GEOTECHNICAL ENGINEERING REPORT

MOSSY OAKS DRAINAGE IMPROVEMENTS PROJECT

PORT ROYAL, SOUTH CAROLINA

MARCH 15, 2019

INSIGHT NUMBER 19-0001

Prepared for:

Infrastructure Consulting & Engineering

Beaufort, South Carolina

Prepared by:

Insight Group, LLC

3359 Meeting Street, Suite 101

North Charleston, South Carolina

INSIGHT GROUP

A CHRISTOPHER COMPANY

March 15, 2019

Infrastructure Consulting & Engineering

Attn: Mr. Jared Fralix, PE
VP of Site Development
O: 843 522 0246
Jared.Fralix@ice-eng.com

Re: Geotechnical Engineering Report
Mossy Oaks Drainage Improvements Project
Port Royal, South Carolina
Insight Group Number: 19-0001

Dear Mr. Fralix:

The purpose of this report is to present geotechnical recommendations for design and construction of the Mossy Oaks Drainage Improvements Project in Charleston, South Carolina. This report presents our understanding of the proposed improvements, the site and subsurface conditions, and conclusions and recommendations. The Spanish Moss Trail causeways at both Basins 1 and 2 are being considered for improvement to flood protection systems. Insight Group has issued a Flood Wall Feasibility Report dated February 15, 2019. This current report provides recommendations for traditional culvert design at the causeways, assuming the causeways will not be used as flood protection. If the project team decides to proceed with the flood wall, Insight Group will issue a subsequent report with final recommendations for the flood protection system.

We appreciate the opportunity to be of service to Infrastructure Consulting & Engineering on this project. If you have any questions concerning this submittal, or if we may be of further service, please contact us.

Sincerely,
Insight Group, A Christopher Company

Christina Lee Olsen, P.E.
Geotechnical Consultant

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER No. 33450 RYAN N. KEIPER

Ryan N. Keiper, P.E.
Geotechnical Consultant

Digitally signed by Ryan Keiper
DN: cn=Ryan Keiper, c=US, o=Insight Group LLC, email=ryan.keiper@insightgrp.com
Reason: I am approving this document
Date: 2019.03.15 11:52:18 -04'00'

APPENDICES

1 INTRODUCTION

Insight Group has completed the geotechnical evaluation for the Mossy Oaks Drainage Improvements Project in Port Royal, South Carolina in general accordance with our proposal dated January 3, 2019 and supplement to our proposal dated February 13, 2019. The purpose of this report is to provide geotechnical information and recommendations for design and construction of the project.

Insight Group evaluated the subsurface conditions with eight Cone Penetration Test (CPT) soundings extending from 36 to 42 feet and eleven Hand Auger Borings (HAB) with Dynamic Cone Penetrometer (DCP) tests to depths of 4 feet in proposed culvert locations. Additionally, four percolation tests were performed at a depth of 2 feet with adjacent Hand Auger Borings (HAB) to depths of 4 feet within the proposed pond area at Southside Park in Basin 2.

At the two CPT soundings performed near the middle of each Spanish Moss Trail causeway (CPT/DP-02 and CPT/DP-06), we collected continuous soil samples to 16.3 feet and 10.4 feet, respectively. We also collected bulk samples of the existing causeway material at CPT-01, CPT-03, CPT-05 and CPT-07.

The testing logs are attached in Exhibit B. Exhibit A shows the test locations at the site. The CPT soundings were conducted in general accordance with ASTM D5778.

2 PROJECT INFORMATION

2.1 Site Location

The project site is located in Port Royal, South Carolina. There are two drainage basins identified, each with a corresponding existing outfall and proposed new pipe culverts / ponds to improve basin drainage. Basin 1 is to the north and Basin 2 to the south. The Spanish Moss Trail, a railroad line converted to a pedestrian path, bisects the marsh areas at the two outfalls. We understand the railroad line was constructed as part of the line to Yemassee, South Carolina by Port Royal Railroad between 1860 and 1870, and was in operation until 2006.

Approximate coordinates of the causeway at Basin 1 are 32.4069, -80.6985 and at Basin 2 are 32.3960, -80.7023. Figure 1 shows conditions of the causeway.

Figure 1. Spanish Moss Trail and Conditions at Basin #2 Outfall Culvert (Looking West)

2.2 Project Description

The Mossy Oaks Drainage Improvement project will evaluate, design and construct measures to improve drainage and mitigate flooding of the Mossy Oaks neighborhood and residences. Currently, the team is evaluating the Spanish Moss Trail causeways for use as flood protection. The existing culverts will be replaced with twin box culverts. Flap gates would be integrated into the culverts if the flood wall is implemented.

The project will also install new and replacement pipe culverts throughout both basins to improve drainage. Additionally, a new pond will be constructed in Basin 2 at Southside Park. The scope of this report will be to provide culvert foundation recommendations. Figure 2 shows the project area and the two outfall locations.

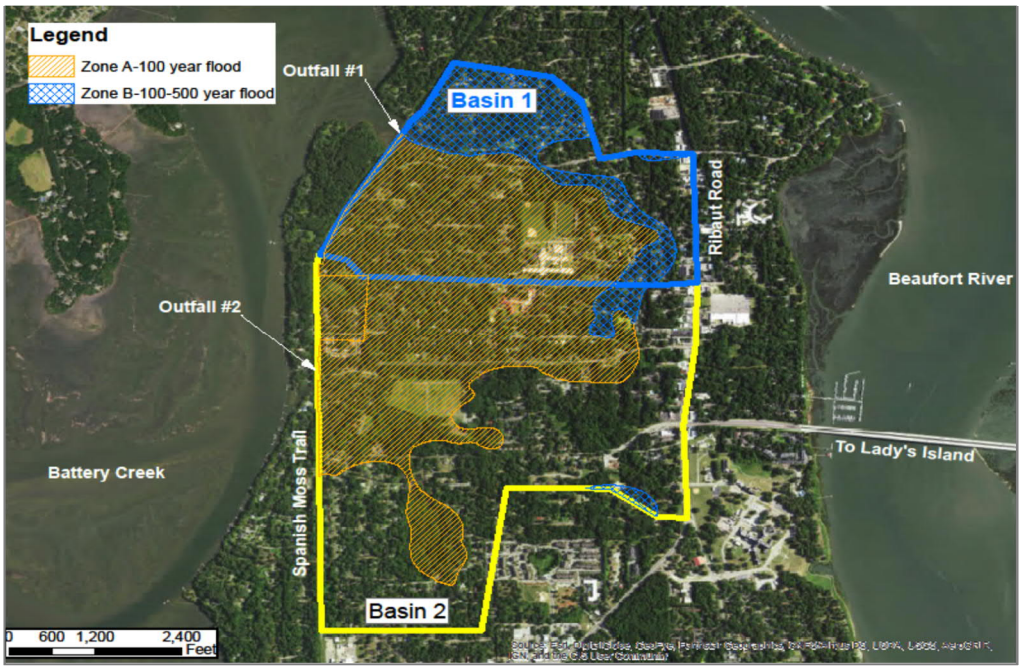


Figure 2. Project Area and FEMA Flood Zones

Table 1 lists the culvert information that has been provided by ICE along with the corresponding testing performed.

Table 1. Culvert Information

Basin Location	Culvert Location	Proposed Culvert Size (in)	Culvert Invert Elevation (ft)	Test
Basin 1	Spanish Moss Trail	Twin 60" Box	-0.7	CPT-05, CPT-06, CPT-07
	Battery Creek Road	Twin 54" Pipes	2.0	CPT-08
	Battery Creek Road	TBD	TBD	DCP-05
	Battery Creek Road	TBD	TBD	DCP-11
	Battery Creek Road	TBD	TBD	DCP-10
	West Royal Oaks Road	Twin 36" Pipes	TBD	DCP-08
	Coates Lane	36" Pipe	TBD	DCP-08
	Jane Way	Twin 54" Pipes	TBD	DCP-07
	First Boulevard	Twin 54" Pipes	TBD	DCP-06
	Center Drive East	Twin 54" Pipes	TBD	DCP-04
Basin 2	Spanish Moss Trail	Twin 60" Box	-1.0	CPT-01, CPT-02, CPT-03
	Battery Creek Road	Twin 54" Pipes	1.8	CPT-04
	Gentry Woods Subdivision	18" Pipe	TBD	DCP-01
	Broad Street	Twin 48" Pipes	TBD	DCP-02, DCP-03

TBD: Culvert type and invert elevation to be determined. Recommendations are based on expected culverts and elevations. Insight Group should review final plans to ensure recommendations are applicable.

Table 2 lists the approximate elevations of the Spanish Moss Trail causeways and flood heights.

Table 2. Causeway and Water Level Elevations

Item	Description
General Lowest Mossy Oaks Residence Finished Floor Elevations	7.0 ft. NAVD88
Spanish Moss Trail Causeway (Both Basin 1 and 2 Outfall)	Approximate Crest Elevation 9.8 ft. NAVD88
Mean High Water	Elevation 3.4 ft. NAVD88
Spring Tide	Elevation 5.8 ft. NAVD88
10-Yr Storm Tide (Hurricane Matthew)	Elevation 7.6 ft. NAVD88
25-Yr Storm Tide	Elevation 10.3 ft. NAVD88

3 GEOTECHNICAL SUBSURFACE CONDITIONS

3.1 Soil Profile

The investigation indicates the subsurface conditions at the basin causeways and other culvert locations can be generalized by the following soil profiles:

Table 3. Basin 1 Causeway - Generalized Subsurface Conditions (CPT-05, CPT/DP-06, CPT-07)

Layer	Depth (feet)		Approximate Layer Thickness (feet)	Description
	from	to		
1	0	14	14	Historic Rail Causeway Fill Concrete Pavement (not sampled) Uncontrolled fill[1] consisting of sand and silty sand with organics and some intermixed shells 6-inch layer of asphalt base about 1-ft. below grade
2	14	25	11	Native soft to stiff clay / silt, undrained shear strength 500 to 850 psf, organic marsh odor *This layer increases in thickness from south to north. At CPT-5, the clay includes interbedded sand layers and terminates at 20 feet deep; at CPT-7 it extends to 29 feet.*
3	25	40[2]	15	Native, medium dense to dense sand and silty sand with some interbedded clay layers

1. Uncontrolled fill is material that was placed without moisture and density control. This material is typically variable in composition, consistency, density, moisture, and depth.
2. Termination of deepest test.

Table 4. Basin 1 Culverts - Generalized Subsurface Conditions (CPT-08, DCP-04 to DCP-11)

Layer	Depth (feet)		Approximate Layer Thickness (feet)	Description
	from	to		
1	0	4	4	Roadway Fill Loose silty sand to clayey sand
2	4	7	3	Native, very soft to firm sandy clay to very loose to loose clayey sand
3	7	38[1]	13	Native, loose to very dense sand and silty sand with some interbedded clay layers

1. Termination of deepest test.

Table 5. Basin 2 Causeway - Generalized Subsurface Conditions (CPT-1, CPT/DP-2, CPT-3)

Layer	Depth (feet)		Approximate Layer Thickness (feet)	Description
	from	to		
1	0	11	11	Historic Rail Causeway Fill Concrete Pavement (not sampled) Uncontrolled fill[1] consisting of fine sand, silty sand, some clay, generally with organics and some intermixed shells 8-inch layer of asphalt base about 1-ft. below grade Oyster shells with some clayey sand intermixed from about 5 to 9 feet
2	11	21	10	Native, medium-dense to dense sand and silty sand, organic marsh odor
3	21	23	2	Native, stiff sandy clay / silt
4	23	34	11	Native, medium dense sand and silty sand
5	34	40	6	Native soft to stiff clay / silt, undrained shear strength 600 to 800 psf
6	40	42[2]	2	Native, dense sand and silty sand

1. Uncontrolled fill is material that was placed without moisture and density control. This material is typically variable in composition, consistency, density, moisture, and depth.
2. Termination of deepest test.

Table 6. Basin 2 Culverts - Generalized Subsurface Conditions (CPT-04, DCP-01 to DCP-03)

Layer	Depth (feet)		Approximate Layer Thickness (feet)	Description
	from	to		
1	0	3	3	Roadway Fill Loose sand to silty sand
2	3	7	4	Very soft to firm sandy clay and very loose to loose clayey sand
3	7	12	5	Medium dense sand to silty sand
4	12	15	3	Soft clay / silt
7	15	22	7	Loose to medium dense sand to silty sand
9	22	30	8	Firm clay / silt
7	30	36[1]	6	Medium dense to very dense sand and silty sand

1. Termination of deepest test.

The testing indicates that the causeway fill material is about 11 to 14 feet thick. Historic fill is often variable and can include debris. Conditions at the culverts throughout Basins 1 and 2 an upper crust of loose silty and clayey sand fill and native soil. Below 3 to 4 feet, soft clay was often encountered.

3.2 Groundwater

The observed groundwater depths at the time testing are listed in Table 7.

Table 7. Observed Groundwater Depths at Time of Testing

Test	Estimated Groundwater Depth (ft)	Test	Estimated Groundwater Depth (ft)
CPT-01	8.5	DCP-05	Not Encountered
CPT-02	7.5	DCP-06	Not Encountered
CPT-03	7.5	DCP-07	Not Encountered
CPT-04	1.0	DCP-08	3.3
CPT-05	8.0	DCP-09	Not Encountered
CPT-06	6.5	DCP-10	Not Encountered
CPT-07	5.5	DCP-11	Not Encountered
CPT-08	3.0	HAB at INF-12	3.8
DCP-01	Not Encountered	HAB at INF-13	Not Encountered
DCP-02	Not Encountered	HAB at INF-14	Not Encountered
DCP-03	Not Encountered	HAB at INF-15	Not Encountered
DCP-04	Not Encountered		

Groundwater levels were measured using the following criteria:

- Physical observation within HAB or CPT testing void.
- Where not encountered within the testing void, groundwater levels are estimated using the hydrostatic line (height of water below the ground surface) on the CPT porewater pressure (U) graph shown on the CPT logs.
- Unless otherwise specified on the logs or in the report, all groundwater measurements are collected during or immediately after drilling.

Groundwater levels can fluctuate and should be measured prior to commencing construction to determine its effect on site work and excavations.

4 DESIGN AND CONSTRUCTION CONSIDERATIONS

4.1 Spanish Moss Trail Causeways Culvert Foundations

The project team is currently considering converting the Spanish Moss Trail causeways to flood protection. If the causeway flood protection plan is chosen, Insight Group will issue a separate report with

recommendations for construction of the cutoff wall and integrated culverts. The recommendations herein apply to the traditional culvert alternative and assume the flood projection alternative is not chosen.

With proper site preparation, the planned new and replacement culverts can bear on a properly prepared stone mat subgrade. We recommend the box culverts be designed with an allowable net contact pressure of 500 psf.

We recommend that the proposed culvert subgrade be over excavated a minimum of 2 feet and backfilled with a free draining stone such as #57 or equivalent. At the base of the excavation, place Mirafi HP270 geotextile, or approved equivalent, for reinforcement and separation. CPT-2 and CPT-6 indicate that the base of the excavations will be in competent silty sand at this elevation. The stone will provide a working mat that will aid in dewatering and provide a stable working platform for construction operations.

We expect a cofferdam and dewatering will be required to prepare the subgrade and place the culverts, which are discussed in the following sections.

4.2 General New and Replacement Culverts

Several new and replacement pipe culverts are planned for the project. The main geotechnical consideration for pipe culvert design will be proper bearing conditions and subgrade preparation. Foundation undercutting depths were determined by using the Dynamic Cone Penetrometer (DCP) blow counts and soil types encountered at each location. We have provided two options for foundation undercutting at each location. Option 1 is the required undercut below pipe bedding when foundation material is installed without Mirafi HP270 geotextile reinforcement. Option 2 is the required undercut below pipe bedding when foundation material is installed with Mirafi HP270 geotextile reinforcement, or approved equivalent. Where Mirafi HP270 is not used, a nonwoven separation fabric is always required between soil (native or fill) and Stone Fill to prevent particle migration into the stone. Table 8 lists the pipe culvert foundation undercutting.

Table 8. Summary of Culvert Foundation Undercutting

Basin Location	Culvert Location	Proposed Culvert Size (in)	Culvert Invert Elevation (ft)	Test	Undercutting Below Pipe Bedding (in)	
					Option 1 (No HP270)	Option 2 (HP270)
Basin 1	Spanish Moss Trail	Twin 60" Box	-0.7	CPT-05, CPT-06, CPT-07	n/a	24
	Battery Creek Road	Twin 54" Pipes	2.0	CPT-08	27	12
	Battery Creek Road	TBD	TBD	DCP-05	20	6
	Battery Creek Road	TBD	TBD	DCP-11	16	3
	Battery Creek Road	TBD	TBD	DCP-10	20	6
	West Royal Oaks Road	Twin 36" Pipes	TBD	DCP-08	20	6
	Coates Lane	36" Pipe	TBD	DCP-08	20	6
	Jane Way	Twin 54" Pipes	TBD	DCP-07	20	6
	First Boulevard	Twin 54" Pipes	TBD	DCP-06	16	3
	Center Drive East	Twin 54" Pipes	TBD	DCP-04	16	3
Basin 2	Spanish Moss Trail	Twin 60" Box	-1.0	CPT-01, CPT-02, CPT-03	NA	24
	Battery Creek Road	Twin 54" Pipes	1.8	CPT-04	27	12
	Gentry Woods Subdivision	18" Pipe	TBD	DCP-01	20	6
	Broad Street	Twin 48" Pipes	TBD	DCP-02, DCP-03	16	3

TBD: Culvert type and invert elevation to be determined. Recommendations are based on expected culverts and elevations. Insight Group should review final plans to ensure recommendations are applicable.

4.3 Excavations and Dewatering

We expect shoring and dewatering will be required to install the replacement culverts at the Spanish Moss Trail causeways. The other culverts will likely not require dewatering or shoring if construction is

coordinated with tide and rain events. However, the contractor is responsible to check water depths prior to construction and implement necessary means and methods based on conditions present at time of construction considering final invert elevations and culvert sizes.

4.3.1 Cofferdam Design Considerations

Shoring and dewatering will be required to install the culvert components while maintaining a dry, stable work environment at the Spanish Moss Trail causeways and may be needed elsewhere. We anticipate full depth shoring will be necessary for excavation and construction of the Spanish Moss Trail box culverts. Sheeting should extend past the anticipated excavation elevation by a minimum of 10 feet to minimize the potential for bottom heave and limit groundwater inflow. The shoring system should be designed by an engineer registered in the state of South Carolina and is familiar with this type of operation.

The construction of the embankment and subsequent culvert installation should be undertaken in general accordance with SCDOT specifications and the manufacturer's recommendations. Additional guidelines for box culvert construction can be found on SCDOT Standard Drawings, such as 722-305-00 and others as appropriate.

4.3.2 Lateral Earth Pressures

Walls with unbalanced backfill and/or water levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Appropriate earth pressures should be used for wall restraint conditions. Active pressure can be used when the top of wall can move 0.002H to 0.004H. At rest earth pressure is used when there is no wall movement. The recommended design lateral earth pressure coefficients do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.

Table 9. Estimated Soil Parameters and Lateral Earth Pressure Coefficients at Basin 1 Causeway Culvert

Stratum	Depth (ft)	Approx. Elevation (ft)	Estimated Soil Properties					
			Total / Effective Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)	Earth Pressure Coeff.		
						Ka	Ko	Kp
Controlled Fill	n/a	n/a	120 / 57.6	30	0	0.33	0.50	3.00
Causeway Fill	0 to 14	+10 to -4	110 / 47.6	26	0	0.39	0.56	2.56
Soft to Stiff Clay	14 to 25	-4 to -15	105 / 42.6	0	500	1	1	1

Stratum	Depth (ft)	Approx. Elevation (ft)	Estimated Soil Properties					
			Total / Effective Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)	Earth Pressure Coeff.		
						Ka	Ko	Kp
Medium-Dense to Dense Sand	25 to 40+	-15 to -30	120 / 57.6	36	0	0.26	0.41	3.85

Table 10. Estimated Soil Parameters and Lateral Earth Pressure Coefficients at Basin 2 Causeway Culvert

Stratum	Depth (ft)	Approx. Elevation (ft)	Estimated Soil Properties					
			Total / Effective Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)	Earth Pressure Coeff.		
						Ka	Ko	Kp
Controlled Fill	n/a	n/a	120 / 57.6	30	0	0.33	0.50	3.00
Causeway Fill	0 to 11	+10 to -1	110 / 47.6	26	0	0.39	0.56	2.56
Medium-Dense to Dense Sand	11 to 21	-1 to -11	120 / 57.6	34	0	0.28	3.54	0.44
Stiff sandy clay	21 to 23	-11 to -13	105 / 42.6	0	800	1	1	1
Medium-Dense to Dense Sand	23 to 34	-13 to -24	120 / 57.6	36	0	0.26	0.41	3.85

Due to the depth of water in the channel, the combined hydrostatic and lateral earth pressures should be calculated to account for hydrostatic pressure. Additionally, the influence of surcharge or equipment loading should be considered when within a distance closer than the height of vertical walls.

Depending on the section modulus of sheeting selected, a sheeting system may require supplemental bracing to maintain stability. The ground support system (with or without slopes) should conform to OSHA Standard 29 CFR 1926. The design of the shoring system should be based on the soils within the study area and parameters provided in the previous table. The contractor is solely responsible for designing and maintaining a stable excavation and all excavations should comply with applicable local, state, and OSHA standards.

4.3.3 Excavation Dewatering

Dewatering will be necessary to provide a stable work environment during excavation and construction below the groundwater table. The design of the excavation dewatering system should be undertaken concurrently with the shoring design. The dewatering design should be undertaken by an engineer registered in the State of South Carolina that is familiar with this type of operation. Sheeting should extend past the anticipated bottom depth of the channel a minimum of 5 feet to minimize the potential for bottom heave and to limit groundwater inflow to a level that can be adequately controlled. Groundwater inflow may be controlled with a system of sumps and pumps installed at the base of the excavation. If pumps cannot keep up with the rate of groundwater inflow, a sanded well point system can be installed inside the excavation.

4.3.4 General Excavation Notes

We expect that onsite excavations can be accomplished with a trackhoe and typical excavation bucket. Soils removed from the excavation should not be placed closer than the height of vertical walls from the edge of the excavation to prevent surcharge loading and to prevent spillage of spoil material back into the excavation.

OSHA standards require daily inspections of excavations, their surrounding areas, and protective systems by a geotechnical engineer or other competent person. Daily inspections are to be conducted prior to the start of work in the excavation, after each storm event or other hazard-increasing occurrence and as needed throughout the workday. These inspections search for evidence of situations that could result in possible cave-ins, indications of failure of the protective systems, or other hazardous conditions.

Safety guidelines concerning means of egress into and out of the excavation, worker protection from falling loads, and other issues as outlined in OSHA Standard 29 CFR Part 1926 should be followed at all times.

4.4 Earthwork

4.4.1 Site Preparation

Any debris or organic material encountered at the base of culvert excavations should be undercut and removed. Voids remaining from the clearing/stripping operation should be backfilled with properly compacted Stone Fill.

4.4.2 Borrow Material

Materials imported for site grading should meet the following criteria:

Table 11. Borrow Material Types

Type[1]	USCS Classification	Acceptable Location for Placement
Controlled Fill / Soil Borrow Material[1]	SP, SP-SM, SP-SW, SW, SM, SC Passing #200<30% Plasticity Index<12%	General grading
Stone Fill Material	Free Draining Stone, #57 or similar	Culvert bedding, undercut backfill, fill within standing water

1. Controlled Fill should consist of approved materials that are free of organic matter and other deleterious debris.

4.4.3 Compaction Specifications

We recommend the following compaction specifications be utilized for the project:

Table 12. Compaction Specifications

ITEM	DESCRIPTION
Fill Lift Thickness for General Grading	➢ Smooth drum/sheepsfoot rollers: fill lifts shall have a maximum of 10 inches in loose thickness ➢ Jumping jack/plate compactor: fill lifts shall have a maximum of 2 to 4 inches in loose thickness ➢ No lift thickness requirement for Stone Fill
Compaction Requirements[1]	➢ Controlled Fill: 95% of the material's maximum Modified Proctor dry density (ASTM D1557) ➢ Stone Fill may be loose placed
Fill Placement Around Culverts	➢ Fill should be placed and compacted around the culverts as indicated in the culvert details. No heavy compaction equipment should be used over the culvert until the manufacturers recommended minimum clear cover has been established.
Moisture Content	Workable levels, generally within the range of ±2% of optimum moisture content value.

1. Fill should be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

4.4.4 Earthwork Quality Control

The earthwork efforts should be monitored under the direction of Insight Group. This monitoring should include documentation of adequate removal of vegetation and top soil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by Insight Group prior to placement of additional lifts. Each lift of fill should be tested for density and water content

at a frequency of at least two tests for every lift of compacted fill. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In addition to the documentation of the essential parameters necessary for construction, the continuation of Insight Group into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer of Record's evaluation of subsurface conditions, including assessing variations and associated design changes.

4.5 Soil Infiltration

Insight Group has evaluated the proposed pond at Southside Park for infiltration rates and seasonal high groundwater levels. The seasonal high groundwater level was estimated through visual observations of mottling (contrasting color pattern), gleying (gray color change), and oxidation in the soils encountered. Infiltration testing was performed at depths of approximately 2 feet below the existing ground surface to determine the infiltration rates.

The infiltration testing was performed on February 8, 2019.

During our investigation, we encountered sands and silty sands to a depth of approximately 15 feet below the existing ground surface. Groundwater was encountered from depths of approximately 2.3 to 3.1 feet below the existing ground surface. The measured infiltration (INF) rate and seasonal high groundwater (SHGW) estimations are summarized in the following table.

Table 13. Infiltration Test Results & Seasonal High Groundwater Estimations

Test Location	Depth of Encountered Groundwater[1] (ft)	Depth of Infiltration Test (ft)	Infiltration Rate (in / hour)	Estimated Seasonal High Groundwater Depth (ft)
INF-12	3.8	2	0.8	2 to 2.5
INF-13	NE	2	0.8	1.5 to 2
INF-14	NE	2	0.4	1.5 to 2
INF-15	NE	2	0.0	2 to 2.5

1. NE: Not encountered

At the INF-15 location, the infiltration rate was measured to be 0 inches per hour. No infiltration was measured for 95 minutes. Soil conditions at this location were clean and silty sand, which would typically have a higher infiltration rate. Based on the soil conditions and results of the other tests, we expect this

result is not representative of global infiltration rates of the planned pond. Insight Group can perform additional infiltration testing upon request.

5 LIMITATIONS OF REPORT

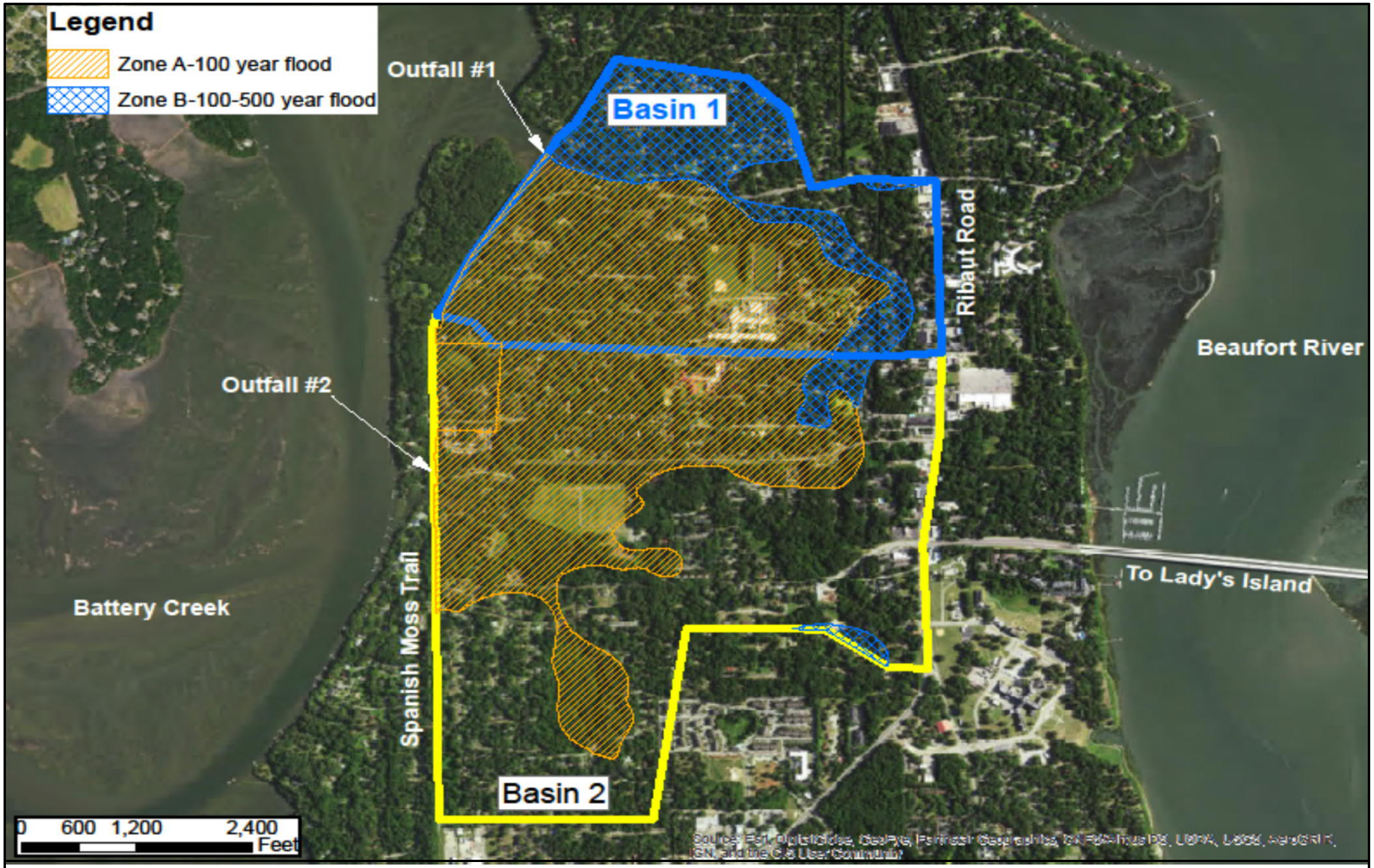
These services and this report have been performed in accordance with the local standard of practice. These recommendations apply only to the specific project referenced herein. Conclusions and recommendations are based on the observations and collected measurements. Subsurface tests were performed at discrete locations; subsurface conditions can vary between test locations. Insight Group should review final plans and specifications for construction.

APPENDICES

Exhibit A	Site and Test Location Plans
Exhibit B	Testing Logs and Records
Exhibit C	Laboratory Test Results

EXHIBIT A

Site and Test Location Plans



Notes: Figure provided by ICE	INSIGHT GROUP 3359 Meeting St. N. Charleston, SC 29405 Phone: (843) 779 9824 InsightGrp.com	Project Name: Mossy Oaks Drainage Project Number: 19-0001 Date: 3/15/2019	Site Location Mossy Oaks Drainage Improvements Geotechnical Report Port Royal South Carolina	Exhibit A

Legend

Cone Penetration Test / Direct Push Boring to Collect Samples

Hand Auger Boring with DCP

INSIGHT GROUP
3359 Meeting St. N. Charleston, SC 29405
Phone: (843) 779 9824 InsightGrp.com

Project Name: Mossy Oaks Drainage

Project Number: 19-0001

Date: 3/15/2019

Test Location Plan for Basin 1

Mossy Oaks Drainage Improvements
Geotechnical Report

Port Royal South Carolina

Exhibit

A

Legend

- Cone Penetration Test / Direct Push Boring to Collect Samples
- Hand Auger Boring with DCP
- Infiltration Test

INSIGHT GROUP
3359 Meeting St. N. Charleston, SC 29405
Phone: (843) 779 9824 InsightGrp.com

Project Name: Mossy Oaks Drainage

Project Number: 19-0001

Date: 3/15/2019

Test Location Plan for Basin 2

Mossy Oaks Drainage Improvements
Geotechnical Report

Port Royal South Carolina

Exhibit

A

EXHIBIT B

Testing Logs and Records

Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-1

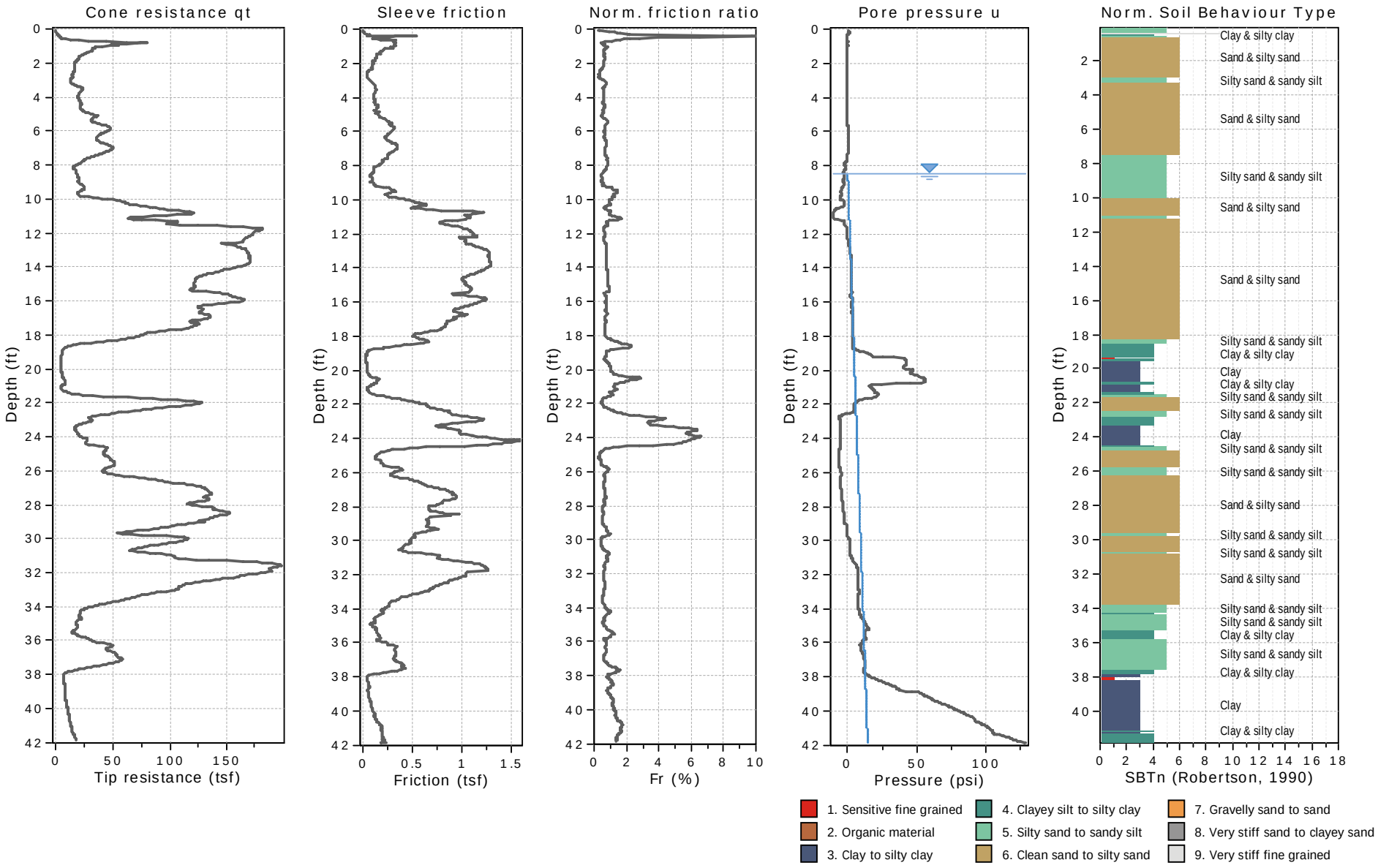
Project: 19-0001 Mossy Oaks Drainage

Location: Port Royal, SC

Total depth: 41.86 ft, Date: 2/4/2019

Cone Type: Mkj610

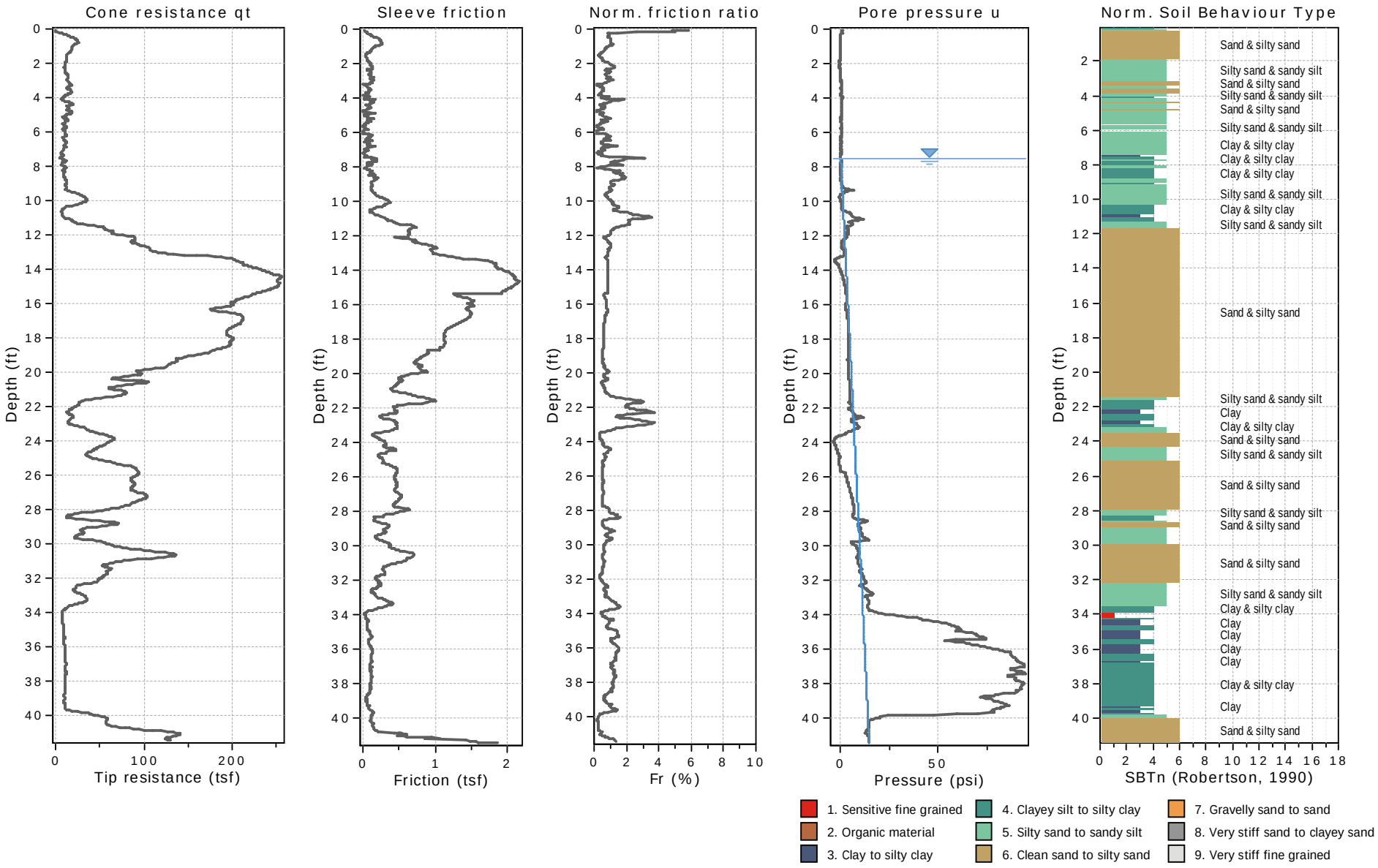
Cone Operator: JMB



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-2
Total depth: 41.44 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

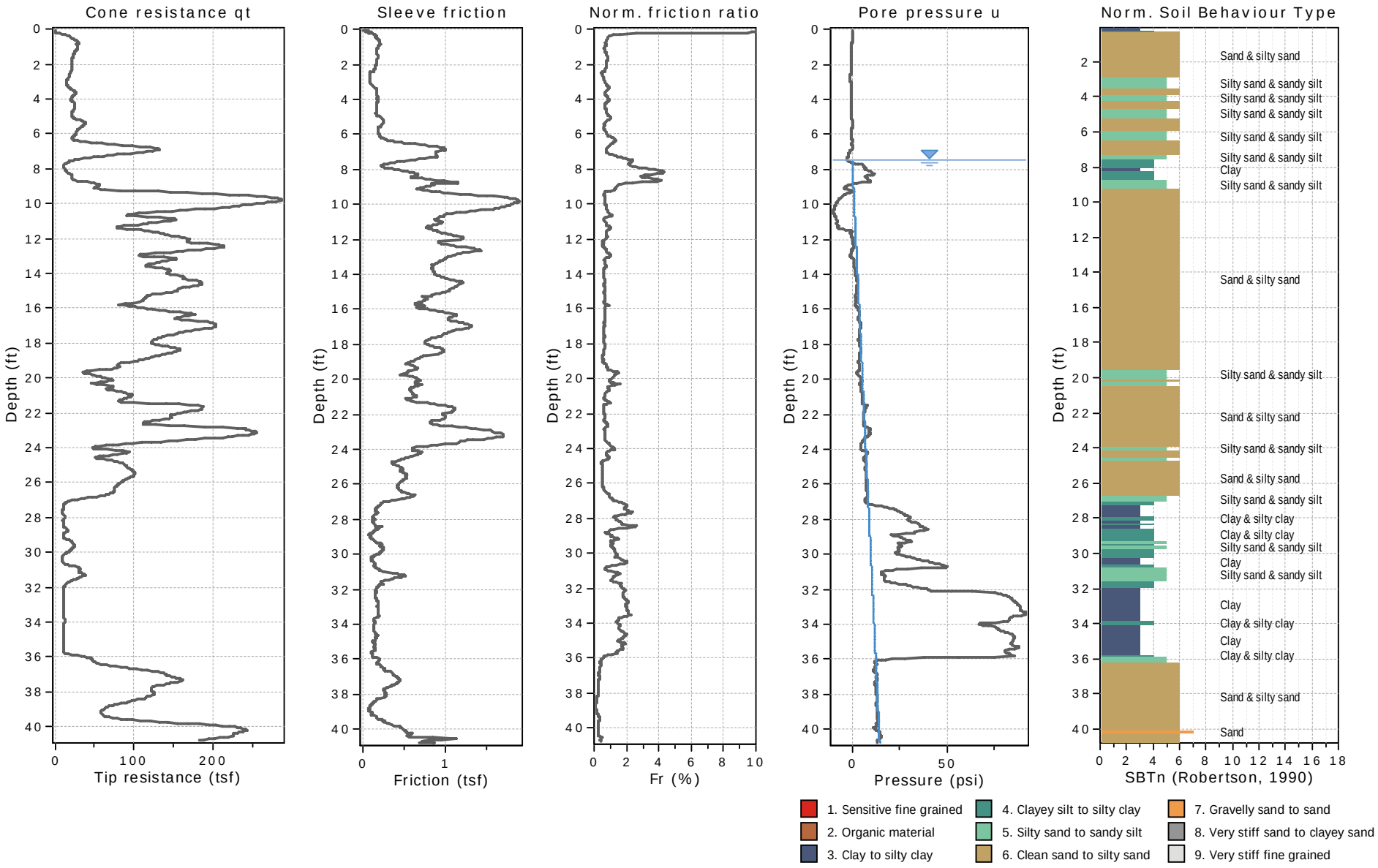
Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-3
Total depth: 40.78 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-4

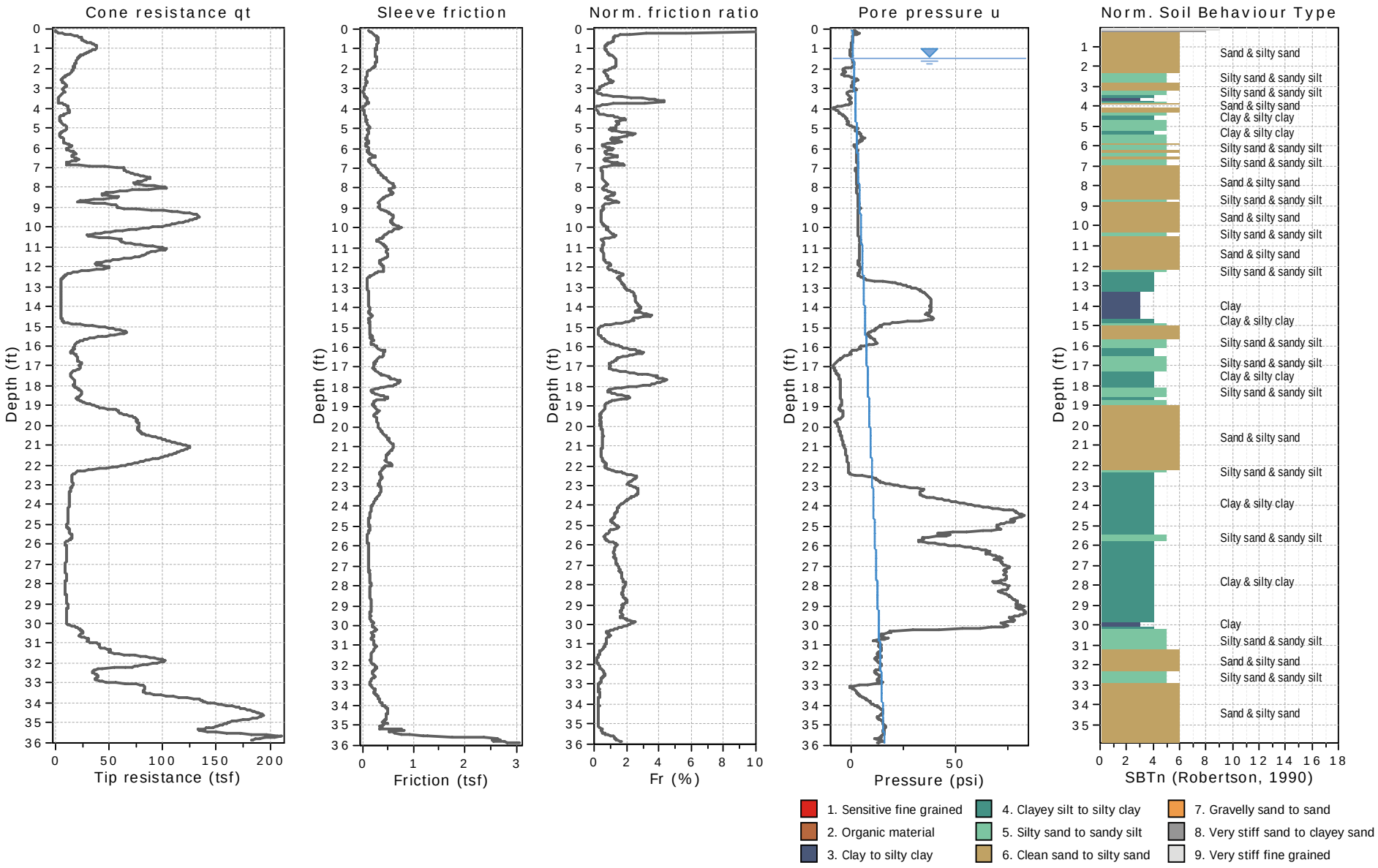
Total depth: 35.89 ft, Date: 2/4/2019

Cone Type: Mkj610

Cone Operator: JMB

Project: 19-0001 Mossy Oaks Drainage

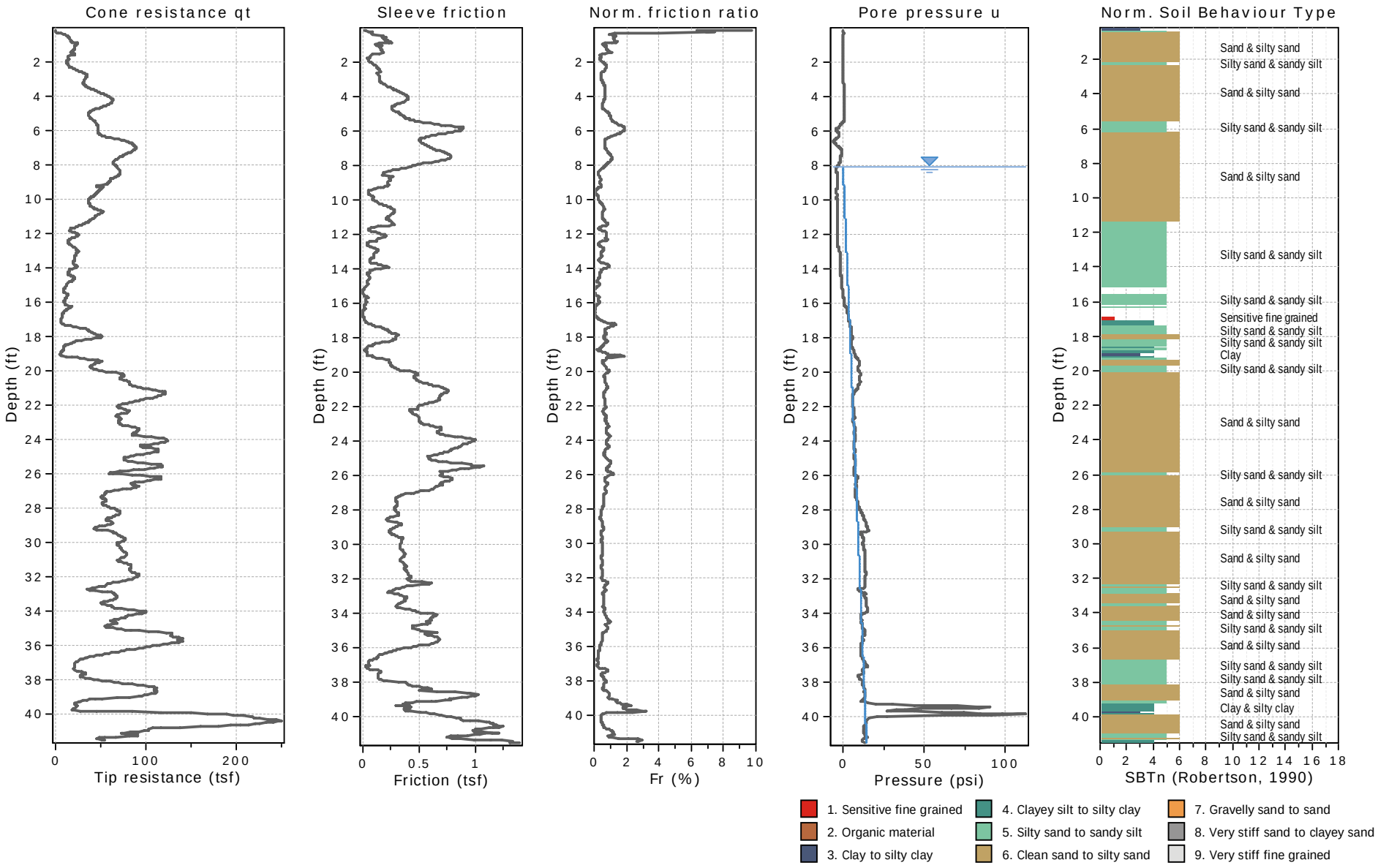
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-5
Total depth: 41.50 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

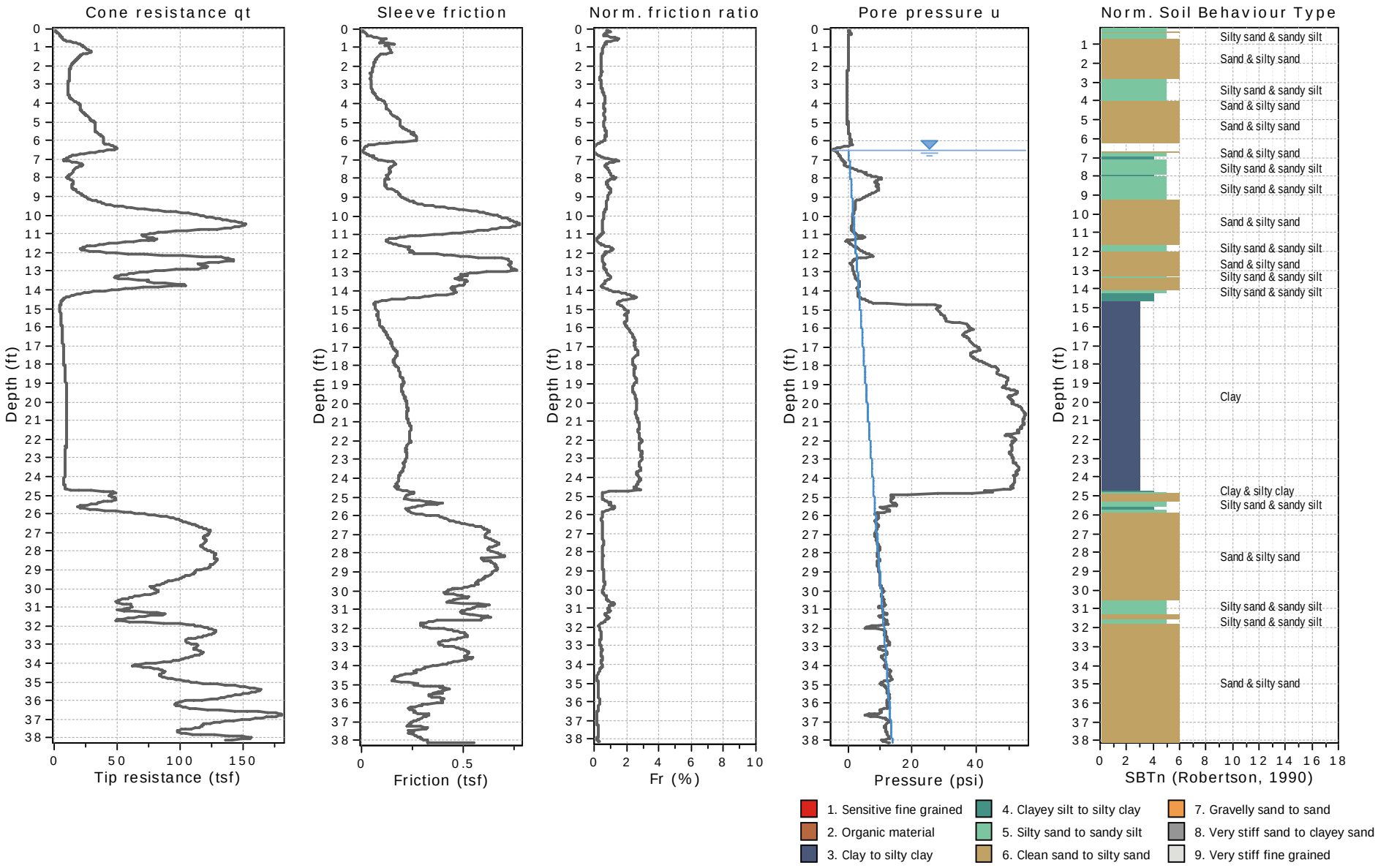
Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-6
Total depth: 38.12 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

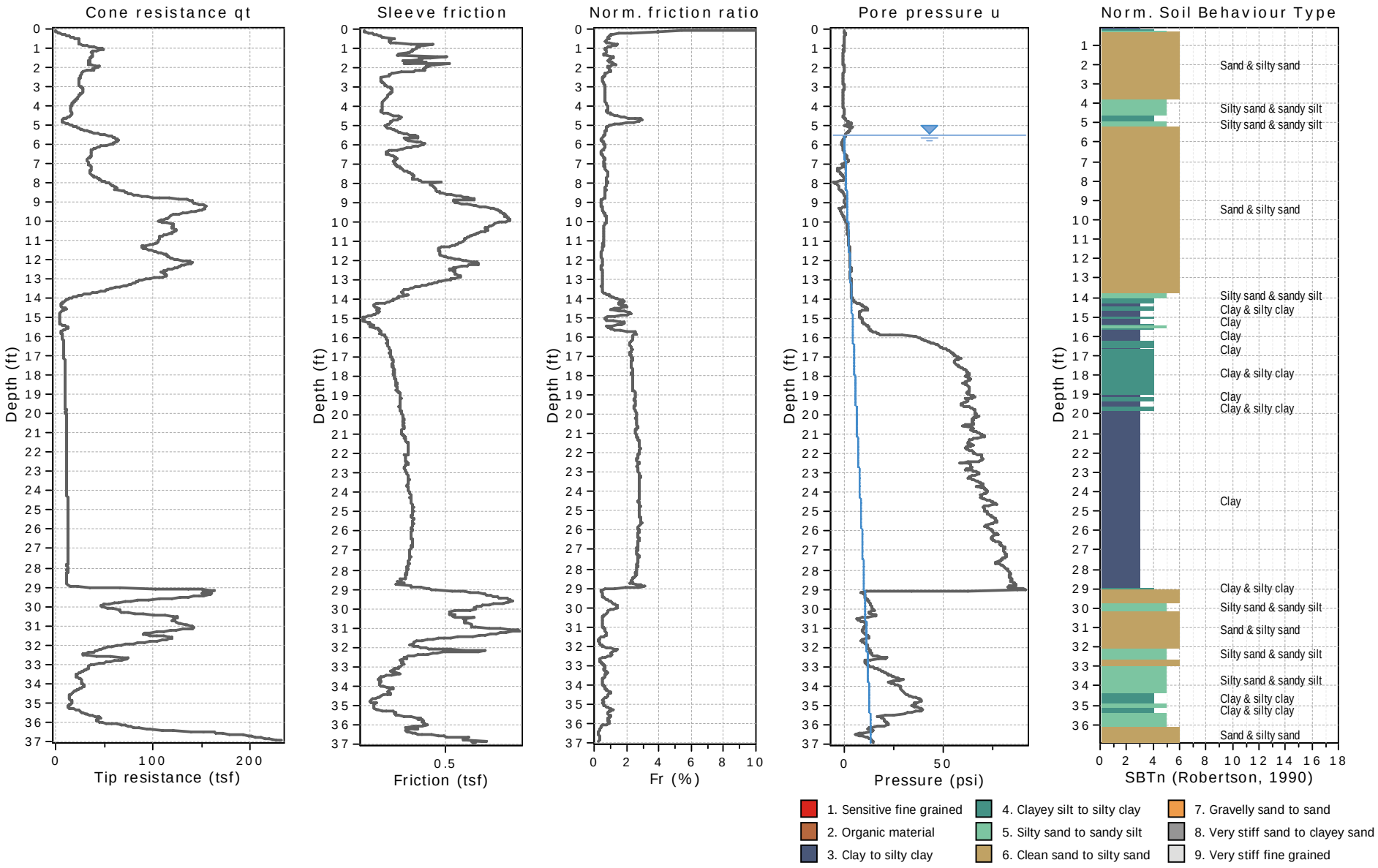
Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-7
Total depth: 36.94 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

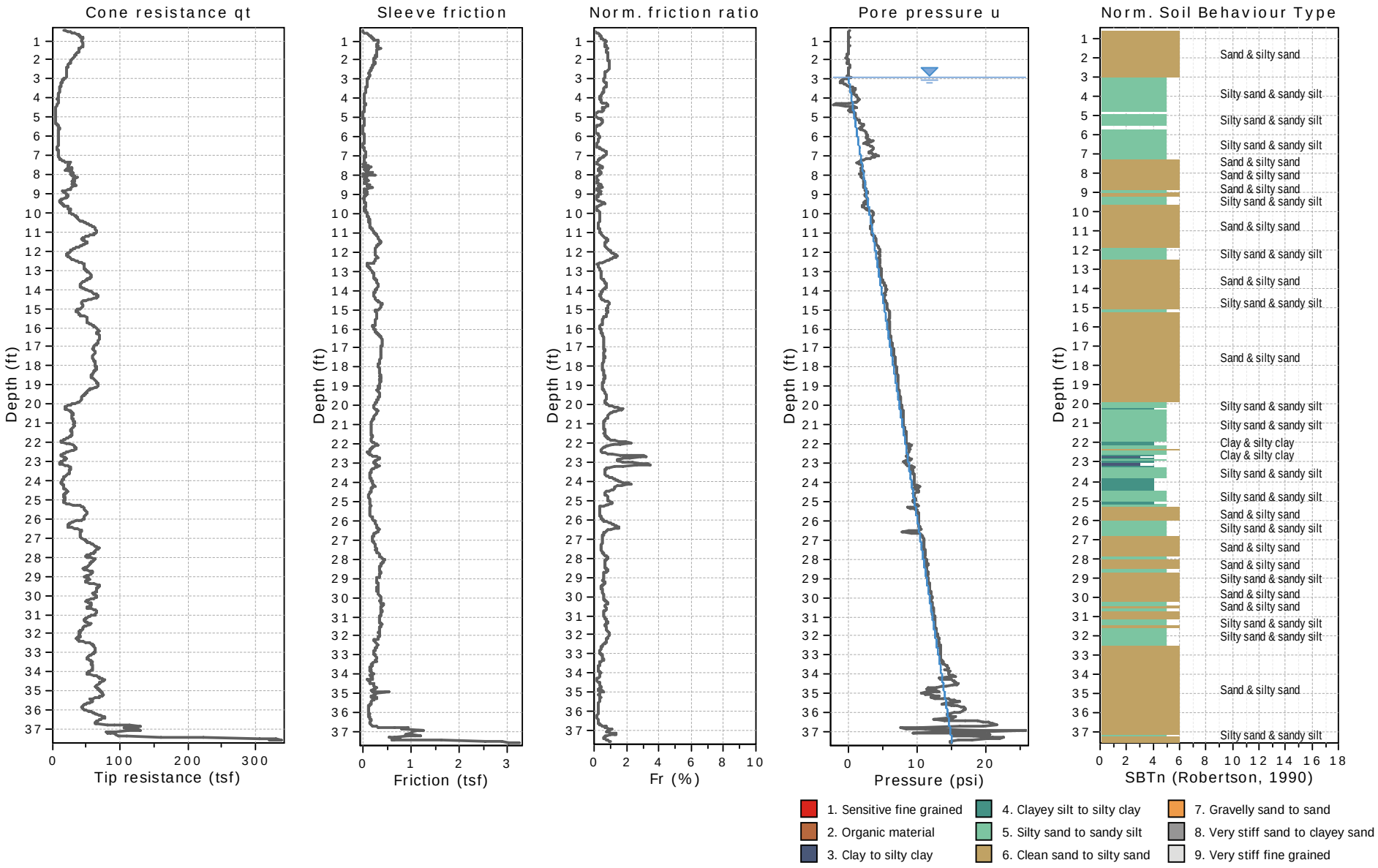
Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



Insight Group
Geotechnical, Construction and Environmental Consultants
North Charleston, South Carolina
www.InsightGrp.com

CPT-8
Total depth: 37.57 ft, Date: 2/4/2019
Cone Type: Mkj610
Cone Operator: JMB

Project: 19-0001 Mossy Oaks Drainage
Location: Port Royal, SC



BORING NUMBER DP-2

Insight Group
3359 Meeting Street Suite 101
N. Charleston, SC 29409

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage
Port Royal, South Carolina

CLIENT: Inrastructure Consulting & Engineering
Beaufort, South Carolina

DATE STARTED 2/4/19 **COMPLETED** 2/4/19

DRILLER/OPERATOR J. Bray

ADVANCEMENT METHOD Direct Push

ADVANCEMENT RIG Pagani 150-63 **LOGGED BY** Z. Driggers

NOTES

GROUND WATER LEVELS:

▽ **Estimated During Sampling:** 7.5 ft.

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DP	SM		Moist, brown, rounded, fine grained, with trace organics, grass roots, **SILTY SAND WITH GRAVEL (SM)** *(FILL)*
			0.8	
				Moist, black, well graded gravel with some oyster shell fragments, **ASPHALT BASE** *(FILL)*
			1.5	
	DP GB 1	SP-SM		Moist, light brown, rounded, fine grained, trace organics, with nodules of some plasticity, **POORLY GRADED SAND WITH SILT (SP-SM)** *(FILL)*
				Root / wood mulch at 2.5 feet, *(FILL)*
			3.5	
		CH	3.8	Moist, dark red, some trace organics and shell fragments, **FAT CLAY WITH SAND (CH)** *(FILL)*
		SM	4.4	Moist, brown, rounded, fine grained, **SILTY SAND (SM)** *(FILL)*
5		CH	5.0	Moist, dark red, with trace shells, **FAT CLAY WITH SAND (CH)** *(FILL)*
	DP			Oyster shells with some clayey sand intermixed, *(FILL)*
			▽	
	DP		9.2	
10		SM	10.5	Moist to wet, gray, rounded, fine grained, with some wood pieces at bottom of layer, **SILTY SAND (SM)** *(FILL)*
	GB 2 DP	SC		Wet, light gray, rounded, fine grained, strong organic (marsh) odor, with interbedded clean sand lenses, **CLAYEY SAND (SC)** *(HOLOCENE)*
			13.7	
15	DP	SP-SM		Wet, light gray, rounded, fine grained, strong organic (marsh) odor, **POORLY GRADED SAND WITH SILT (SP-SM)** *(HOLOCENE)*
			16.3	
				Terminated at 16.3 feet

BORING NUMBER DP-6

Insight Group
3359 Meeting Street Suite 101
N. Charleston, SC 29409

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage
Port Royal, South Carolina

CLIENT: Inrastructure Consulting & Engineering
Beaufort, South Carolina

DATE STARTED 2/5/19 **COMPLETED** 2/5/19

DRILLER/OPERATOR J. Bray

ADVANCEMENT METHOD Direct Push

ADVANCEMENT RIG Pagani 150-63 **LOGGED BY** Z. Driggers

NOTES

GROUND WATER LEVELS:

▽ **Estimated During Sampling:** 6.5 ft.

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DP	SM		Moist, brown, rounded, fine grained, with organics, leaves, grass, **SILTY SAND (SM)** *(FILL)*
		SM		0.2 Moist, brown, rounded, fine grained, trace organics, **SILTY SAND (SM)** *(FILL)*
				0.7 Moist, black, well graded gravel with some oyster shell fragments, **ASPHALT BASE** *(FILL)*
		SP-SM		1.2 Moist, light gray to dark brown, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)** *(FILL)*
				4.0
		SC		4.3 Moist to wet, dark brown, rounded, fine grained, **CLAYEY SAND (SC)** *(FILL)*
5	DP	SP-SM		Wet, gray, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)** *(FILL)* ▽
				7.0
		SM		Wet, dark brown, rounded, fine grained, with trace organics, **SILTY SAND (SM)** *(FILL)*
	GB 1 DP			8.5
10		SP-SM		Wet, light brown to gray, rounded, fine grained, strong organic (marsh) odor, **POORLY GRADED SAND WITH SILT (SP-SM)** *(HOLOCENE)*
				10.4
				Terminated at 10.4 feet

BORING NUMBER DCP-01

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			5" of Topsoil
	DCP 2	0			
	DCP 3	0			0.4
	DCP 4	0			Dry, dark brown, rounded, fine grained, with clay seams, **SILTY SAND (SM)**
	DCP 5	3			
	DCP 6	4			
1	DCP 7	4			
	DCP 8	3			
	DCP 9	2			
	DCP 10	5			
	DCP 11	4	SM		
	DCP 12	3			
2	DCP 13	1			
	DCP 14	2			
	DCP 15	2			
	DCP 16	3			
	DCP 17	3			
	DCP 18	3			
3	DCP 19	1			3.2
	DCP 20	2			Moist, gray and dark brown, **SANDY LEAN CLAY (CL)**
	DCP 21	3			
	DCP 22	2	CL		
	DCP 23	2			
4	DCP 24	3			4.0
					Terminated at 4 feet

BORING NUMBER DCP-02

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	4			1" of Topsoil
				0.1	Dry to moist, pale yellow, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)**
	DCP 2	4			
	DCP 3	3			
	DCP 4	1			
	DCP 5	4			
1	DCP 6	7			
	DCP 7	8			
	DCP 8	8			
	DCP 9	7			
	DCP 10	8			
	DCP 11	6			
2	DCP 12	4			
	DCP 13	5	SP-SM		
	DCP 14	5			
	DCP 15	4			
	DCP 16	5			
	DCP 17	4			
3	DCP 18	5			
	DCP 19	5			
	DCP 20	5			
	DCP 21	5			
	DCP 22	5			
	DCP 23	5			
4	DCP 24	5		4.0	

Terminated at 4 feet

BORING NUMBER DCP-03

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			2" of Topsoil
				0.2	
	DCP 2	0	SP-SM		Dry to moist, dark brown, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)**
	DCP 3	0			
	DCP 4	0			
	DCP 5	0			
1	DCP 6	4			
	DCP 7	3			
	DCP 8	3			
	DCP 9	4			
	DCP 10	3			
	DCP 11	1			
2	DCP 12	2			
	DCP 13	2			
	DCP 14	2			
	DCP 15	2			
	DCP 16	2			
	DCP 17	3			
3	DCP 18	2			
	DCP 19	3			
	DCP 20	3			
	DCP 21	15+			
	DCP 22				
	DCP 23				
4	DCP 24			4.0	

Terminated at 4 feet

BORING NUMBER DCP-04

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			6" of Topsoil
	DCP 2	2			
	DCP 3	2		0.5	
	DCP 4	3	SP-SM		Dry, dark brown, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)**
	DCP 5	4			
1	DCP 6	5			
	DCP 7	6		1.2	
	DCP 8	6	SM		Moist, dark brown, rounded, fine grained, with clay seams, **SILTY SAND (SM)**
	DCP 9	4			
	DCP 10	2			
	DCP 11	2			
2	DCP 12	2			
	DCP 13	1			
	DCP 14	2			
	DCP 15	2			
	DCP 16	3			
	DCP 17	2			
3	DCP 18	2			
	DCP 19	3			
	DCP 20	1			
	DCP 21	2			
	DCP 22	2			
	DCP 23	3			
4	DCP 24	3		4.0	

Terminated at 4 feet

BORING NUMBER DCP-05

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	2		0.1	1" of Topsoil
	DCP 2	3	SM		Dry, dark brown, rounded, fine grained, **SILTY SAND (SM)**
	DCP 3	2			
	DCP 4	2			
	DCP 5	1			
1	DCP 6	2			
	DCP 7	2			
	DCP 8	2			
	DCP 9	3			
	DCP 10	2			
	DCP 11	3			
2	DCP 12	3		2.0	
	DCP 13	3	SC		Moist, dark brown, rounded, fine grained, **CLAYEY SAND (SC)**
	DCP 14	3			
	DCP 15	4			
	DCP 16	3			
	DCP 17	5			
3	DCP 18	6			
	DCP 19	4			
	DCP 20	3			
	DCP 21	2			
	DCP 22	3			
	DCP 23	4			
4	DCP 24	4		4.0	
					Terminated at 4 feet

BORING NUMBER DCP-06

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0	SM		Dry to moist, dark brown, rounded, fine grained, with clay seams, **SILTY SAND (SM)**
	DCP 2	0			
	DCP 3	0			
	DCP 4	0			
	DCP 5	0			
1	DCP 6	0			
	DCP 7	0			
	DCP 8	0			
	DCP 9	0			
	DCP 10	0			
	DCP 11	0			
2	DCP 12	0			
	DCP 13	3			
	DCP 14	6			
	DCP 15	5			
	DCP 16	7			
	DCP 17	8			
3	DCP 18	7			
	DCP 19	7			
	DCP 20	6			
	DCP 21	7			
	DCP 22	6			
	DCP 23	8			
4	DCP 24	8			4.0

Terminated at 4 feet

BORING NUMBER DCP-07

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0		0.1	1" of Topsoil
	DCP 2	0			Dry to moist, dark brown, rounded, fine grained, **SILTY SAND (SM)**
	DCP 3	0			
	DCP 4	3			
	DCP 5	3			
1	DCP 6	3			
	DCP 7	3			
	DCP 8	3			
	DCP 9	3			
	DCP 10	2			
	DCP 11	2			
2	DCP 12	3			
	DCP 13	3	SM		
	DCP 14	2			
	DCP 15	1			
	DCP 16	1			
	DCP 17	1			
3	DCP 18	1			
	DCP 19	1			
	DCP 20	1			
	DCP 21	2			
	DCP 22	1			
	DCP 23	1			
4	DCP 24	1		4.0	

Terminated at 4 feet

BORING NUMBER DCP-08

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method ▽ **At time of test:** 3.3 ft.

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			3" of Topsoil
	DCP 2	1			0.3
	DCP 3	2	SC		Dry to moist, dark brown, rounded, fine grained, **CLAYEY SAND (SC)**
	DCP 4	2			
	DCP 5	3			
1	DCP 6	3			
	DCP 7	4			
	DCP 8	5			
	DCP 9	3			
	DCP 10	3			
	DCP 11	2			
2	DCP 12	3			
	DCP 13	3			
	DCP 14	3			
	DCP 15	1			
	DCP 16	2			2.7
	DCP 17	2	CL		Moist, dark brown, **SANDY LEAN CLAY (CL)**
3	DCP 18	2			▽
	DCP 19	2			
	DCP 20	5			
	DCP 21	3			
	DCP 22	2			
	DCP 23	6			
4	DCP 24	4			4.0
					Terminated at 4 feet

BORING NUMBER DCP-09

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			8" of Topsoil
	DCP 2	0			
	DCP 3	0			
	DCP 4	0			
	DCP 5	2			0.7
	DCP 6	3			Moist to wet, brown to dark brown, rounded, fine grained, **SILTY SAND (SM)**
1	DCP 7	3			
	DCP 8	3			
	DCP 9	3			
	DCP 10	3			
	DCP 11	2			
	DCP 12	3			
2	DCP 13	2			
	DCP 14	1			
	DCP 15	1	SM		
	DCP 16	1			
	DCP 17	1			
	DCP 18	1			
3	DCP 19	1			
	DCP 20	1			
	DCP 21	0			
	DCP 22	0			
	DCP 23	1			
	DCP 24	1			4.0
4					Terminated at 4 feet

BORING NUMBER DCP-10

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0			4" of Topsoil
	DCP 2	0			0.3
	DCP 3	0	SM		Moist, brown, rounded, fine grained, **SILTY SAND (SM)**
	DCP 4	2			
	DCP 5	3			
1	DCP 6	3			
	DCP 7	2			
	DCP 8	2			
	DCP 9	1			
	DCP 10	1			
	DCP 11	2			
2	DCP 12	2			
	DCP 13	2			
	DCP 14	2			
	DCP 15	1			
	DCP 16	1			
	DCP 17	1			
3	DCP 18	1			
	DCP 19	2			
	DCP 20	1			
	DCP 21	2			
	DCP 22	1			
	DCP 23	1			
4	DCP 24	1			4.0

Terminated at 4 feet

BORING NUMBER DCP-11

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/18/19 **COMPLETED** 2/18/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Dynamic Cone Penetrometer - Kessler Method

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	DCP BLOW COUNT (BLOWS/2")	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	DCP 1	0		0.1	1" of Topsoil
	DCP 2	0			Moist, light gray and brown, rounded, fine grained, **SILTY SAND (SM)**
	DCP 3	3			
	DCP 4	3			
	DCP 5	3			
1	DCP 6	4			
	DCP 7	4			
	DCP 8	3			
	DCP 9	3			
	DCP 10	4			
	DCP 11	3			
2	DCP 12	3			
	DCP 13	2	SM		
	DCP 14	2			
	DCP 15	2			
	DCP 16	2			
	DCP 17	1			
3	DCP 18	1			
	DCP 19	2			
	DCP 20	1			
	DCP 21	1			
	DCP 22	1			
	DCP 23	1			
4	DCP 24	1		4.0	

Terminated at 4 feet

BORING NUMBER HAB at INF-12

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/20/19 **COMPLETED** 2/20/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Hand Auger Boring

▽ **At time of test:** 3.8 ft.

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			0.1	1" of Topsoil
		SM		Dry, dark brown, rounded, fine grained, **SILTY SAND (SM)**
1			1.3	
		SC		Moist, grayish brown, rounded, fine grained, **CLAYEY SAND (SC)**
2				
3			3.5	
		SP		Wet, grayish brown, rounded, fine to medium grained, **POORLY GRADED SAND (SP)** ▽
4			4.0	
				Terminated at 4 feet

GENERAL BH / TP / WELL - IG-PROJ-FOR-TEMPLATE.GPJ - 2/28/19 10:46 - 19-0001 MOSSY OAKS DRAINAGE.GPJ

BORING NUMBER HAB at INF-13

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/20/19 **COMPLETED** 2/20/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Hand Auger Boring

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0				1" of Topsoil (0.1)
		SM		Moist, dark brown, rounded, fine grained, **SILTY SAND (SM)**
1				
2				
3				
4				4.0

Terminated at 4 feet

GENERAL BH / TP / WELL - IG-PROJ-FOR-TEMPLATE.GPJ - 2/28/19 10:46 - 19-0001 MOSSY OAKS DRAINAGE.GPJ

BORING NUMBER HAB at INF-14

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/20/19 **COMPLETED** 2/20/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Hand Auger Boring

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			0.1	1" of Topsoil
		SM		Moist, dark brown, rounded, fine grained, **SILTY SAND (SM)**
1				
2				
3				
4			4.0	

Terminated at 4 feet

GENERAL BH / TP / WELL - IG-PROJ-FOR-TEMPLATE.GPJ - 2/28/19 10:46 - 19-0001 MOSSY OAKS DRAINAGE.GPJ

BORING NUMBER HAB at INF-15

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage

CLIENT: Infrastructure Consulting & Engineering

Port Royal, South Carolina

Beaufort, South Carolina

DATE STARTED 2/20/19 **COMPLETED** 2/20/19

DRILLER/OPERATOR Z. Driggers

GROUND WATER LEVELS:

ADVANCEMENT METHOD Hand Auger Boring

At time of test: Groundwater not encountered

ADVANCEMENT RIG N/A **LOGGED BY** Z. Driggers

NOTES

DEPTH (ft)	SAMPLE TYPE NUMBER	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			0.1	1" of Topsoil
		SM		Dry, dark brown, rounded, fine grained, **SILTY SAND (SM)**
1			1.0	
		SP-SM		Moist, grayish brown, rounded, fine grained, **POORLY GRADED SAND WITH SILT (SP-SM)**
2				
3				
4			4.0	
				Terminated at 4 feet

EXHIBIT C

Laboratory Test Results

INSIGHT GROUP
A CHRISTOPHER COMPANY

SUMMARY OF LABORATORY RESULTS

CLIENT Inrastructure Consulting & Engineering **PROJECT NAME** Mossy Oaks Drainage

PROJECT NUMBER 19-0001 **PROJECT LOCATION** Port Royal, South Carolina

Test No.	Depth (ft)	USCS Soil Classification	%<#200 Sieve	Liquid Limit	Plastic Limit	Plasticity Index	Water Content (%)
BULK at CPT-01	0 - 2	SAND with SILT(SP-SM)	10	NP	NP	NP	9.5
BULK at CPT-03	0 - 2	SILTY SAND(SM)	20	24	23	1	41.3
BULK at CPT-05	0 - 2	SAND with SILT(SP-SM)	10	NP	NP	NP	8.9
BULK at CPT-07	0 - 2	SAND with SILT(SP-SM)	7	NP	NP	NP	10.7
DP at CPT-02	2 - 3	SILTY SAND(SM)	12	NP	NP	NP	14.5
DP at CPT-02	11 - 12	SAND with SILT(SP-SM)	11	NP	NP	NP	29.8
DP at CPT-06	8 - 9	SILTY SAND(SM)	24	NP	NP	NP	34.8

GRAIN SIZE DISTRIBUTION

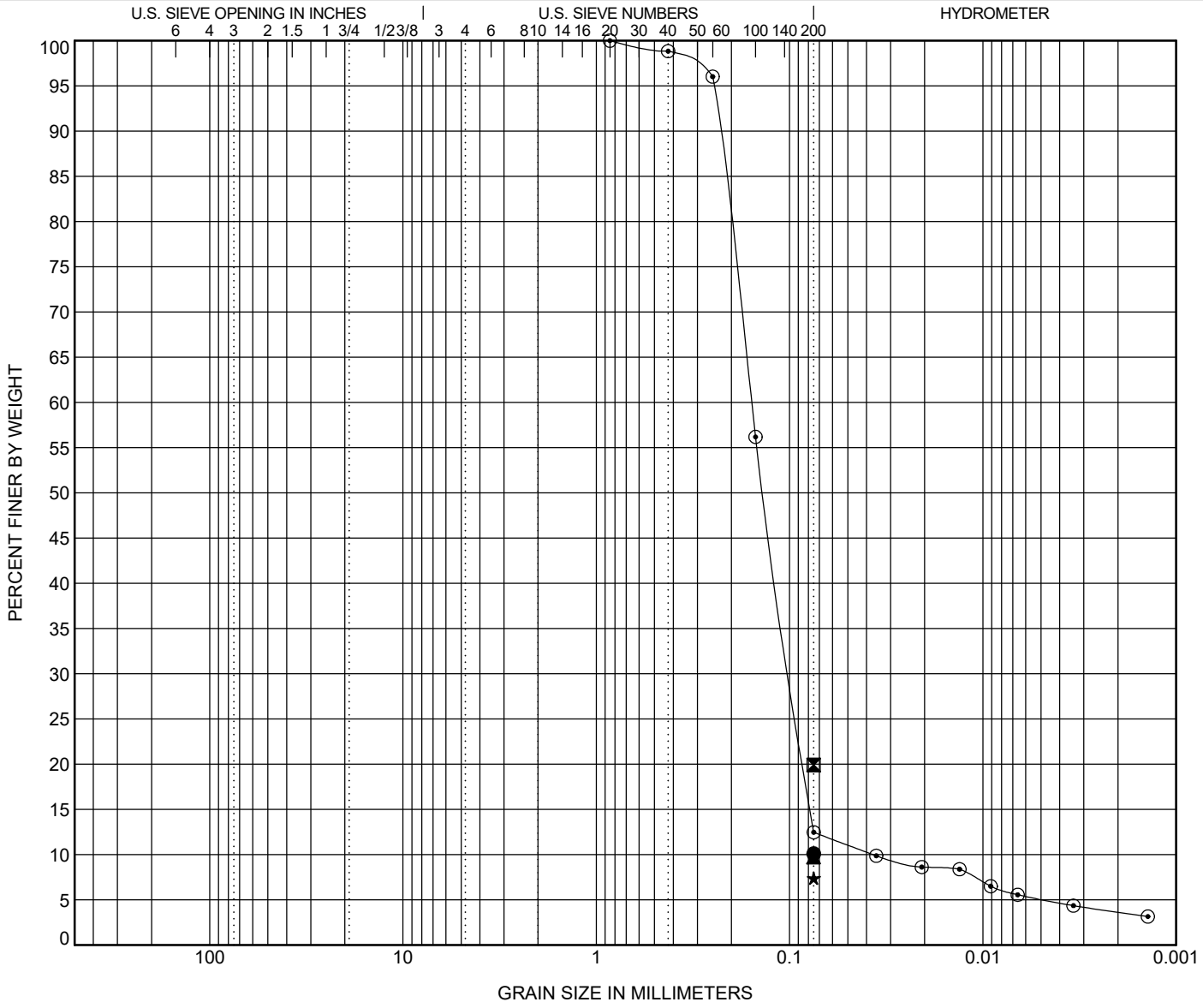
INSIGHT GROUP
A CHRISTOPHER COMPANY

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage
Port Royal, South Carolina

CLIENT: Infrastructure Consulting & Engineering
Beaufort, South Carolina



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● BULK at CPT-01	0.0	SAND with SILT(SP-SM)	NP	NP	NP		
⊠ BULK at CPT-03	0.0	SILTY SAND(SM)	24	23	1		
▲ BULK at CPT-05	0.0	SAND with SILT(SP-SM)	NP	NP	NP		
★ BULK at CPT-07	0.0	SAND with SILT(SP-SM)	NP	NP	NP		
⊙ DP at CPT-02	2.0	SILTY SAND(SM)	NP	NP	NP	1.68	4.26

BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BULK at CPT-01	0.0	0.075						10.1	
⊠ BULK at CPT-03	0.0	0.075						19.9	
▲ BULK at CPT-05	0.0	0.075						9.6	
★ BULK at CPT-07	0.0	0.075						7.4	
⊙ DP at CPT-02	2.0	0.85	0.158	0.099	0.037	0.0	87.5	7.4	5.1

GRAIN SIZE - GINT STD US LAB.GDT - 2/27/19 16:35 - 19-0001 MOSSY OAKS DRAINAGE.GPJ

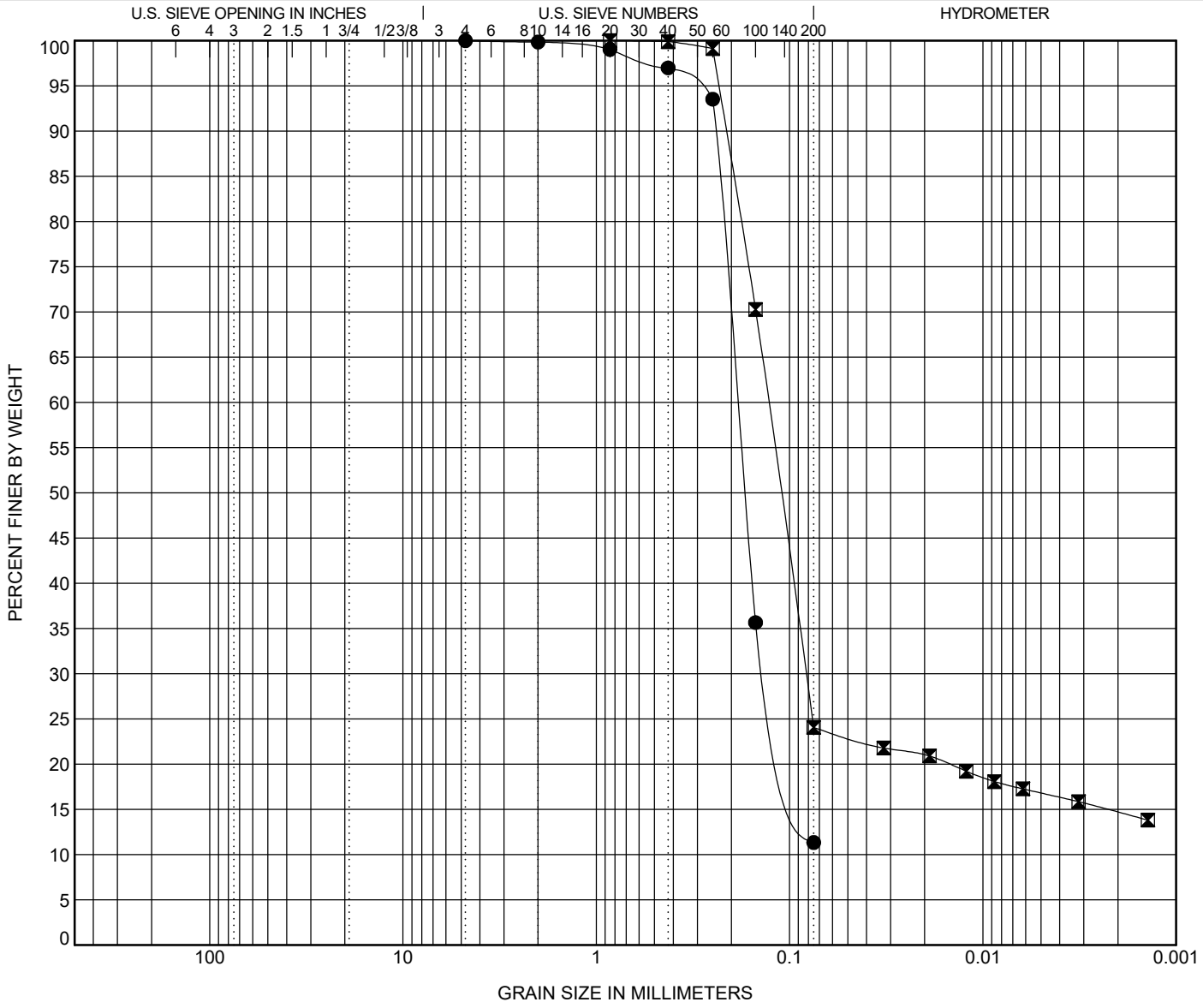
GRAIN SIZE DISTRIBUTION

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage
Port Royal, South Carolina

CLIENT: Infrastructure Consulting & Engineering
Beaufort, South Carolina



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**DP at CPT-02**	**11.0**	**SAND with SILT(SP-SM)**	**NP**	**NP**	**NP**	**1.21**	**2.58**
⊠	**DP at CPT-06**	**8.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**DP at CPT-02**	**11.0**	**4.75**	**0.186**	**0.128**		**0.0**	**88.7**	**11.3**	
⊠	**DP at CPT-06**	**8.0**	**0.85**	**0.129**	**0.082**		**0.0**	**75.9**	**7.3**	**16.8**

GRAIN SIZE - GINT STD US LAB.GDT - 2/27/19 16:35 - 19-0001 MOSSY OAKS DRAINAGE.GPJ

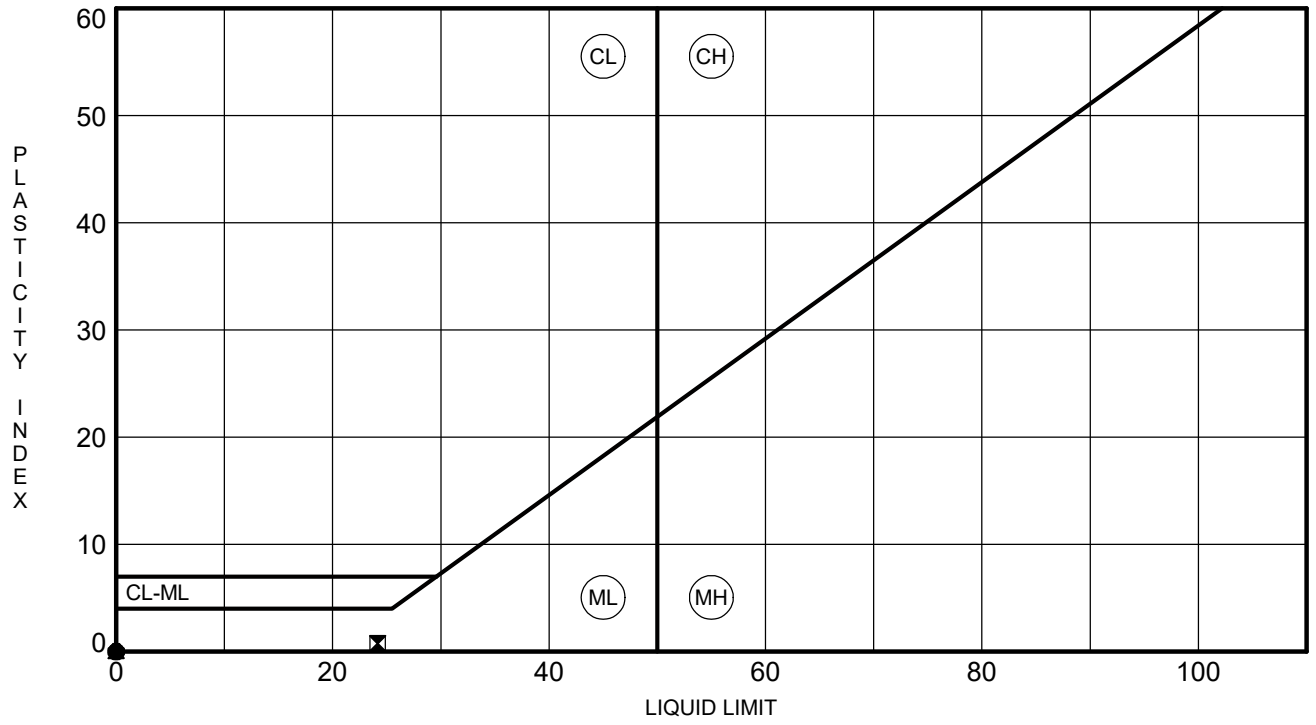
ATTERBERG LIMITS' RESULTS

Insight Group

INSIGHT GROUP NUMBER: 19-0001

PROJECT: Mossy Oaks Drainage
Port Royal, South Carolina

CLIENT: Infrastructure Consulting & Engineering
Beaufort, South Carolina



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**BULK at CPT-01**	**0.0**	**NP**	**NP**	**NP**	**10**	**SAND with SILT(SP-SM)**
⊠	**BULK at CPT-03**	**0.0**	**24**	**23**	**1**	**20**	**SILTY SAND(SM)**
▲	**BULK at CPT-05**	**0.0**	**NP**	**NP**	**NP**	**10**	**SAND with SILT(SP-SM)**
★	**BULK at CPT-07**	**0.0**	**NP**	**NP**	**NP**	**7**	**SAND with SILT(SP-SM)**
⊙	**DP at CPT-02**	**2.0**	**NP**	**NP**	**NP**	**12**	**SILTY SAND(SM)**
✿	**DP at CPT-02**	**11.0**	**NP**	**NP**	**NP**	**11**	**SAND with SILT(SP-SM)**
○	**DP at CPT-06**	**8.0**	**NP**	**NP**	**NP**	**24**	**SILTY SAND(SM)**