GeoTechnologies, Inc.
Geotechnical and Construction Materials Testing Services

March 29, 2019

Todd Kennedy
MOFFATT NICHOL
4700 Falls of Neuse Road, Suite 300
Raleigh, NC 27609

Re: Subsurface Investigation
Storm Water Ponds and Dredge Material Containment Area
Bucksport Marina
Bucksport, South Carolina
GeoTechnologies Project No. 1-18-0747-EA2

Dear Mr. Kennedy:

GeoTechnologies, Inc. has completed the authorized investigation to evaluate subsurface soil conditions for the referenced project located at the Bucksport Marina in Bucksport, South Carolina. Our investigation consisted of performing a total of 24 soil test borings at the approximate locations shown on Figure 1 and summarized in Table 1. The borings were advanced with an ATV drill rig turning hollow stem augers with automatic hammer standard penetration sampling at select intervals to depths of about 10 to 20 feet. This report presents the findings of our investigation and our recommendations concerning site grading and foundation support.

SITE AND PROJECT INFORMATION

The project will involve the construction of two (south/wet) storm water ponds and a dredge spoil containment area. The ponds and the containment area are each over 1000 feet long, and will involve cuts and fills generally not exceeding 13 (cut) or 10 (fill) feet. The property is cleared and is currently used for a sod farm and spray field for the nearby water treatment plant. Several drainage ditches traverse the property.

SUBSURFACE CONDITIONS

Generalized subsurface profile prepared from the test boring data are attached to this report as Figures 2A and 2B to graphically illustrate subsurface conditions encountered at this site. More detailed descriptions of the conditions encountered at the individual test boring locations are then presented on the test boring records in Appendix A.

The site is overlain by a veneer of topsoil/soil in most areas. These materials are initially underlain by low to high plasticity clays and silty or clayey sands with penetration resistances of no less than 3 blows per foot (bpf). With depth, the borings encountered low plasticity clays, and silty, clayey, or clean sands with penetration resistances of at least 2 bpf. The borings were terminated at 10 to 20 feet.

Groundwater was encountered at depths of 4 to 9 feet at the time of boring, or after 24 hours. However, it should be noted that the near surface soils at the site are conducive to the temporary development of perched groundwater conditions during periods of wet weather, and that groundwater levels will fluctuate during different periods of the year.

LABORATORY TESTING

A total of four bulk samples were returned to our laboratory for classification, standard Proctor, and natural moisture content testing. The laboratory results are included in Appendix B, and the results are discussed as appropriate in this report.

RECOMMENDATIONS

The following recommendations are made based upon a review of the attached test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions. As development details become available, they should be provided to GeoTechnologies so that they can be incorporated into our recommendations.

Site Grading. Site grading should begin with the stripping of any vegetation/topsoil. To minimize surface disturbance, the site should be cleared with wide track equipment, and concentrated wheel loads should be kept off the subgrade to avoid rutting. Truly organic soils should be removed during the stripping process; however organically stained soils with less than 5% organics can be left in-place provided they are stable. Subsequently, we recommend that those areas at grade or designated to receive fill be proofrolled with a partially loaded dump truck or similar piece of rubber tired equipment to identify areas necessitating repair. Hand auger borings should also be used to evaluate the near surface soils.

Our experience has been that near surface soils with penetration resistances of about 5 bpf or less require stabilization. This implies that some near surface stabilization will be needed at this site. It is strongly recommended that the site be graded during a warm and dry period of the year to facilitate stabilization of the near surface soils with drying and recompaction rather than undercut and replacement where possible. Although some undercut will be required no matter what time of the year the site is graded, volumes will increase during a wet and/or cool period of the year. In our experience, the most effective way to dry soils is with a farm disc turning the soils every 60 to 90 minutes under favorable (warm/dry) conditions. If the contractor is not prepared to dry soils, or if the site is graded during a wet or cool period of the year, drying will be ineffective and undercut quantities will increase.

Borrow Sources/Fill Placement. The soils at this site are suitable for berm construction; however, some significant drying with a disc and favorable weather will be needed to achieve density and stability, especially where cuts extend below the water table. Our laboratory testing indicates that the soils are generally wet to very wet of optimum moisture content, although the soils may be drier if the site is graded during a warm period of the year.

If off-site borrow is needed we recommend this material consist of silty and clayey sands or low plasticity silts and clays having Unified Soil Classifications of SM, SC, ML, or CL. All fill material should be compacted to not less than 95% of the standard Proctor maximum dry density except in the final foot where this requirement should be increased to 98%. to achieve density and stability, the soils should be compacted within about 2% of optimum moisture content unless otherwise directed by the geotechnical engineer.

If physical properties (such as permeability) are a requirement, the proposed borrow must be tested to verify it meets the specification. Similarly, the in-situ soils must be tested for compliance.

Dewatering. The borings encountered groundwater at depths of about 4 to 9 feet, and it is likely that levels will be higher during other periods of the year. Cuts will extend below the water table in some areas, and in some cases, those cuts will encounter very loose clean to silty sands which will be moderately to highly pervious and subject to becoming unstable even at the plan slope angle of 3H:1V. In our opinion, attempting to cut and shape any side slopes

below the water table without proactive dewatering will risk slope instability, especially where clean sands are exposed. As such, it is recommended that the contractor be prepared to dewater proposed cut areas which will be submerged as necessary to maintain stability. Dewatering means and methods should be left to the discretion of the contractor.

Slope Stability. Provided plans indicate that the maximum fill slope will be about 10 feet, and that the maximum cut will be just under 13 feet. However, the maximum 3H:1V cut slope is about 10 feet. The proposed side slopes are 3H:1V. The boring data was used to model the proposed geometries in the computer program SLIDE. Those analyses are included in Appendix C.

The deepest fills are located on the west side of the dredge spoils containment area. Our analysis of a 10 foot well compacted fill slope over the boring B-12 profile indicates a safety factor in excess of 1.5 which is acceptable. Our analysis assumed that dredge spoils could be placed to crest height of the berm, and that a phreatic surface could develop through the berm, both of which appear conservative. It was also conservatively assumed that the dredge material has no shear strength.

The deepest cut slopes are located on the south storm water pond. Our analysis of a 10 foot cut slope at the approximate B-22 boring profile indicates a safety factor in excess of 1.5 for a deep seated slope failure which is acceptable. The safety factor against a shallow slide with submerged clean sands is below 1.0 for a seepage condition. This illustrates the need to dewater, and the need to armor submerged slopes with exposed granular soils subject to shallow seepage instability. A typical armoring detail includes a geotextile fabric and rip-rap below the water line for stability, and to reduce long-term maintenance. A 2 foot thickness of rip-rap armor will increase the shallow safety factor to about 1.3 to 1.5+. If full draw down is not expected, or if it will rarely occur, a safety factor of 1.3 is acceptable. If full draw down will occur regularly, additional provisions or possibly more maintenance will be needed. Safety factors for a number of conditions are summarized in the table below:

Draw Down	Shallow Safety Factor	Rip-Rap Thickness (ft)
Full	<1.0	NA
Half	<1.0	NA
Full	1.32	2
Half	1.5+	2

It is noted that the above safety factors are for submerged granular soils, and that materials with increased fines are generally less subject to this type of instability. As such, although consideration could be given to armoring all submerged cuts, it will be more feasible to target only those areas where granular soils with little to no fines are exposed. A geotechnical consultant should be engaged to assist the contractor with identifying such areas. With this approach, it should be understood that increased long-term maintenance is likely, but this approach will still be cheaper than armoring all submerged slopes.

SUMMARY

In summary, the site profile is characterized by near surface clays and sands which become clayey, silty, and sandy with depth. Penetration resistances vary somewhat; however, near surface resistances of 5 bpf or less were common implying that some surface repairs will be necessary at the start of site grading. Repairs can be performed through a combination of drying/recompaction, undercut/drying/recompaction, or undercut/replacement. Drying repairs will be most effective if the site is graded during warm and dry period of the year which will also be favorable when drying potential on-site borrow. The need for drying borrow prior to effective reuse should not be overlooked as we expect that much of the potential borrow will be too wet to directly reuse (at least based on current conditions). The site should be stripped and graded with wide tracked equipment to minimize subgrade rutting.

Proposed excavations will extend below the water table in some areas, and those areas should be dewatered as necessary to minimize the potential for shallow sloughing of the more granular soils. Dewatering means and methods are the responsibility of the contractor. Consideration should be given to armoring the surface of submerged excavations with a fabric and rip-rap detail to limit surficial slides, and to reduce long-term maintenance. This is especially true where cleaner sands are encountered, and consideration could be given to targeting those areas only to reduce costs. However, this approach could increase the need for maintenance. If the borrow or in-situ soils will have physical property requirements, such as permeability, appropriate sampling and testing should be performed to verify compliance.

GeoTechnologies, Inc. appreciates the opportunity to be of service on this phase of the project. Please contact us if you have any questions concerning this letter or if we may be of additional service on this or other projects.

Sincerely,

GeoTechnologies, Inc.

Ernest L. Stitzinger, P.E.
Senior Engineer

David L. Israel, P.E.
SC Registration No. 13473

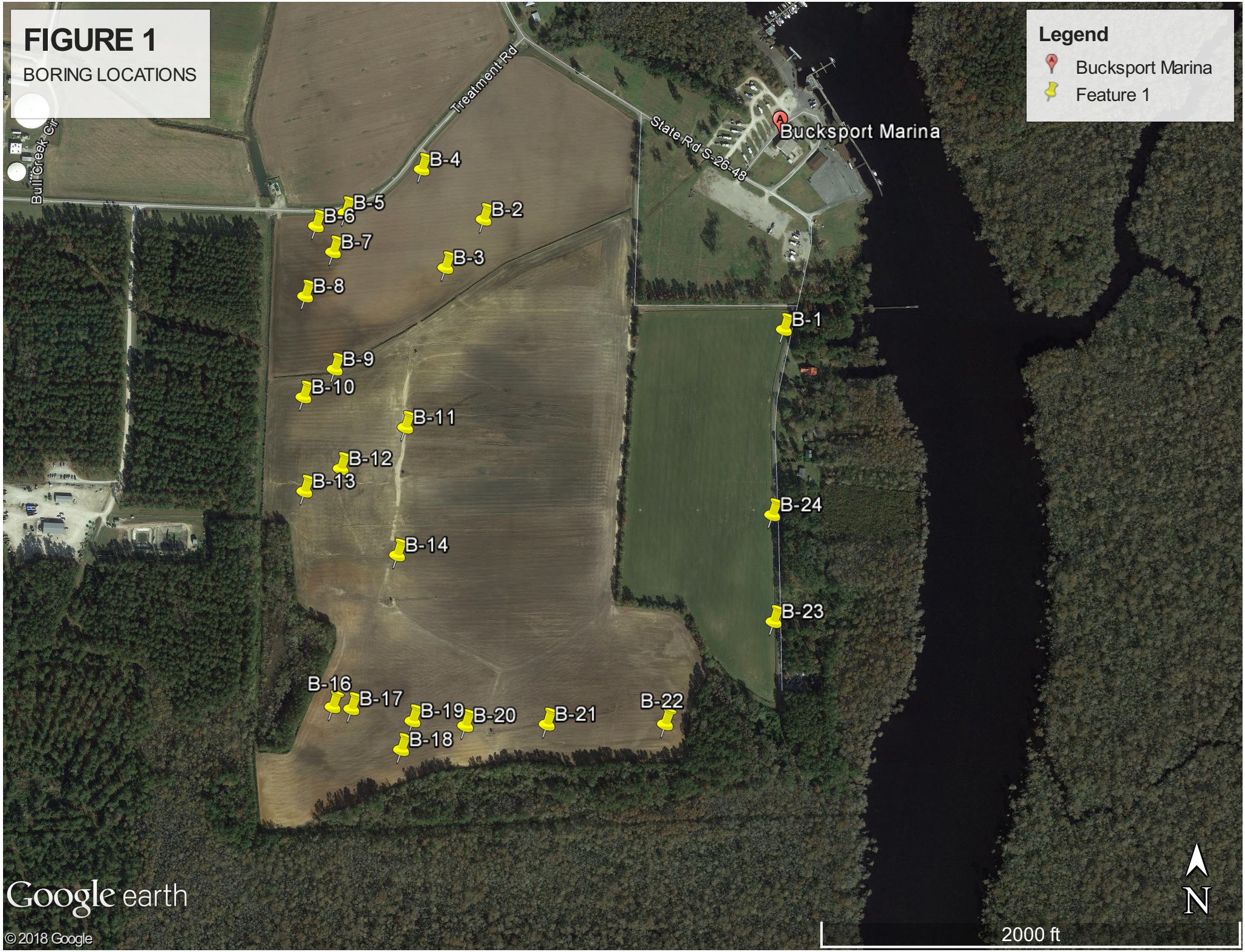
FIGURE 1
BORING LOCATIONS
Legend
Bucksport Marina
Feature 1
Treatment Rd
State Rd S-26-48
Bucksport Marina
Bull Creek Cir
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
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Google earth
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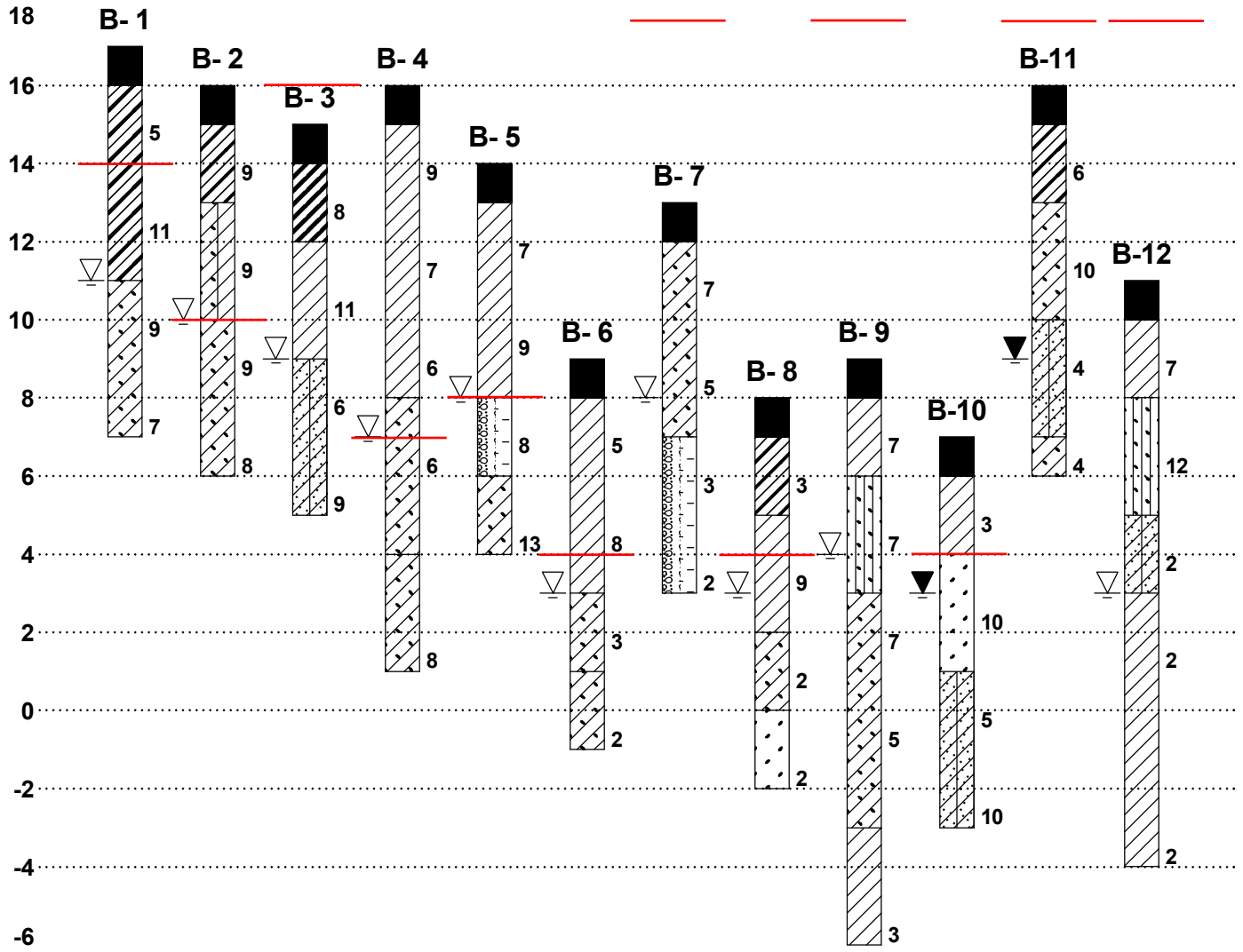
2000 ft

APPENDIX A

TEST BORING RECORDS

GENERALIZED SUBSURFACE PROFILE



LEGEND

- Topsoil/Vegetation
- Moderate Plasticity Clay
- Clayey Sand
- Clayey Sand - Sandy Clay
- High Plasticity Clay
- Low Plasticity Clay
- Slightly Clayey Fine to Medium SAND
- Slightly Silty Sand
- Poorly-graded Sand
- Silty Sand
- Standard Penetration Resistance
- Groundwater at Time of Boring
- Groundwater after Time of Boring
- Plan Grade

PROJECT:

Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

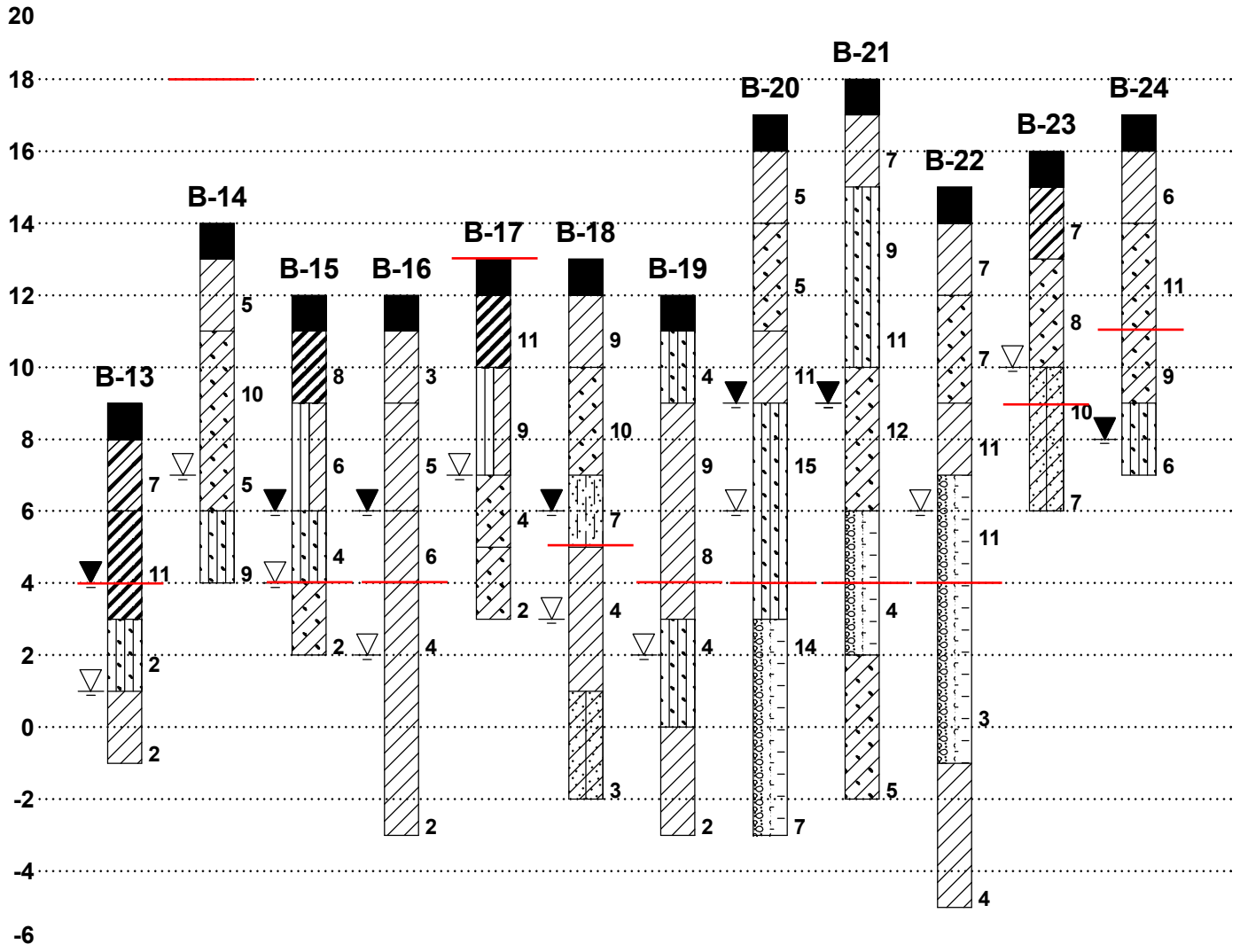
GeoTechnologies, Inc.

SCALE: As Shown

JOB No:1-18-0747-EA

FIGURE No:2A

GENERALIZED SUBSURFACE PROFILE



LEGEND

- Topsoil
- Moderate Plasticity Clay
- High Plasticity Clay
- Silty Sand
- Low Plasticity Clay
- Clayey Sand
- Low Plasticity Silt to Clay
- Poorly-graded Sand with Silt
- Slightly Clayey Fine to Medium SAND
- Slightly Silty Sand
- Standard Penetration Resistance
- Groundwater at Time of Boring
- Groundwater after Time of Boring
- Plan Grade

PROJECT:

Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

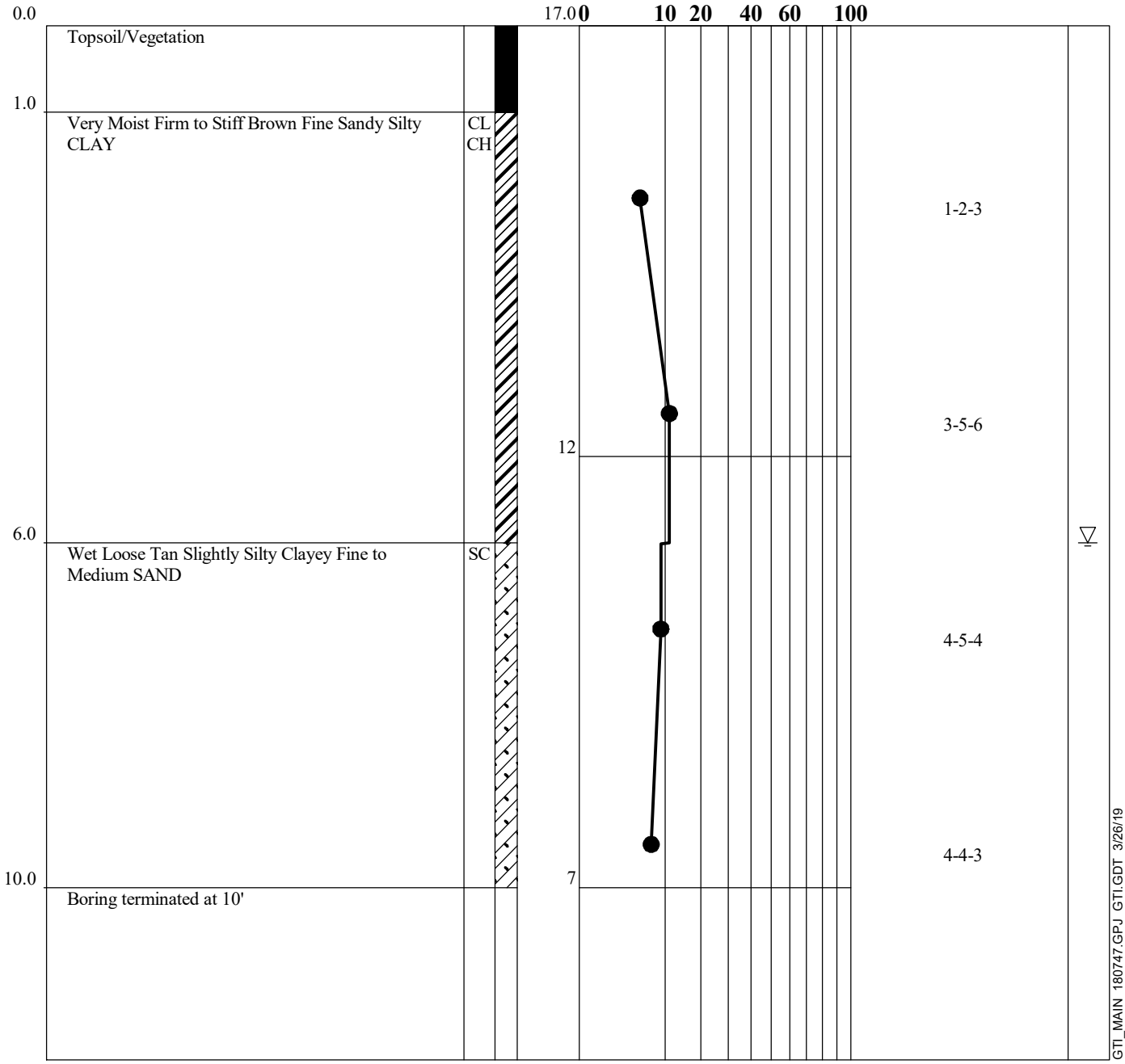
GeoTechnologies, Inc.

SCALE: As Shown

JOB No:1-18-0747-EA

FIGURE No:2B

TEST BORING RECORD



Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 1
DATE 3-18-19

PAGE 1 OF 1

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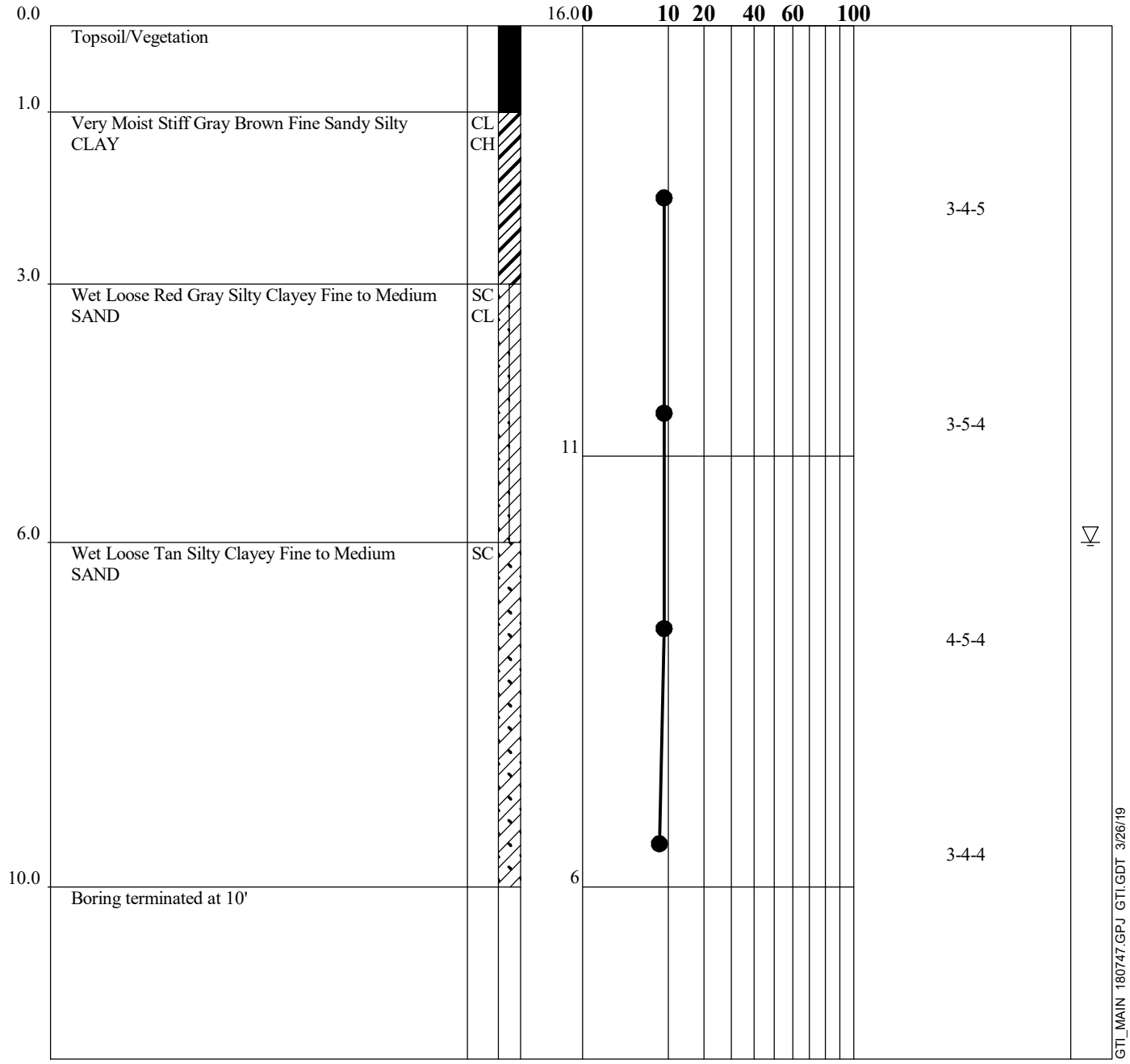
TEST BORING RECORD



Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 2
DATE 3-18-19

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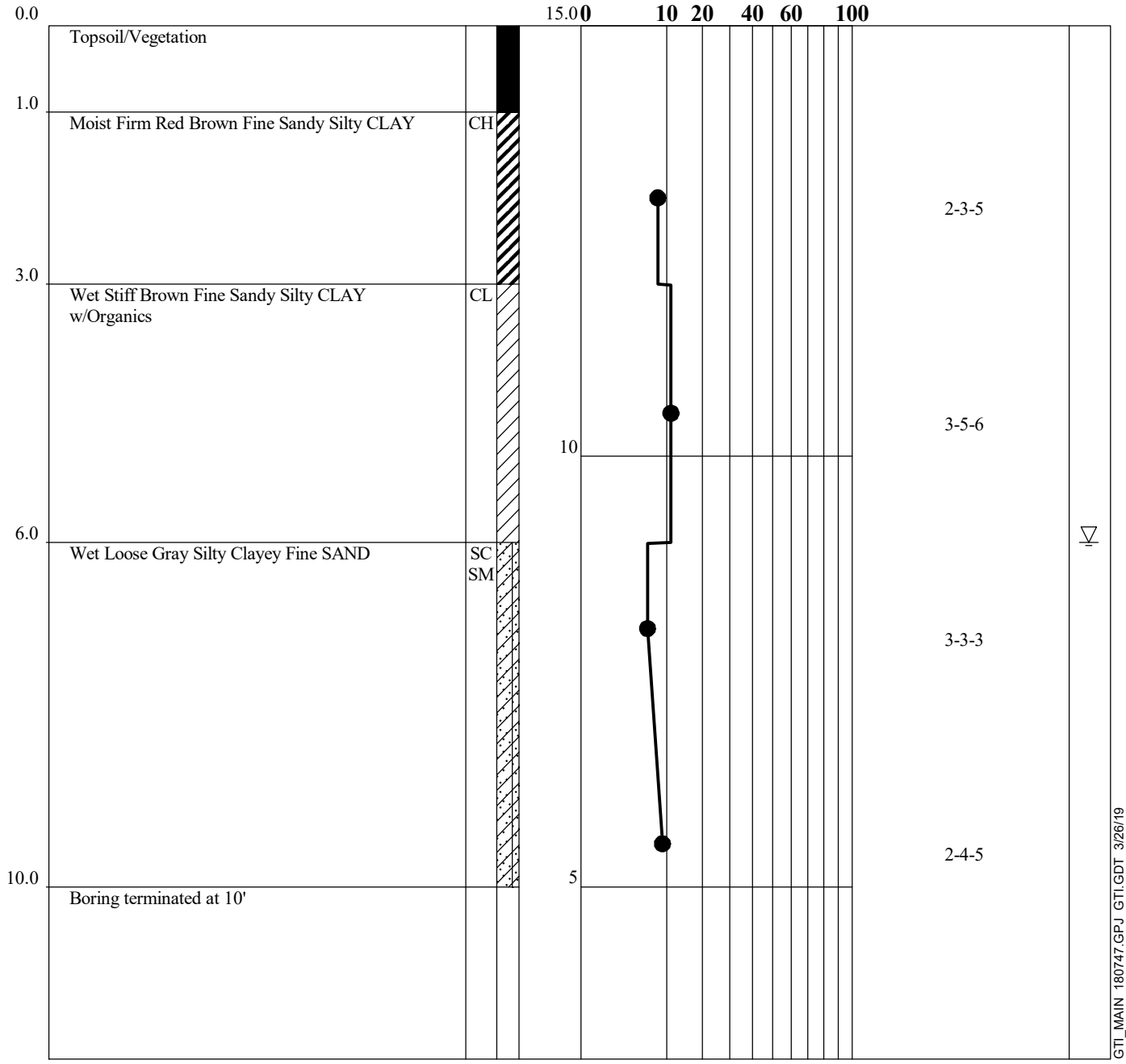
TEST BORING RECORD



Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 3
DATE 3-18-19

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	16.0	0 10 20 40 60 100	
1.0	Very Moist Firm to Stiff Gray Brown Fine to Medium Sandy Silty CLAY (CL)			3-4-5
		11		3-3-4
				2-3-3
8.0	Wet Loose Black Gray Clayey Fine to Medium SAND w/Organics (SC)			
		6		2-3-3
12.0				

Groundwater encountered at 9' at time of boring.

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JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 4
DATE 3-18-19

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 40 60 100	BLOWS PER SIX INCHES
	Wet Loose Gray SIlty Clayey Fine SAND SC	1		3-4-4
15.0	Boring terminated at 15'	-4		

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 4
DATE 3-18-19

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	14.0	0 10 20 40 60 100	
1.0	Moist Firm to Stiff Red Fine to Medium Sandy Silty CLAY (CL)			3-3-4
		9		3-5-4
6.0	Wet Loose Gray Silty Fine SAND (SM SP)			3-4-4
8.0	Moist Medium Dense Tan Silty Clayey Fine to Medium SAND (SC)			3-6-7
10.0	Boring terminated at 10'	4		

Groundwater encountered at 6' at time of boring.

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JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 5
DATE 3-18-19

PAGE 1 OF 1

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	9.0	0 10 20 40 60 100	
1.0	Wet Firm Tan Brown Fine to Medium Sandy Silty CLAY (CL)			1-2-3
		4		3-3-5
6.0	Wet Very Loose Black Silty Clayey Fine to Medium SAND (SC)			2-2-1
8.0	Wet Very Loose Orange Brown Silty Clayey Fine to Medium SAND (SC)			1-1-1
10.0	Boring terminated at 10'	-1		

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GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 6
DATE 3-18-19

PAGE 1 OF 1

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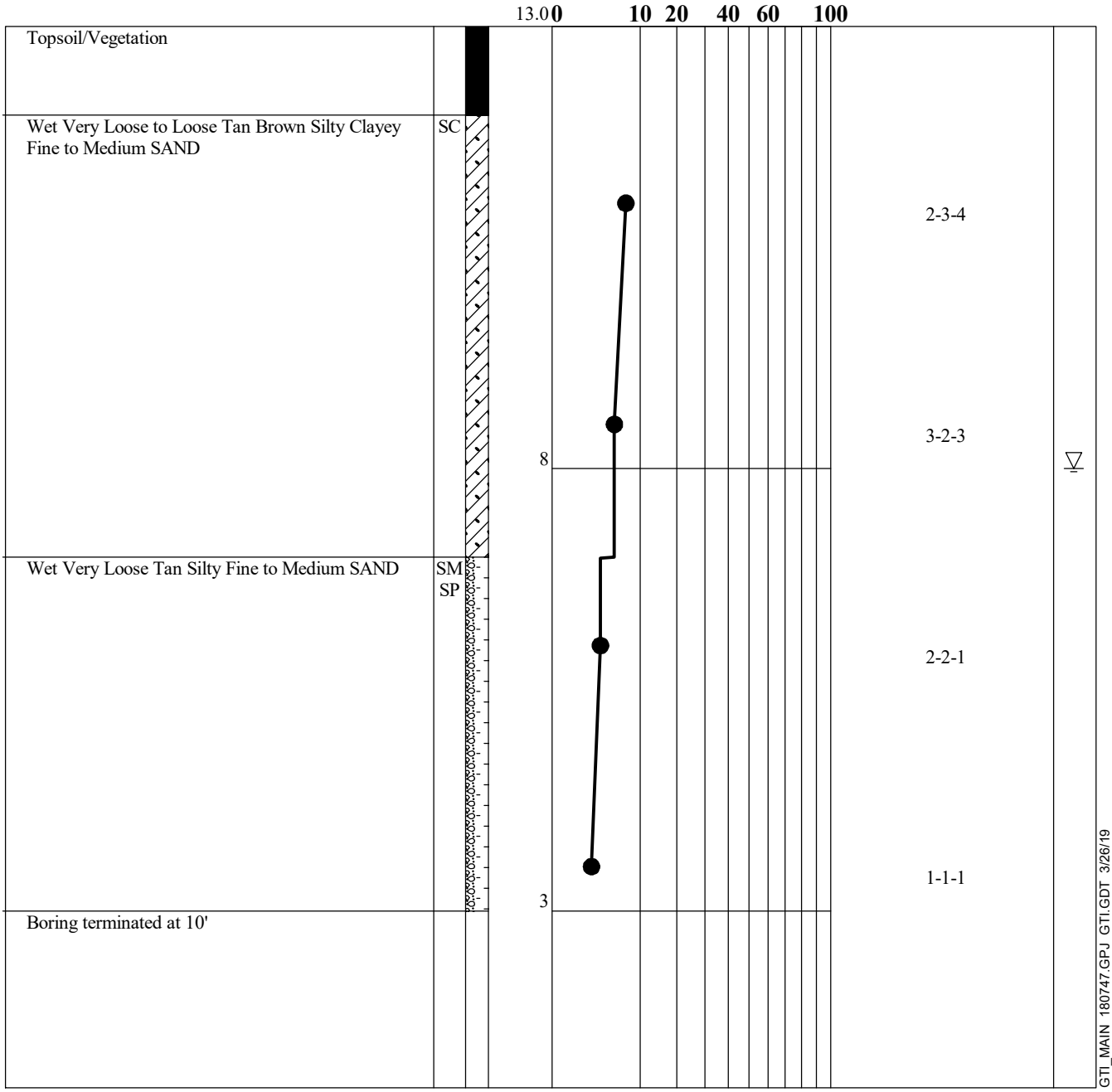
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	13.0	0 10 20 40 60 100	
1.0	Wet Very Loose to Loose Tan Brown Silty Clayey Fine to Medium SAND (SC)			2-3-4
		8		3-2-3
6.0	Wet Very Loose Tan Silty Fine to Medium SAND (SM SP)			2-2-1
		3		1-1-1
10.0	Boring terminated at 10'			



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Groundwater encountered at 5' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 7
DATE 3-18-19

PAGE 1 OF 1

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	8.0	0 10 20 40 60 100	
1.0	Wet Soft Gray Silty CLAY (CL CH)			2-2-1
3.0	Wet Stiff Gray Fine to Medium Sandy Silty CLAY (CL)	3		3-4-5
6.0	Wet Very Loose Orange Brown Silty Clayey Fine to Medium SAND (SC)			1-1-1
8.0	Wet Very Loose Tan Gray Slightly Silty Fine to Medium SAND (SP)			1-1-1
10.0	Boring terminated at 10'	-2		

▽

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

Groundwater encountered at 5' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 8
DATE 3-18-19

PAGE 1 OF 1

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TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	9.0	0 10 20 40 60 100	
1.0	Wet Firm Brown Fine to Medium Sandy Silty CLAY (CL)			3-4-3
3.0	Very Moist Loose Tan Slightly Clayey Silty Fine to Medium SAND (SM)	4		4-3-4
6.0	Very Moist Very Loose to Loose Gray Brown Silty Clayey Fine to Medium SAND (SC)			1-3-4
		-1		2-3-2
12.0	Wet Soft Gray Fine to Medium Sandy Silty CLAY (CL)			
15.0	Boring terminated at 15'	-6		2-1-2

▽

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Groundwater encountered at 5' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B- 9
DATE 3-18-19

PAGE 1 OF 1

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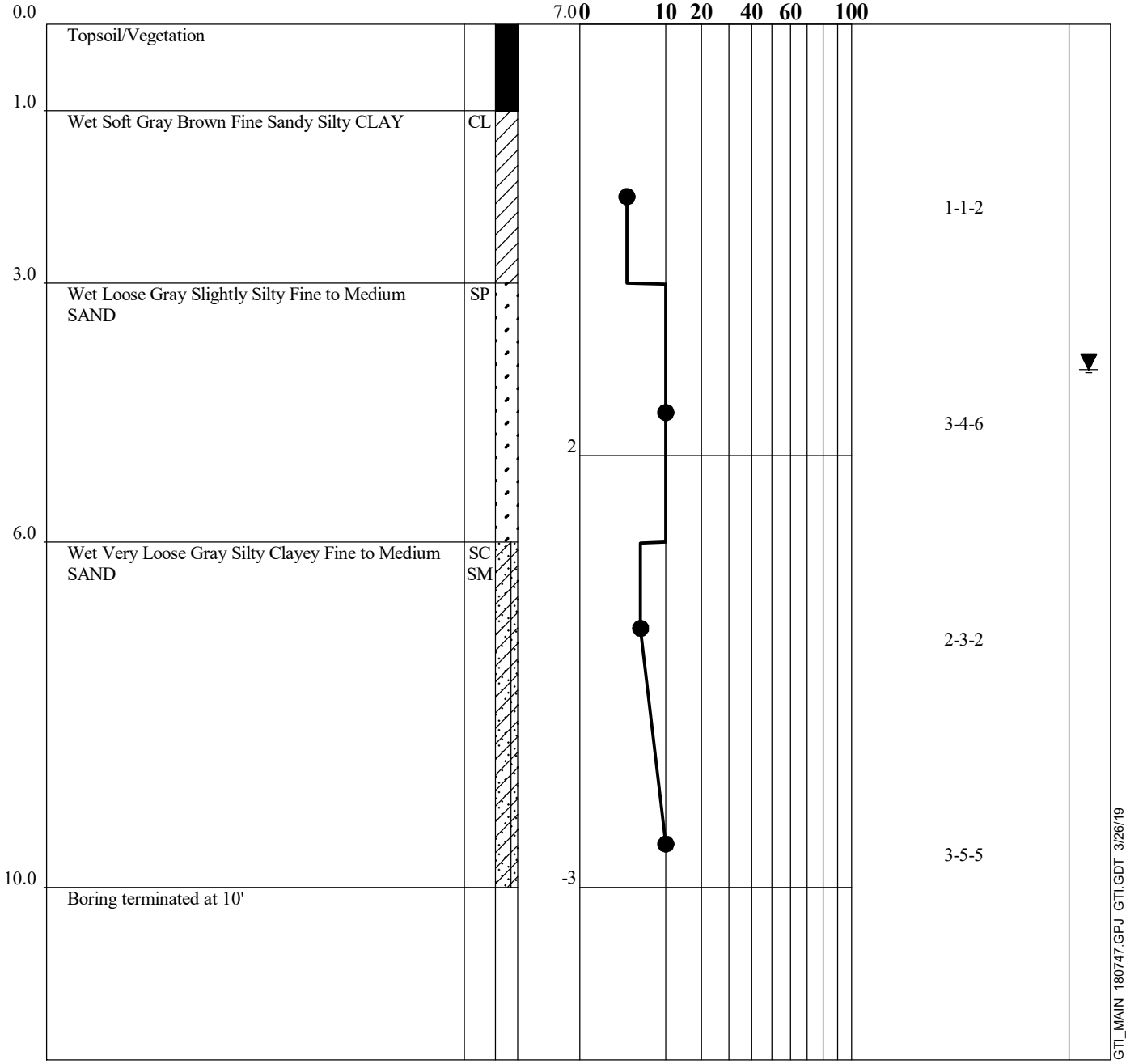
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	7.0	0 10 20 40 60 100	
1.0	Wet Soft Gray Brown Fine Sandy Silty CLAY (CL)			1-1-2
3.0	Wet Loose Gray Slightly Silty Fine to Medium SAND (SP)	2		3-4-6
6.0	Wet Very Loose Gray Silty Clayey Fine to Medium SAND (SC SM)			2-3-2
10.0	Boring terminated at 10'	-3		3-5-5



Groundwater encountered at 4' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-10
DATE 3-18-19

PAGE 1 OF 1

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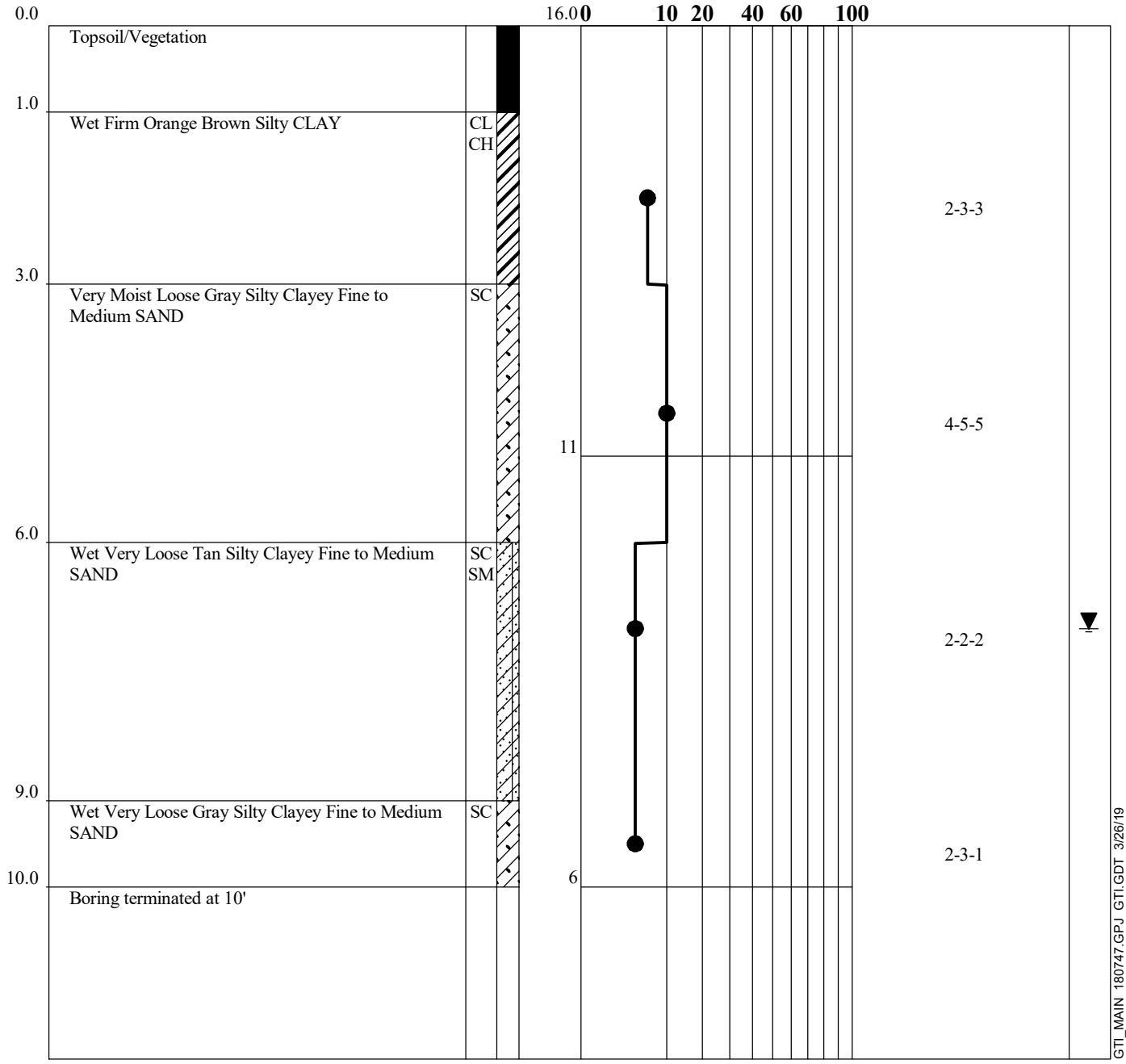
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	16.0	0 10 20 40 60 100	
1.0	Wet Firm Orange Brown Silty CLAY (CL CH)			2-3-3
3.0	Very Moist Loose Gray Silty Clayey Fine to Medium SAND (SC)			4-5-5
6.0	Wet Very Loose Tan Silty Clayey Fine to Medium SAND (SC SM)	11		2-2-2
9.0	Wet Very Loose Gray Silty Clayey Fine to Medium SAND (SC)			2-3-1
10.0	Boring terminated at 10'	6		



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Groundwater encountered at 7' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-11
DATE 3-18-19

PAGE 1 OF 1

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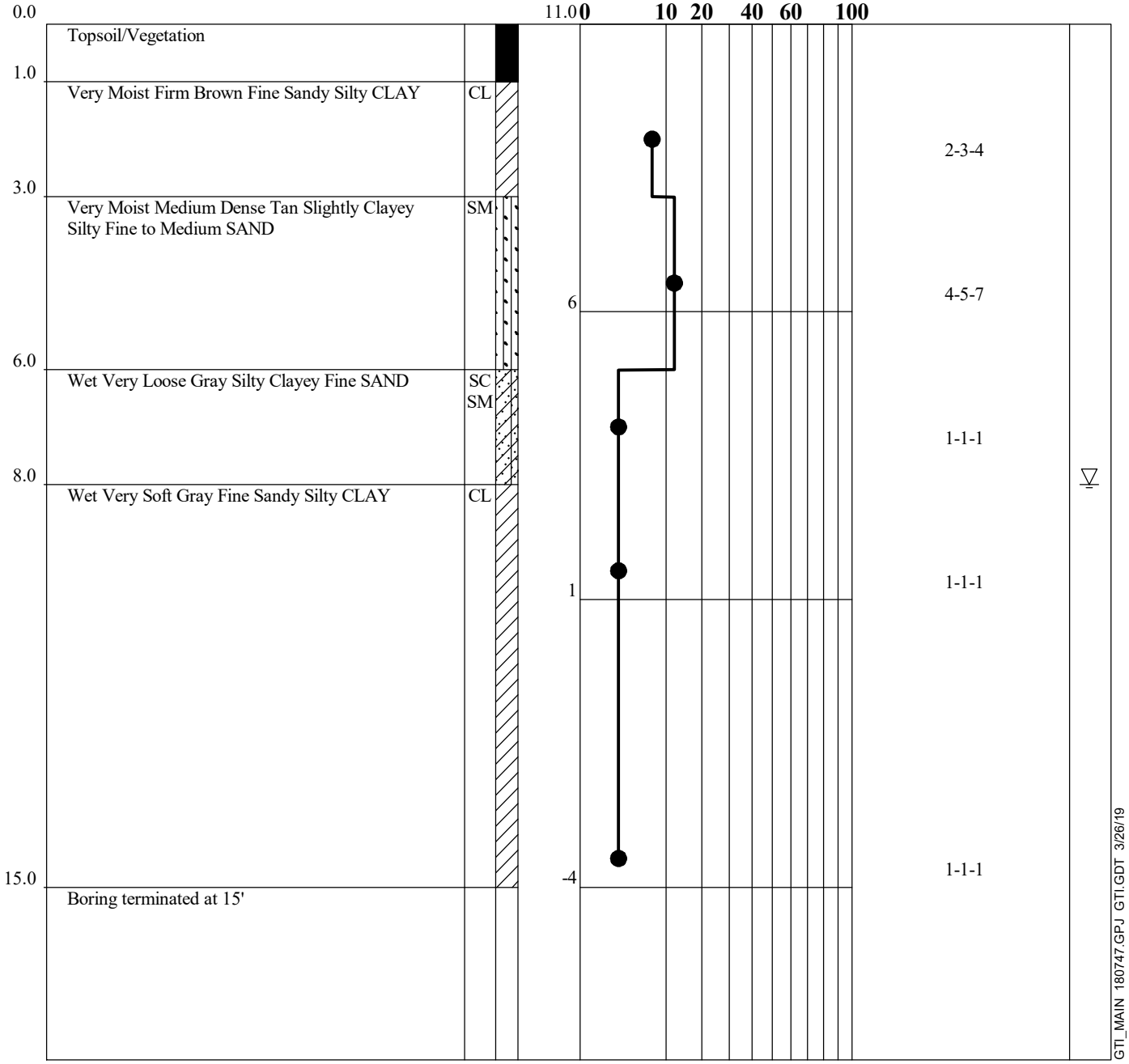
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	11.0	0 10 20 40 60 100	
1.0	Very Moist Firm Brown Fine Sandy Silty CLAY (CL)			2-3-4
3.0	Very Moist Medium Dense Tan Slightly Clayey Silty Fine to Medium SAND (SM)	6		4-5-7
6.0	Wet Very Loose Gray Silty Clayey Fine SAND (SC/SM)			1-1-1
8.0	Wet Very Soft Gray Fine Sandy Silty CLAY (CL)	1		1-1-1
15.0	Boring terminated at 15'	-4		1-1-1



Groundwater encountered at 8' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-12
DATE 3-18-19

PAGE 1 OF 1

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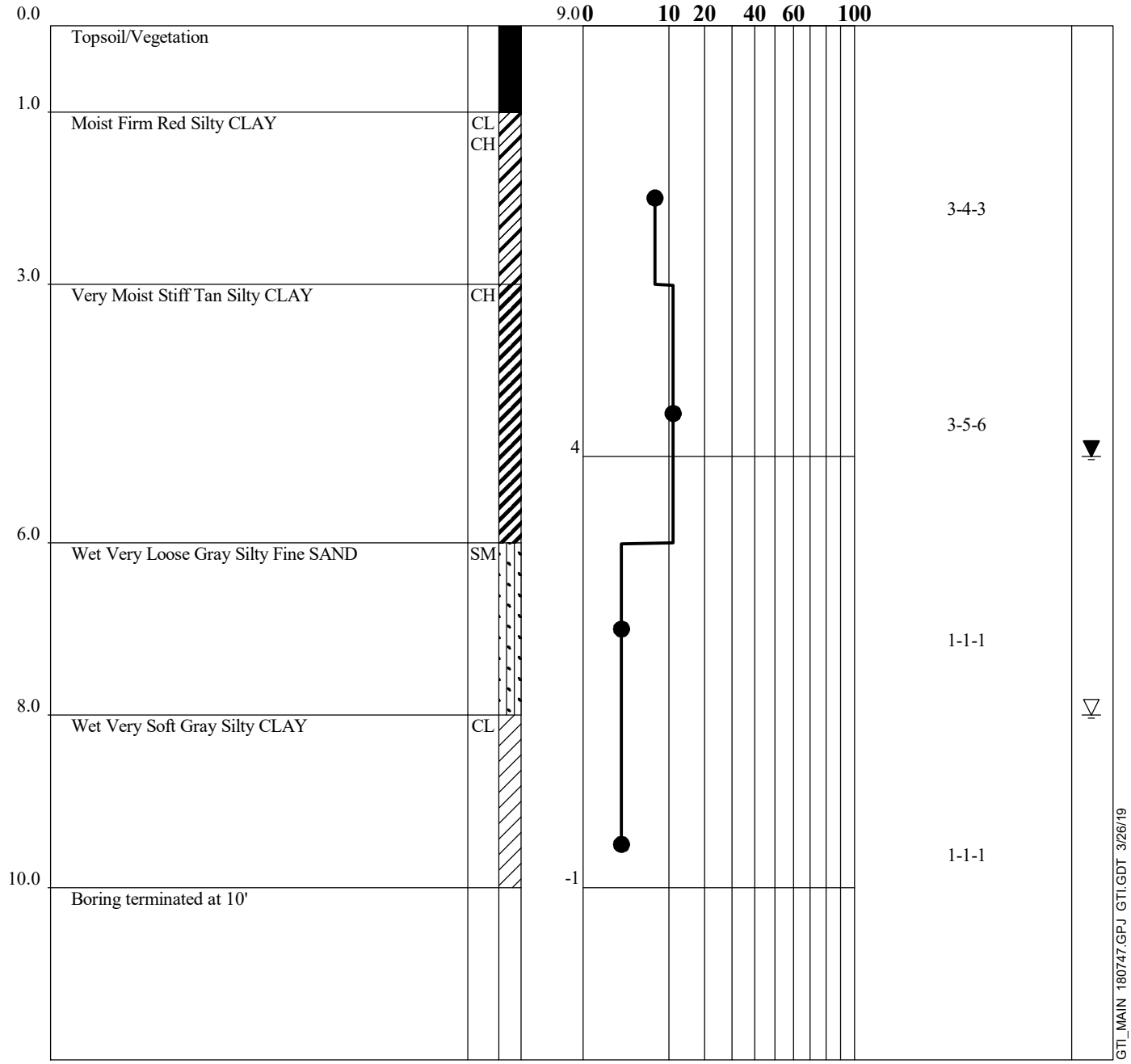
TEST BORING RECORD



Groundwater encountered at 8' at time of boring and at 5' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-13
DATE 3-18-19

PAGE 1 OF 1

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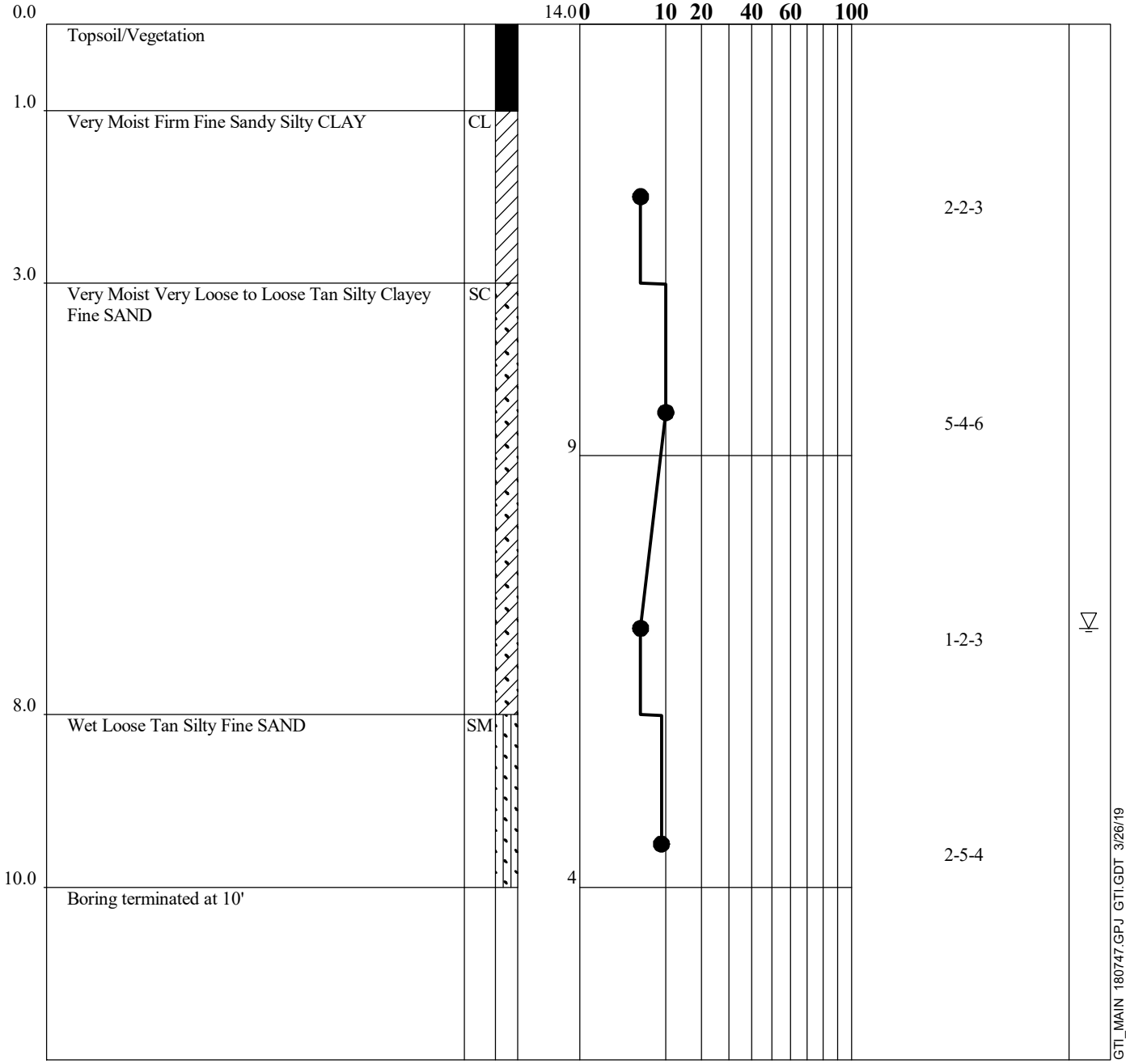
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	14.0	0 10 20 40 60 100	
1.0	Very Moist Firm Fine Sandy Silty CLAY (CL)			2-2-3
3.0	Very Moist Very Loose to Loose Tan Silty Clayey Fine SAND (SC)	9		5-4-6
8.0	Wet Loose Tan Silty Fine SAND (SM)			1-2-3
10.0	Boring terminated at 10'	4		2-5-4



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Groundwater encountered at 7' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-14
DATE 3-18-19

PAGE 1 OF 1

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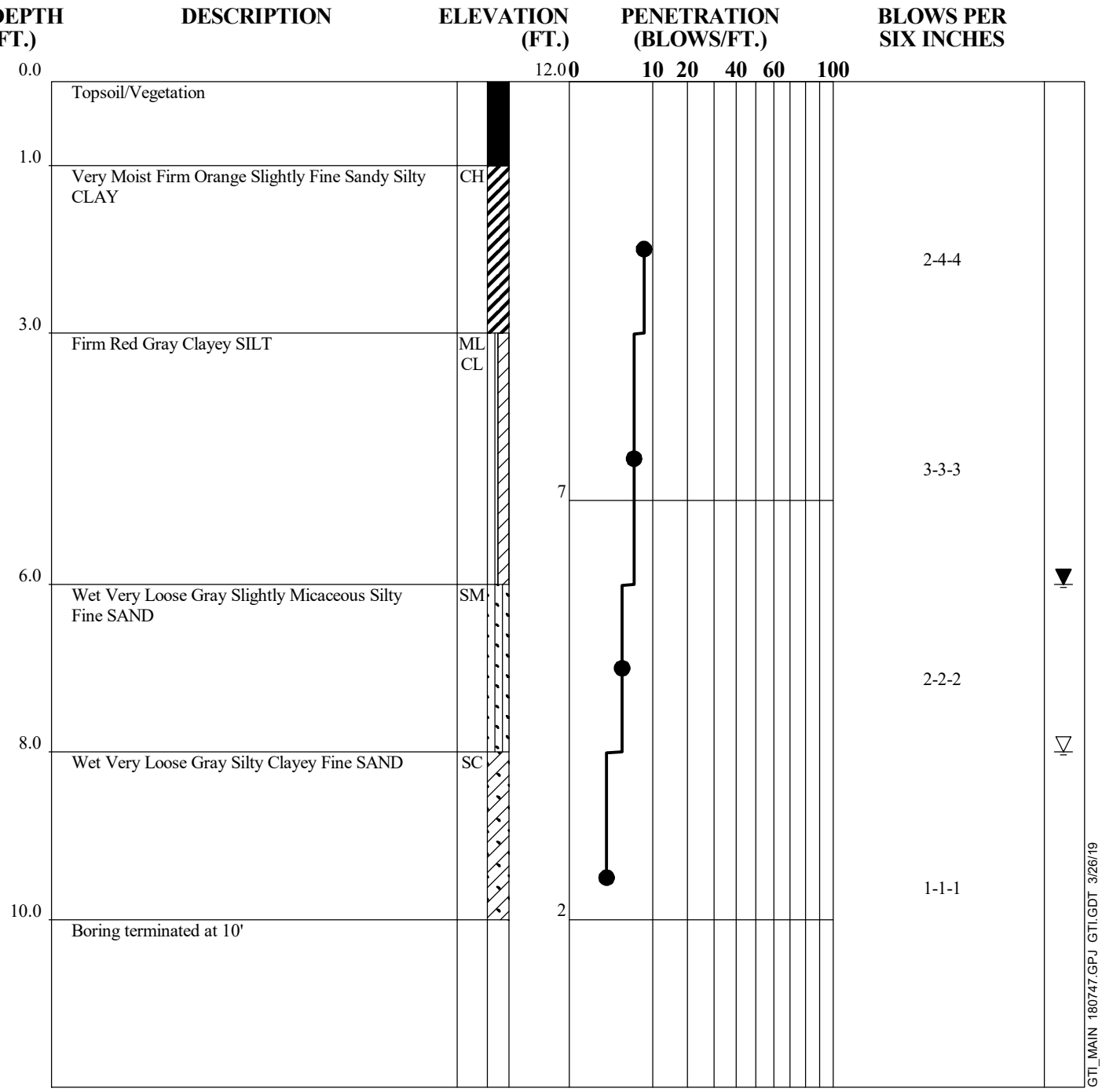
Raleigh, NC 27615

TEST BORING RECORD



Groundwater encountered at 8' at time of boring and at 6' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-15
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 40 60 100	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	12.0		
1.0	Wet Soft Brown Slightly Fine Sandy Silty CLAY CL			2-1-2
3.0	Very Moist Firm Orange Silty CLAY CL	7		3-2-3
6.0	Wet Firm Gray Slightly Fine Sandy Silty CLAY CL			1-4-2
8.0	Wet Very Soft to Soft Gray Silty CLAY CL	2		2-2-2
15.0	Boring terminated at 15'	-3		1-1-1

Groundwater encountered at 10' at time of boring and at 6' after 24 hours.

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-16
DATE 3-18-19

PAGE 1 OF 1

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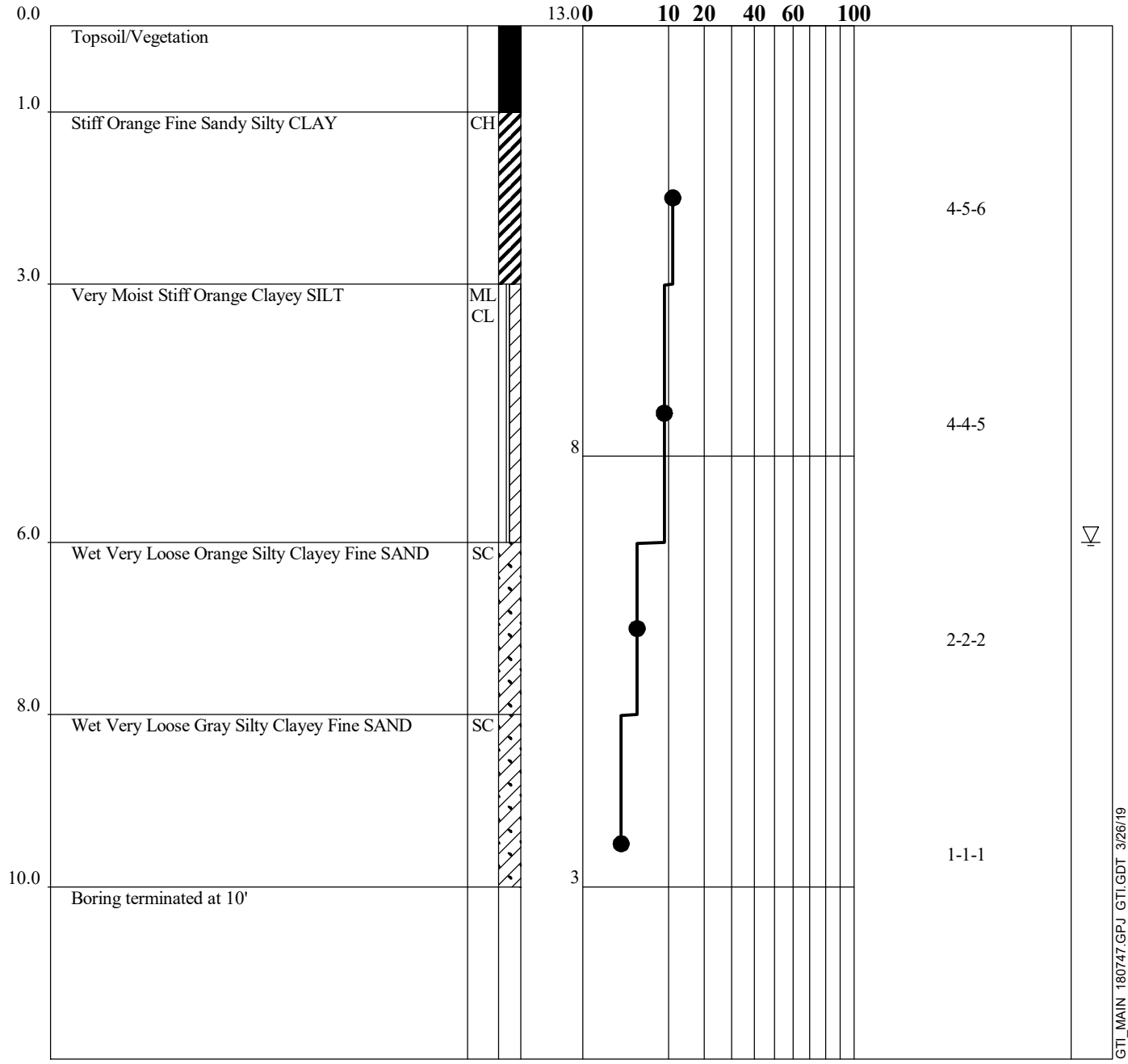
Raleigh, NC 27615

TEST BORING RECORD



Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-17
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	13.0	0 10 20 40 60 100	
1.0	Stiff Orange Brown Slightly Fine Sandy Silty CLAY (CL)			2-4-5
3.0	Loose Orange Silty Clayey Fine to Medium SAND (SC)	8		2-5-5
6.0	Wet Loose Tan Slightly Silty Fine SAND (SP SM)			3-4-3
8.0	Wet Soft Gray Fine Sandy Silty CLAY (CL)	3		2-2-2
12.0	Wet Very Loose Tan Silty Clayey Fine SAND (SC SM)			
15.0	Boring terminated at 15'	-2		2-1-2

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

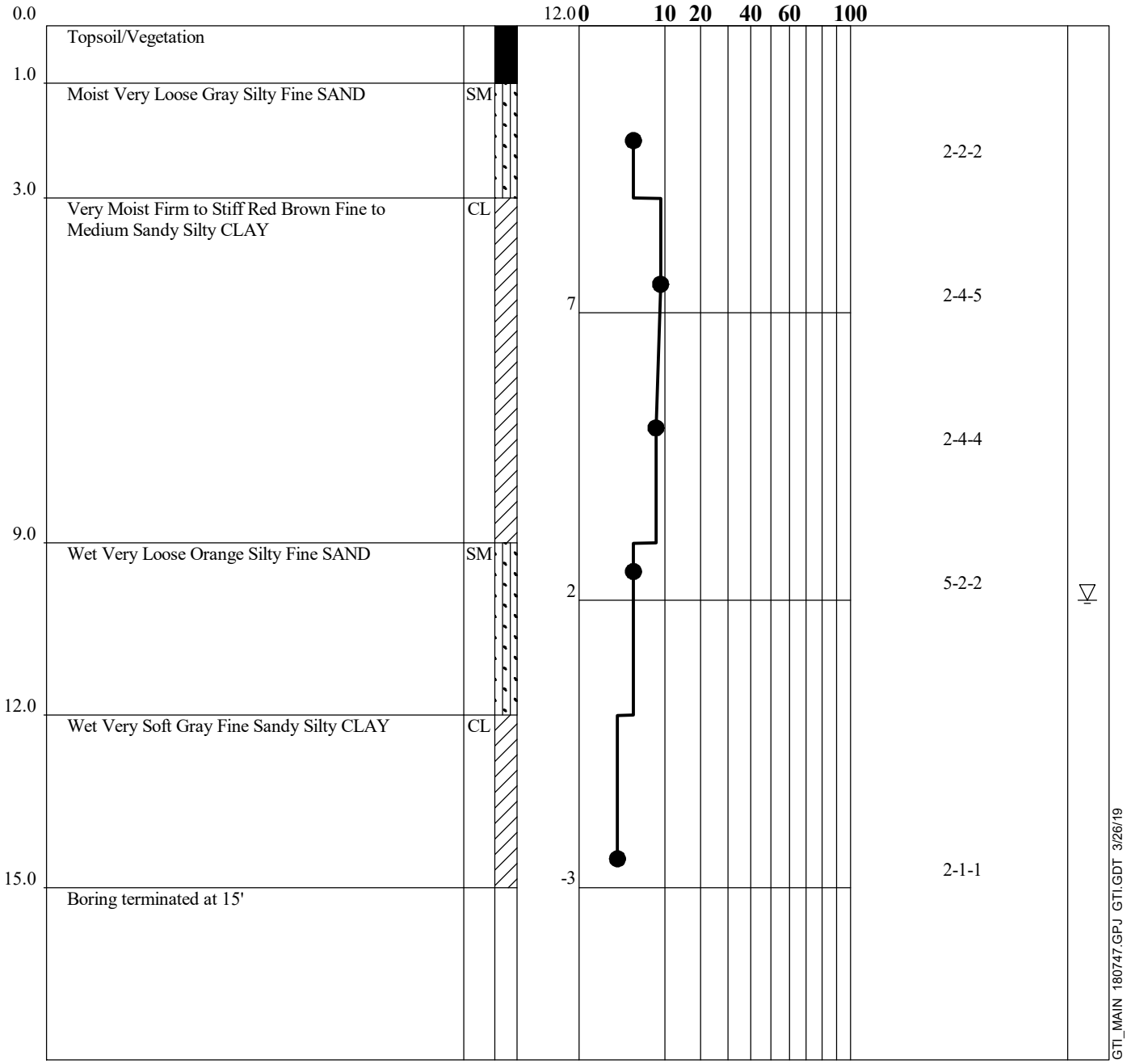
Groundwater encountered at 10' at time of boring and at 7' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-18
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD



Groundwater encountered at 10' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-19
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	17.0	0 10 20 40 60 100	
1.0	Very Moist Firm Brown Fine Sandy Silty CLAY (CL)			2-2-3
3.0	Very Moist Very Loose Gray Silty Clayey Fine to Medium SAND (SC)	12		2-2-3
6.0	Wet Stiff Brown Gray Fine Sandy Silty CLAY (CL)			2-5-6
8.0	Very Moist Medium Dense Tan Gray Clayey Silty Fine to Medium SAND (SM)	7		5-7-8
14.0	Wet Loose to Medium Dense Tan Slightly Silty Fine to Medium SAND (SM SP)	2		5-7-7
20.0	Boring terminated at 20'	-3		3-4-3

▼ Groundwater encountered at 11' at time of boring and at 8' after 24 hours.

▽

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-20
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
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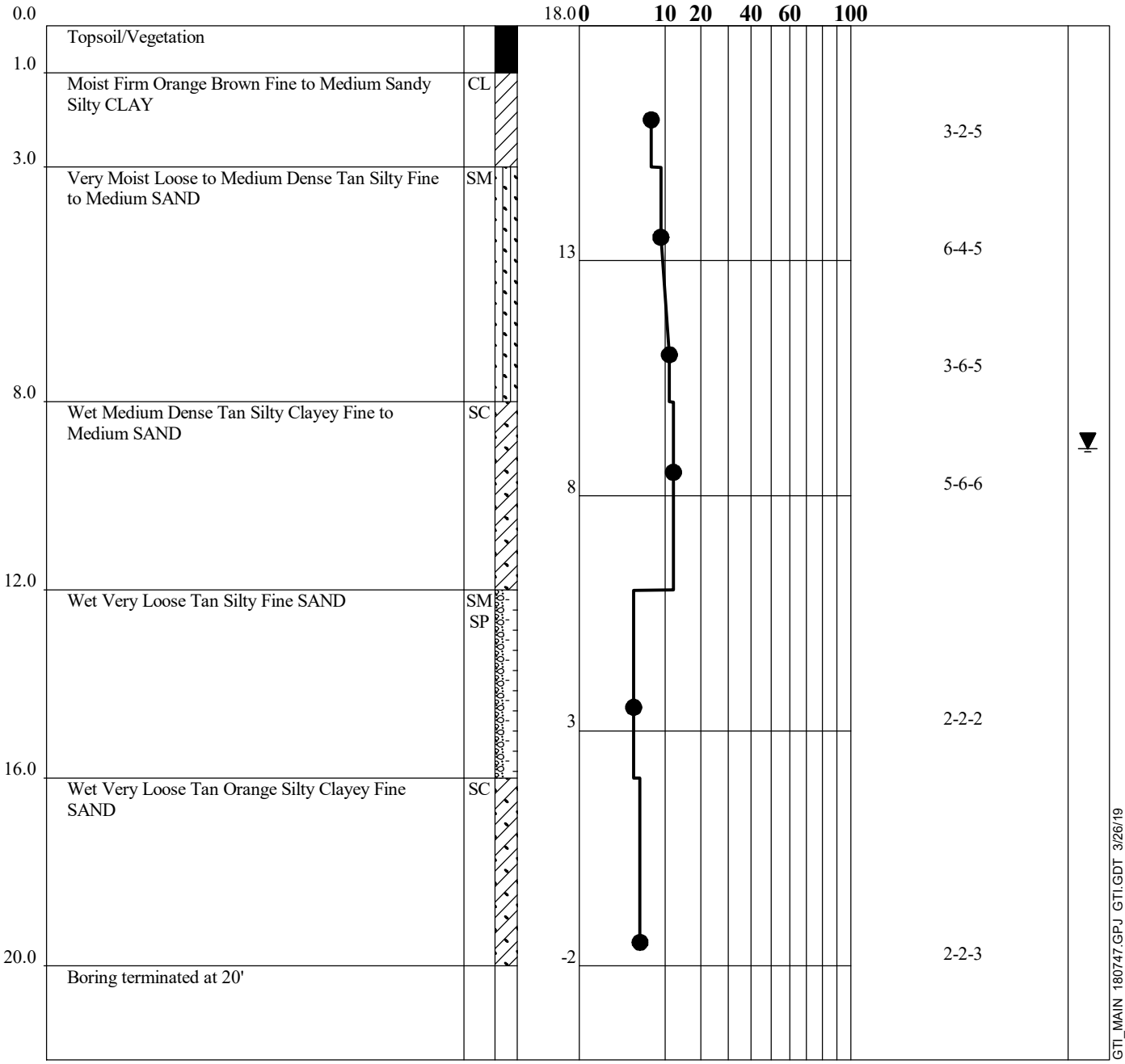
TEST BORING RECORD



Groundwater encountered at 9' at time of boring and at 9' after 24 hours.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-21
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
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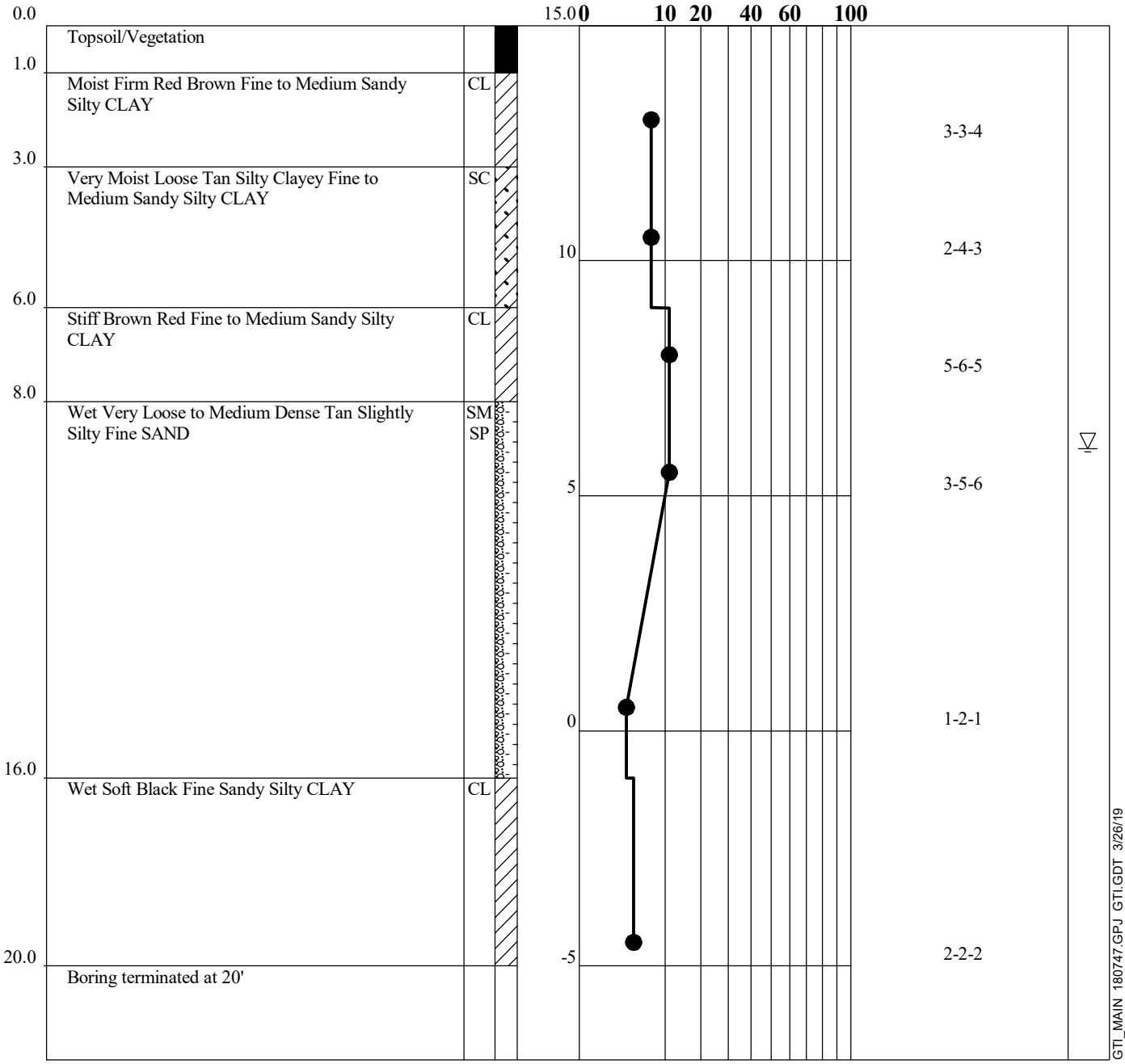
Raleigh, NC 27615

TEST BORING RECORD



Groundwater encountered at 9' at time of boring.

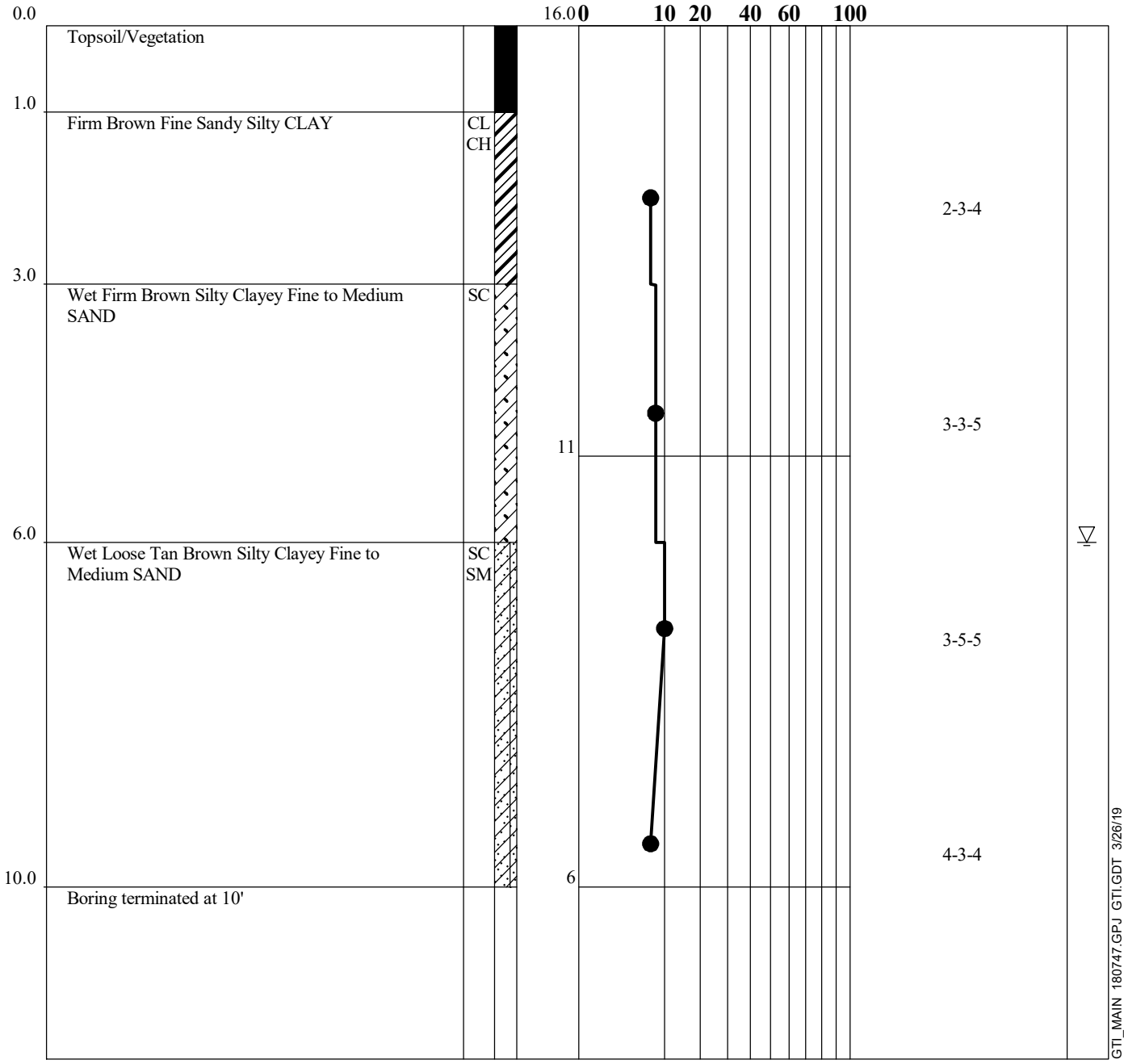
JOB NUMBER 1-18-0747-EA
BORING NUMBER B-22
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	16.0	0 10 20 40 60 100	
1.0	Firm Brown Fine Sandy Silty CLAY (CL CH)			2-3-4
3.0	Wet Firm Brown Silty Clayey Fine to Medium SAND (SC)	11		3-3-5
6.0	Wet Loose Tan Brown Silty Clayey Fine to Medium SAND (SC SM)			3-5-5
10.0	Boring terminated at 10'	6		4-3-4



Groundwater encountered at 6' at time of boring.

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-23
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.)	BLOWS PER SIX INCHES
0.0	Topsoil/Vegetation	17.0	0 10 20 40 60 100	
1.0	Firm Red Brown Fine Sandy Silty CLAY (CL)			2-3-3
3.0	Moist Loose to Medium Dense Tan Silty Clayey Fine SAND (SC)			4-5-6
8.0	Wet Loose Tan Silty Fine SAND (SM)	12		4-5-4
10.0	Boring terminated at 10'	7		3-3-3

Groundwater encountered at 9' after 24 hours.

GTI_MAIN 180747.GPJ GTI.GDT 3/26/19

JOB NUMBER 1-18-0747-EA
BORING NUMBER B-24
DATE 3-18-19

PAGE 1 OF 1

GeoTechnologies, Inc.
3200 Wellington Court, Ste 108
Raleigh, NC 27615

APPENDIX B

LABORATORY DATA

GeoTechnologies, Inc.

Job No: 1-18-0747-EA Date: 3/26/19

Job Name: Stormwater Ponds/Dredge Spoils Bucksport Marina

Job Location: Conway, SC

Boring No: B-2

Sample No:

Depth: 1.0-6.0'

TEST RESULTS

Method of Test: ASTM D 698

Maximum Dry Density: 112.3 PCF

Optimum Moisture Content: 15.1%

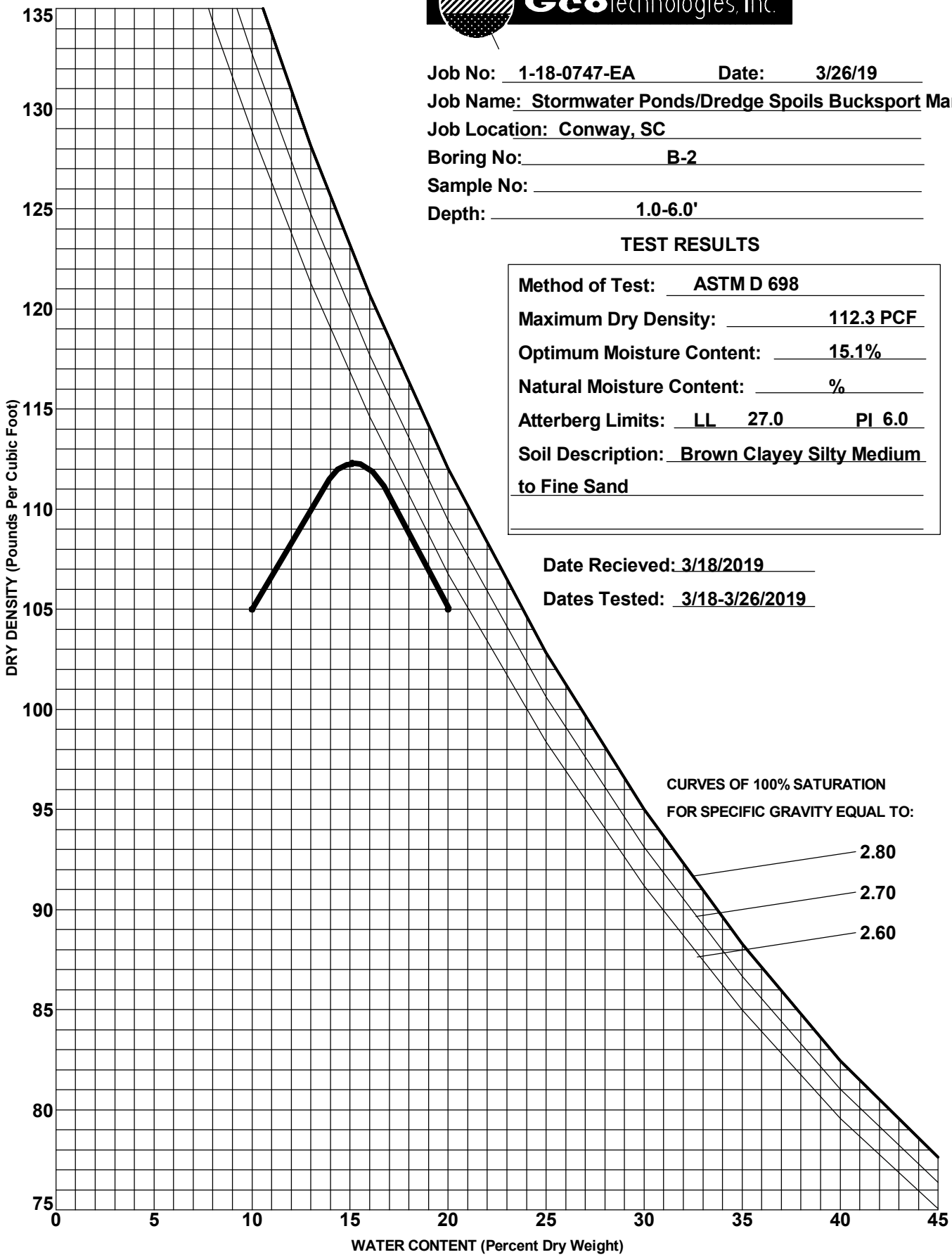
Natural Moisture Content: %

Atterberg Limits: LL 27.0 PI 6.0

Soil Description: Brown Clayey Silty Medium to Fine Sand

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019



MOISTURE-DENSITY RELATIONSHIP

3200 Wellington Court, Ste 108
Raleigh, NC 27615

GeoTechnologies, Inc.

Job No: 1-18-0747-EA Date: 3/26/19

Job Name: Stormwater Ponds/Dredge Spoils Bucksport Marina

Job Location: Conway, SC

Boring No: B-15

Sample No:

Depth: 1.0-8.0'

TEST RESULTS

Method of Test: ASTM D 698

Maximum Dry Density: 107.5 PCF

Optimum Moisture Content: 16.8%

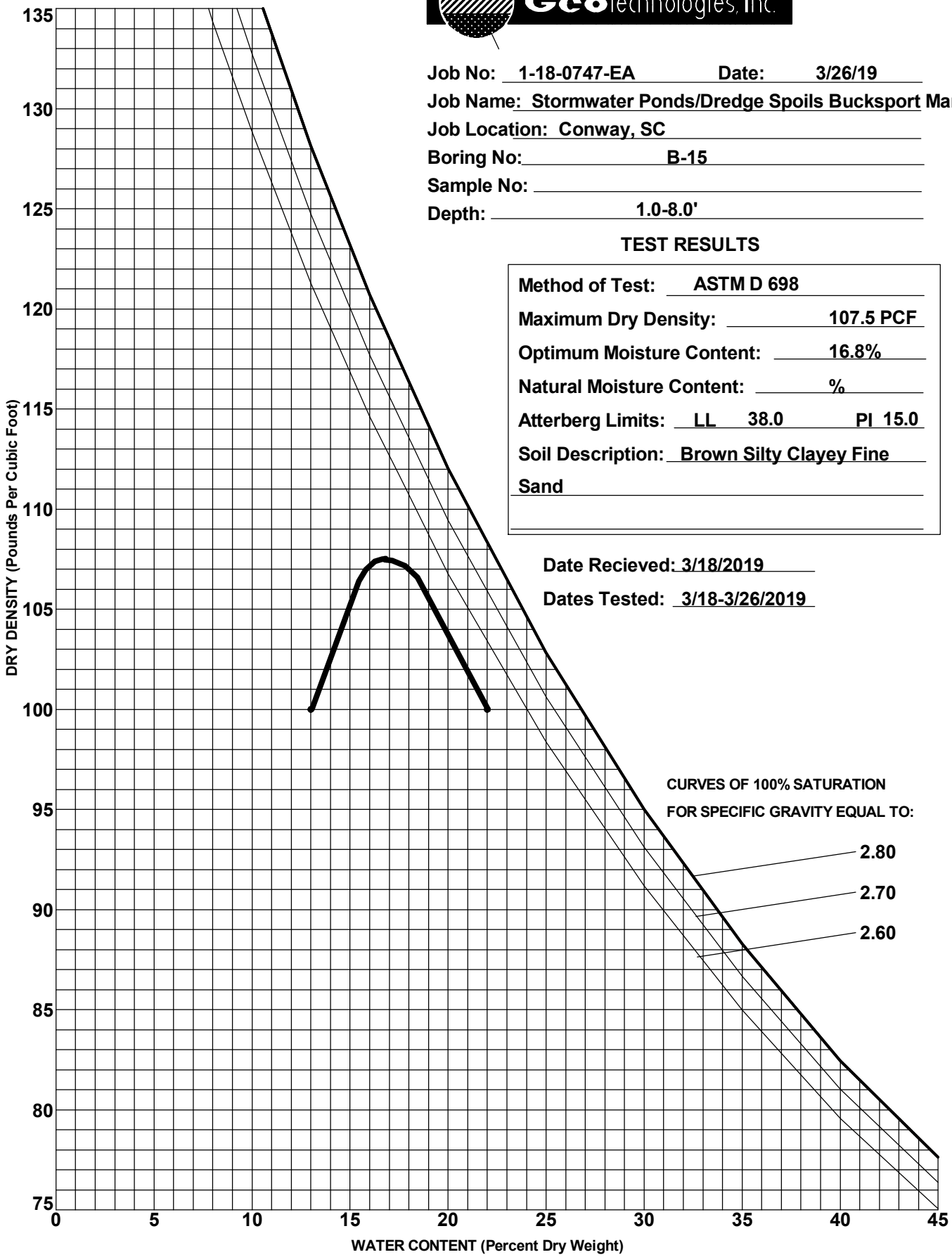
Natural Moisture Content: %

Atterberg Limits: LL 38.0 PI 15.0

Soil Description: Brown Silty Clayey Fine Sand

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019



MOISTURE-DENSITY RELATIONSHIP

3200 Wellington Court, Ste 108
Raleigh, NC 27615

GeoTechnologies, Inc.

Job No: 1-18-0747-EA Date: 3/26/19

Job Name: Stormwater Ponds/Dredge Spoils Bucksport Marina

Job Location: Conway, SC

Boring No: B-20

Sample No:

Depth: 5.0-12.0'

TEST RESULTS

Method of Test: ASTM D 698

Maximum Dry Density: 108.8 PCF

Optimum Moisture Content: 17.0%

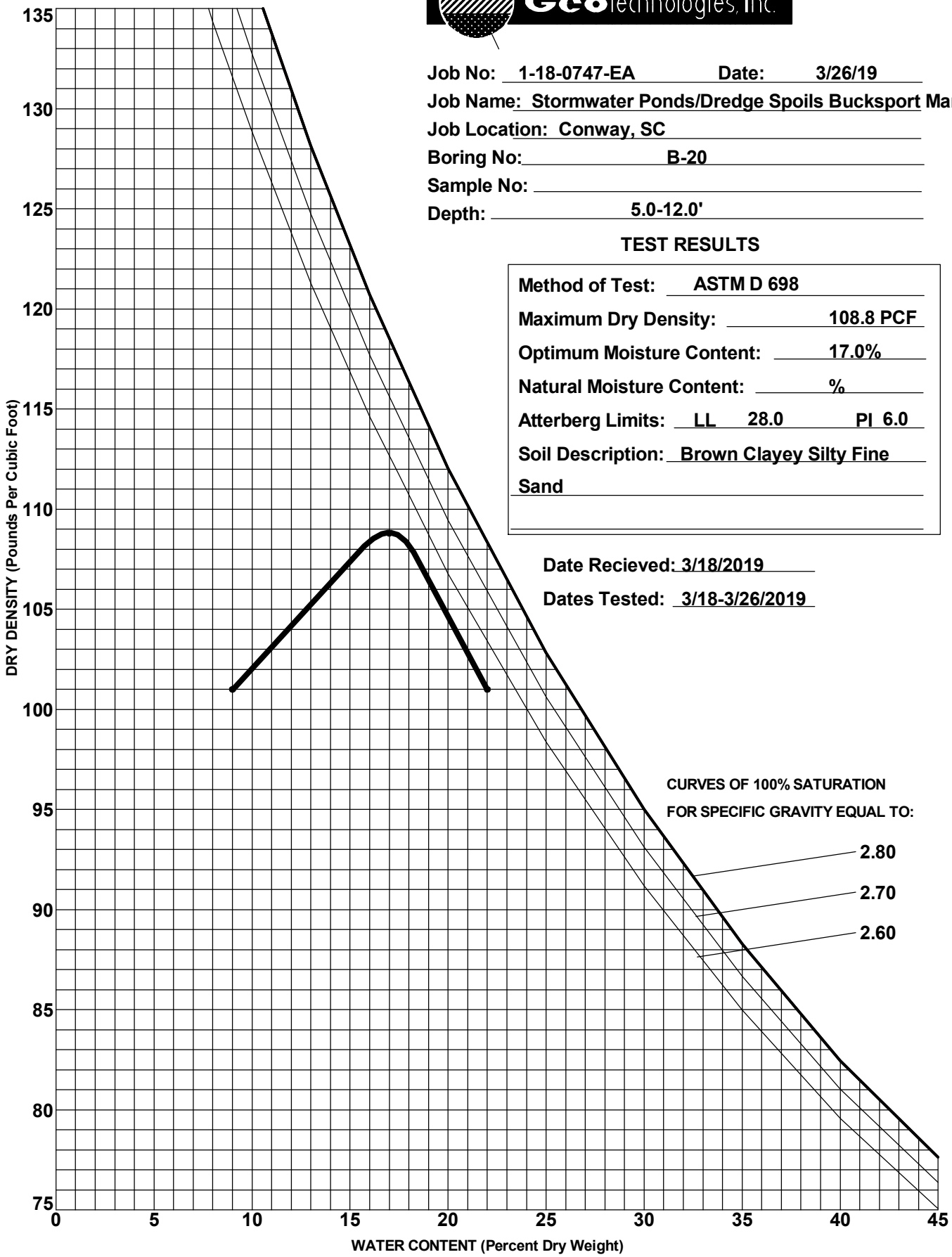
Natural Moisture Content: %

Atterberg Limits: LL 28.0 PI 6.0

Soil Description: Brown Clayey Silty Fine Sand

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019



MOISTURE-DENSITY RELATIONSHIP

3200 Wellington Court, Ste 108
Raleigh, NC 27615

GeoTechnologies, Inc.

Job No: 1-18-0747-EA Date: 3/26/19

Job Name: Stormwater Ponds/Dredge Spoils Bucksport Marina

Job Location: Conway, SC

Boring No: B-23

Sample No:

Depth: 1.0-6.0'

TEST RESULTS

Method of Test: ASTM D 698

Maximum Dry Density: 115.0 PCF

Optimum Moisture Content: 14.0%

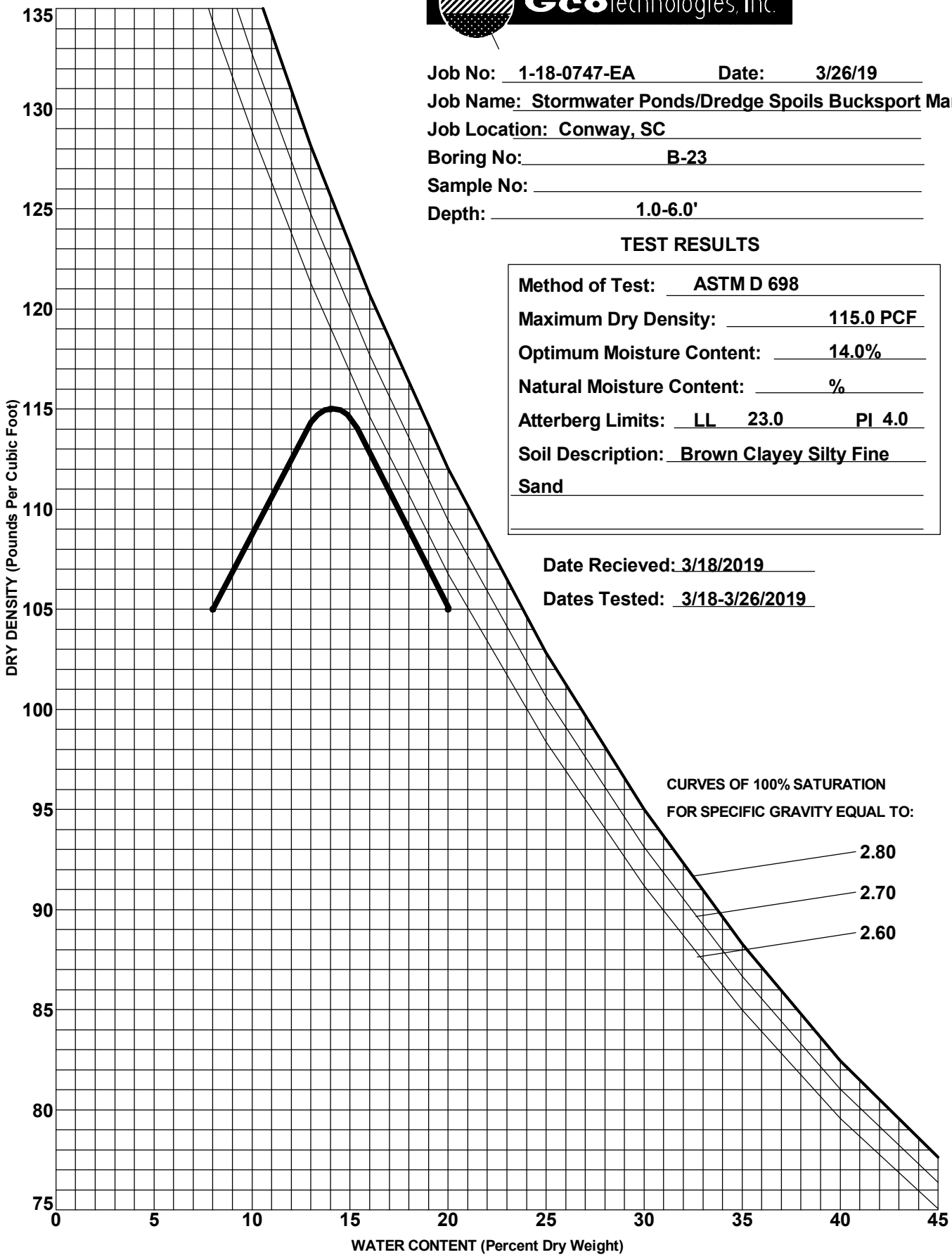
Natural Moisture Content: %

Atterberg Limits: LL 23.0 PI 4.0

Soil Description: Brown Clayey Silty Fine Sand

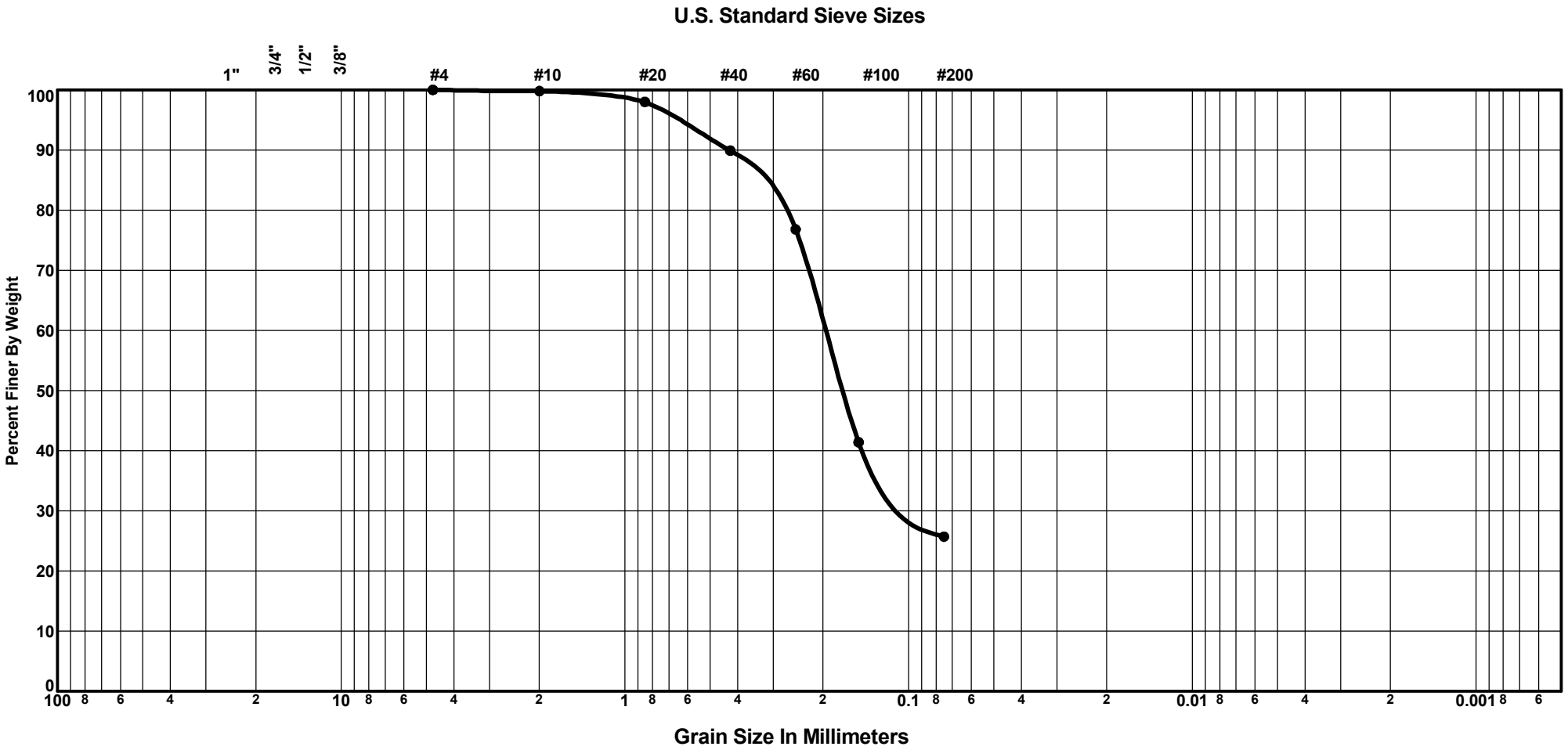
Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019



MOISTURE-DENSITY RELATIONSHIP

3200 Wellington Court, Ste 108
Raleigh, NC 27615



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-2	1.0-6.0'		27.0	21.0	6.0	Brown Clayey Silty Medium to Fine Sand

Project:
Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

Job No.: 1-18-0747-EA

Date: 3/26/19

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

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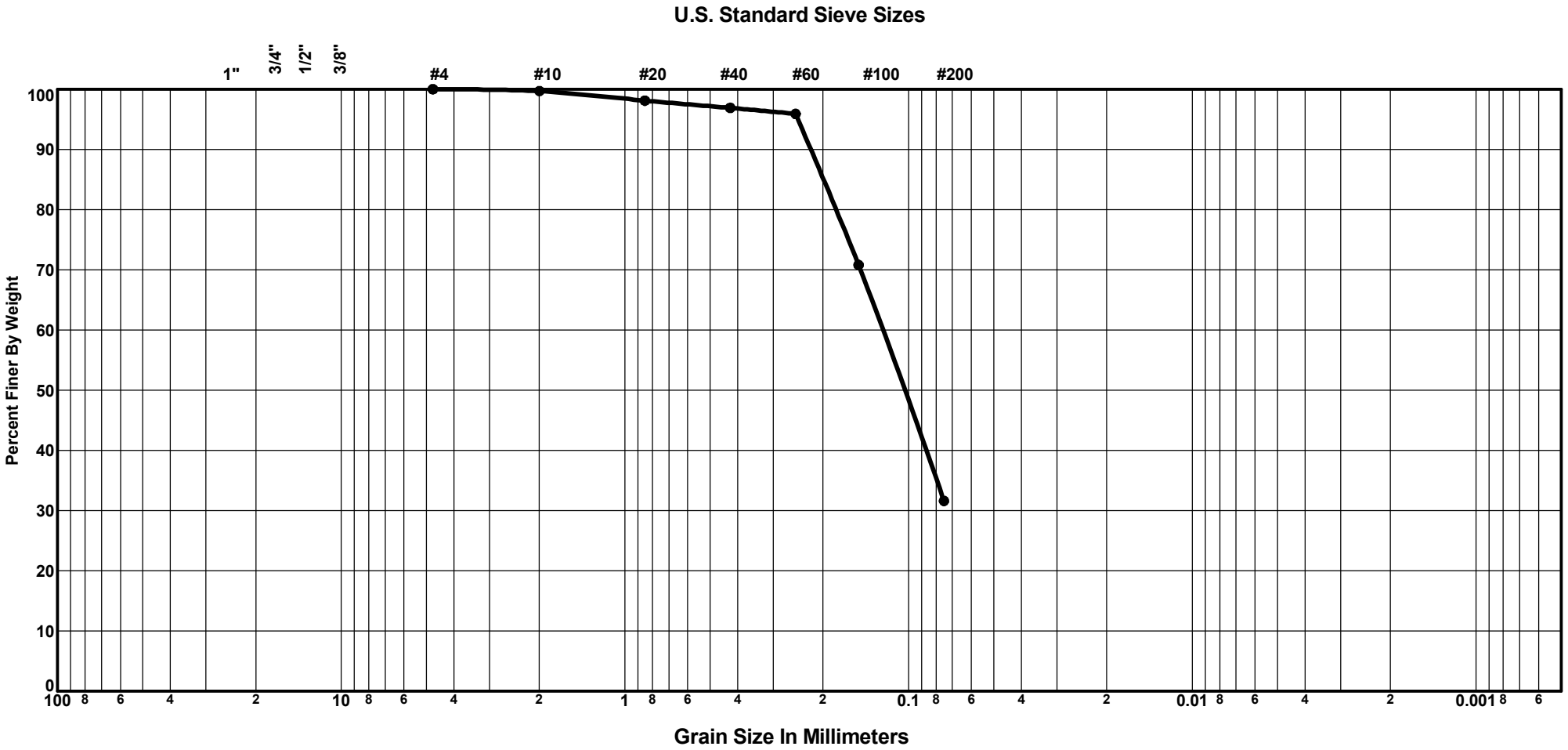
Raleigh, NC 27615



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-15	1.0-8.0'		38.0	23.0	15.0	Brown Silty Clayey Fine Sand

Project:
Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

Job No.: 1-18-0747-EA

Date: 3/26/19

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

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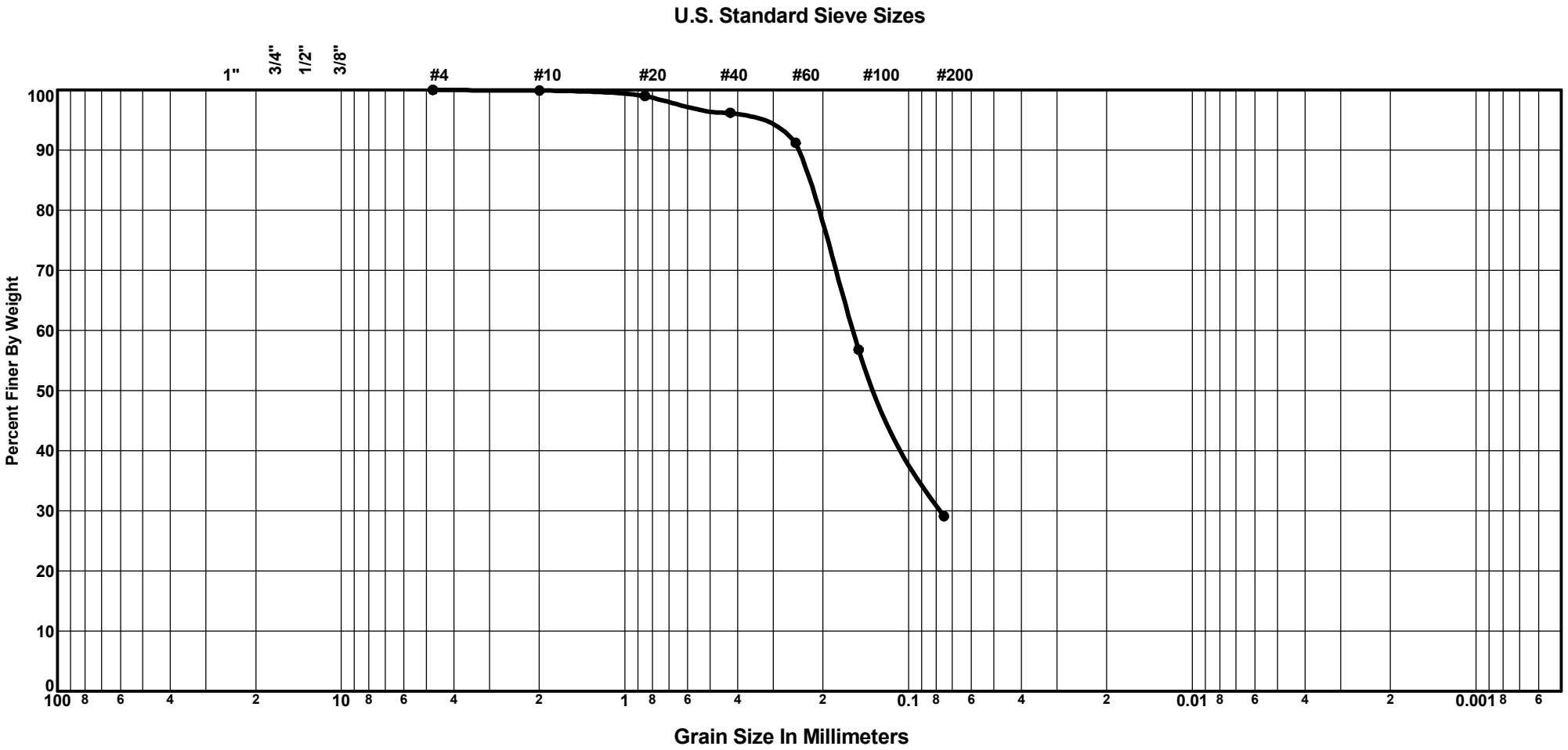
Raleigh, NC 27615



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-20	5.0-12.0'		28.0	22.0	6.0	Brown Clayey Silty Fine Sand

Project:
Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

Job No.: 1-18-0747-EA

Date: 3/26/19

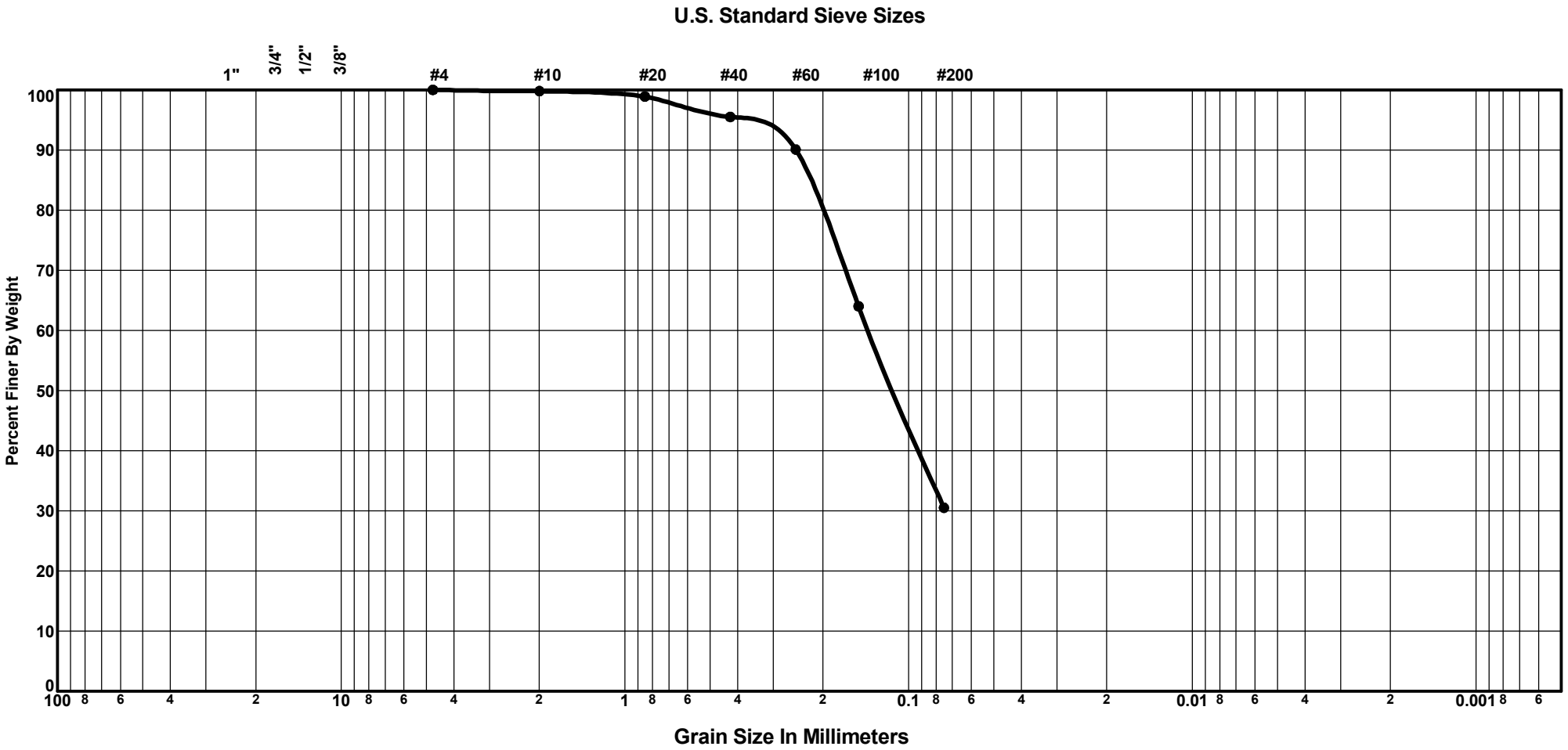
Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

3200 Wellington Court, Ste 108
Raleigh, NC 27615



GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES

Boring No.	Elev./Depth	Nat. W.C.	L.L.	P.L.	P.I.	Soil Description or Classification
B-23	1.0-6.0'		23.0	19.0	4.0	Brown Clayey Silty Fine Sand

Project:
Stormwater Ponds/Dredge Spoils
Bucksport Marina
Conway, SC

Job No.: 1-18-0747-EA

Date: 3/26/19

Date Recieved: 3/18/2019

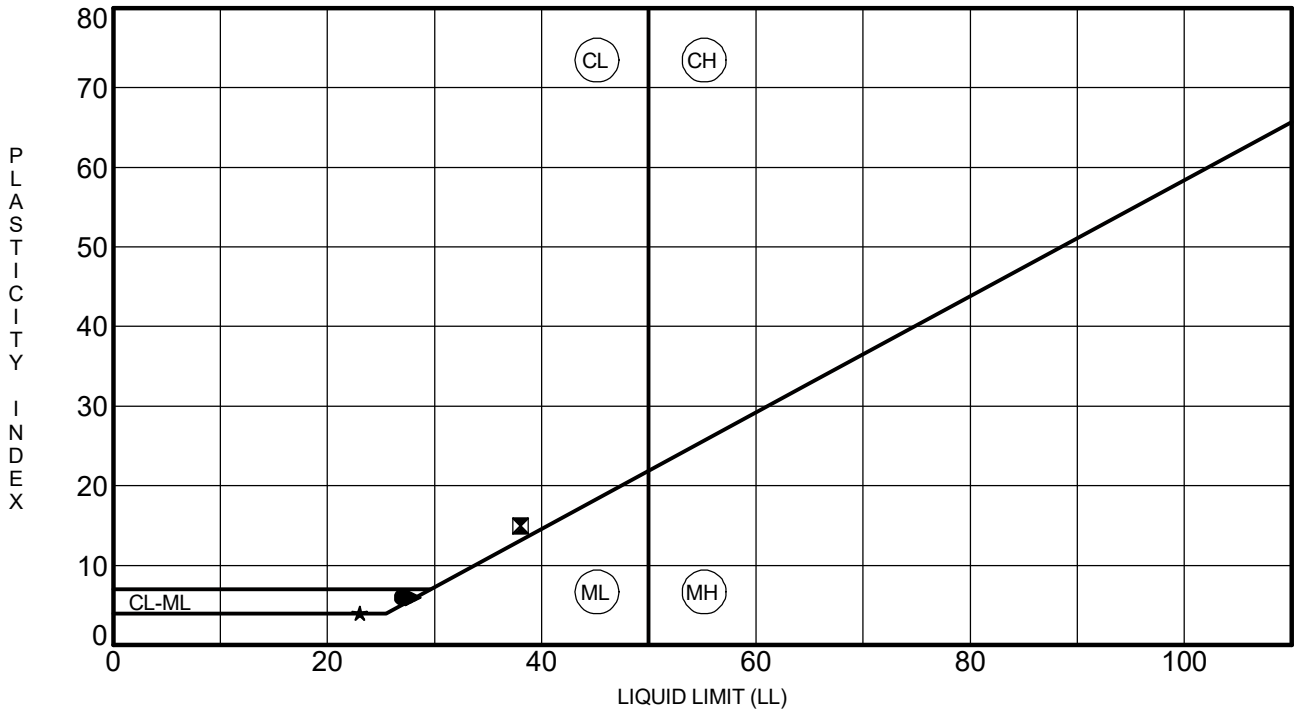
Dates Tested: 3/18-3/26/2019

GRAIN SIZE DISTRIBUTION

GeoTechnologies, Inc.

3200 Wellington Court, Ste 108
Raleigh, NC 27615

ASTM D-4318



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-2	1.0-6.0'	27	21	6	25.7	Brown Clayey Silty Medium to Fine Sand
⊠	B-15	1.0-8.0'	38	23	15	31.6	Brown Silty Clayey Fine Sand
▶	B-20	5.0-12.0'	28	22	6	29.1	Brown Clayey Silty Fine Sand
★	B-23	1.0-6.0'	23	19	4	30.5	Brown Clayey Silty Fine Sand

PROJECT **Bucksport Marina - Conway, SC**

JOB NO. **1-18-0747-EA**

DATE **3/26/19**

Date Recieved: 3/18/2019

Dates Tested: 3/18-3/26/2019

ATTERBERG LIMITS' RESULTS

3200 Wellington Court, Ste 108
Raleigh, NC 27615

GeoTechnologies, Inc.

LF-3

MOISTURE CONTENT DATA SHEET

ASTM D-2216, D-4643

JOB NAME: **Bucksport Marina** **JOB NO.:** **1-18-0747-EA**

PERFORMED BY: **CAS** **DATE:** **3/26/2019**

	Boring	SAMPLE	DEPTH (ft.)	CAN #	CAN WT.	WET SOIL WT. w/ CAN	DRY SOIL WT. w/ CAN	WATER WEIGHT	DRY SOIL WEIGHT	% MOISTURE
1	B-2	S-1	1.0-2.5	NIN	97.36	248.89	215.13	33.76	117.77	28.7
2	B-2	S-2	3.5-5.0	Coil	94.08	240.50	215.06	25.44	120.98	21.0
3	B-15	S-1	1.0-2.5	Wee	93.13	231.64	198.47	33.17	105.34	31.5
4	B-15	S-2	3.5-5.0	G-3	93.03	209.39	187.07	22.32	94.04	23.7
5	B-15	S-3	6.0-8.5	State	97.97	223.39	190.53	32.86	92.56	35.5
6	B-20	S-1	1.0-2.5	Ecu	97.42	204.04	183.99	20.05	86.57	23.2
7	B-20	S-2	3.5-5.0	Tri	93.77	232.12	209.98	22.14	116.21	19.1
8	B-20	S-3	6.0-7.5	S-11	103.61	220.24	198.20	22.04	94.59	23.3
9	B-20	S-4	8.5-10.0	Ren	93.80	240.64	216.64	24.00	122.84	19.5
10	B-23	S-1	1.0-2.5	Gold	90.36	186.59	165.85	20.74	75.49	27.5
11	B-23	S-2	3.5-5.0	Pwned	95.91	223.03	199.42	23.61	103.51	22.8
12	B-23	S-3	6.0-7.5	James	97.25	210.29	190.41	19.88	93.16	21.3
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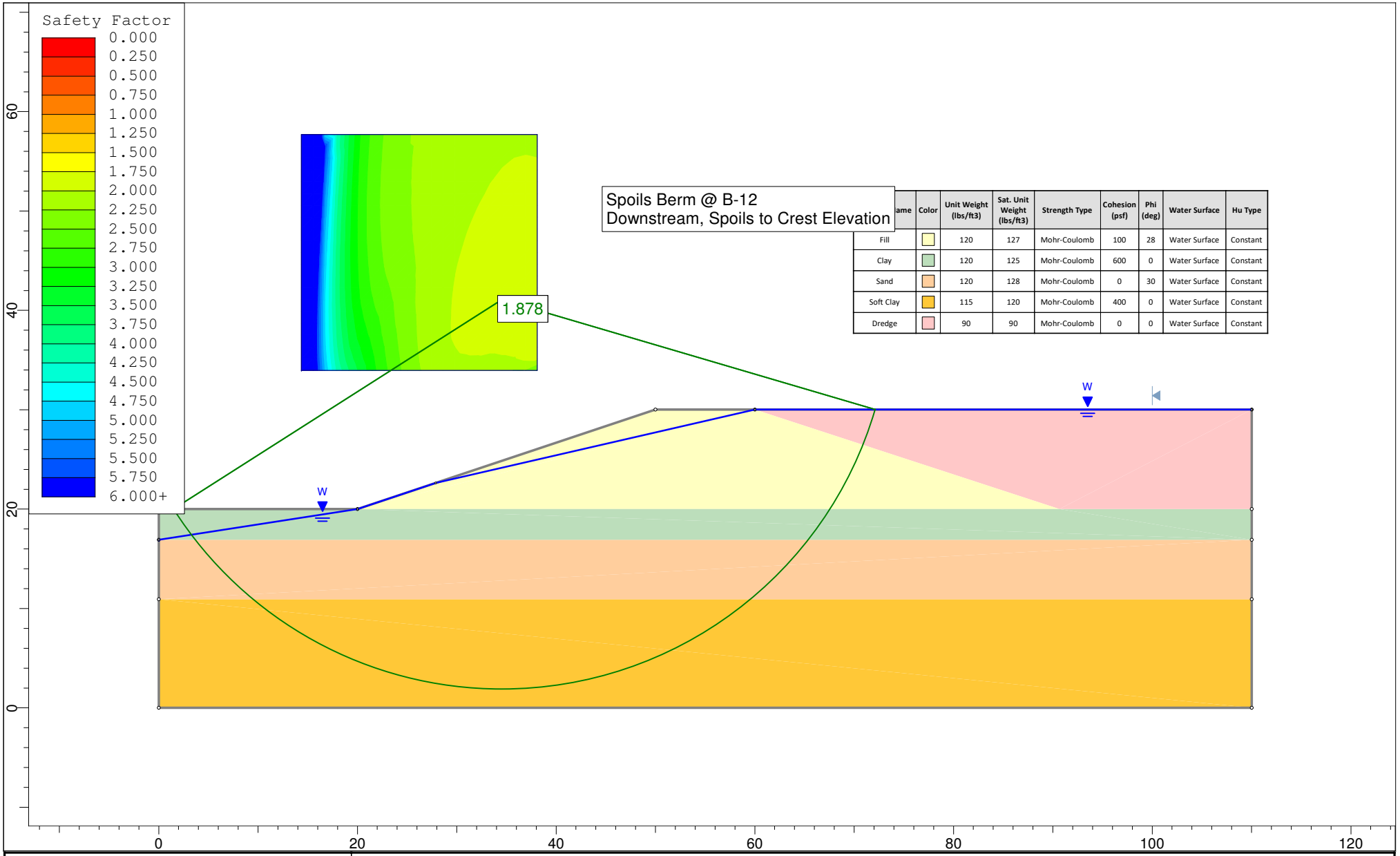
APPENDIX C

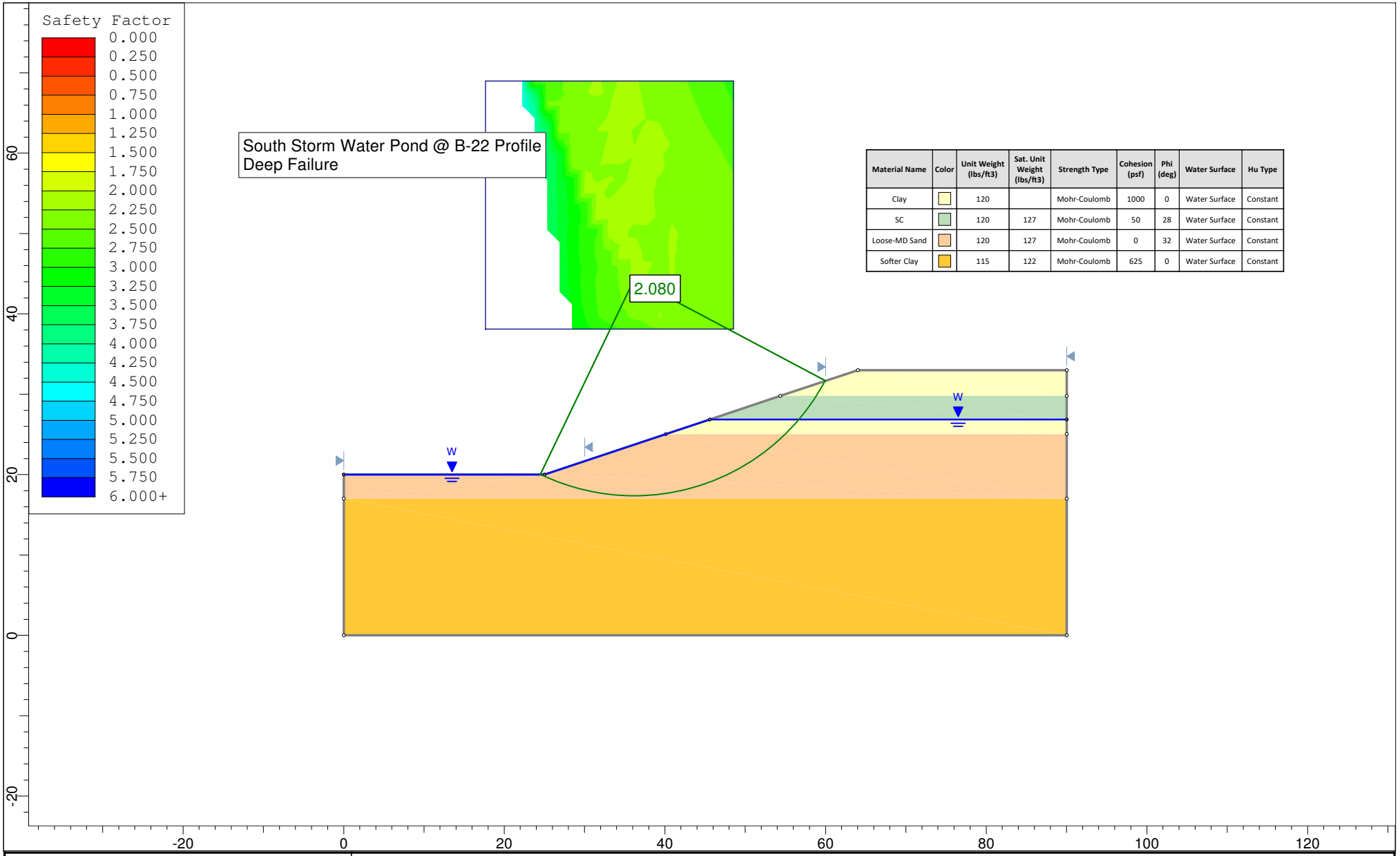
SLOPE STABILITY ANALYSES



Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Fill		120	127	Mohr-Coulomb	100	28	Water Surface	Constant
Clay		120	125	Mohr-Coulomb	600	0	Water Surface	Constant
Sand		120	128	Mohr-Coulomb	0	30	Water Surface	Constant
Soft Clay		115	120	Mohr-Coulomb	400	0	Water Surface	Constant
Dredge		90	90	Mohr-Coulomb	0	0	Water Surface	Constant

rocscience	Project: Bucksport		
	Analysis Description: Spoils Containment		
	Drawn By: Ernie S	Scale: 1:160	Company:
	Date: 3/25/2019, 7:31:48 AM		File Name: spoils.slim

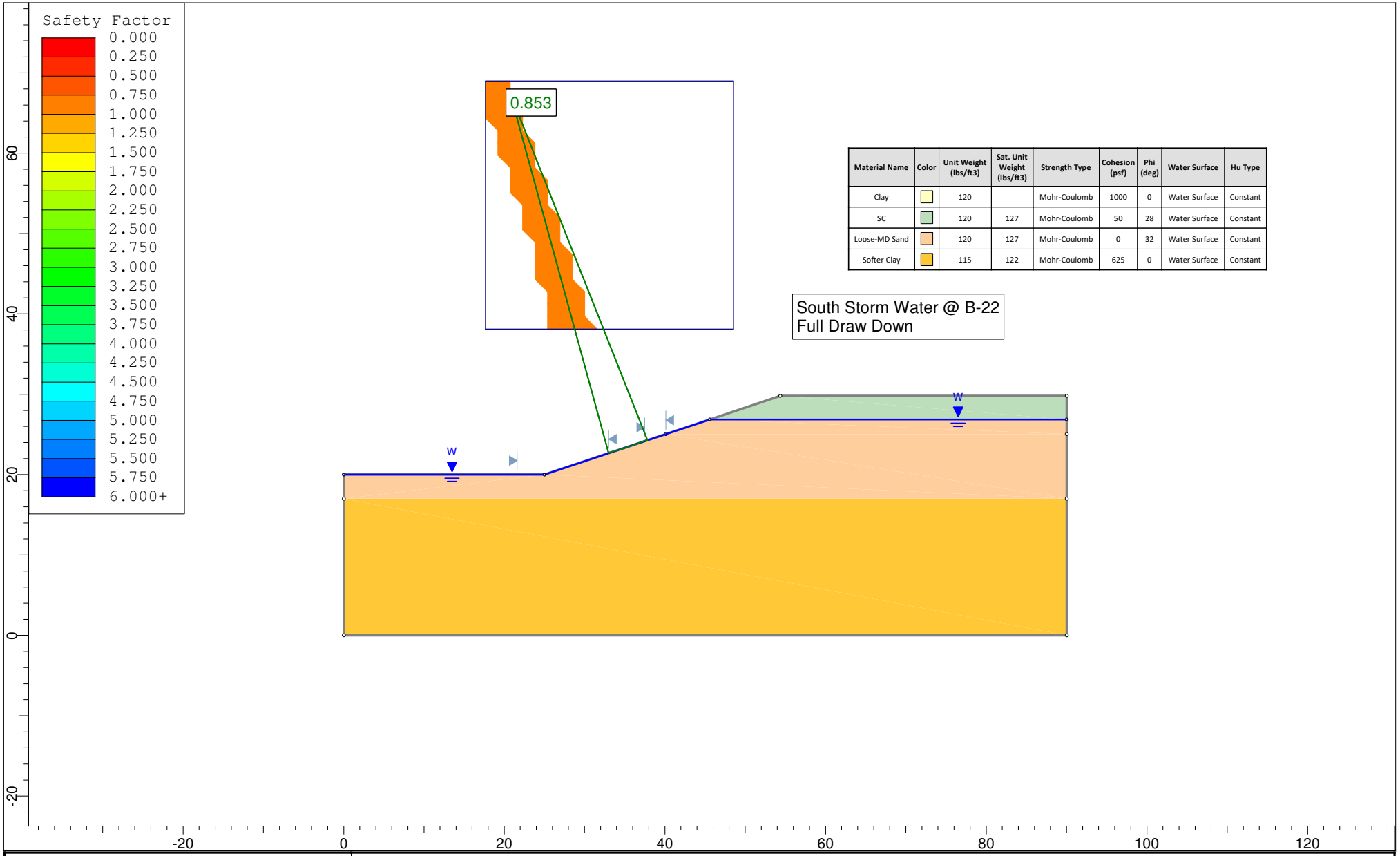
SLIDEINTERPRET 6.020



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clay		120		Mohr-Coulomb	1000	0	Water Surface	Constant
SC		120	127	Mohr-Coulomb	50	28	Water Surface	Constant
Loose-MD Sand		120	127	Mohr-Coulomb	0	32	Water Surface	Constant
Softer Clay		115	122	Mohr-Coulomb	625	0	Water Surface	Constant

rocscience	*Project*	Bucksport South SW Pond	
	Analysis Description	13' Excavation	
	Drawn By Ernie S	*Scale* 1:198	*Company*
	Date 3/25/2019, 11:36:40 AM		*File Name* southstorm.slim

SLIDEINTERPRET 6.020

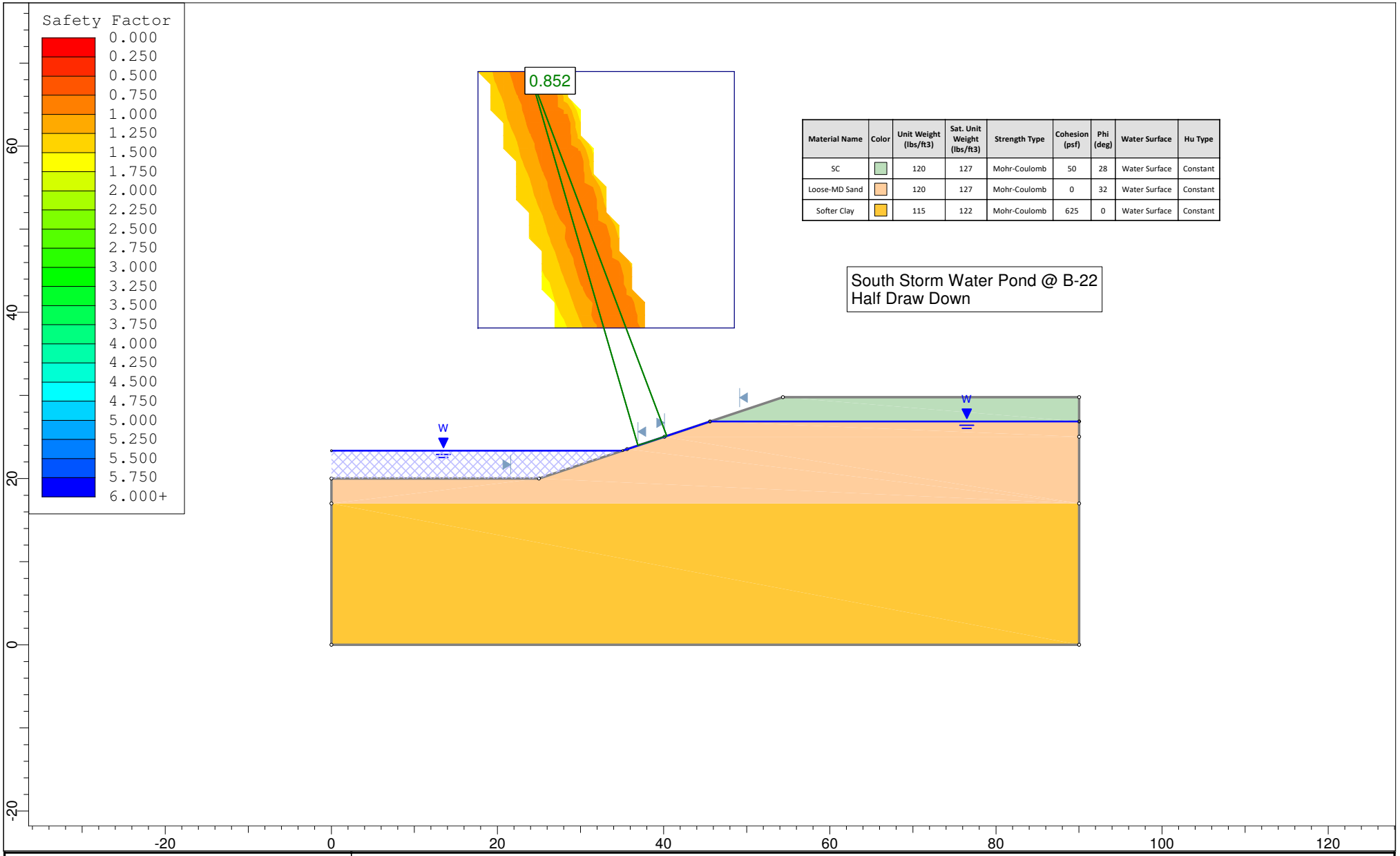


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
Clay		120		Mohr-Coulomb	1000	0	Water Surface	Constant
SC		120	127	Mohr-Coulomb	50	28	Water Surface	Constant
Loose-MD Sand		120	127	Mohr-Coulomb	0	32	Water Surface	Constant
Softer Clay		115	122	Mohr-Coulomb	625	0	Water Surface	Constant

rocscience

SLIDEINTERPRET 6.020

Project	Bucksport South SW Pond		
Analysis Description	13' Excavation		
Drawn By	Ernie S	*Scale* 1:198	*Company*
Date	3/25/2019, 11:36:40 AM	*File Name*	southstormshallow.slim

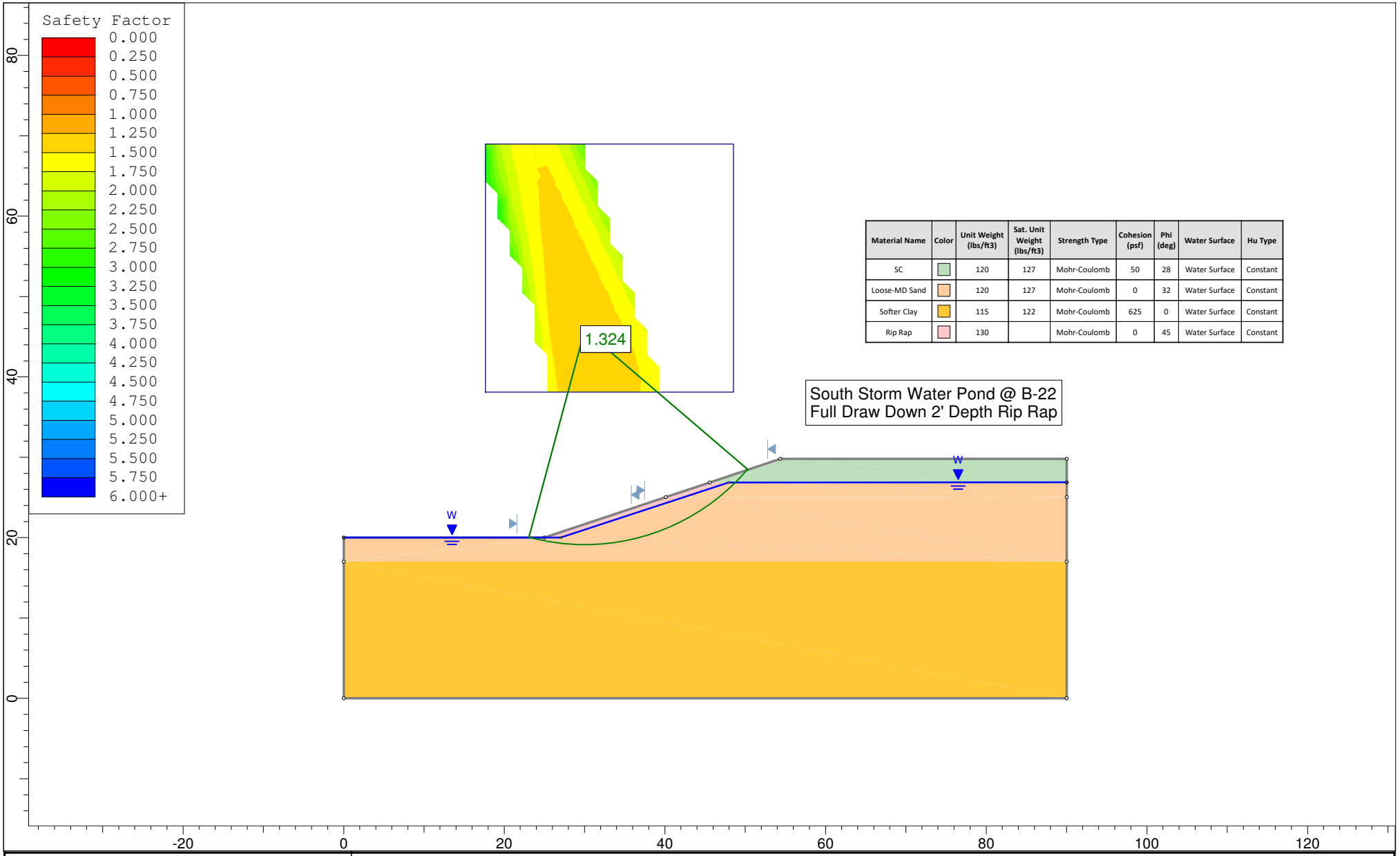


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
SC		120	127	Mohr-Coulomb	50	28	Water Surface	Constant
Loose-MD Sand		120	127	Mohr-Coulomb	0	32	Water Surface	Constant
Softer Clay		115	122	Mohr-Coulomb	625	0	Water Surface	Constant

South Storm Water Pond @ B-22
Half Draw Down

Project	Bucksport South SW Pond		
Analysis Description	13' Excavation		
Drawn By	Ernie S	Scale 1:192	Company
Date	3/25/2019, 11:36:40 AM		File Name southstormshallowhalf.slim

SLIDEINTERPRET 6.020

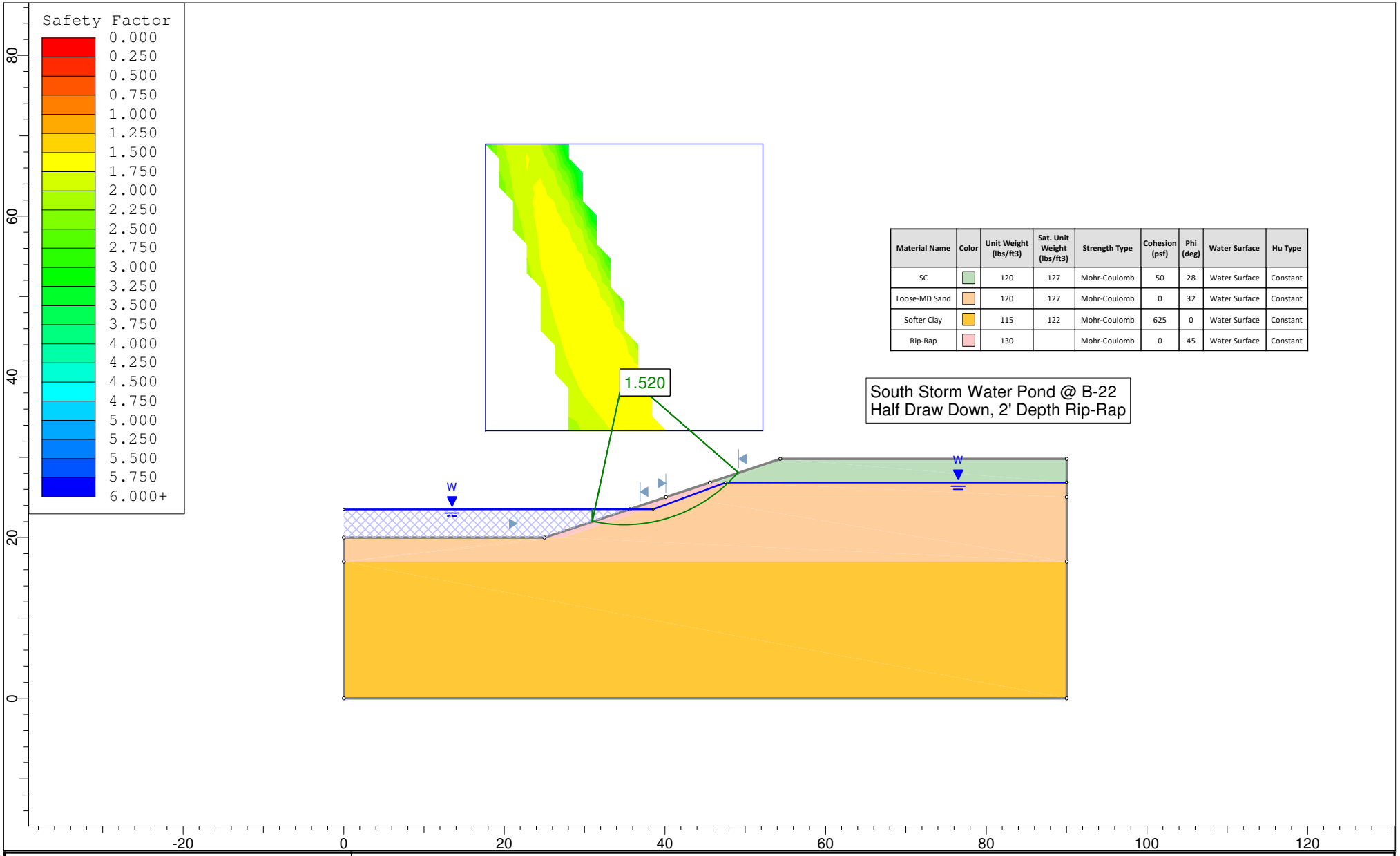


Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
SC		120	127	Mohr-Coulomb	50	28	Water Surface	Constant
Loose-MD Sand		120	127	Mohr-Coulomb	0	32	Water Surface	Constant
Softer Clay		115	122	Mohr-Coulomb	625	0	Water Surface	Constant
Rip Rap		130		Mohr-Coulomb	0	45	Water Surface	Constant

rocscience

SLIDEINTERPRET 6.020

Project	Bucksport South SW Pond		
Analysis Description	13' Excavation		
Drawn By	Ernie S	*Scale* 1:198	*Company*
Date	3/25/2019, 11:36:40 AM		*File Name* southstormshallowarmor.slim



Material Name	Color	Unit Weight (lbs/ft3)	Sat. Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type
SC		120	127	Mohr-Coulomb	50	28	Water Surface	Constant
Loose-MD Sand		120	127	Mohr-Coulomb	0	32	Water Surface	Constant
Softer Clay		115	122	Mohr-Coulomb	625	0	Water Surface	Constant
Rip-Rap		130		Mohr-Coulomb	0	45	Water Surface	Constant

South Storm Water Pond @ B-22
Half Draw Down, 2' Depth Rip-Rap

	Project	Bucksport South SW Pond	
	Analysis Description	13' Excavation	
	Drawn By: Ernie S	Scale: 1:198	Company:
SLIDEINTERPRET 6.020	Date: 3/25/2019, 11:36:40 AM		File Name: southstormshallowhalfarmor.slim