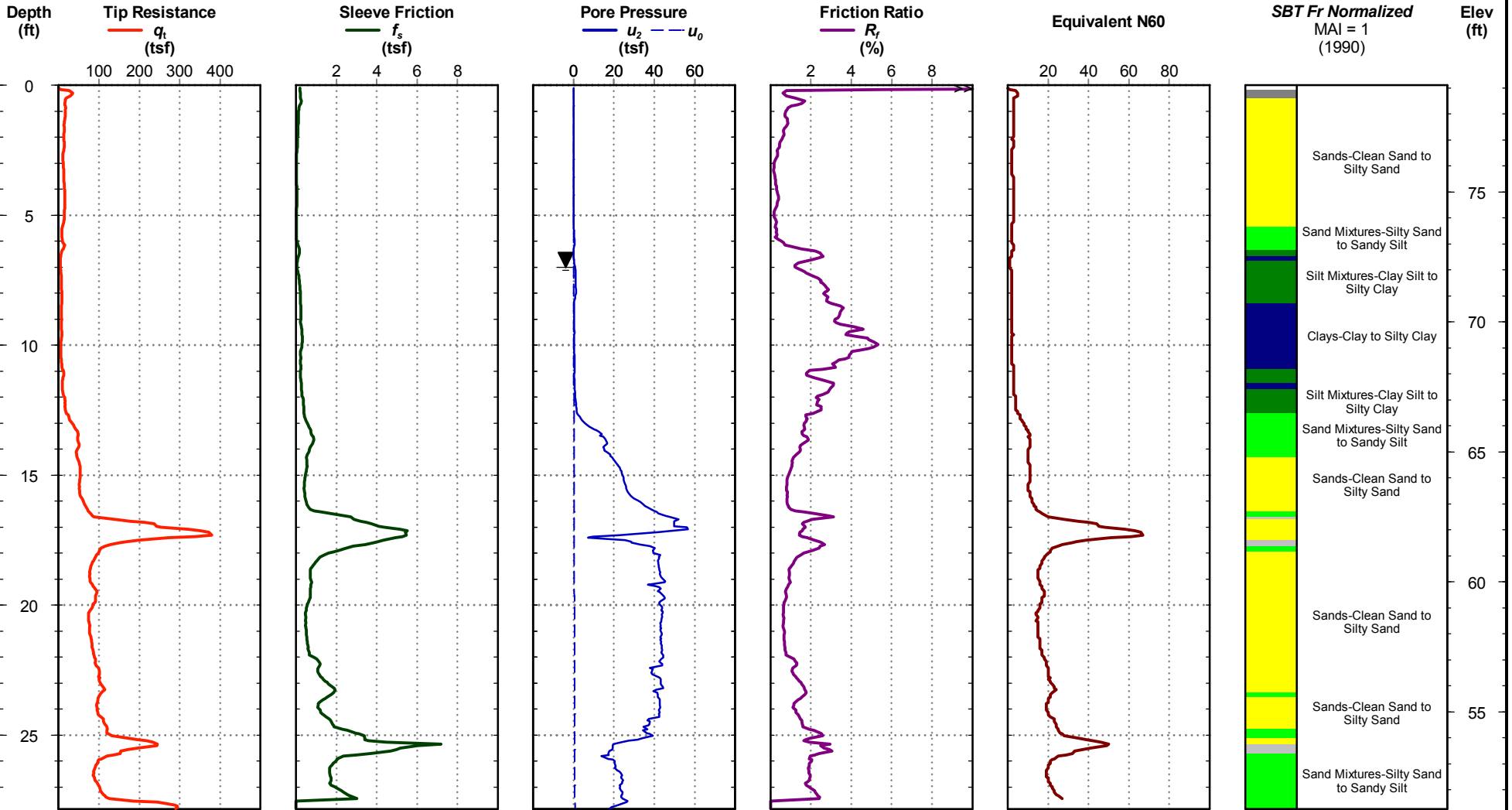
Cone Penetration Test

CPT-2

Date: Sep. 19, 2019
Estimated Water Depth: 7 ft
Rig/Operator: CME 45-B/L. Guempel

Station: 91+29
Offset: 13'-RT
Elevation: 79.1

Total Depth: 27.8 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



CPT REPORT - STANDARD G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/31/19

CPT-2



US 15 Bridge Replacement over Indian Field Swamp
 (Dorchester County, South Carolina)
 Project Number : P037127

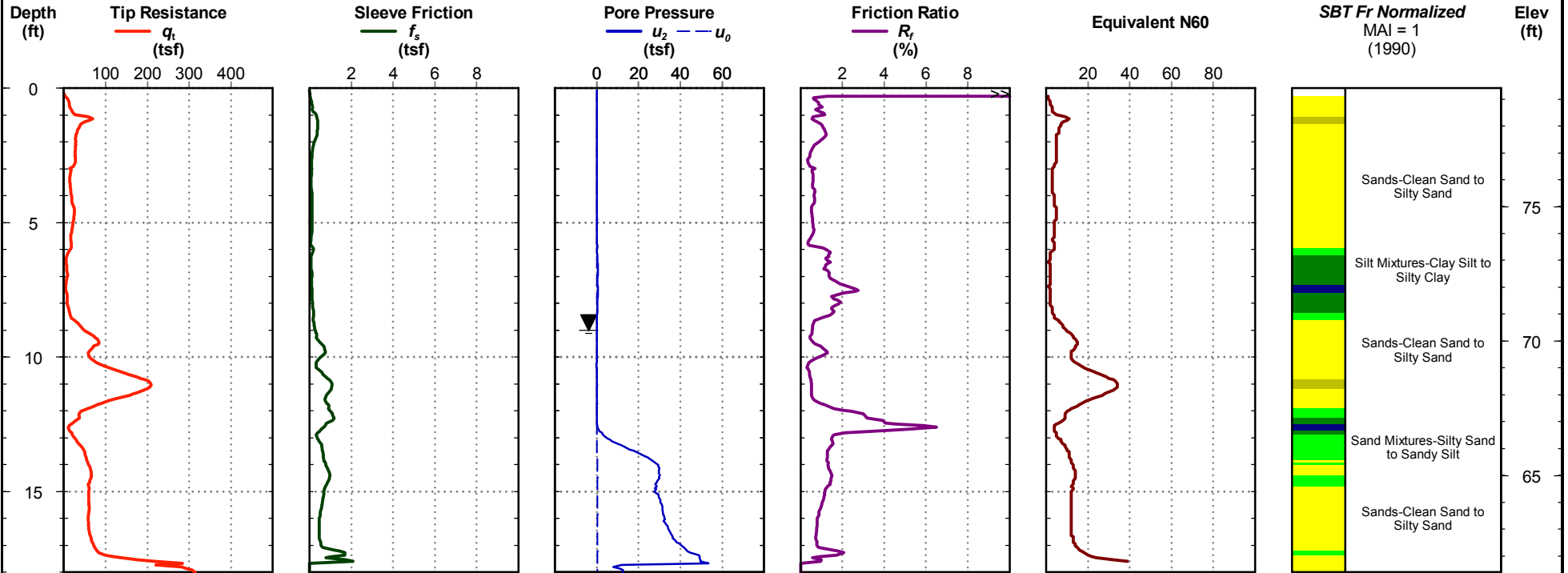
Cone Penetration Test

CPT-3

Date: Sep. 19, 2019
Estimated Water Depth: 9 ft
Rig/Operator: CME 45-B/L. Guempel

Station: 97+94
Offset: 12'-LT
Elevation: 79.4

Total Depth: 18.0 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



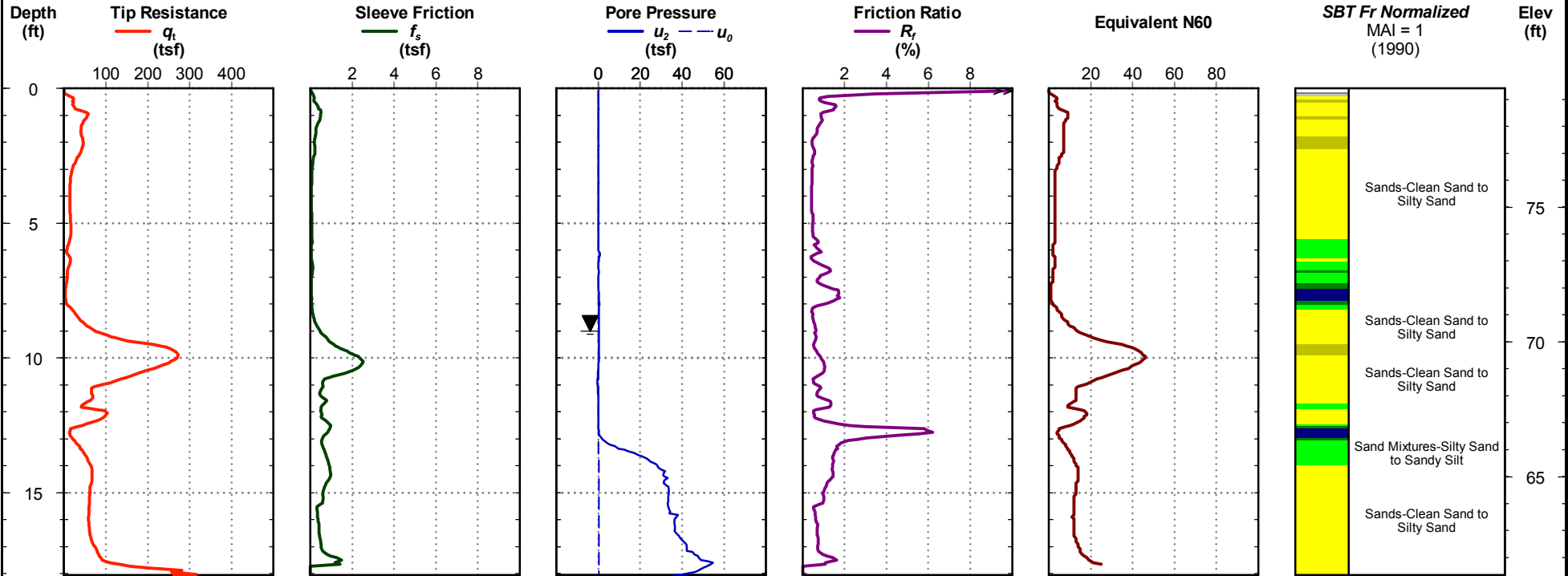
CPT REPORT - STANDARD_G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ_FME2017.GDT_10/31/19

CPT-3

Date: Sep. 19, 2019
 Estimated Water Depth: 9 ft
 Rig/Operator: CME 45-B/L. Guempel

Station: 97+79
 Offset: 12'-LT
 Elevation: 79.4

Total Depth: 18.1 ft
 Termination Criteria: Maximum Reaction Force
 Cone Size:





US 15 Bridge Replacement over Indian Field Swamp
 (Dorchester County, South Carolina)
 Project Number : P037127

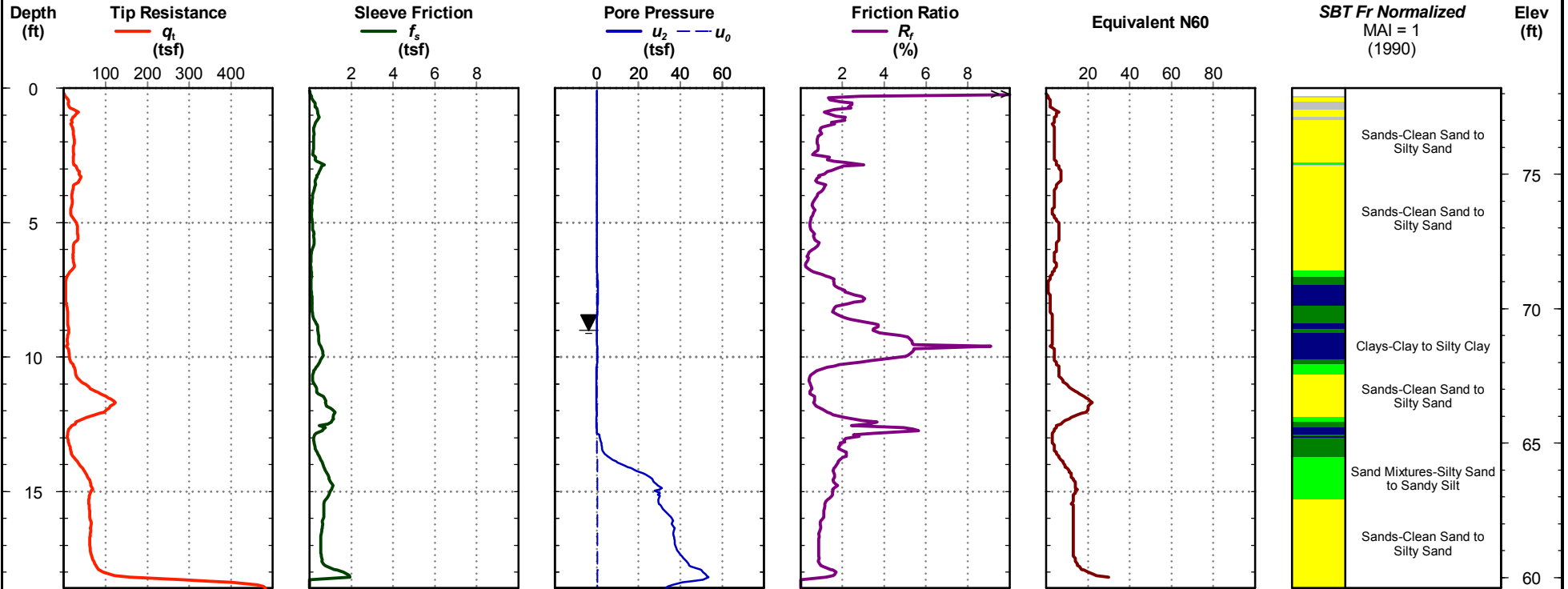
Cone Penetration Test

CPT-4

Date: Sep. 19, 2019
Estimated Water Depth: 9 ft
Rig/Operator: CME 45-B/L. Guempel

Station: 98+92
Offset: 14'-RT
Elevation: 78.2

Total Depth: 18.6 ft
Termination Criteria: Maximum Reaction Force
Cone Size:



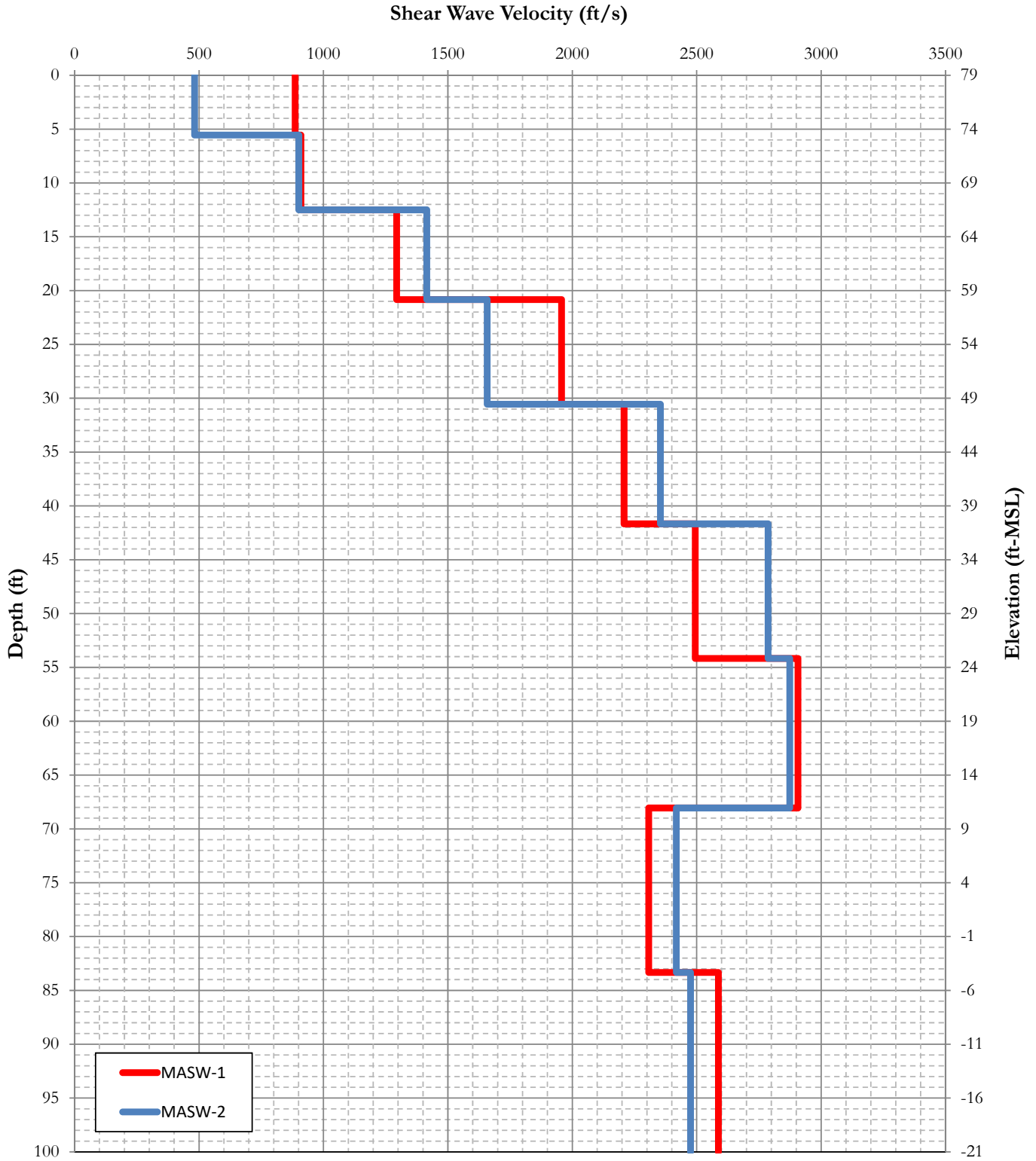
CPT REPORT - STANDARD_G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ_FME2017.GDT_10/31/19

CPT-4

US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 7 GEOPHYSICAL TEST RESULTS



US 15 Bridge Replacement over Indian Field Swamp

Geotechnical Base Line Report

APPENDIX

SECTION 8 ADRS CURVES

3-Point Acceleration Design Response Spectrum

SCDOT v3.0 - 05/14/2019

Project ID: P037127	Latitude: 33.2299
Route: US 15	County: 18 - Dorchester
Project: RBO Indian Field Swamp	Longitude: 80.5398

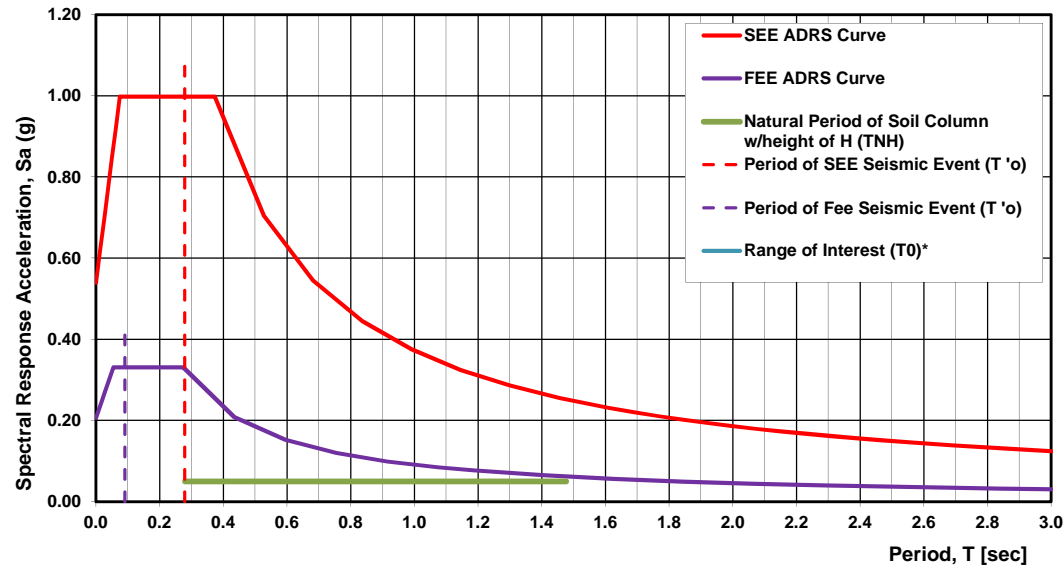
Designer: N. Harman - Support
Date: 10/14/2019

Design EQ	PGA	S _{DS}	S _{D1}	M _W	R	PGV	D _{a5-95}	T' _o
	g	g	g	-	km	inches/sec	sec	sec
FEE	0.21	0.33	0.09	7.30	47.03	3.44	27.90	0.09
SEE	0.54	1.00	0.37	7.30	45.10	14.12	27.61	0.28

Damping: 5%	Geologic Condition: Geologically Realistic (Q = 100)*
	SCCP
ADRS Location within Soil Column: At Ground Surface	South Carolina Coastal Plain

Fundamental Period of Structure, T ₀ sec	Range of Interest [*] sec		V [*] _{s,H} ft/sec	H ft	T _{NH} sec	
	0.5*T ₀	2.0*T ₀			(4*H)/V [*] _{s,H}	(6*H)/V [*] _{s,H}
0.00	0.00	0.00	1821.15	452.80	0.28	1.48
0.00	0.00	0.00				

SC Seismic ADRS Curve



FEE Data		SEE Data	
T	S _a	T	S _a
0.00	0.207	0.00	0.539
0.01	0.227	0.01	0.616
0.02	0.248	0.02	0.692
0.03	0.269	0.04	0.768
0.04	0.289	0.05	0.845
0.05	0.310	0.06	0.921
0.07	0.331	0.07	0.998
0.09	0.331	0.10	0.998
0.11	0.331	0.12	0.998
0.13	0.331	0.15	0.998
0.15	0.331	0.17	0.998
0.16	0.331	0.20	0.998
0.18	0.331	0.22	0.998
0.20	0.331	0.25	0.998
0.22	0.331	0.27	0.998
0.24	0.331	0.30	0.998
0.26	0.331	0.32	0.998
0.27	0.331	0.35	0.998
0.28	0.331	0.37	0.998
0.43	0.209	0.53	0.705
0.59	0.152	0.68	0.545
0.76	0.120	0.84	0.444
0.92	0.099	0.99	0.375
1.08	0.084	1.15	0.325
1.24	0.073	1.30	0.286
1.40	0.065	1.45	0.256
1.56	0.058	1.61	0.231
1.72	0.053	1.76	0.211
1.88	0.048	1.92	0.194
2.04	0.044	2.07	0.179
2.20	0.041	2.23	0.167
2.36	0.038	2.38	0.156
2.52	0.036	2.54	0.147
2.68	0.034	2.69	0.138
2.84	0.032	2.85	0.131
3.00	0.030	3.00	0.124

US 15 Bridge Replacement over Indian Field Swamp
Geotechnical Base Line Report

APPENDIX

SECTION 9 LABORATORY TEST RESULTS

**US 15 BRIDGE REPLACEMENT OVER INDIAN FIELD SWAMP
DORCHESTER COUNTY, SOUTH CAROLINA
F&ME PROJECT NO.: G6100.120; SCDOT PROJECT NO.: P037127**

SPLIT SPOON SAMPLE LABORATORY RESULTS SUMMARY

Boring Number	Sample Number	Sample Depth (ft)	Index									Organic Content (%)	Electro-Chemical			
			% Gravel	% Sand	% Fines (Silt/Clay)	LL	PL	PI	Moisture Content	USCS	AASHTO Class		pH	Resistivity (Ohms-cm)	Sulfate (mg/kg)	Chloride (mg/kg)
B-1	SS-2	2.0-4.0	--	--	20.9	NP	NP	NP	9.6	SM	A-2-4	--	--	--	--	--
B-1	SS-3	4.0-6.0	--	--	26.1	NP	NP	NP	35.7	SM	A-2-4	4.7	--	--	--	--
B-1	SS-4	6.0-8.0	0.0	60.2	39.8	27	14	13	21.2	SC	A-6(1)	--	--	--	--	--
B-1	SS-5	8.0-10.0	0.0	66.5	33.6	29	13	16	16.8	SC	A-2-6(1)	--	--	--	--	--
B-1	SS-6	13.5-15.0	--	--	52.5	48	29	19	50.0	ML	A-7-6(8)	--	--	--	--	--
B-1	SS-8	23.5-25.0	--	--	32.8	NP	NP	NP	32.9	SM	A-2-4	--	--	--	--	--
B-1	SS-10	33.5-35.0	--	--	26.5	NP	NP	NP	28.7	SM	A-2-4	--	--	--	--	--
B-1	SS-13	48.5-50.0	--	--	23.1	NP	NP	NP	30.7	SM	A-2-4	--	--	--	--	--
B-1	SS-16	63.5-65.0	--	--	24.8	NP	NP	NP	33.3	SM	A-2-4	--	--	--	--	--
B-1	SS-19	78.5-80.0	--	--	25.2	NP	NP	NP	33.6	SM	A-2-4	--	--	--	--	--
B-2	SS-2	2.0-4.0	--	--	20.4	NP	NP	NP	9.0	SM	A-2-4	--	--	--	--	--
B-2	SS-3	4.0-6.0	--	--	14.9	NP	NP	NP	14.1	SM	A-2-4	--	--	--	--	--
B-2	SS-4	6.0-8.0	0.0	62.3	37.7	31	16	15	16.4	SC	A-6(2)	--	--	--	--	--
B-2	SS-5	8.0-10.0	--	--	36.0	31	13	18	17.0	SC	A-6(2)	--	--	--	--	--
B-2	SS-6	13.5-15.0	0.0	42.7	57.3	41	30	11	38.5	ML	A-7-5(5)	--	--	--	--	--
B-2	SS-8	23.5-25.0	--	--	36.4	NP	NP	NP	31.0	SM	A-4(0)	--	--	--	--	--
B-2	SS-11	38.5-40.0	--	--	27.0	20	15	5	23.4	SC-SM	A-2-4	--	--	--	--	--
B-2	SS-14	53.5-55.0	--	--	22.8	NP	NP	NP	34.5	SM	A-2-4	--	--	--	--	--
B-2	SS-17	68.5-70.0	--	--	27.5	NP	NP	NP	32.6	SM	A-2-4	--	--	--	--	--
B-3	SS-3 & SS-4	4-6 & 6-8	--	--	--	--	--	--	--	--	--	--	7.42	9,247	<10.	<10.
B-3	SS-5	8.0-10.0	0.0	81.0	19.0	NP	NP	NP	20.0	SM	A-2-4	--	--	--	--	--
B-3	SS-6	13.5-15.0	0.0	42.0	58.0	44	36	8	62.1	ML	A-5(4)	--	--	--	--	--
B-3	SS-7	18.5-20.0	--	--	41.7	28	27	1	29.4	SM	A-4(0)	--	--	--	--	--
B-3	SS-10	33.5-35.0	--	--	18.8	NP	NP	NP	27.5	SM	A-2-4	--	--	--	--	--
B-3	SS-12	43.5-45.0	--	--	24.6	21	15	6	22.7	SC-SM	A-2-4	--	--	--	--	--
B-3	SS-17	68.5-70.0	--	--	23.1	NP	NP	NP	28.7	SM	A-2-4	--	--	--	--	--
B-3	SS-20	83.5-85.0	--	--	26.0	NP	NP	NP	33.0	SM	A-2-4	--	--	--	--	--

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2535 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	B-1	B-1	B-1	B-1	B-1
SAMPLE NO.	SS-2	SS-3	SS-4	SS-5	SS-6
SAMPLE DEPTH (FT.)	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	13.5 - 15.0
WATER CONTENT, W%	9.6	35.7	21.2	16.8	50.0

BORING NO.	B-1	B-1	B-1	B-1	B-1
SAMPLE NO.	SS-8	SS-10	SS-13	SS-16	SS-19
SAMPLE DEPTH (FT.)	23.5 - 25.0	33.5 - 35.0	48.5 - 50.0	63.5 - 65.0	78.5 - 80.0
WATER CONTENT, W%	32.9	28.7	30.7	33.3	33.6

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

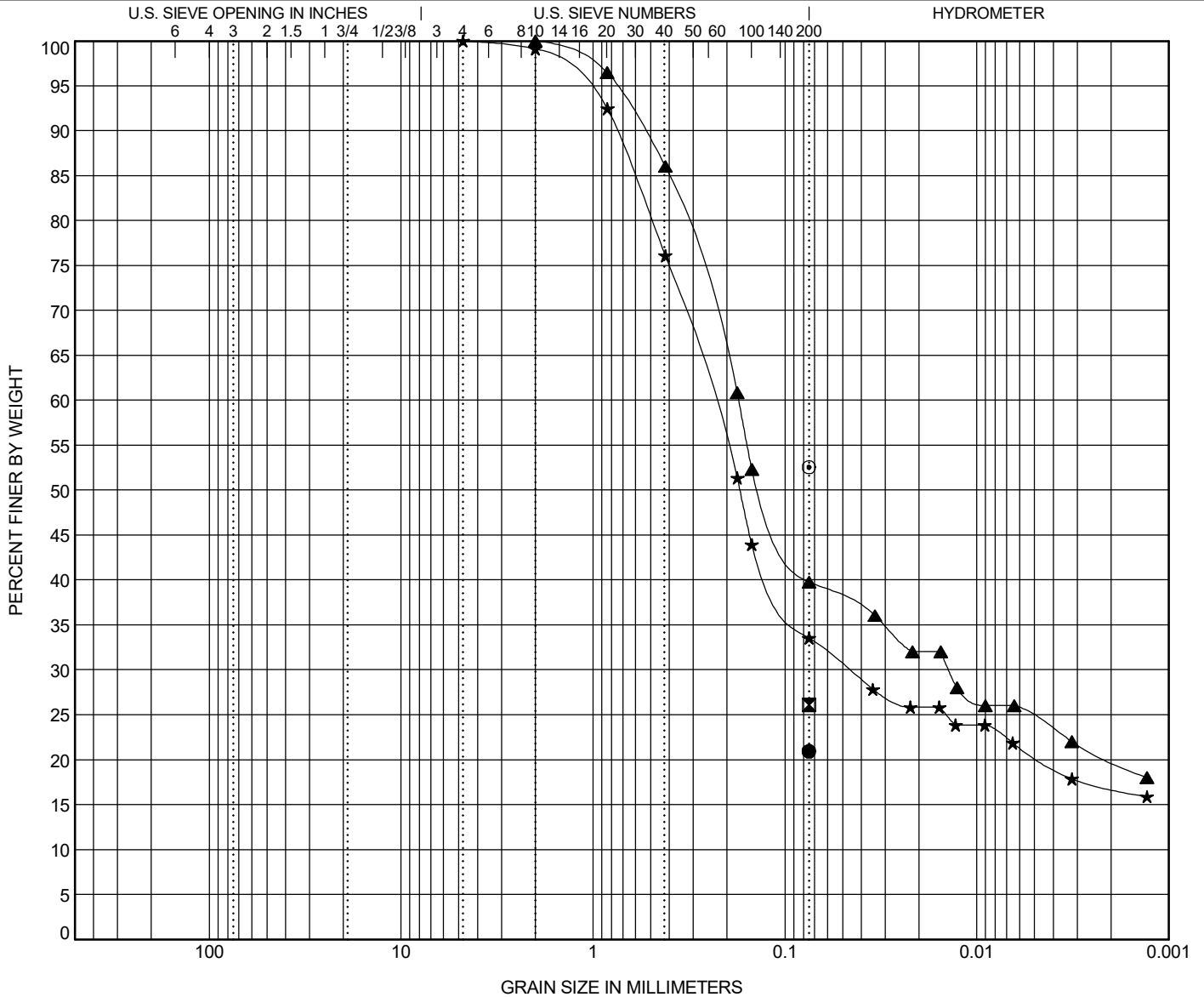


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	4.0	Silty SAND (SM)	NP	NP	NP		
☒ B-1	6.0	Silty SAND (SM)	NP	NP	NP		
▲ B-1	8.0	Clayey SAND (SC/A-6(1))	27	14	13		
★ B-1	10.0	Clayey SAND (SC/A-2-6(1))	29	13	16		
◎ B-1	15.0	Sandy SILT (ML)	48	29	19		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	4.0	0.075						20.9	
☒ B-1	6.0	0.075						26.1	
▲ B-1	8.0	2	0.763	0.131		0.0	60.2	15.2	24.6
★ B-1	10.0	4.76	1.169	0.172		0.0	66.5	13.2	20.4
◎ B-1	15.0	0.075						52.5	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

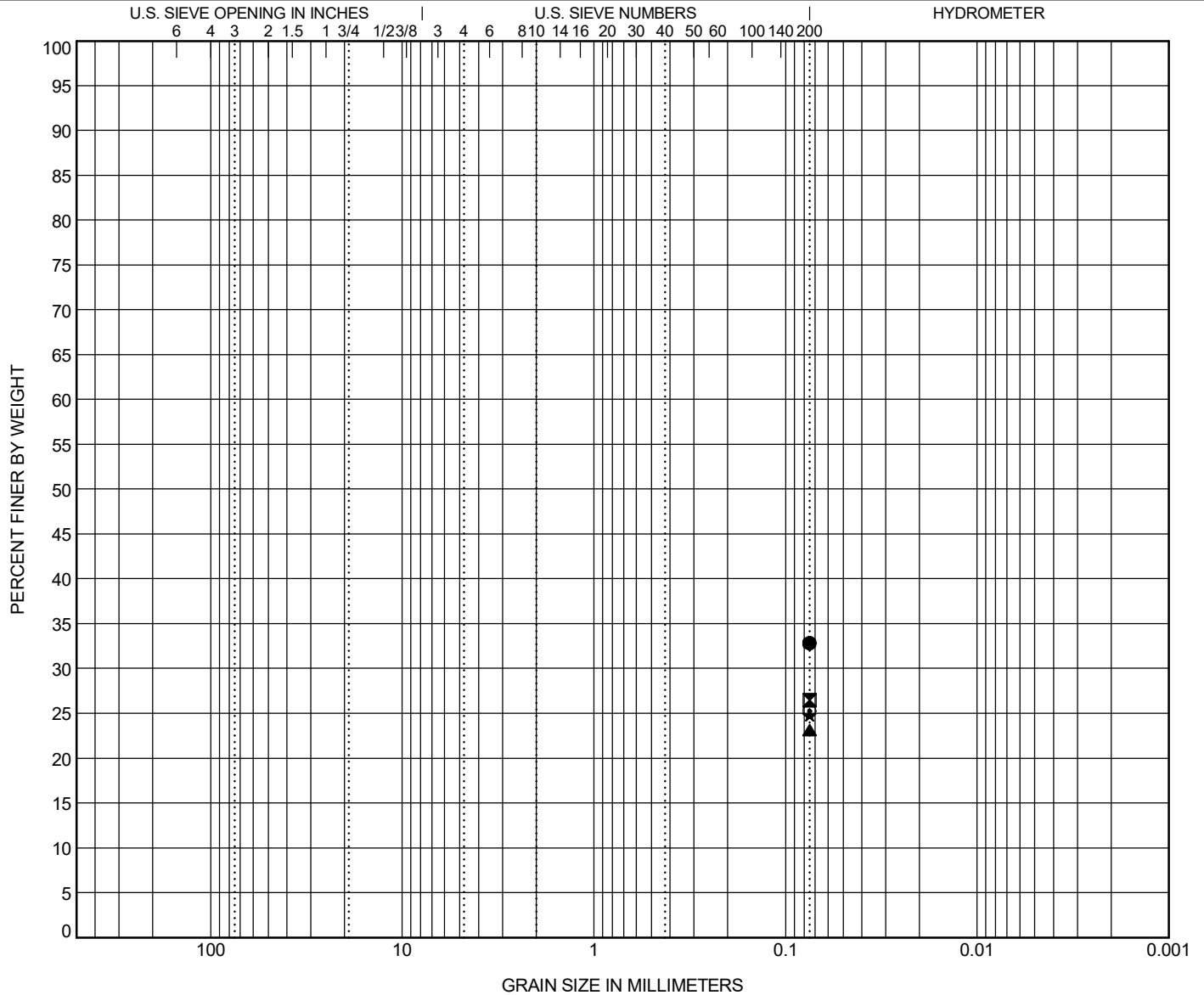


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-1	25.0	<u>Silty SAND (SM)</u>	NP	NP	NP		
☒ B-1	35.0	<u>Silty SAND (SM)</u>	NP	NP	NP		
▲ B-1	50.0	<u>Silty SAND (SM)</u>	NP	NP	NP		
★ B-1	65.0	<u>Silty SAND (SM)</u>	NP	NP	NP		
◎ B-1	80.0	<u>Silty SAND (SM)</u>	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	25.0	0.075						32.8	
☒ B-1	35.0	0.075						26.5	
▲ B-1	50.0	0.075						23.1	
★ B-1	65.0	0.075						24.8	
◎ B-1	80.0	0.075						25.2	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

F&ME CONSULTANTS
 3112 Devine Street
 Columbia, South Carolina 29205

**ORGANIC IMPURITIES DETERMINATION
 (AASHTO T267)**

Project Name:	<u>US-15 RBO Indian Field Swamp</u>	Project Number:	<u>G6100.12</u>
Sample Location:	<u>B-1</u>	Sample Elevation/Depth:	<u>4.0 ft. - 6.0 ft.</u>
Description of Sample:	<u>Silty SAND (SM)</u>	Date Tested:	<u>10/8/2019</u>
Tested By:	<u>J. Hiers</u>	Date Weighed:	<u>10/9/2019</u>
Weighed By:	<u>A. Abernethy</u>	Ignition Oven Temperature:	<u>455 °C</u>

Boring/Sample No.	B-1			
Crucible No.	A			
Mass of Crucible & Dry Soil (Before Ignition) [g]	172.02			
Mass of Crucible & Dry Soil (After Ignition) [g]	170.13			
Mass of Crucible [g]	132.02			
Mass of Dry Soil (Before Ignition) [g]	40.00			
Mass of Dry Soil (After Ignition) [g]	38.11			
% Organic Impurities	4.7%			

Date Reviewed: 10/9/2019 Reviewed By: A. Abernethy



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3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2536 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	B-2	B-2	B-2	B-2	B-2
SAMPLE NO.	SS-2	SS-3	SS-4	SS-5	SS-6
SAMPLE DEPTH (FT.)	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	8.0 - 10.0	13.5 - 15.0
WATER CONTENT, W%	9.0	14.1	16.4	17.0	38.5

BORING NO.	B-2	B-2	B-2	B-2	
SAMPLE NO.	SS-8	SS-11	SS-14	SS-17	
SAMPLE DEPTH (FT.)	23.5 - 25.0	38.5 - 40.0	53.5 - 55.0	68.5 - 70.0	
WATER CONTENT, W%	31.0	23.4	34.5	32.7	

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

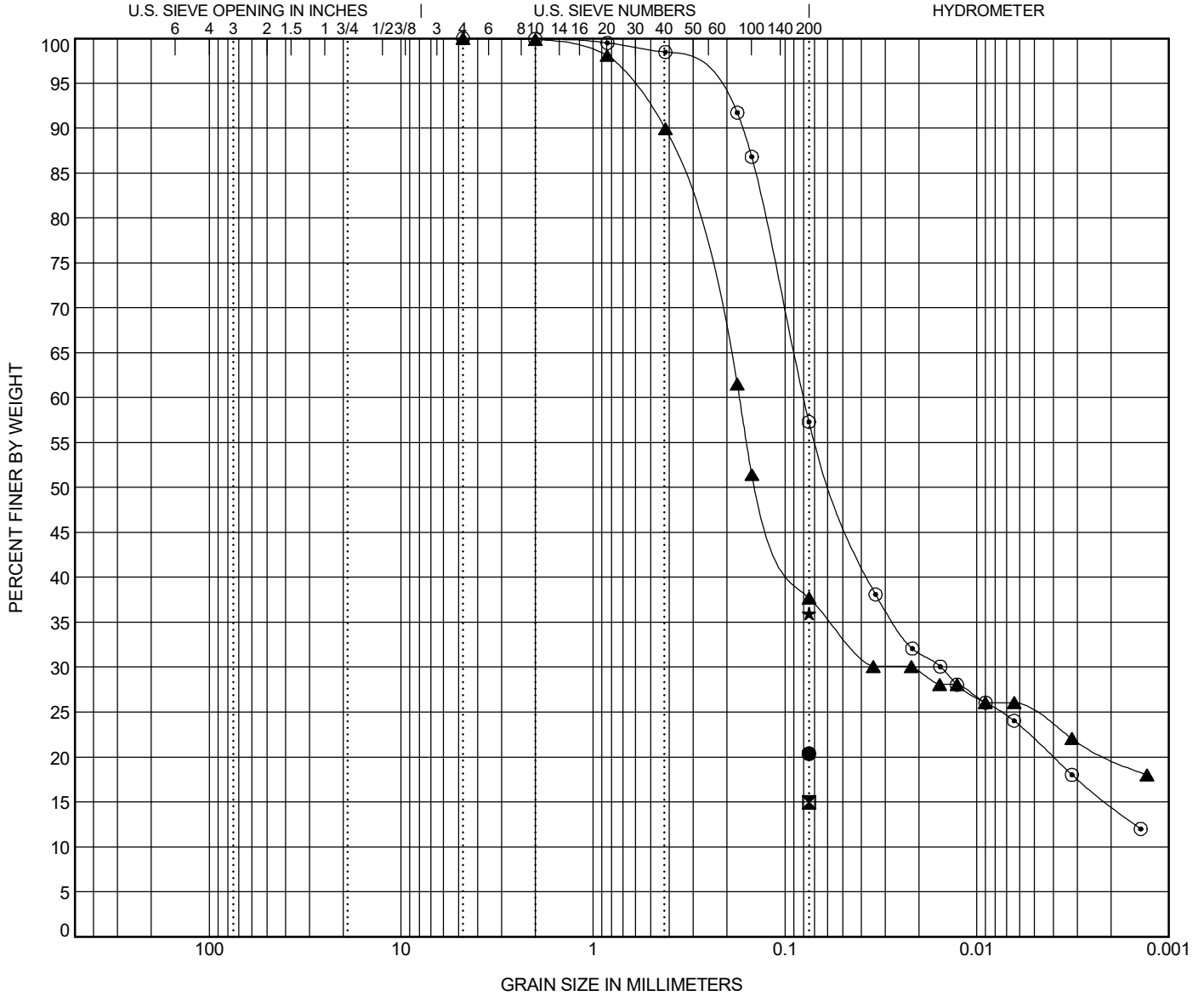


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-2	4.0	Silty SAND (SM)	NP	NP	NP		
☒ B-2	6.0	Silty SAND (SM/A-2-4)	NP	NP	NP		
▲ B-2	8.0	Clayey SAND (SC)	31	16	15		
★ B-2	10.0	Clayey SAND (SC)	31	13	18		
⊙ B-2	15.0	Sandy SILT (ML/A-7-5(5))	41	30	11		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-2	4.0	0.075						20.4	
☒ B-2	6.0	0.075						14.9	
▲ B-2	8.0	4.76	0.646	0.139		0.0	62.3	13.1	24.6
★ B-2	10.0	0.075						36.0	
⊙ B-2	15.0	4.76	0.269	0.055		0.0	42.7	35.4	21.9

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/23/19

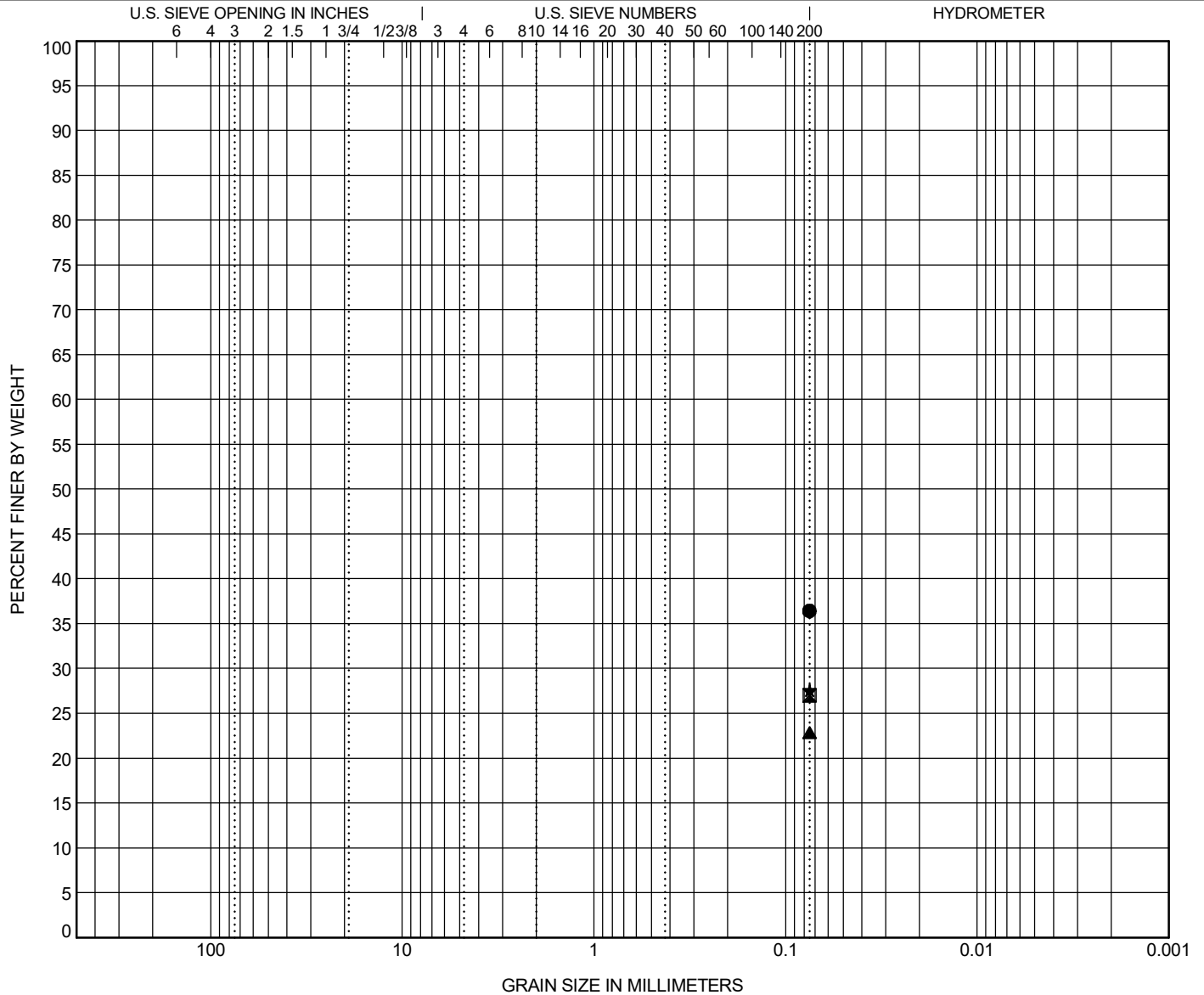


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-2	25.0	Silty SAND (SM)	NP	NP	NP		
☒ B-2	40.0	Silty, Clayey SAND (SC-SM)	20	15	5		
▲ B-2	55.0	Silty SAND (SM)	NP	NP	NP		
★ B-2	70.0	Silty SAND (SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-2	25.0	0.075						36.4	
☒ B-2	40.0	0.075						27.0	
▲ B-2	55.0	0.075						22.8	
★ B-2	70.0	0.075						27.5	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/23/19

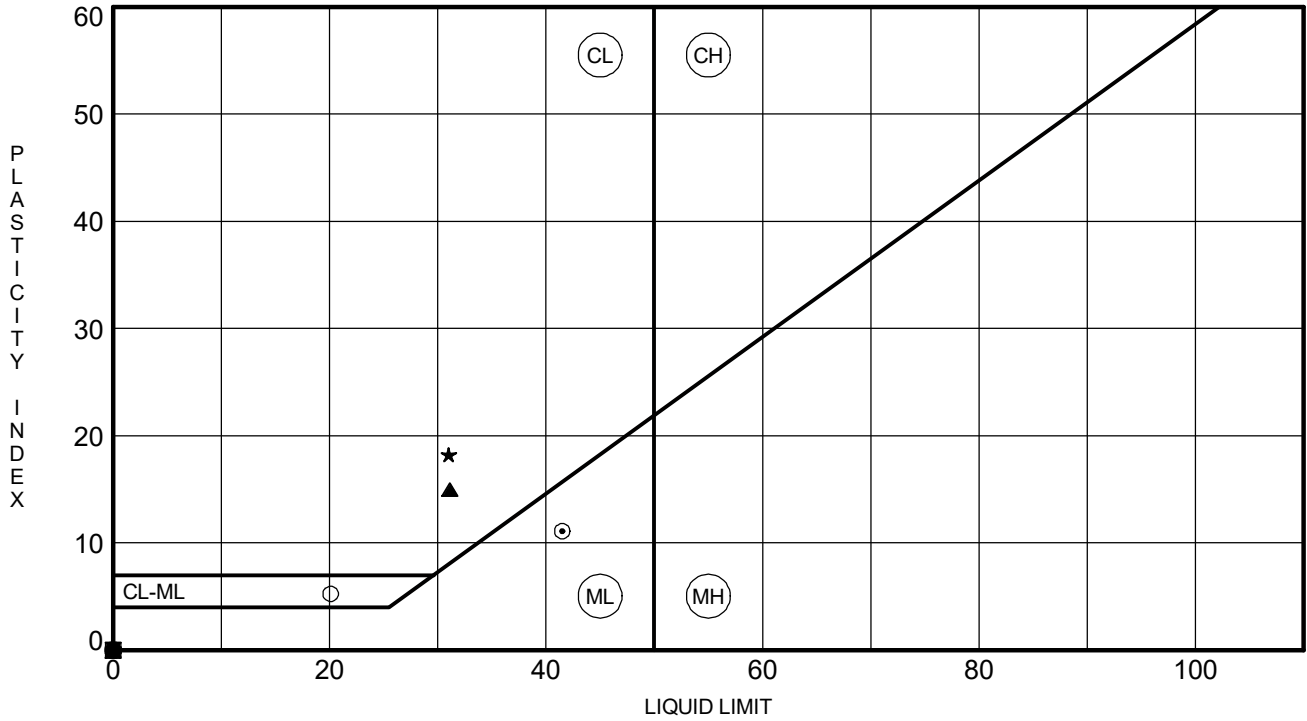


ATTERBERG LIMITS' RESULTS

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
● B-2	4.0	NP	NP	NP	20	Silty SAND (SM)
■ B-2	6.0	NP	NP	NP	15	Silty SAND (SM/A-2-4)
▲ B-2	8.0	31	16	15	38	Clayey SAND (SC)
★ B-2	10.0	31	13	18	36	Clayey SAND (SC)
⊙ B-2	15.0	41	30	11	57	Sandy SILT (ML/A-7-5(5))
⊕ B-2	25.0	NP	NP	NP	36	Silty SAND (SM)
○ B-2	40.0	20	15	5	27	Silty, Clayey SAND (SC-SM)
△ B-2	55.0	NP	NP	NP	23	Silty SAND (SM)
⊗ B-2	70.0	NP	NP	NP	28	Silty SAND (SM)

ATTERBERG LIMITS G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/23/19

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2537 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	B-3	B-3	B-3	B-3	B-3
SAMPLE NO.	SS-5	SS-6	SS-8	SS-10	SS-12
SAMPLE DEPTH (FT.)	8.0 - 10.0	13.5 - 15.0	18.5 - 20.0	33.5 - 35.0	43.5 - 45.0
WATER CONTENT, W%	20.0	62.1	29.4	27.5	22.7

BORING NO.	B-3	B-3			
SAMPLE NO.	SS-17	SS-20			
SAMPLE DEPTH (FT.)	68.5 - 70.0	83.5 - 85.00			
WATER CONTENT, W%	28.7	33.0			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

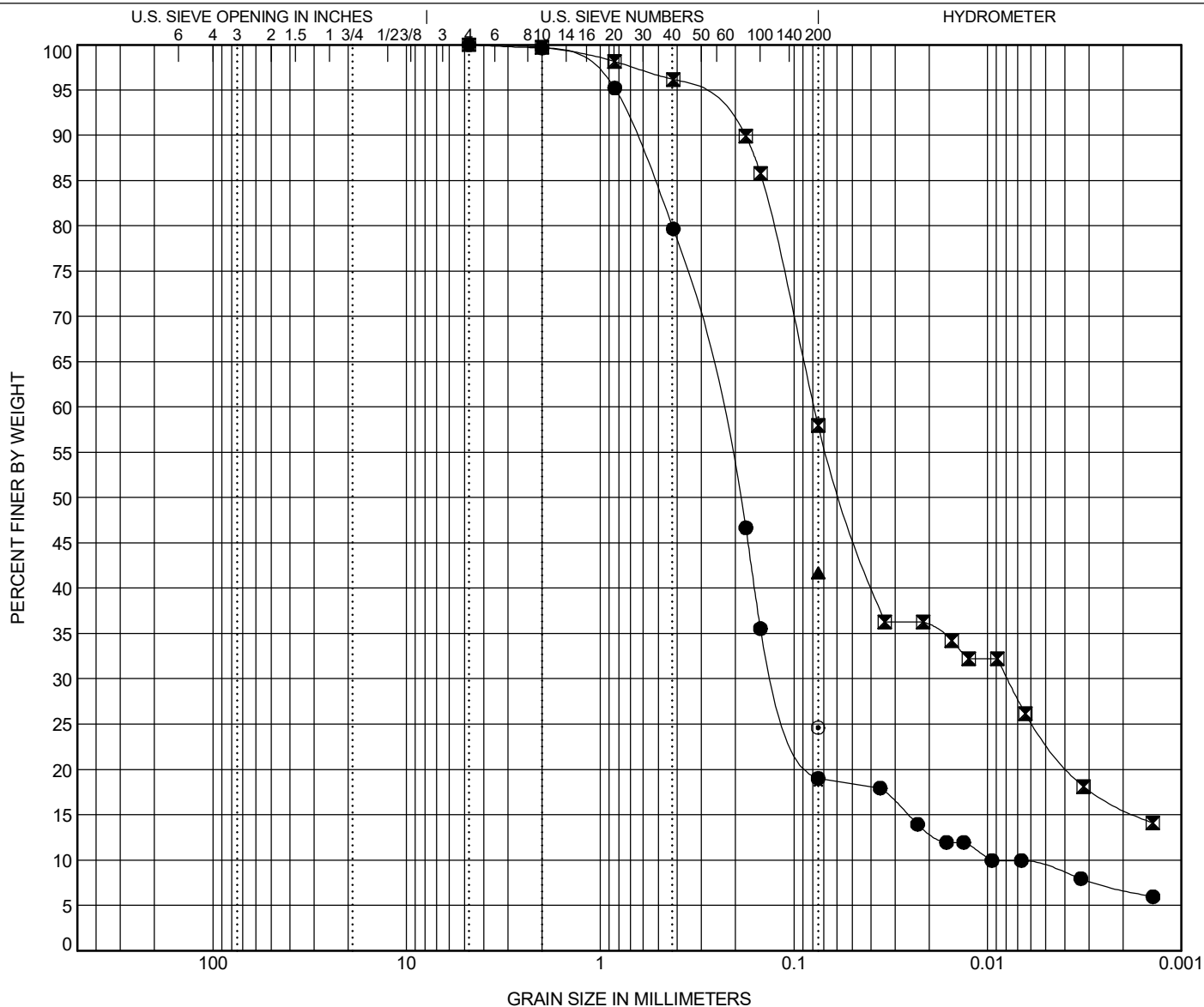


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-3	10.0	Silty SAND (SM/A-2-4)	NP	NP	NP	5.82	26.13
⊠ B-3	15.0	Sandy SILT (MLA-5(4))	44	36	8		
▲ B-3	20.0	Silty SAND (SM)	28	27	1		
★ B-3	35.0	Silty SAND (SM)	NP	NP	NP		
⊙ B-3	45.0	Silty, Clayey SAND (SC-SM)	21	15	6		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-3	10.0	4.76	0.833	0.193	0.01	0.0	81.0	9.9	9.1
⊠ B-3	15.0	4.76	0.357	0.056		0.0	42.0	34.7	23.3
▲ B-3	20.0	0.075							41.7
★ B-3	35.0	0.075							18.8
⊙ B-3	45.0	0.075							24.6

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

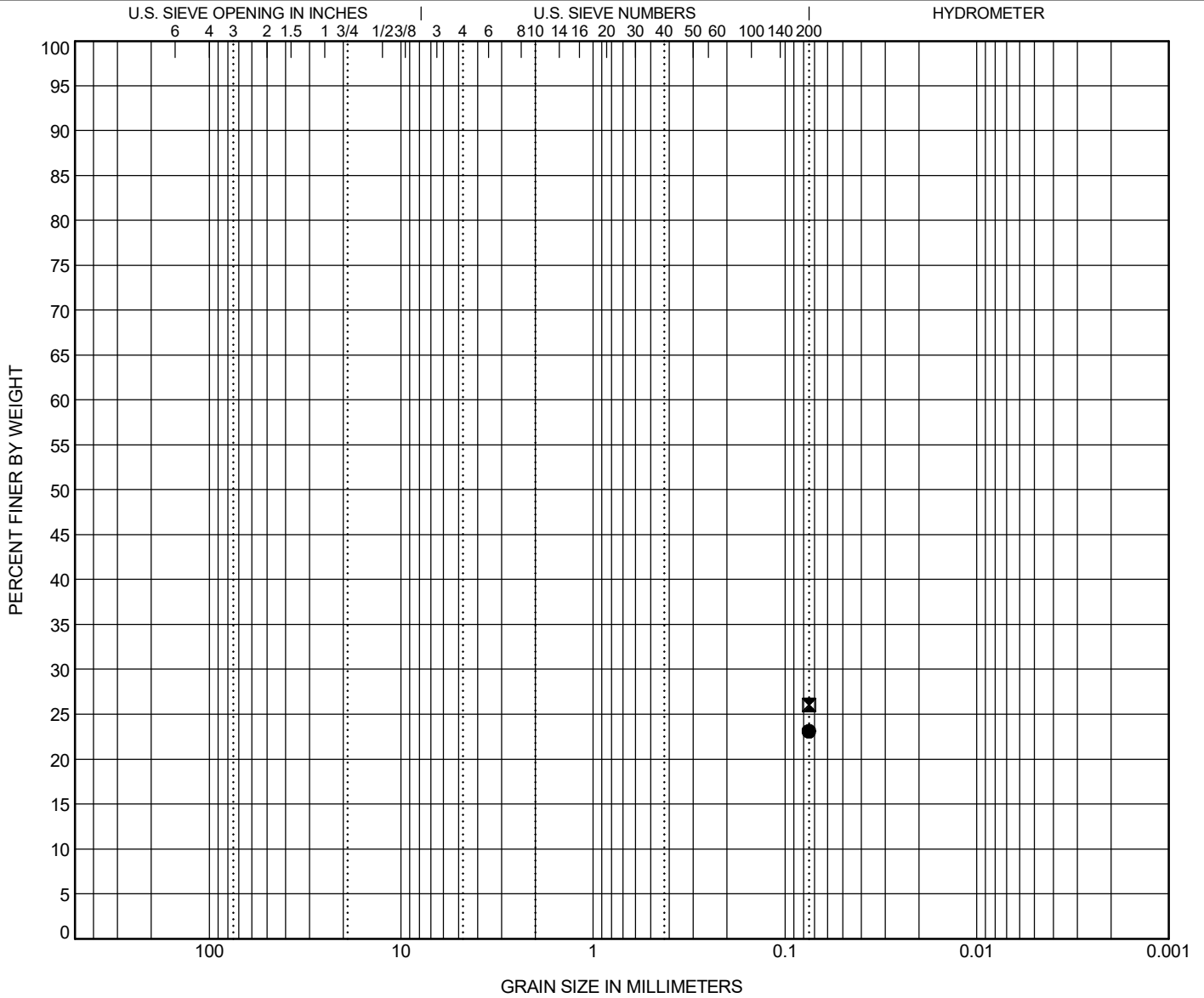


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-3	70.0	Silty SAND (SM)	NP	NP	NP		
■ B-3	85.0	Silty SAND (SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-3	70.0	0.075						23.1	
■ B-3	85.0	0.075						26.0	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2510 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	B-4	B-4	B-4	B-4	B-4
SAMPLE NO.	SS-3	SS-4	SS-6	SS-8	48.5 - 50.0
SAMPLE DEPTH (FT.)	4.0 - 6.0	6.0 - 8.0	13.5 - 15.0	23.5 - 25.0	SS-13
WATER CONTENT, W%	10.4	14.9	46.5	32.8	25.8

BORING NO.	B-4	B-4			
SAMPLE NO.	SS-16	SS-19			
SAMPLE DEPTH (FT.)	63.5 - 65.0	78.5 - 80.0			
WATER CONTENT, W%	27.9	33.6			

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

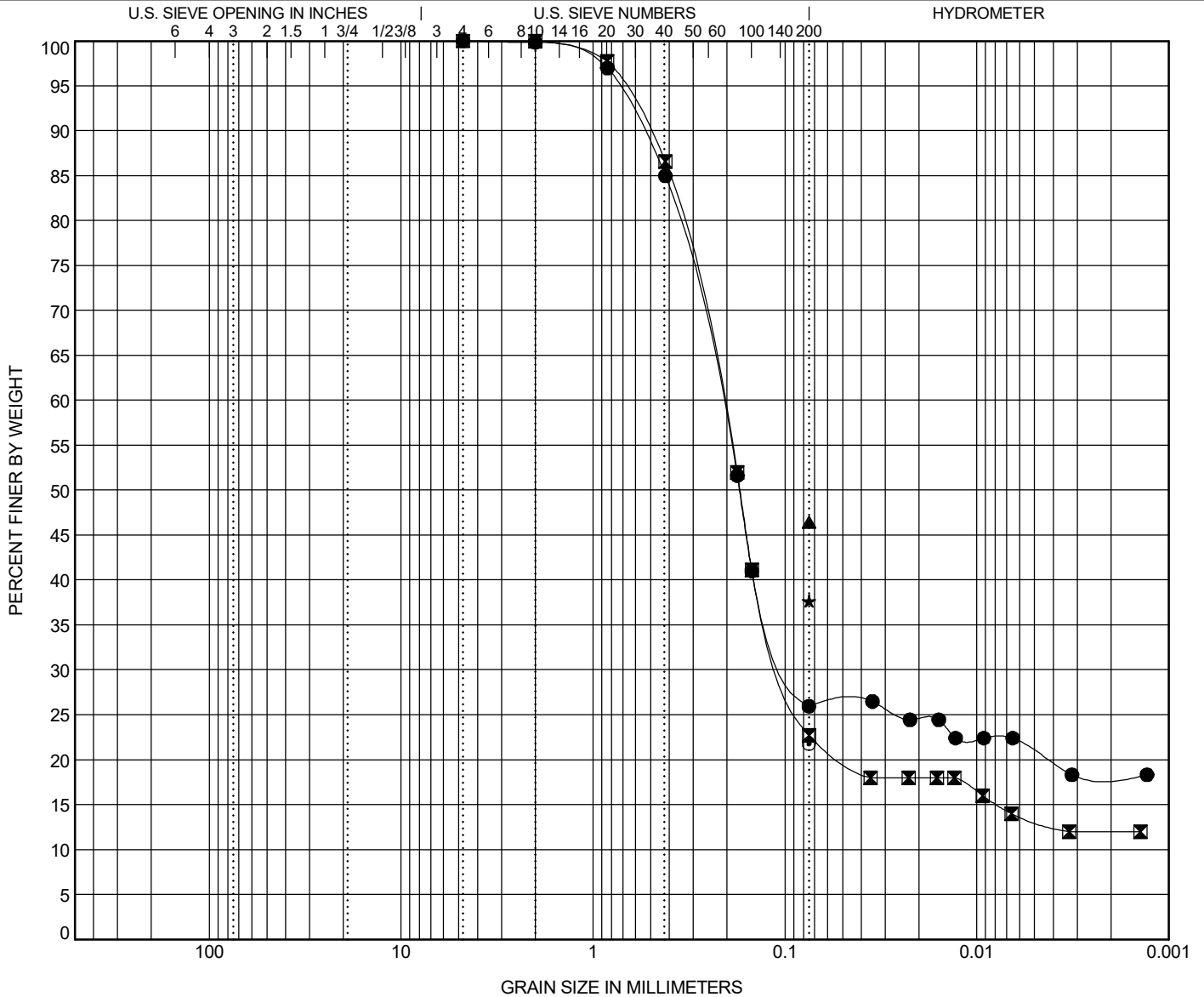


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-4	6.0	Silty SAND (SM/A-2-4)	NP	NP	NP		
⊠ B-4	8.0	Silty SAND (SM/A-2-4)	NP	NP	NP		
▲ B-4	15.0	Silty SAND (SM)	46	38	8		
★ B-4	25.0	Silty SAND (SM)	NP	NP	NP		
◎ B-4	50.0	Silty SAND (SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-4	6.0	4.76	0.75	0.172		0.0	74.1	5.1	20.9
⊠ B-4	8.0	4.76	0.71	0.172		0.0	77.3	9.5	13.2
▲ B-4	15.0	0.075							46.4
★ B-4	25.0	0.075							37.7
◎ B-4	50.0	0.075							21.8

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

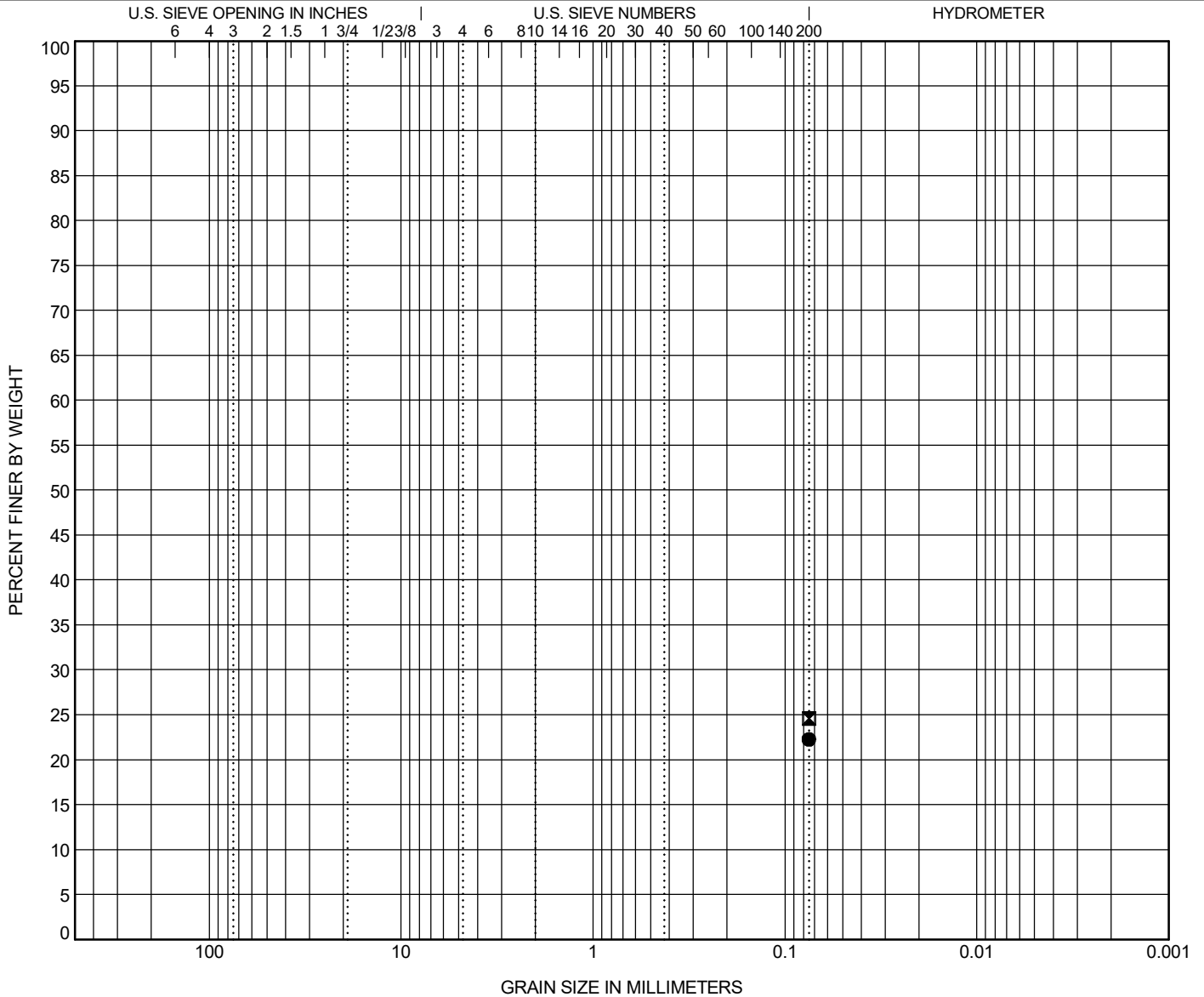


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● B-4	65.0	Silty SAND (SM)	NP	NP	NP		
▣ B-4	80.0	Silty SAND (SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● B-4	65.0	0.075						22.2	
▣ B-4	80.0	0.075						24.6	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

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**ORGANIC IMPURITIES DETERMINATION
 (AASHTO T267)**

Project Name:	<u>US-15 RBO Indian Field Swamp</u>	Project Number:	<u>G6100.12</u>
Sample Location:	<u>B-4</u>	Sample Elevation/Depth:	<u>4.0 ft. - 6.0 ft.</u>
Description of Sample:	<u>Silty SAND (SM/A-2-4)</u>	Date Tested:	<u>10/8/2019</u>
Tested By:	<u>J. Hiers</u>	Date Weighed:	<u>10/9/2019</u>
Weighed By:	<u>A. Abernethy</u>	Ignition Oven Temperature:	<u>455 °C</u>

Boring/Sample No.	B-4			
Crucible No.	B			
Mass of Crucible & Dry Soil (Before Ignition) [g]	175.63			
Mass of Crucible & Dry Soil (After Ignition) [g]	175.22			
Mass of Crucible [g]	135.63			
Mass of Dry Soil (Before Ignition) [g]	40.00			
Mass of Dry Soil (After Ignition) [g]	39.59			
% Organic Impurities	1.0%			

Date Reviewed: 10/9/2019 Reviewed By: A. Abernethy



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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2533 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	R-1	R-1	R-1	R-1	R-1
SAMPLE NO.	SS-1	SS-2	SS-3	SS-4	SS-7
SAMPLE DEPTH (FT.)	0.0 - 2.0	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	18.5 - 20.0
WATER CONTENT, W%	12.6	17.8	16.0	15.5	31.4

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

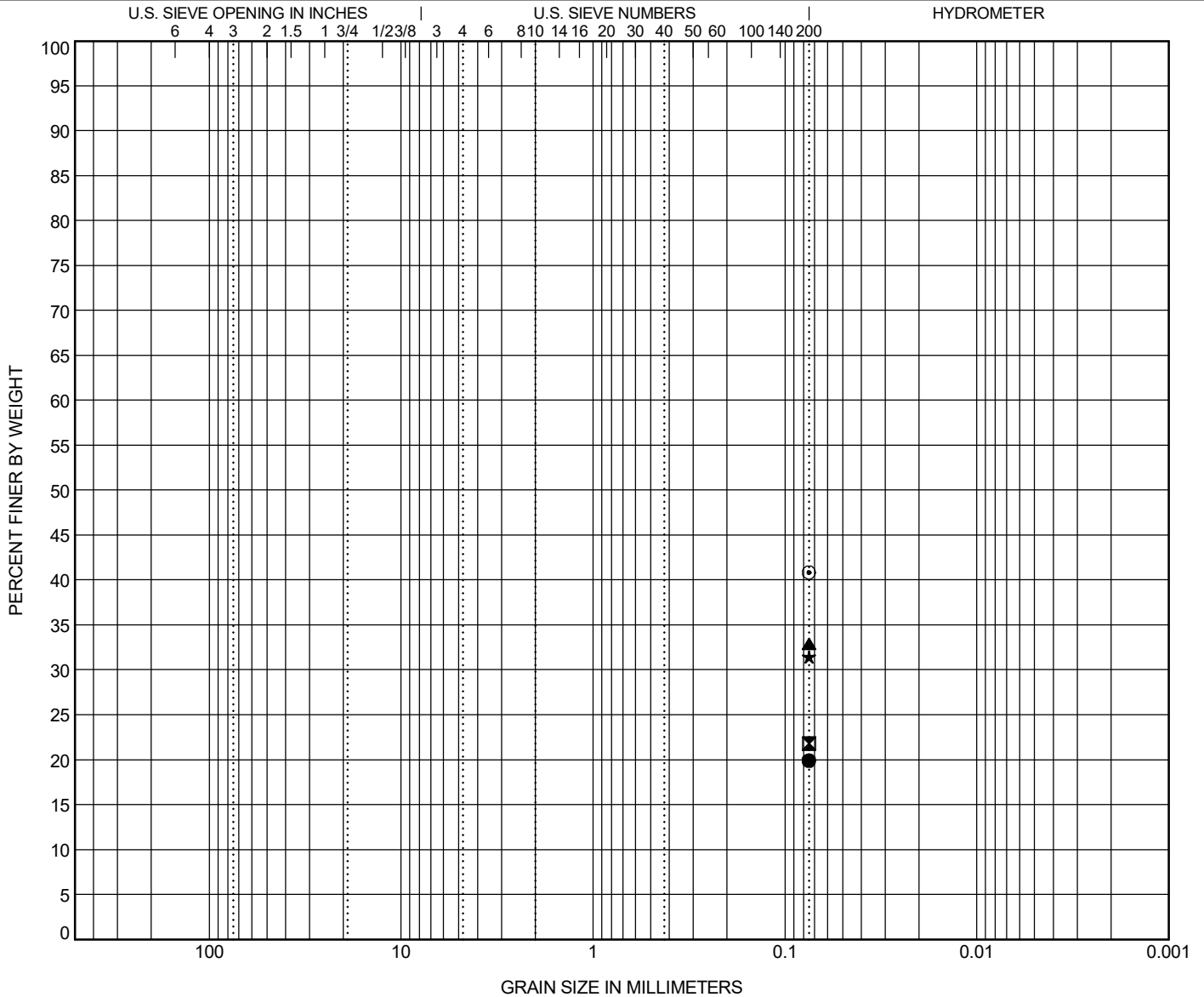


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● R-1	2.0	Silty SAND (SM)	NP	NP	NP		
☒ R-1	4.0	Silty SAND (SM)	17	15	2		
▲ R-1	6.0	Clayey SAND (SC)	39	15	24		
★ R-1	8.0	Clayey SAND (SC)	39	14	25		
◎ R-1	20.0	Silty SAND (SM)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● R-1	2.0	0.075							19.9
☒ R-1	4.0	0.075							21.8
▲ R-1	6.0	0.075							32.9
★ R-1	8.0	0.075							31.4
◎ R-1	20.0	0.075							40.8

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2534 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	R-2	R-2	R-2	R-2	R-2
SAMPLE NO.	SS-1	SS-2	SS-3	SS-5	SS-6
SAMPLE DEPTH (FT.)	0.0 - 2.0	2.0 - 4.0	4.0 - 6.0	8.0 - 10.0	13.5 - 15.0
WATER CONTENT, W%	11.3	8.9	8.6	15.1	43.1

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

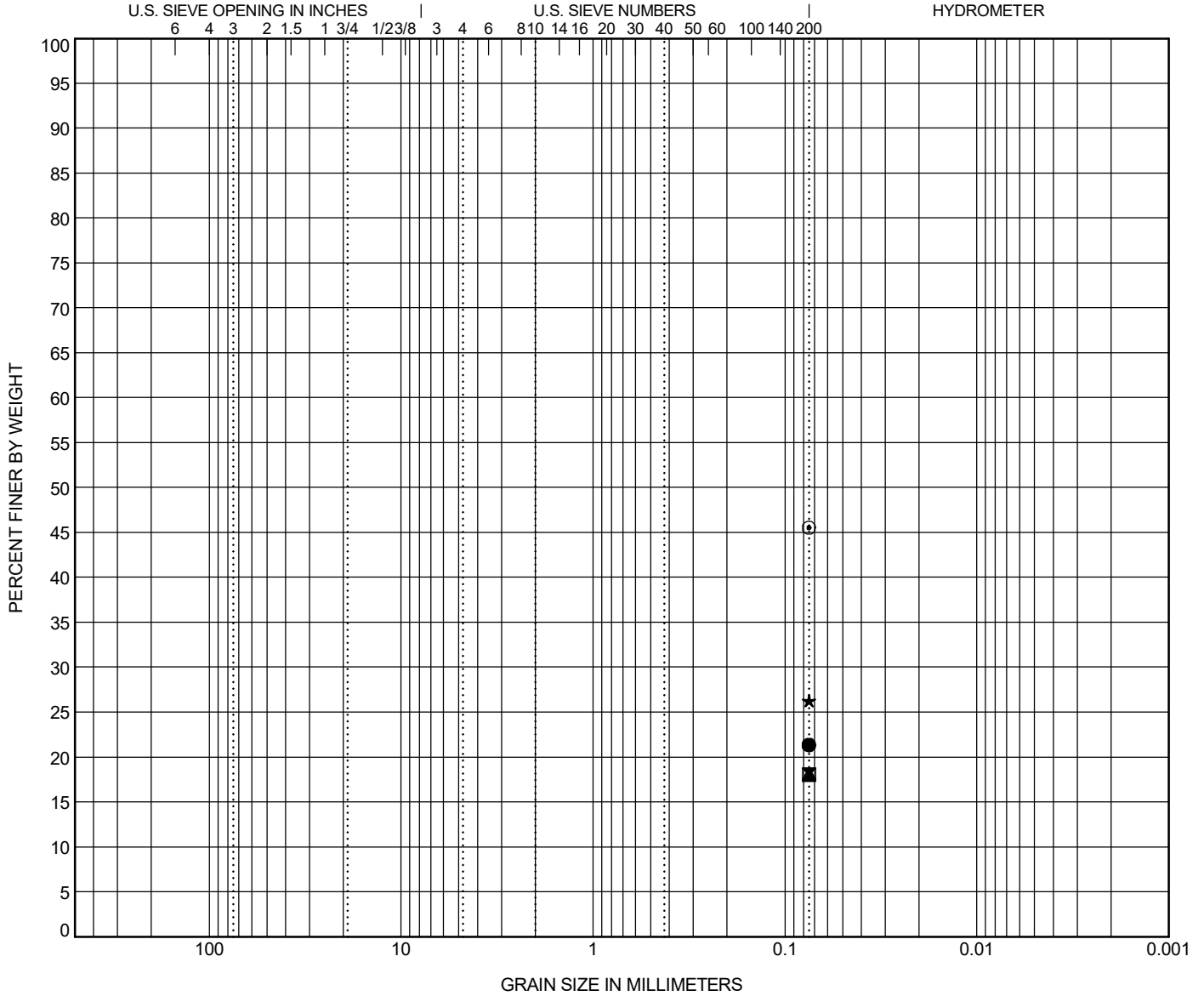


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● R-2	2.0	Silty SAND (SM)	NP	NP	NP		
☒ R-2	4.0	Silty SAND (SM)	NP	NP	NP		
▲ R-2	6.0	Silty SAND (SM)	NP	NP	NP		
★ R-2	10.0	Clayey SAND (SC)	31	14	17		
◎ R-2	15.0	Silty SAND (SM)	44	31	13		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● R-2	2.0	0.075						21.3	
☒ R-2	4.0	0.075						18.0	
▲ R-2	6.0	0.075						18.1	
★ R-2	10.0	0.075						26.3	
◎ R-2	15.0	0.075						45.5	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2511 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	R-3	R-3	R-3	R-3	R-3
SAMPLE NO.	SS-1	SS-2	SS-3	SS-5	SS-8
SAMPLE DEPTH (FT.)	0.0 - 2.0	2.0 - 4.0	4.0 - 6.0	8.0 - 10.0	23.5 - 25.0
WATER CONTENT, W%	16.4	9.6	11.7	15.6	28.6

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

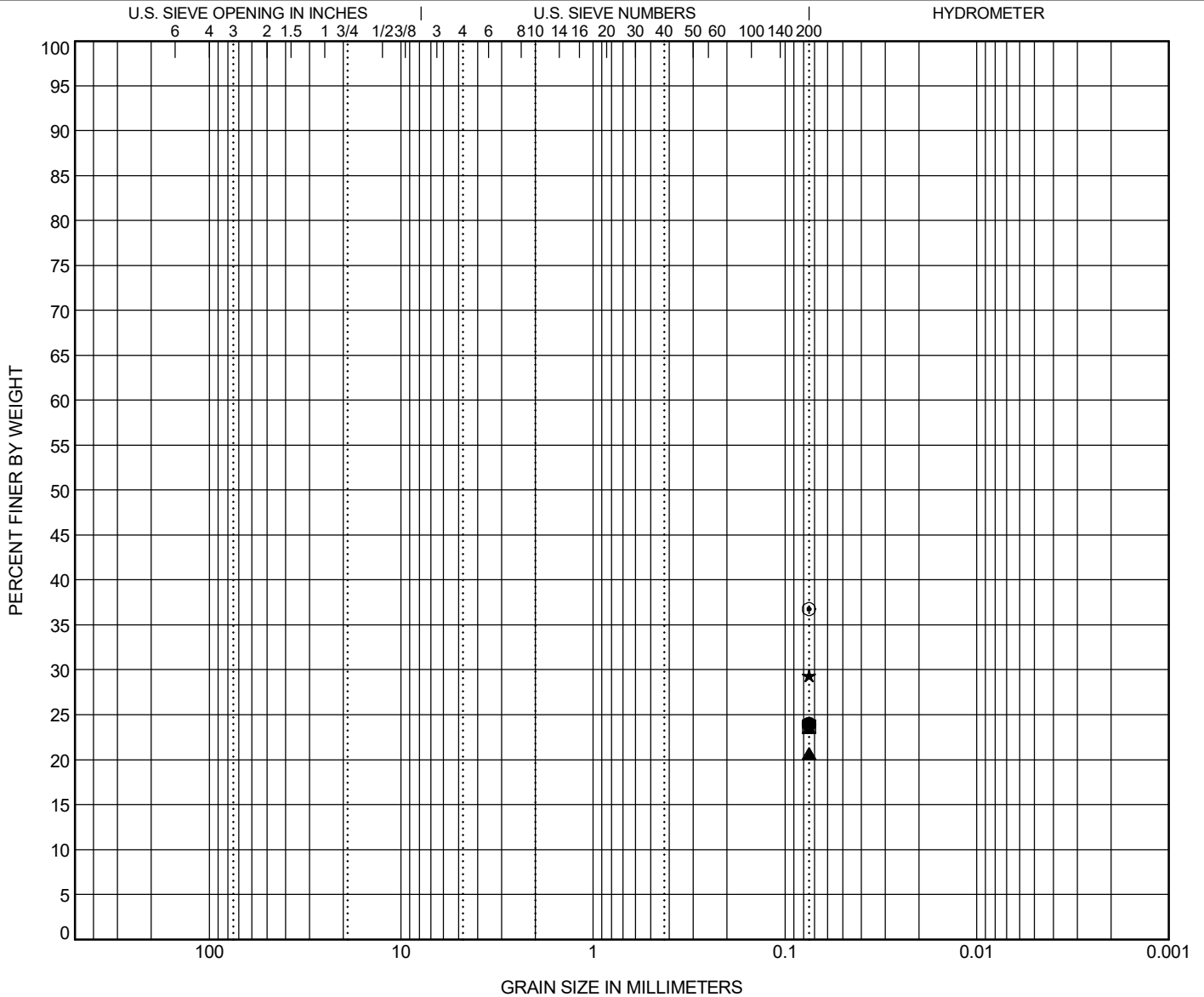


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● R-3	2.0	Clayey SAND (SC)					25	17	8		
☒ R-3	4.0	Silty SAND (SM)					NP	NP	NP		
▲ R-3	6.0	Silty SAND (SM)					NP	NP	NP		
★ R-3	10.0	Clayey SAND (SC)					24	14	10		
◎ R-3	25.0	Silty SAND (SM)					NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● R-3	2.0	0.075							23.9
☒ R-3	4.0	0.075							23.7
▲ R-3	6.0	0.075							20.7
★ R-3	10.0	0.075							29.3
◎ R-3	25.0	0.075							36.8

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2512 **DATE SAMPLE RECEIVED:** 9/30/2019
DESCRIPTION OF SOIL: VARIOUS
TESTED BY: AA/TA **DATE OF TESTING:** 10/2/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/3/2019

BORING NO.	R-4	R-4	R-4	R-4	
SAMPLE NO.	SS-2	SS-3	SS-4	SS-7	
SAMPLE DEPTH (FT.)	2.0 - 4.0	4.0 - 6.0	6.0 - 8.0	18.5 - 20.0	
WATER CONTENT, W%	11.2	6.9	13.2	39.0	

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

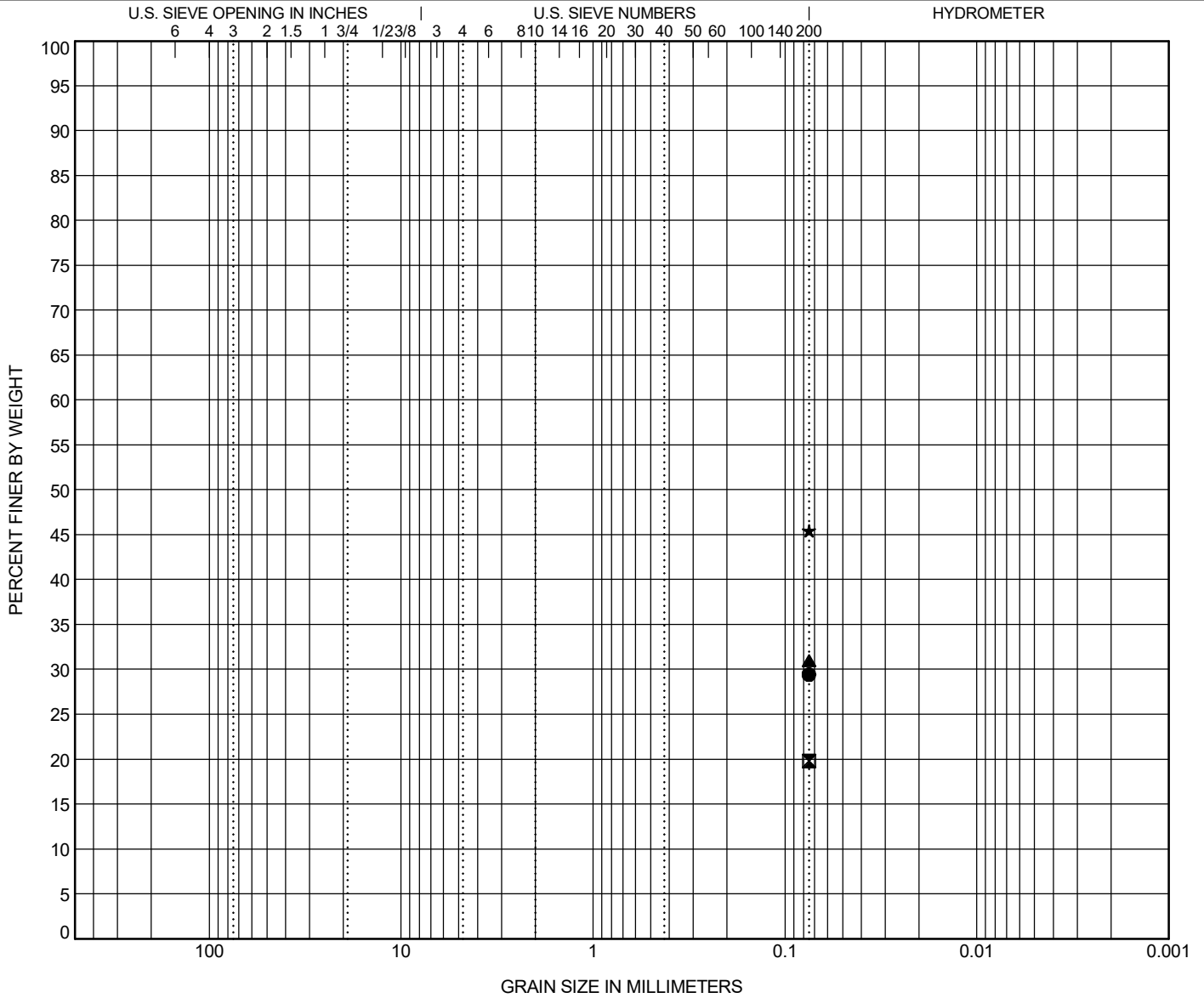


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● R-4	4.0	Silty SAND (SM)	NP	NP	NP		
☒ R-4	6.0	Silty SAND (SM)	NP	NP	NP		
▲ R-4	8.0	Clayey SAND (SC)	29	14	15		
★ R-4	20.0	Silty SAND (SM)	41	36	5		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● R-4	4.0	0.075						29.4	
☒ R-4	6.0	0.075						19.8	
▲ R-4	8.0	0.075						31.0	
★ R-4	20.0	0.075						45.4	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/18/19

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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US-15 Replacement Bridge over Indian Field Swamp	PROJECT NO.:	G6100.12
SAMPLE NUMBER:	19-2538	DATE SAMPLE RECEIVED:	9/27/2019
DESCRIPTION OF SOIL:	Silty SAND (SM/A-2-4)		
TESTED BY:	AA	DATE OF TESTING:	10/4/2019
WEIGHED BY:	AA	DATE OF WEIGHING:	10/7/2019

BORING NO.	BS-1				
SAMPLE NO.	--				
SAMPLE DEPTH (FT.)	0.0 - 5.0				
WATER CONTENT, W%	12.6				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

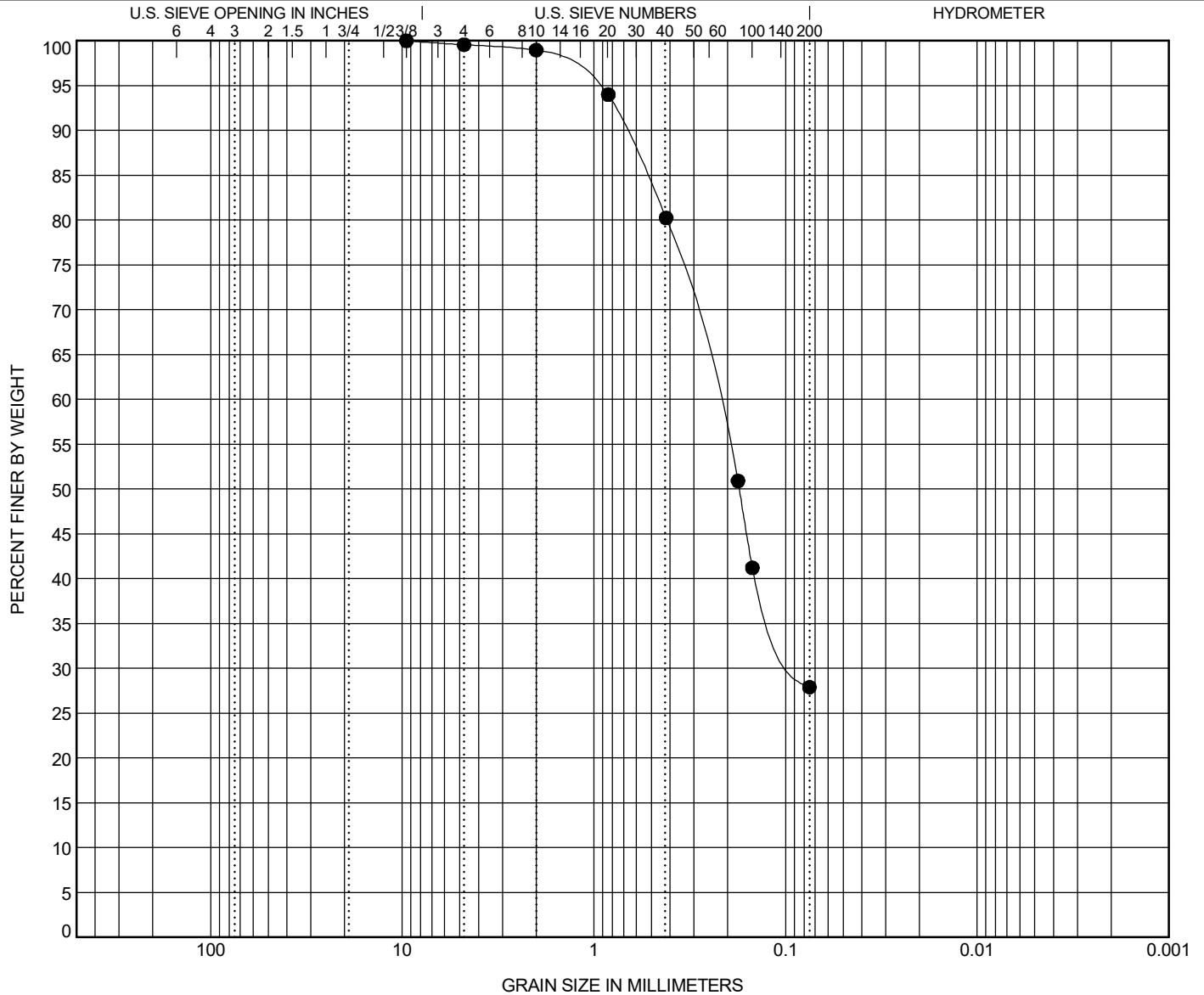


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● BS-1	5.0	Silty SAND (SM/A-2-4)					NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● BS-1	5.0	9.51	1	0.174		0.4	71.7	27.9	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/14/19

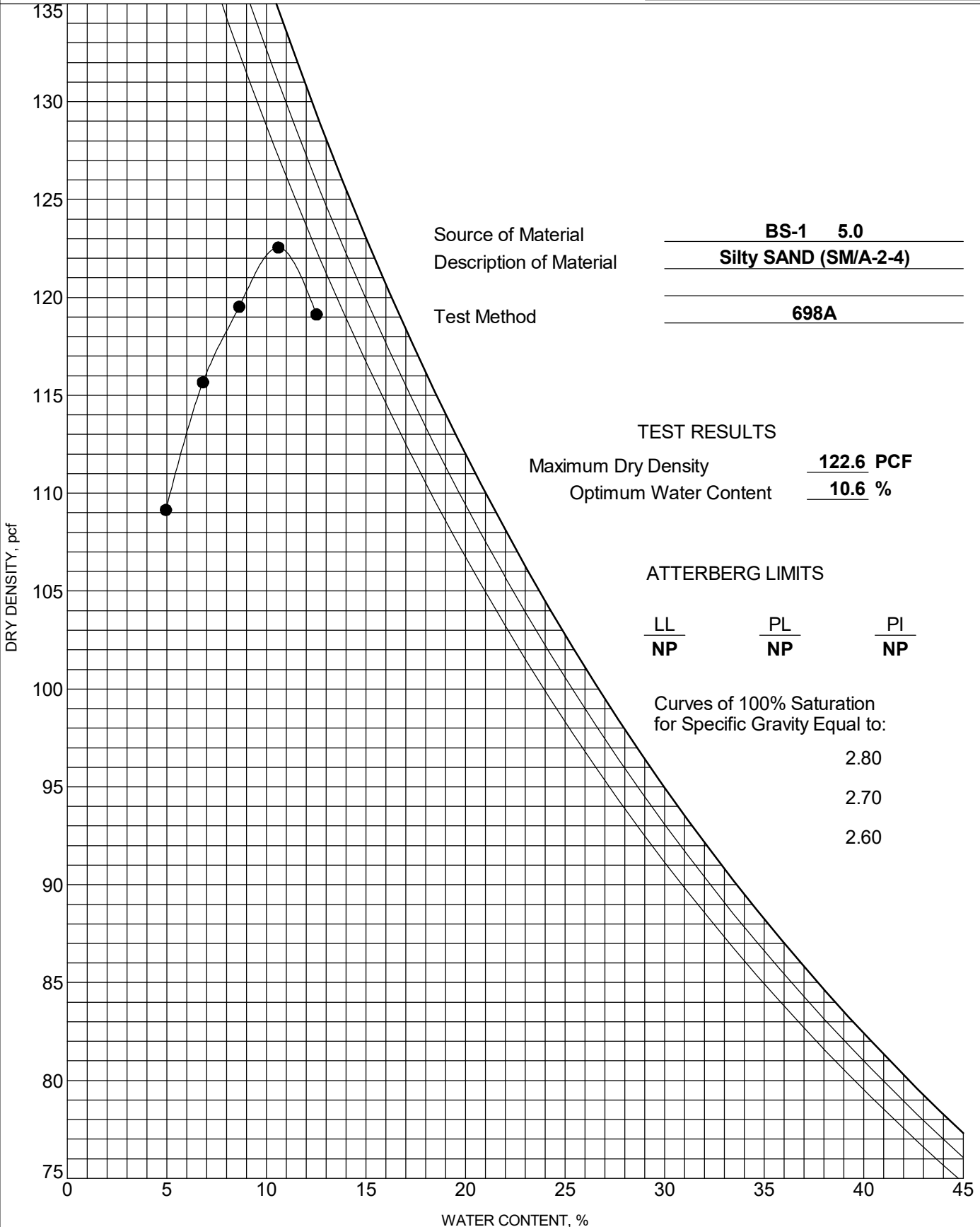


MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



Source of Material	<u>BS-1 5.0</u>
Description of Material	<u>Silty SAND (SM/A-2-4)</u>
Test Method	<u>698A</u>

TEST RESULTS

Maximum Dry Density	<u>122.6 PCF</u>
Optimum Water Content	<u>10.6 %</u>

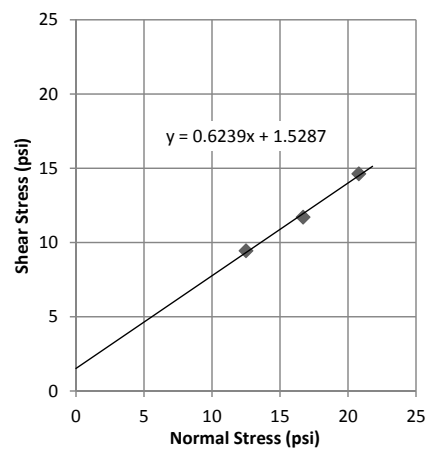
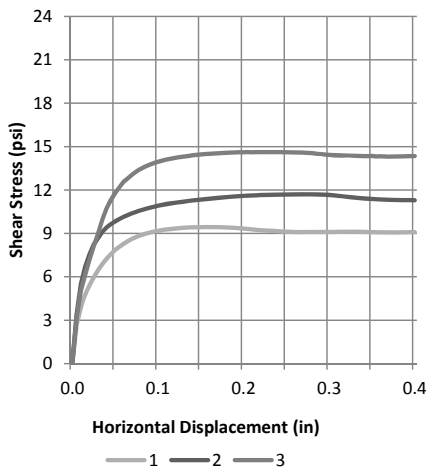
ATTERBERG LIMITS

<u>LL</u>	<u>PL</u>	<u>PI</u>
<u>NP</u>	<u>NP</u>	<u>NP</u>

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236



Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	12.4%
Wet Density (pcf)	133.0
Dry Density (pcf)	118.4
t50 (min.)	0.2
Saturation (%)	82.7%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.67
0.010	3.91
0.015	4.78
0.020	5.41
0.030	6.43
0.040	7.24
0.050	7.86
0.060	8.29
0.070	8.63
0.080	8.88
0.090	9.05
0.100	9.18
0.125	9.37
0.150	9.43
0.175	9.43
0.200	9.33
0.225	9.20
0.250	9.12
0.300	9.11
0.350	9.09
0.400	9.09
Max Shear Stress	9.44

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	12.7%
Wet Density (pcf)	133.2
Dry Density (pcf)	118.2
t50 (min.)	0.2
Saturation (%)	84.3%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.39
0.010	5.51
0.015	6.69
0.020	7.54
0.030	8.68
0.040	9.41
0.050	9.83
0.060	10.15
0.070	10.41
0.080	10.59
0.090	10.76
0.100	10.91
0.125	11.16
0.150	11.33
0.175	11.48
0.200	11.59
0.225	11.66
0.250	11.69
0.300	11.67
0.350	11.36
0.400	11.29
Max Shear Stress	11.71

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	12.2%
Wet Density (pcf)	110.9
Dry Density (pcf)	98.9
t50 (min.)	0.2
Saturation (%)	48.2%
Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.17
0.010	5.06
0.015	6.17
0.020	7.16
0.030	8.99
0.040	10.73
0.050	11.79
0.060	12.57
0.070	13.08
0.080	13.46
0.090	13.74
0.100	13.94
0.125	14.27
0.150	14.45
0.175	14.56
0.200	14.61
0.225	14.62
0.250	14.61
0.300	14.43
0.350	14.35
0.400	14.34
Max Shear Stress	14.63

Project Name US 15 RBO Indian Field Swamp

F&ME Project No. G6100.12 Date 10/14/19

SCDOT Project No. P037127

Location/Sample BS-1 / Sample 19-2538

Depth/Elevation 0' - 5'

Type of Test : Direct Shear - 4" by 4" Square Shear Box

Sample Type : Remolded 1" Thick, Non-Innundated

Description: **Brown Silty Fine to Medium SAND (SM, A-2-4)**

PI= NP % Fines= 27.9

SG= 2.65 Box Gap= 1.5 mm

φ= 32.0° C_{apparent}= 1.53 psi



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MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US-15 Replacement Bridge over Indian Field Swamp	PROJECT NO.:	G6100.12
SAMPLE NUMBER:	19-2513	DATE SAMPLE RECEIVED:	9/25/2019
DESCRIPTION OF SOIL:	Silty SAND (SM/A-2-4)		
TESTED BY:	AA	DATE OF TESTING:	10/4/2019
WEIGHED BY:	AA	DATE OF WEIGHING:	10/7/2019

BORING NO.	BS-2				
SAMPLE NO.	--				
SAMPLE DEPTH (FT.)	0.0 - 5.0				
WATER CONTENT, W%	8.9				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

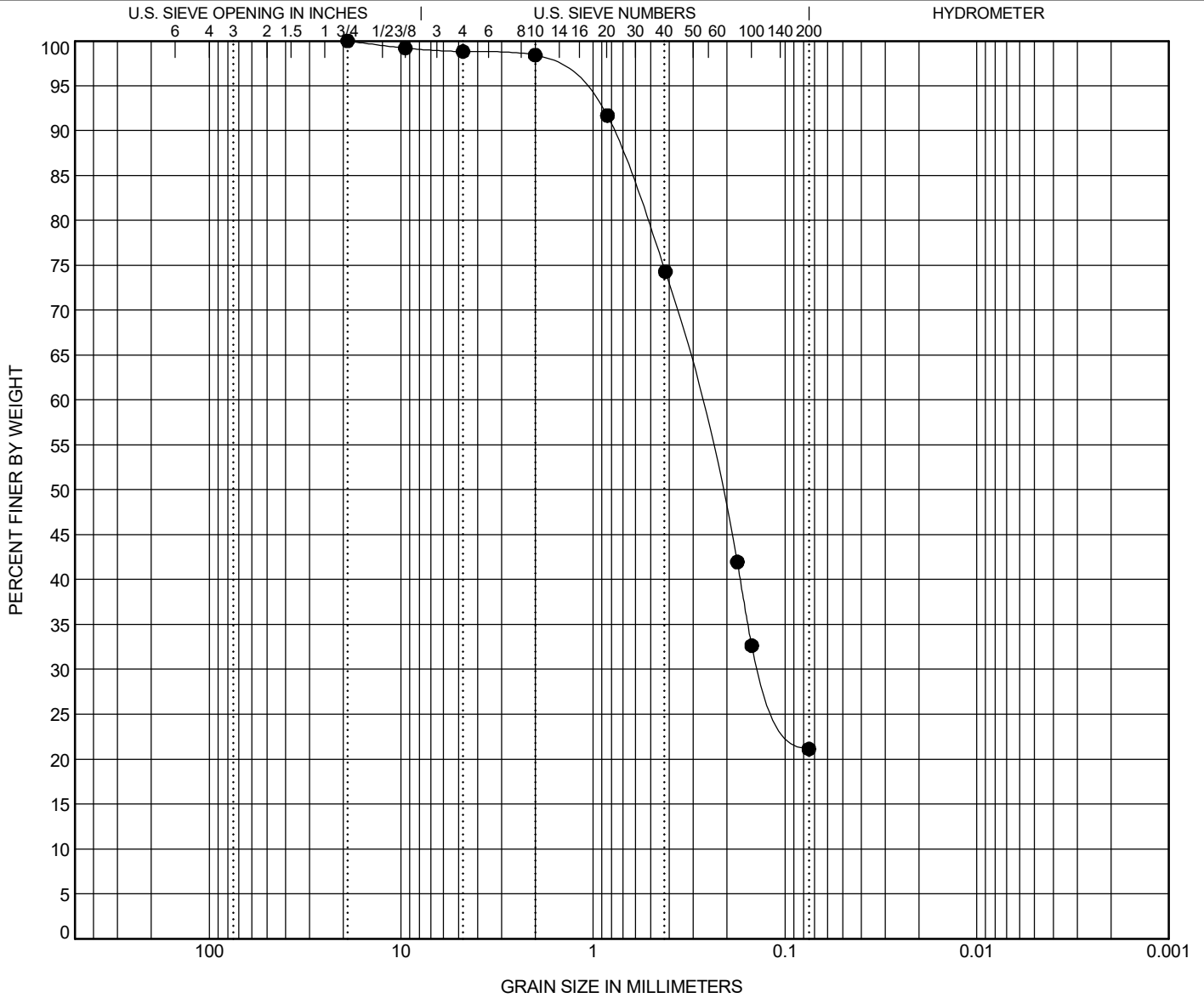


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● BS-2	5.0	Silty SAND (SM/A-2-4)	NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● BS-2	5.0	19	1.288	0.219		1.2	77.7	21.1	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/17/19

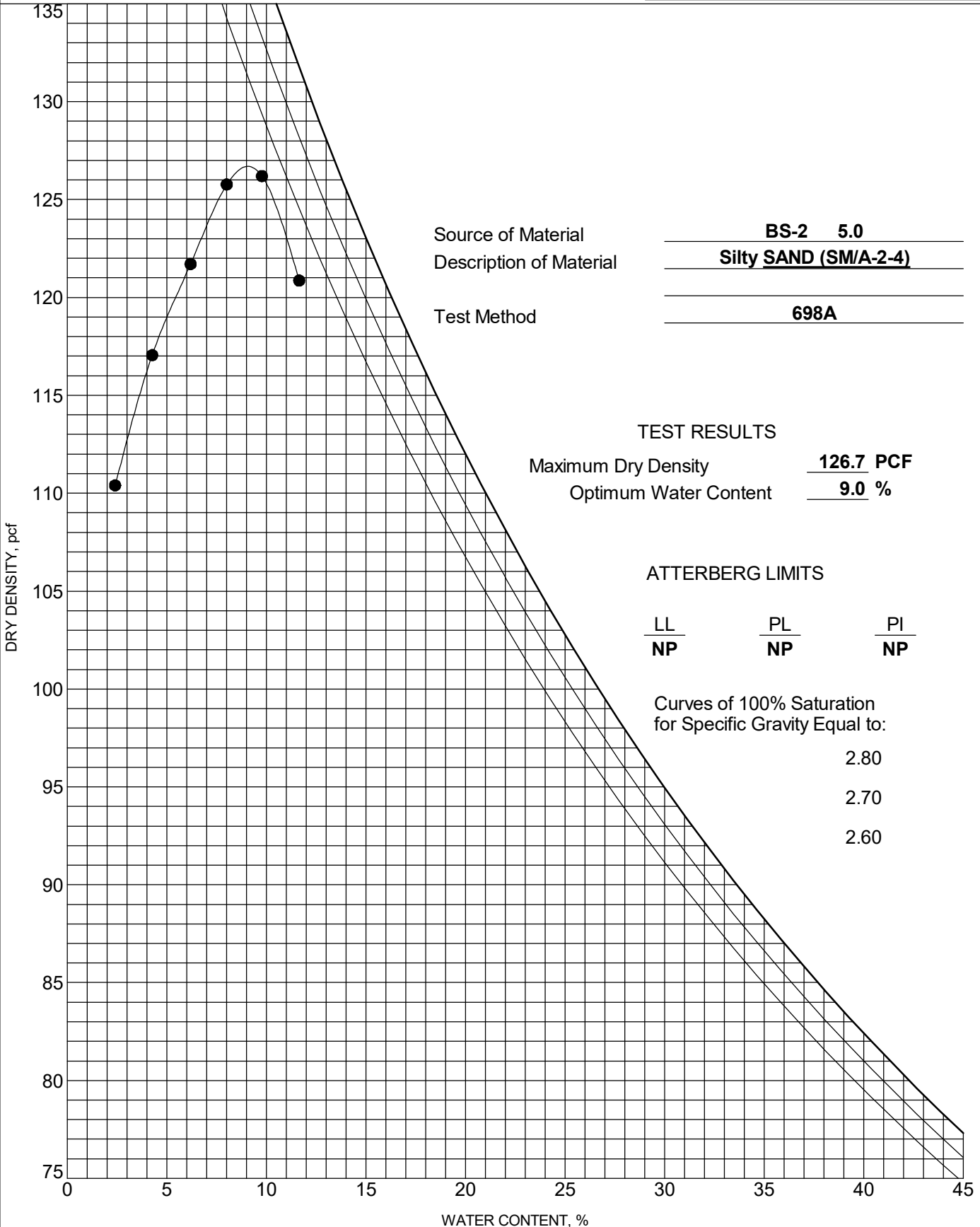


MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



Source of Material	<u>BS-2 5.0</u>
Description of Material	<u>Silty SAND (SM/A-2-4)</u>
Test Method	<u>698A</u>

TEST RESULTS

Maximum Dry Density	<u>126.7 PCF</u>
Optimum Water Content	<u>9.0 %</u>

ATTERBERG LIMITS

<u>LL</u>	<u>PL</u>	<u>PI</u>
<u>NP</u>	<u>NP</u>	<u>NP</u>

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80
2.70
2.60

**California Bearing Ratio Test
(AASHTO T193 / ASTM D1883)**

PROJECT NAME:	US 15 over Indian Field Swamp	SOIL DESCRIPTION:	Silty SAND
PROJECT NO.:	P037127/G6100.12	USCS CLASSIFICATION:	SM
SAMPLE LOCATION:	BS-2	AASHTO CLASSIFICATION:	A-2-4
SAMPLE DEPTH:	5 ft	LL = NP PL = NP PI = NP	
SAMPLE ID:	19-2513	MAX. DRY DENSITY =	126.7 pcf
SAMPLED BY:	Craig Piercy	OPT. MOISTURE CONTENT =	9.0 %
DATE TEST BEGAN:	10/11/2019		
DATE TEST COMPLETED:	10/15/2019		
DATE SAMPLED:	9/24/2019		
DATE RECEIVED:	9/24/2019		

Water Content (before compaction)

Wt. Wet Soil + Tare (g) = 172.10 Wt. Dry Soil + Tare (g) = 158.60 Wt. Can = 7.43 Moisture Content = 8.9 %

Water Content (after compaction)

Wt. Wet Soil + Tare (g) = 181.17 Wt. Dry Soil + Tare (g) = 166.99 Wt. Can = 8.44 Moisture Content = 8.9 %

Unit Weight (before soaking)

Wt. Mold + Soil = 25.5 lbs Wt. Mold = 15.6 lbs Ht. Soil = 4.67 in Dry Density = 120.0 pcf

Unit Weight (after soaking)

Wt. Mold + Soil = 25.7 lbs Wt. Mold = 15.6 lbs Ht. Soil = 4.67 in Dry Density = 119.5 pcf

Swell Data

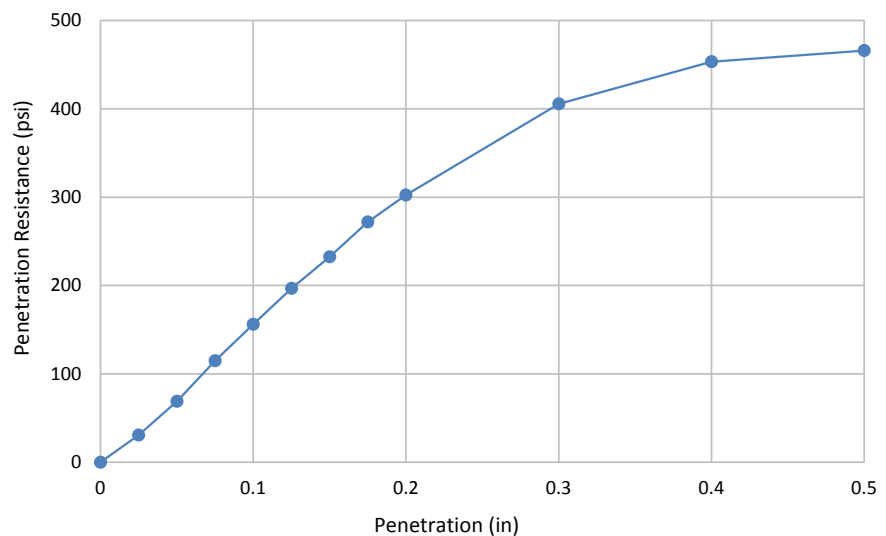
Elapsed Time <i>hrs</i>	Dial Reading <i>in</i>	Swell <i>%</i>
0	0.1	0.0%
96	0.101	0.0%

Final Water Content

Wt. Wet Soil + Tare <i>g</i>	Dry Soil + Tare <i>g</i>	Wt. Can <i>g</i>	Moisture Content <i>%</i>
286.79	261.11	8.58	10.8 %

Penetration Test Data

Pen. <i>in</i>	Dial Reading <i>in x 1000</i>	Stress <i>psi</i>	CBR <i>%</i>
0	0	0	
0.025	12	30.6	
0.05	27	68.88	
0.075	45	114.8	
0.1	62	156.2	15.6%
0.125	79	196.7	
0.15	94	232.5	
0.175	110	272	
0.2	122	302.2	20.1%
0.3	163	405.5	
0.4	182	453.3	
0.5	187	465.9	



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3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT:	US-15 Replacement Bridge over Indian Field Swamp	PROJECT NO.:	G6100.12
SAMPLE NUMBER:	19-2494	DATE SAMPLE RECEIVED:	9/24/2019
DESCRIPTION OF SOIL:	Silty SAND (SM/A-2-4)		
TESTED BY:	AA	DATE OF TESTING:	10/4/2019
WEIGHED BY:	AA	DATE OF WEIGHING:	10/7/2019

BORING NO.	BS-3				
SAMPLE NO.	--				
SAMPLE DEPTH (FT.)	0.0 - 5.0				
WATER CONTENT, W%	7.3				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

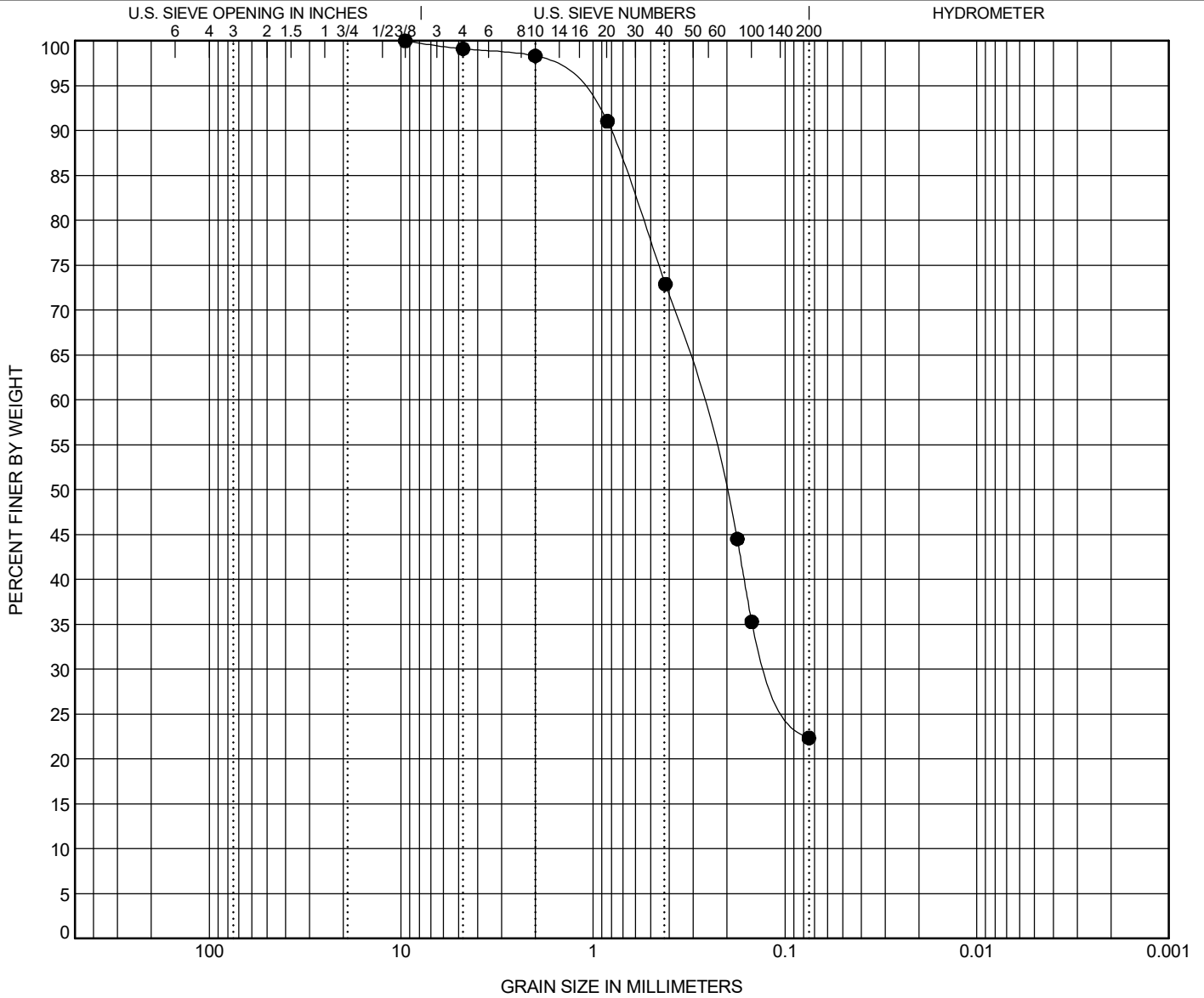


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● BS-3	5.0	Silty SAND (SM/A-2-4)					NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● BS-3	5.0	9.51	1.346	0.209		0.9	76.8	22.3	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/14/19

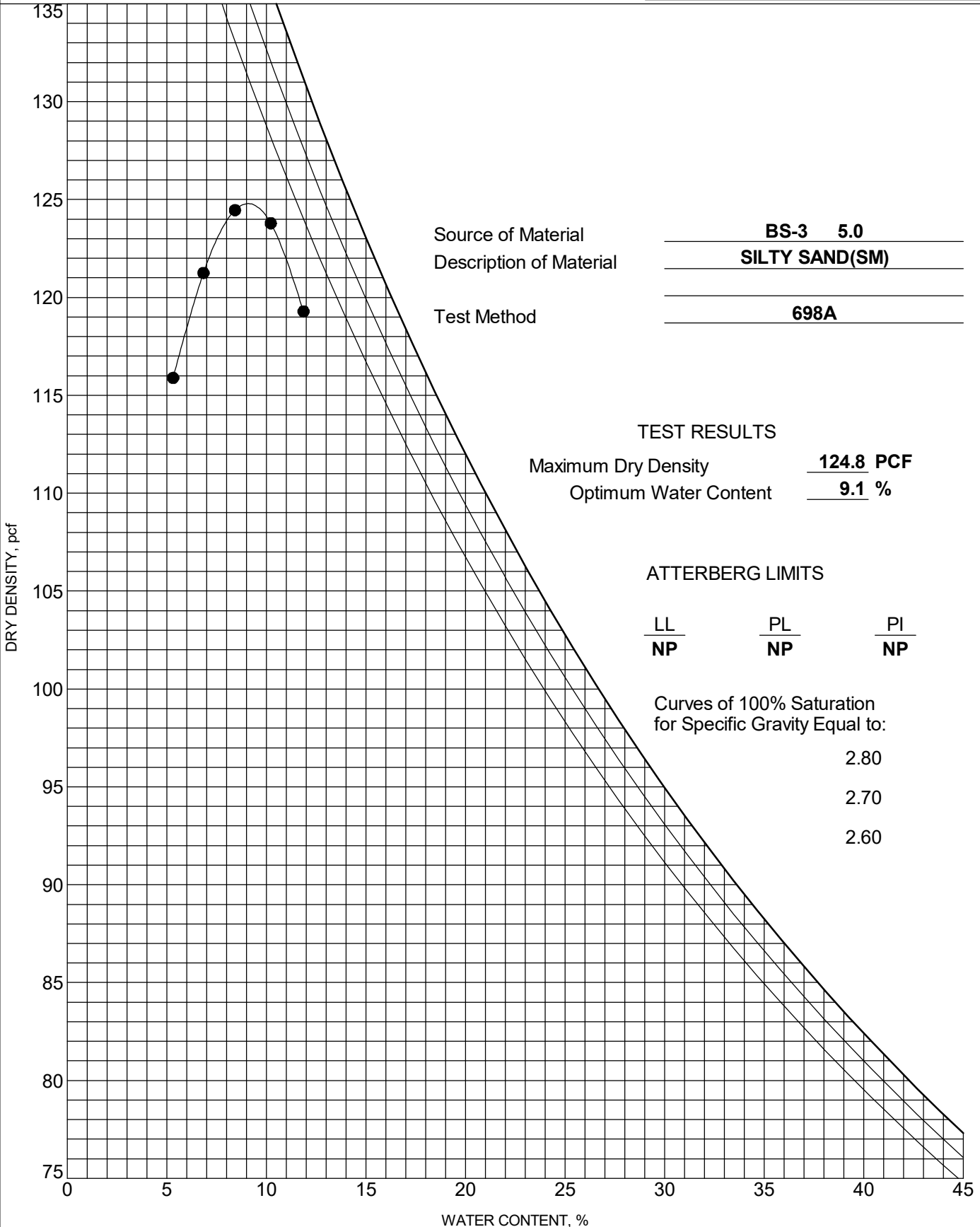


MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



Source of Material	<u>BS-3 5.0</u>
Description of Material	<u>SILTY SAND(SM)</u>
Test Method	<u>698A</u>

TEST RESULTS

Maximum Dry Density	<u>124.8 PCF</u>
Optimum Water Content	<u>9.1 %</u>

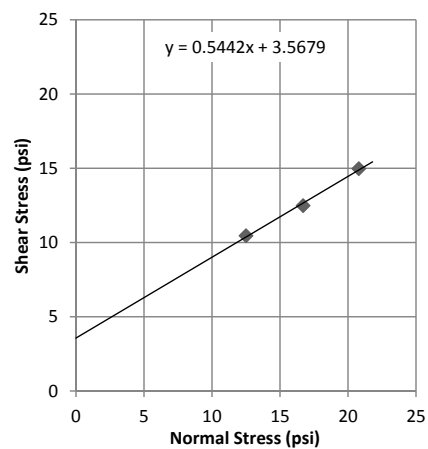
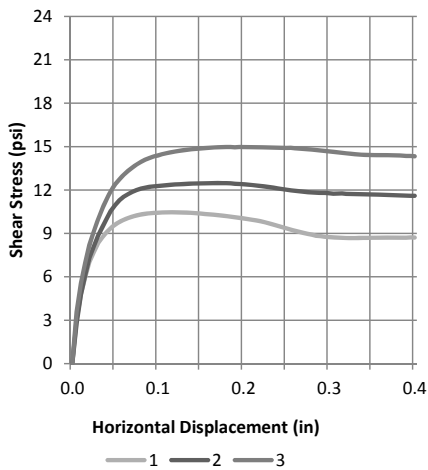
ATTERBERG LIMITS

<u>LL</u>	<u>PL</u>	<u>PI</u>
NP	NP	NP

Curves of 100% Saturation for Specific Gravity Equal to:

2.80
2.70
2.60

DIRECT SHEAR TEST REPORT
ASTM - D3080 / AASHTO T236



Sample 1	
Normal Stress (psi)	12.5
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	9.6%
Wet Density (pcf)	132.6
Dry Density (pcf)	121.0
t50 (min.)	0.2
Saturation (%)	69.5%

Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.05
0.010	4.81
0.015	6.01
0.020	7.01
0.030	8.32
0.040	9.08
0.050	9.61
0.060	9.94
0.070	10.16
0.080	10.31
0.090	10.39
0.100	10.43
0.125	10.46
0.150	10.38
0.175	10.24
0.200	10.04
0.225	9.78
0.250	9.34
0.300	8.75
0.350	8.70
0.400	8.72

Max Shear Stress **10.46**

Sample 2	
Normal Stress (psi)	16.7
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	10.2%
Wet Density (pcf)	133.9
Dry Density (pcf)	121.6
t50 (min.)	0.2
Saturation (%)	74.8%

Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	2.78
0.010	4.77
0.015	6.14
0.020	7.33
0.030	8.83
0.040	9.99
0.050	10.96
0.060	11.53
0.070	11.86
0.080	12.09
0.090	12.21
0.100	12.29
0.125	12.40
0.150	12.46
0.175	12.48
0.200	12.40
0.225	12.24
0.250	12.01
0.300	11.78
0.350	11.70
0.400	11.60

Max Shear Stress **12.48**

Sample 3	
Normal Stress (psi)	20.8
Speed (in./min.)	0.01
Sample Width (in.)	4.00
Percent Moisture	9.4%
Wet Density (pcf)	133.4
Dry Density (pcf)	121.9
t50 (min.)	0.2
Saturation (%)	70.0%

Horizontal Displacement (in.)	Shear Stress (psi)
0.000	0.00
0.005	3.58
0.010	5.54
0.015	6.97
0.020	8.20
0.030	9.97
0.040	11.37
0.050	12.40
0.060	13.05
0.070	13.55
0.080	13.94
0.090	14.21
0.100	14.39
0.125	14.71
0.150	14.88
0.175	14.96
0.200	14.96
0.225	14.94
0.250	14.91
0.300	14.66
0.350	14.42
0.400	14.34

Max Shear Stress **14.98**

Project Name US 15 RBO Indian Field Swamp

F&ME Project No. G6100.12 Date 10/14/19

SCDOT Project No. P037127

Location/Sample BS-3 / Sample 19-2494

Depth/Elevation 0' - 5'

Type of Test : Direct Shear - 4" by 4" Square Shear Box

Sample Type : Remolded 1" Thick, Non-Innundated

Description: Brown Silty Fine to Medium SAND (SM, A-2-4)

PI= NP % Fines= 22.3

SG= 2.65 Box Gap= 1.5 mm

φ= 28.6° C_{apparent}= 3.57 psi



3112 Devine Street Columbia, SC 29205

Geotechnical · Environmental · Materials

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

MOISTURE CONTENT DETERMINATION
(AASHTO T265)

PROJECT: US-15 Replacement Bridge over Indian Field Swamp **PROJECT NO.:** G6100.12
SAMPLE NUMBER: 19-2495 **DATE SAMPLE RECEIVED:** 9/25/2019
DESCRIPTION OF SOIL: Silty SAND (SM/A-2-4)
TESTED BY: AA **DATE OF TESTING:** 10/4/2019
WEIGHED BY: AA **DATE OF WEIGHING:** 10/7/2019

BORING NO.	BS-4				
SAMPLE NO.	--				
SAMPLE DEPTH (FT.)	0.0 - 5.0				
WATER CONTENT, W%	5.5				

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

BORING NO.					
SAMPLE NO.					
SAMPLE DEPTH (FT.)					
WATER CONTENT, W%					

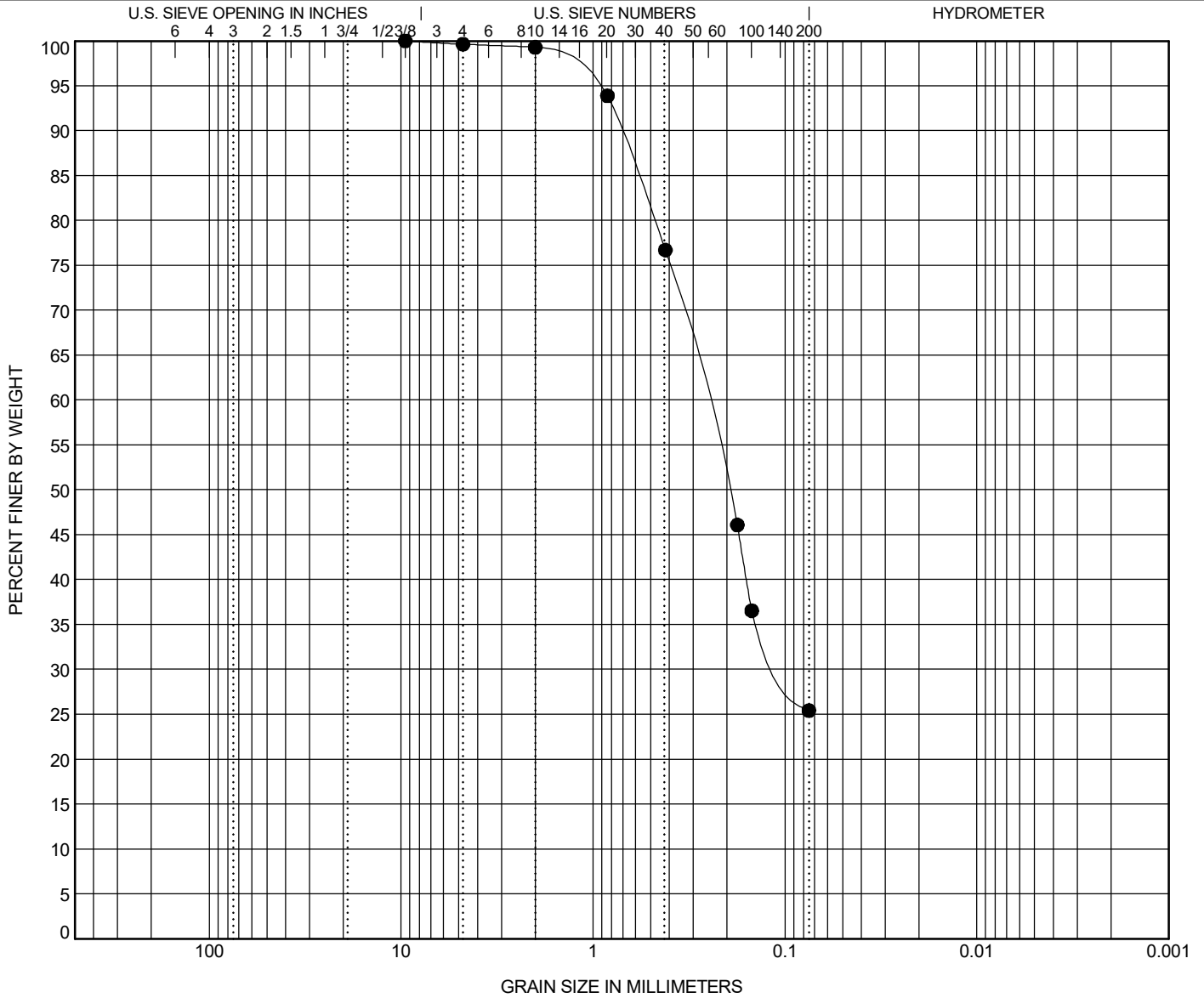


GRAIN SIZE DISTRIBUTION

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification					LL	PL	PI	Cc	Cu
● BS-4	5.0	Silty SAND (SM/A-2-4)					NP	NP	NP		

BOREHOLE	DEPTH	D100	D95	D50	D10	%Gravel	%Sand	%Silt	%Clay
● BS-4	5.0	9.51	1.005	0.198		0.4	74.2	25.4	

GRAIN SIZE G6100.120 - US-15 RBO INDIAN FIELD SWAMP.GPJ FME2017.GDT 10/17/19

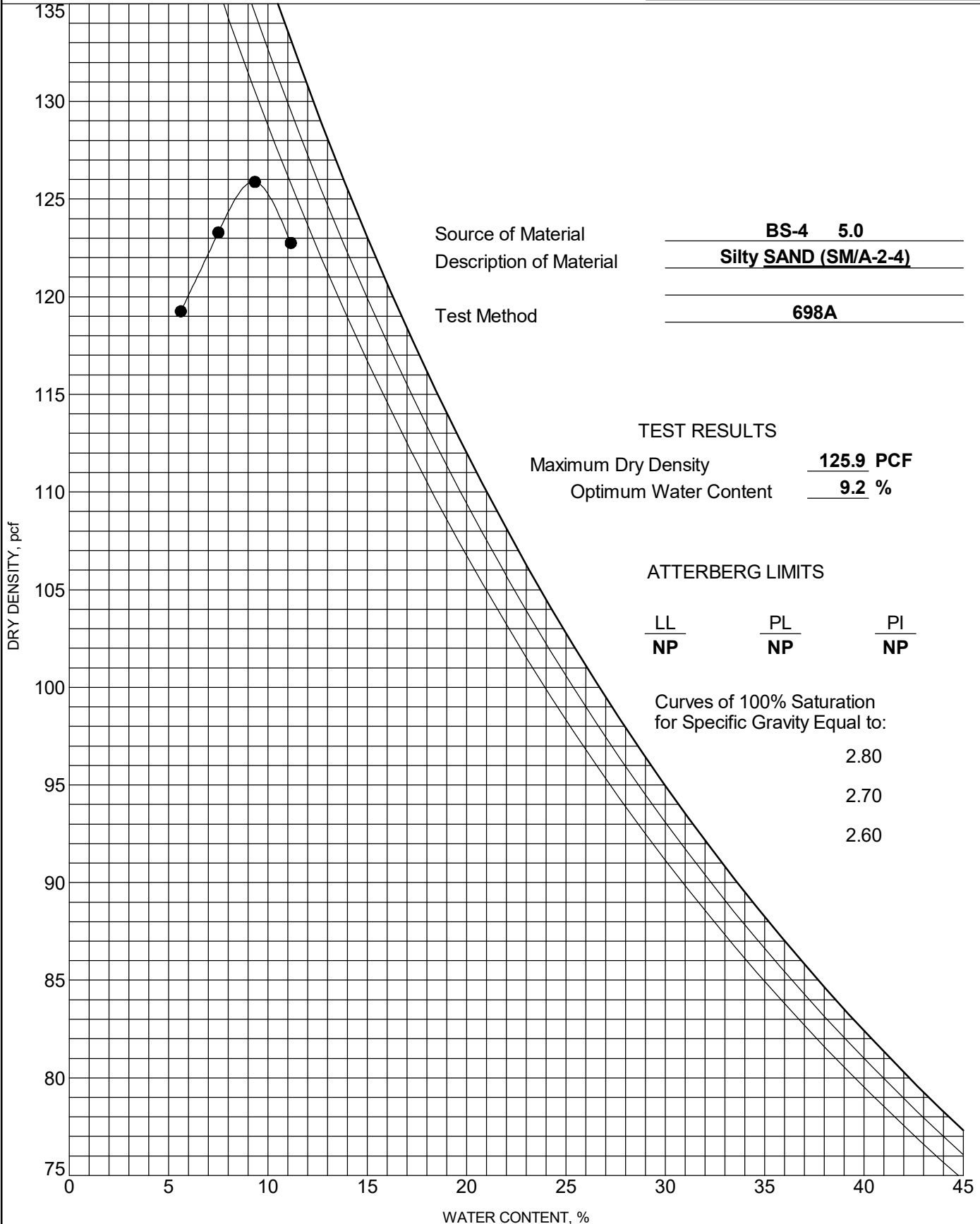


MOISTURE-DENSITY RELATIONSHIP

PROJECT ID P037127

PROJECT NAME US-15 over Indian Field Swamp

PROJECT COUNTY Dorchester



California Bearing Ratio Test (AASHTO T193 / ASTM D1883)

PROJECT NAME:	US 15 over Indian Field Swamp	SOIL DESCRIPTION:	Silty SAND
PROJECT NO.:	P037127/G6100.12	USCS CLASSIFICATION:	SM
SAMPLE LOCATION:	BS-4	AASHTO CLASSIFICATION:	A-2-4
SAMPLE DEPTH:	5 ft	LL = NP PL = NP PI = NP	
SAMPLE ID:	19-2513	MAX. DRY DENSITY =	125.9 pcf
SAMPLED BY:	Craig Piercy	OPT. MOISTURE CONTENT =	9.2 %
DATE TEST BEGAN:	10/11/2019		
DATE TEST COMPLETED:	10/15/2019		
DATE SAMPLED:	9/24/2019		
DATE RECEIVED:	9/24/2019		

Water Content (before compaction)

Wt. Wet Soil + Tare (g) = 243.91 Wt. Dry Soil + Tare (g) = 224.09 Wt. Can = 9.28 Moisture Content = 9.2 %

Water Content (after compaction)

Wt. Wet Soil + Tare (g) = 232.53 Wt. Dry Soil + Tare (g) = 213.84 Wt. Can = 7.08 Moisture Content = 9.0 %

Unit Weight (before soaking)

Wt. Mold + Soil = 25.5 lbs Wt. Mold = 15.4 lbs Ht. Soil = 4.60 in Dry Density = 123.8 pcf

Unit Weight (after soaking)

Wt. Mold + Soil = 25.6 lbs Wt. Mold = 15.4 lbs Ht. Soil = 4.58 in Dry Density = 123.9 pcf

Swell Data

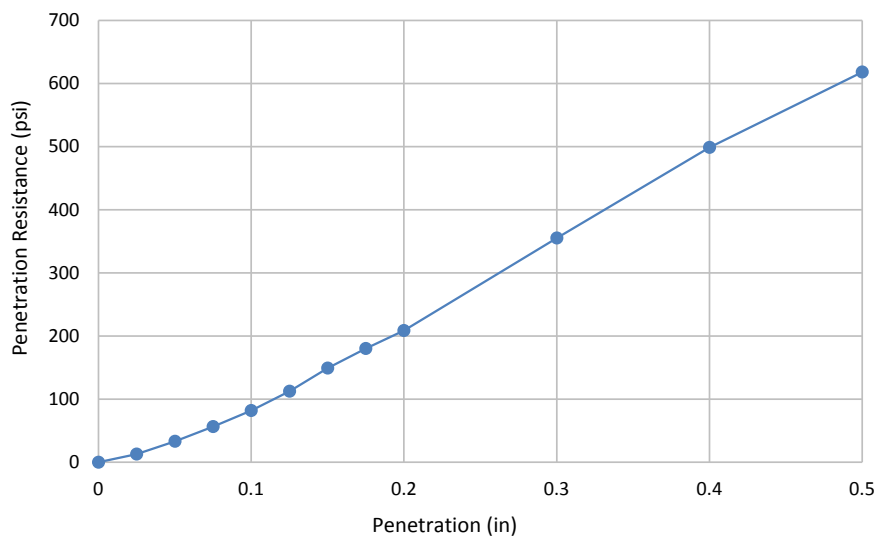
Elapsed Time <i>hrs</i>	Dial Reading <i>in</i>	Swell <i>%</i>
0	0.1	0.0%
96	0.089	-0.2%

Final Water Content

Wt. Wet Soil + Tare <i>g</i>	Dry Soil + Tare <i>g</i>	Wt. Can <i>g</i>	Moisture Content <i>%</i>
234.96	214.17	9.27	10.2 %

Penetration Test Data

Pen. <i>in</i>	Dial Reading <i>in x 1000</i>	Stress <i>psi</i>	CBR <i>%</i>
0	0	0	
0.025	5	13	
0.05	13	33	
0.075	22	56	
0.1	32	82	8.2%
0.125	44	112	
0.15	59	149	
0.175	72	180	
0.2	84	209	13.9%
0.3	143	355	
0.4	200	499	
0.5	250	618	





Client:	F&ME Consultants
Project Name:	US 15 Over Indian Field Swamp
Project Location:	---
GTX #:	310810
Test Date:	10/23/19
Tested By:	twh
Checked By:	mcm

<h2>Minimum Laboratory Soil Resistivity by AASHTO T 288</h2>
--

Boring ID	Sample ID	Depth, ft.	Sample Description	Minimum Soil Resistivity, ohm-cm
B-3	---	4-8 ft	Moist, grayish brown silty sand	9,247
BS-1	---	0-5 ft	Moist, grayish brown silty sand	21,229

Comments: Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Test conducted in standard laboratory atmosphere: 68-73 F



Client:	F&ME Consultants
Project Name:	US 15 Over Indian Field Swamp
Project Location:	---
GTX #:	310810
Test Date:	10/23/19
Tested By:	twh
Checked By:	mcm

pH by AASHTO T 289

Boring ID	Sample ID	Depth, ft	Description	pH
B-3	---	4-8 ft	Moist, grayish brown silty sand	7.42
BS-1	---	0-5 ft	Moist, grayish brown silty sand	6.9

Notes:



PO Box 572455 / Salt Lake City UT 84157-2455 / USA
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|||||
 GEOTESTING EXPRESS INCORPORATED
 2358 PERIMETER PARK DRIVE SUITE 320
 ATLANTA GA 30341-1315
 USA

Analysis No. TS-A1908331
 Report Date 28 October 2019
 Date Sampled 21 October 2019
 Date Received 23 October 2019
 Where Sampled Atlanta, GA USA
 Sampled By Client

This is to attest that we have examined: Soil for Project Name: US 15 over Indian Field Swamp; Site Location: - ;
 Job Number: GTX-310810

When examined to the applicable requirements of:

- AASHTO T-291-13 "Standard Method of Test for Determining Water-Soluble Chloride Ion Content in Soil" Method B
- AASHTO T-290-16 "Standard Method of Test for Determining Water-Soluble Sulfate Ion Content in Soil"

Results:

AASHTO T-291 – Chloride Method B

Sample		Results		Detection Limit
		ppm (mg/kg)	% ¹	
BS-1		<10.	<0.0010	10.
-	0 – 5'			
B-3		<10.	<0.0010	
-	4 – 8'			

NOTE: ¹Percent by weight after drying.

CERTIFICATE OF ANALYSIS

AASHTO T-290 - Sulfate (soluble)

Sample		Results		Detection Limit
		ppm (mg/kg)	% ¹	
BS-1		<10.	<0.0010	10.
-	0 – 5'			
B-3		<10.	<0.0010	
-	4 – 8'			

NOTE: ¹Percent by weight after drying.

END OF ANALYSIS

USEPA Laboratory ID UT00930



Merrill Gee P.E. – Engineer in Charge