Geotechnical Data Report
Bayou De Cade Marsh Creation and Ridge Restoration (TE-0138)
Terrebonne Parish, Louisiana

Fugro Project No. 04.55174066
June 2018

Report No. 04.55174047
June 8, 2018

COASTAL PROTECTION AND RESTORATION AUTHORITY
8404 River Road
Geismar, Louisiana 70734

Attention: Ms. April Newman
CPRA Task Manager

DRAFT Geotechnical Data Report
Bayou De Cade Marsh Creation and Ridge Restoration (TE-0138)
Terrebonne Parish, Louisiana

Fugro USA Land, Inc. (Fugro) is pleased to submit this geotechnical data report for the referenced project. Fugro's services were authorized by the State of Louisiana Coastal Protection and Restoration Authority (CPRA) on March 5, 2018 under Contract No. 440010495. This study was performed in general accordance with Fugro's Proposal No. 04.55174066_rev2, dated December 19, 2017.

As of June 8, 2018, there are a few pending test results pertaining to the consolidation tests, i.e., Atterberg limits and specific gravities. They will be added to the final report.

We appreciate the opportunity to be of service to CPRA and look forward to working together on the next phase of the project. Please call if you have any questions about this report.

Sincerely,
FUGRO USA LAND, INC.

Samuel M. Bryant, P.E.
Vice President

Eric Marx, P.E.
Vice President

Copies Submitted: pdf to addressee

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ILLUSTRATIONS

APPENDICES

1. INTRODUCTION

1.1 Project Description

The Louisiana Coastal Protection and Restoration Authority (CPRA) is planning to restore 11,276 linear feet of ridge habitat along the northern bank of Bayou De Cade and create/nourish approximately 504 acres of marsh by pumping hydraulically dredged material from Lake De Cade to the designated fill sites.

The site is located as shown on Plate 1. A site layout is presented as Plate 2. The project site is located in Terrebonne Parish, Louisiana, about 12 miles west of Dulac and immediately west of Lake De Cade. Approximate project area center coordinates are N29°22'37.23" and W90°55'00.39" (RE: NAD83). Elevations noted herein are based on the 1983 North American Vertical Datum (NAVD83). The land owner for the marsh creation area is Apache Louisiana Minerals LLC.

1.2 Purposes and Scope

The purpose of the geotechnical data study was to: 1) explore and evaluate subsurface soil conditions, and 2) perform laboratory testing to develop pertinent engineering parameters for marsh restoration.

1.3 Authorization and Personnel

Ms. April Newman is the CPRA task manager. Mr. Eric Marx, P.E., is the Fugro Project Manager, and Mr. Sam Bryant, P.E., is the Fugro technical lead. Mr. Ryan Fasone, with Fugro, coordinated field exploration. Exploration location and magnetometer survey services were provided by Fugro's survey group in Lafayette, Louisiana, with Mr. Jesse Kibodeaux, as the survey manager. Dr. William Moe, Ph.D, P.E., Principal/Manager, with SCTCS Group LLC, performed the column settling tests

1.4 Report Applicability

Explorations, laboratory testing, findings, and conclusions presented in this data report are based on the project description, as described herein, and the authorized scope of work.

If there are differences or changes in project location or design features from those described herein, Fugro should be authorized to review changes and propose additional exploration and laboratory testing, if deemed appropriate. Observations, conclusions, and recommendations may not apply to locations beyond explorations performed for this study and beyond project boundaries.

Fugro prepared this report exclusively for CPRA to guide geotechnical aspects of design and construction of proposed facilities. The study was conducted using the standard level of care and

diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances in the area. This report, including all illustrations and appendices, should be used in its entirety. This report should be made available for information only and not as a warranty of subsurface conditions.

2. FIELD EXPLORATION

Field exploration, described in Appendix A, included fifteen (15) cone penetration test (CPT) soundings and fifteen (15) borings.

3. LABORATORY TESTING

Laboratory testing was performed to aid material classification, shear strength, compressibility and corrosion characteristics. Laboratory test results are presented in Appendix B. Column settling tests were performed on two selected composite samples. Test procedures and results are presented in Appendix B1.

4. GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Site Description

Topographic and existing feature information is presented on Plate 2. Saucier (1994, Plate 14) indicate the site is underlain by Holocene Interdistributary deposits. Surficial conditions range from over water to within the marsh area and out in Lake DeCade, to just above water land surfaces around the marsh perimeter.

4.2 Geographic Information System Database

Information developed or obtained for the project was included in a geographic information system (GIS) databased using ESRI (2018) ArcGIS, version 10.4. Data from explorations, i.e., field and laboratory data, was included in a GIS database using Bentley Systems (2018) gINT, version 10. The gINT database file is linked to ArcGIS for processing. CPT electronic data files are included in the ArcGIS database.

4.3 Subsurface Conditions

4.3.1 Cross-Sections

Example subsurface profiles, presented as Plates 3a to 3d, generally show the distribution of subsurface conditions across the section lines. Profile locations are shown on Plate 2.

4.3.2 Earth Materials

Earth materials encountered in explorations consist mostly of soft clay with interbedded sand and silt layers. Organic and peat layers are also present. Comparing to Profile A-A', Profile B-B seems to indicate a more continuous sandy zone following along the profile line between about El -13 and -5 ft or so.

4.3.3 Water Conditions

A nearby CRMS (2018) gauge CRMS0398-H01, located about 3/4-mile north of the marsh site center, indicates a mean water elevation of about El+0.65 ft, a range from about El-0.5 ft to as high as El+2.0 ft, and with a more typical range from about El+0.2 to El+1 ft for daily measurements between October 2016 to September/October 2017.

Wave action during field exploration was notable and affected water surface elevation measurements at exploration locations, see Table A-1 in Appendix A.

5. REFERENCES

Apache Louisiana Mineral LLC (2017) "Access Permit; Bayou Decade Ridge and Marsh Creation (TE-138), Terrebonne Parish, Louisiana," letter to Fugro USA Land, Inc., Attn: Mr. Mike Allen, P.G., November 10.

ASTM International (2017) "ASTM Compass, Section: 4 Construction," https://compass.astm.org.

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Olson, R.E., Rauch, A.F., Mecham, E.C., and Luke, A.M. (2003) "Self-Weight Consolidation of Large Laboratory Deposits of Clay," Proceedings 12th Pan American Conference on Soil Mechanics and Geotechnical Engineering, MIT, Vol 1, pp. 703-708/

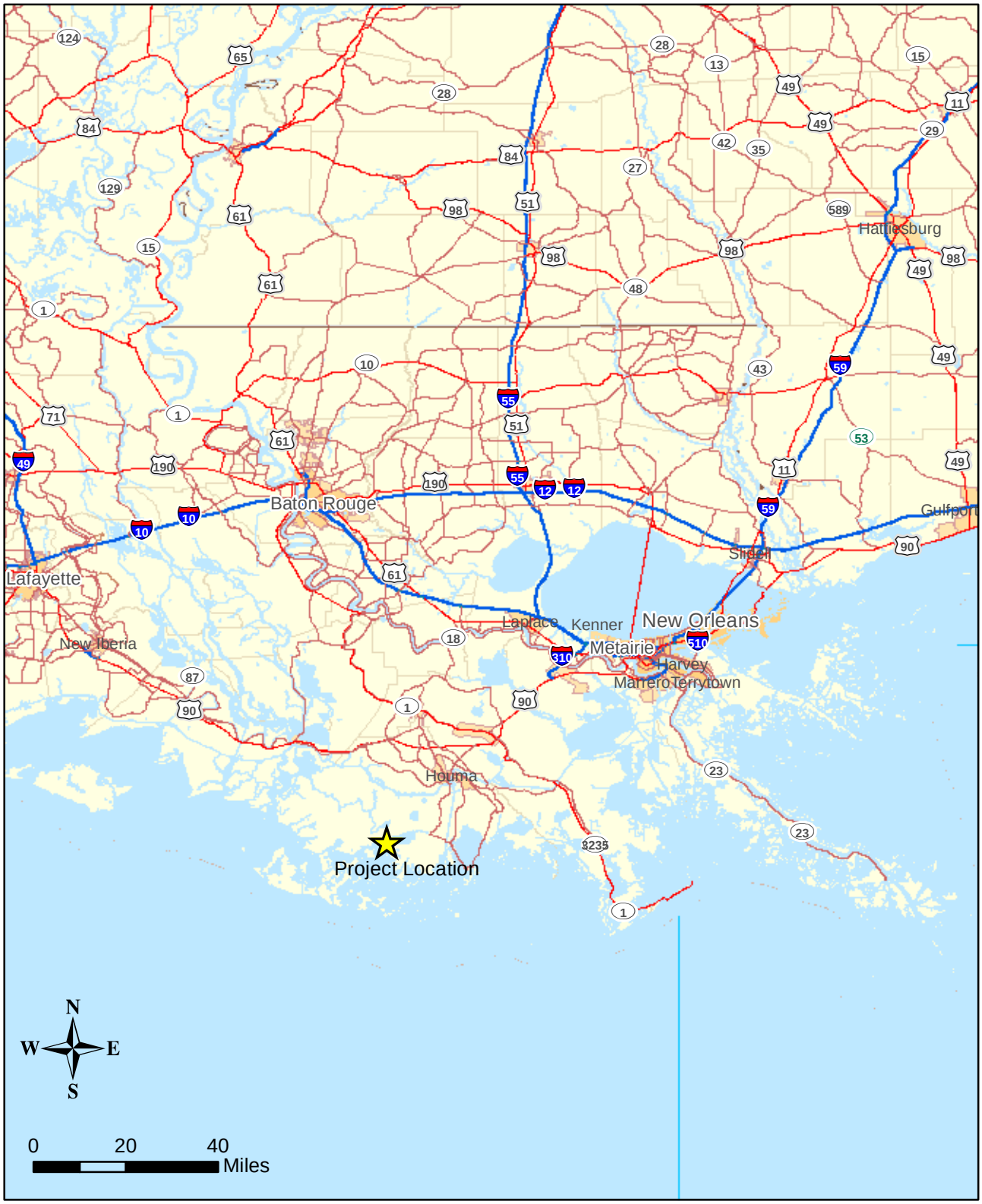
Robertson, P.K. and Cabal, K.L. (2015) "Guide to Cone Penetration Testing for Geotechnical Engineering, 6th Edition," prepared for Gregg Drilling & Testing, Inc.

Saucier, R.T. (1994) "Geomorphology and Quaternary Geologic History of the Lower Mississippi River Valley, Volumes I and II," prepared for The President Mississippi River Commission Vicksburg, Mississippi and US Army of Corps of Engineers, December.

U.S. Army Corps of Engineers (USACE) (1987) “Confined Disposal of Dredged Material,” EM 1110-2-5027, September 30, *column settling testing described in Section 3-3 and Appendix B, Plans and Specifications*.

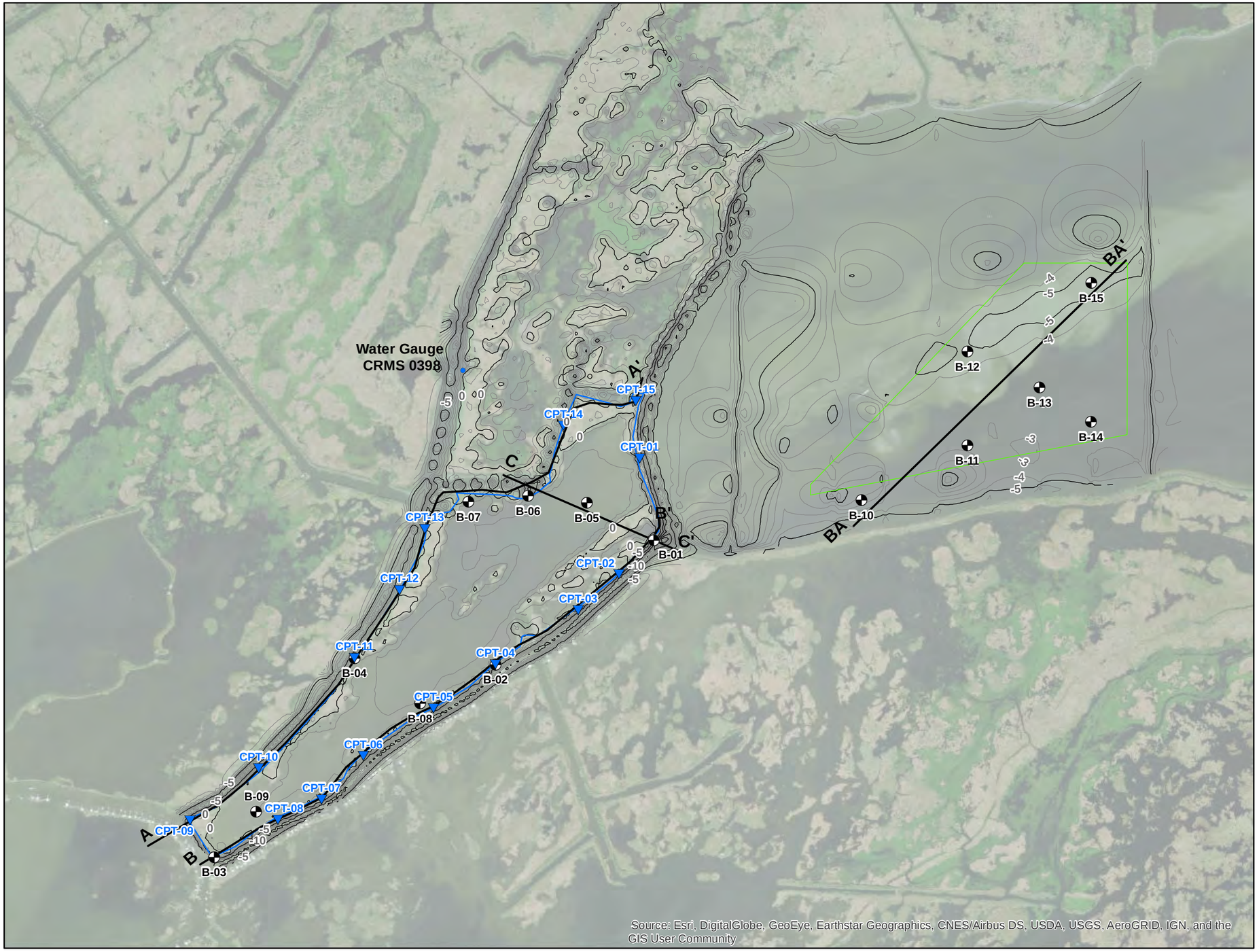
U.S. Army Corps of Engineers (USACE) (2015) “Dredging and Dredged Material Management,” EM 1110-2-5025, July 31, *supersedes EM 1110-2-5027, column settling testing described in Appendix G, Plans and Specifications and Appendix H, Column Settling Test Procedures*.

PLATES



VICINITY MAP
Bayou Decade Marsh Creation and Ridge Restoration
Terrebonne Parish, Louisiana

Plate 1



Legend

- Fugro CPT
- Fugro Boring
- Subsurface Profile Line Location
- Project Area
- Borrow Area

Topographic Survey Contours (Feet, NAVD88)
(survey data provided by client)

- -5 Contour interval is 5 feet
- Contour interval is 1 foot

N
W E
S

0 2,000 4,000 Feet

SITE LAYOUT AND EXPLORATION PLAN
Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

Plate 2

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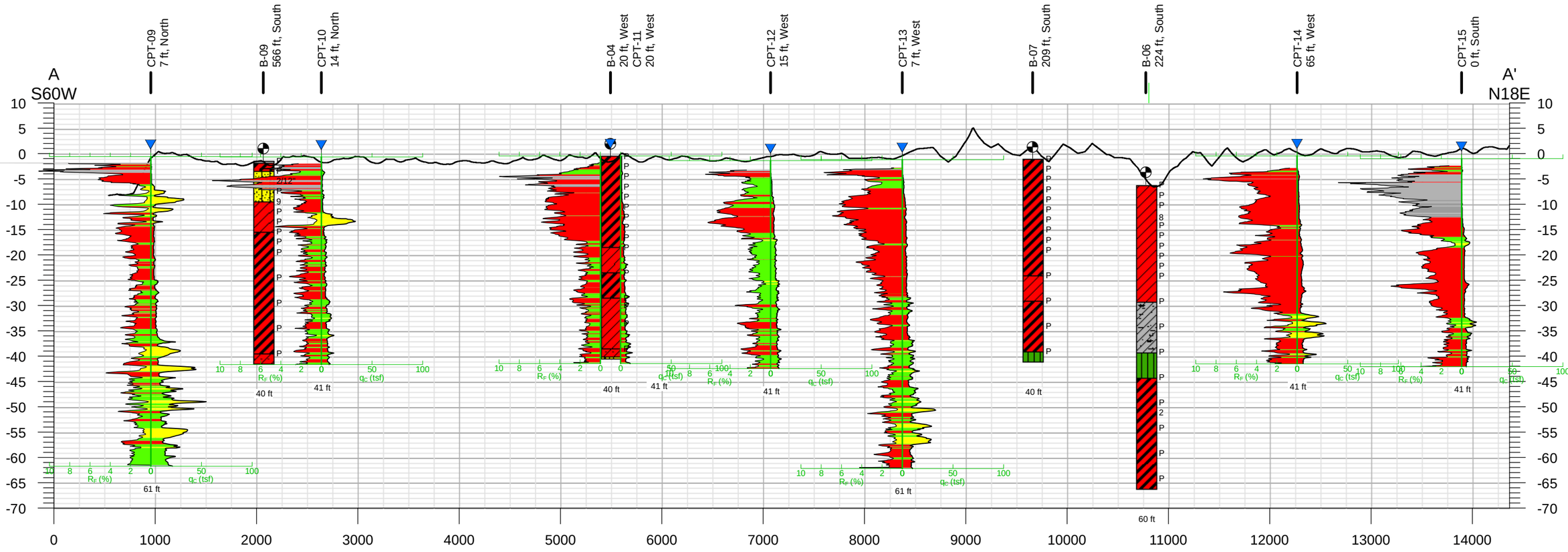


20 ft

1000 ft

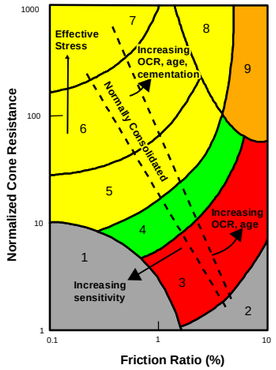
Vertical Exaggeration = 50.0X

Legend

- Fugro Boring Location
- Fugro CPT
- 13 Field SPT N-Value
- P Push

Soil Descriptions

- High-Plasticity Organic (OH)
- Peat
- Lean CLAY (CL)
- Sandy Lean Clay (CL)
- Fat CLAY (CH)
- Silt (ML)
- Silty SAND (SM)



Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay to Silty Clay	CL-CH
4	Clayey Silt to Silty Clay	MH-CL
5	Silty Sand to Sandy Silt	SM-ML
6	Sand to Silty Sand	SP-SM
7	Gravelly Sand to Sand	GP-SP
8	Sand to Clayey Sand	SP-SC
9	Very Stiff Fine-grained*	CH-CL

*overconsolidated or cemented

SBT CORRELATION CHART
ROBERTSON, 1990

SUBSURFACE PROFILE A-A'

Bayou Decade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

Plate 3a

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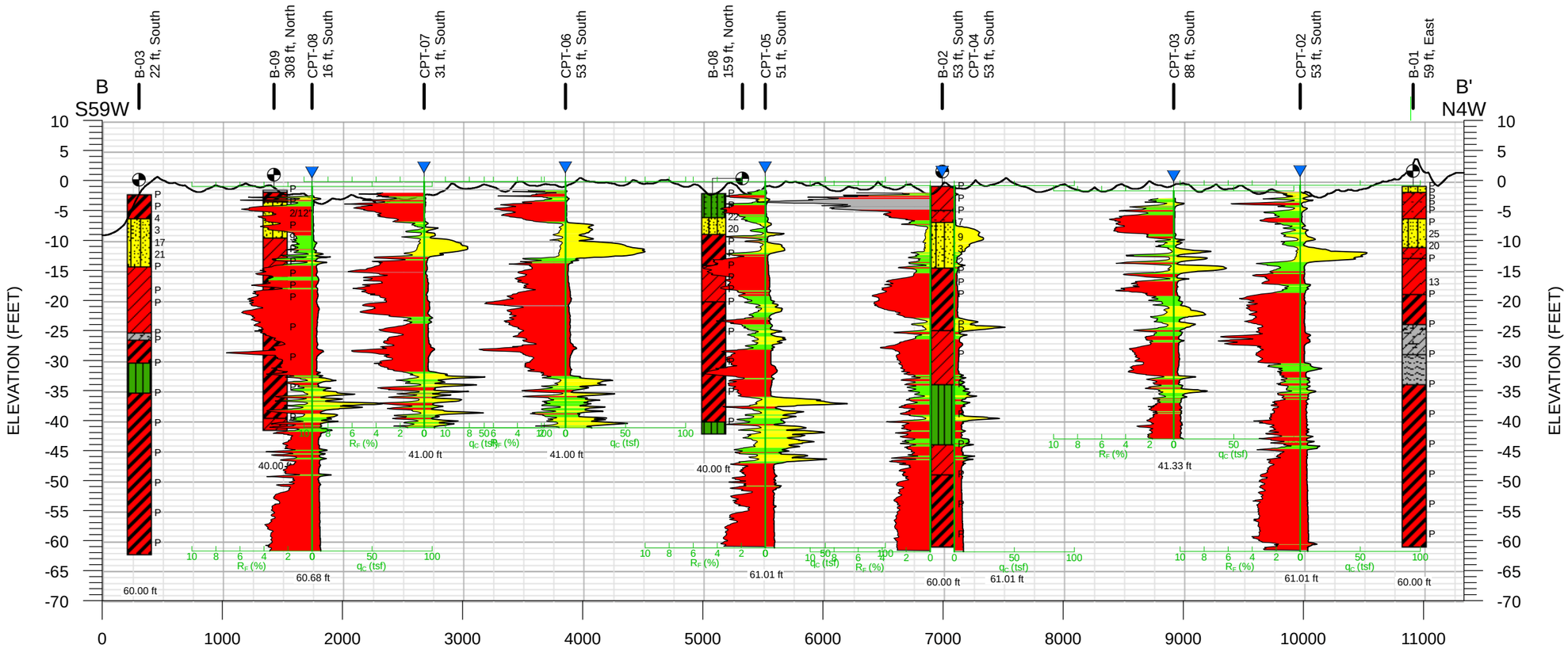


20 ft

1000 ft

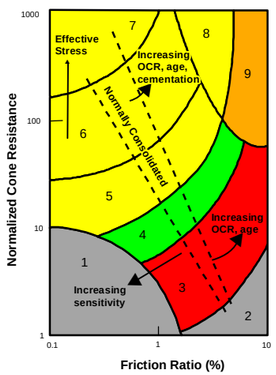
Vertical Exaggeration = 50.0X

Legend

- Fugro Boring Location
- Fugro CPT
- 13 Field SPT N-Value
- P Push

Soil Descriptions

- High-Plasticity Organic (OH)
- Peat
- Lean CLAY (CL)
- Sandy Lean Clay (CL)
- Fat CLAY (CH)
- Silt (ML)
- Silty SAND (SM)



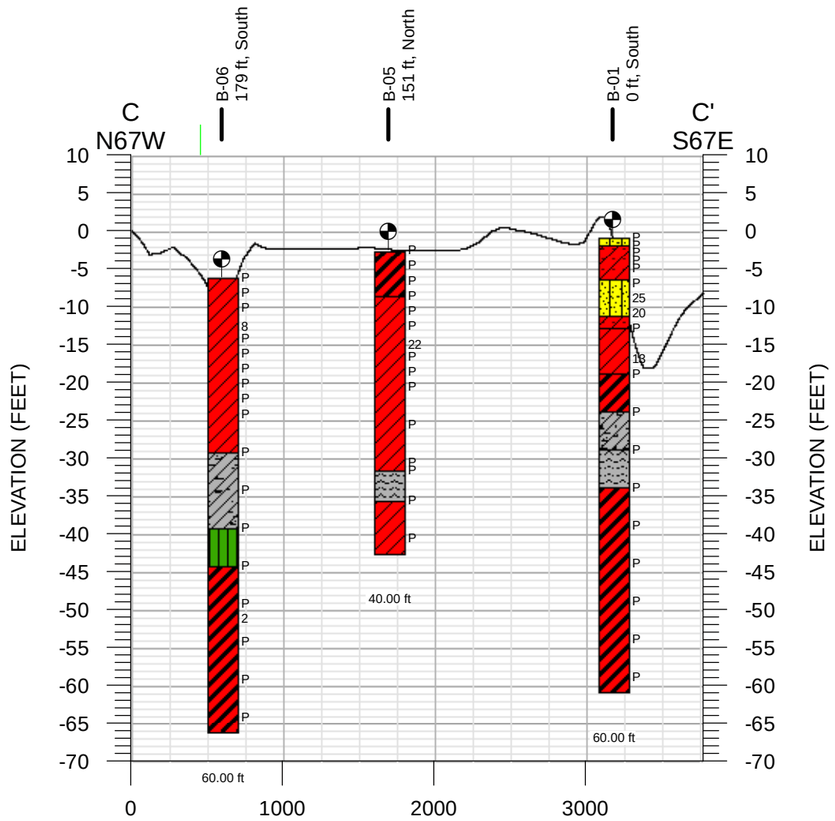
Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay to Silty Clay	CL-CH
4	Clayey Silt to Silty Clay	MH-CL
5	Silty Sand to Sandy Silt	SM-ML
6	Sand to Silty Sand	SP-SM
7	Gravelly Sand to Sand	GP-SP
8	Sand to Clayey Sand	SP-SC
9	Very Stiff Fine-grained*	CH-CL

*overconsolidated or cemented

**SBT CORRELATION CHART
ROBERTSON, 1990**

SUBSURFACE PROFILE B-B'
Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

Plate 3b



20 ft

1000 ft

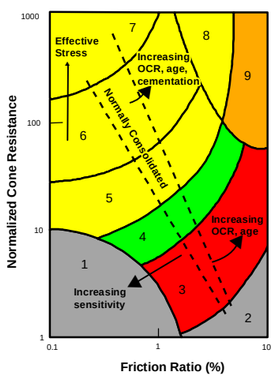
Vertical Exaggeration = 50.0X

Legend

- Fugro Boring Location
- Fugro CPT
- 13 Field SPT N-Value
- P Push

Soil Descriptions

- High-Plasticity Organic (OH)
- Peat
- Lean CLAY (CL)
- Sandy Lean Clay (CL)
- Fat CLAY (CH)
- Silt (ML)
- Silty SAND (SM)



Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay to Silty Clay	CL-CH
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6	Sand to Silty Sand	SP-SM
7	Gravelly Sand to Sand	GP-SP
8	Sand to Clayey Sand	SP-SC
9	Very Stiff Fine-grained*	CH-CL

*overconsolidated or cemented

SBT CORRELATION CHART
ROBERTSON, 1990

SUBSURFACE PROFILE C-C'
Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

Plate 3c

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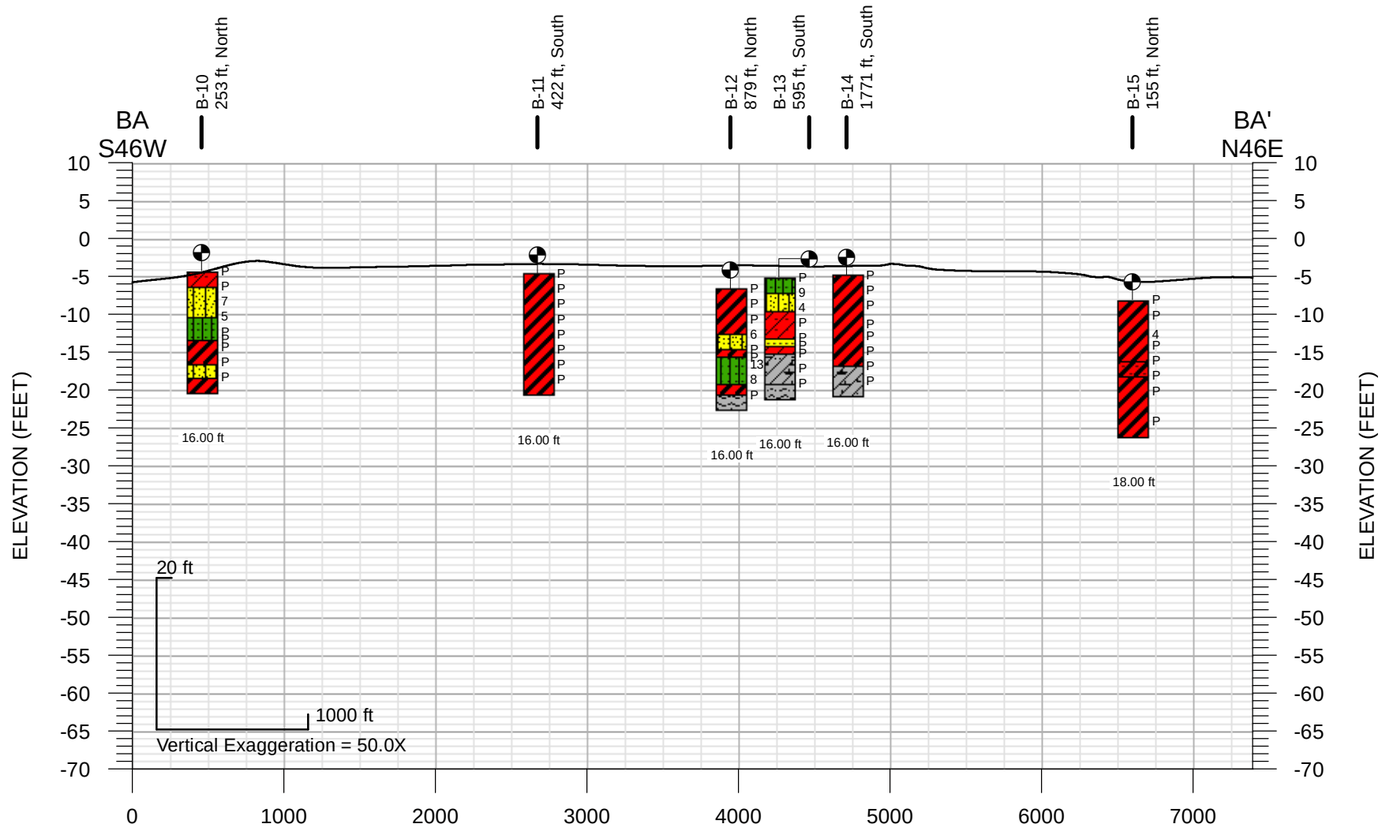

Legend

- Fugro Boring Location
- Fugro CPT
- 13 Field SPT N-Value
- P Push

Soil Descriptions

- High-Plasticity Organic (OH)
- Peat
- Lean CLAY (CL)
- Sandy Lean Clay (CL)
- Fat CLAY (CH)
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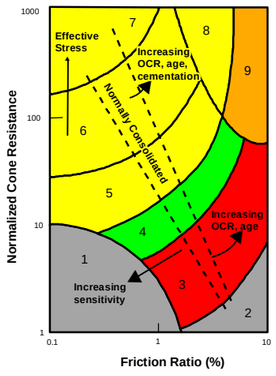

Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay to Silty Clay	CL-CH
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7	Gravelly Sand to Sand	GP-SP
8	Sand to Clayey Sand	SP-SC
9	Very Stiff Fine-grained*	CH-CL

*overconsolidated or cemented

**SBT CORRELATION CHART
ROBERTSON, 1990**

SUBSURFACE PROFILE Borrow Area A
Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

Plate 3d

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APPENDIX A

FIELD EXPLORATION

APPENDIX A - FIELD EXPLORATION

INTRODUCTION

This appendix provides information about field exploration, including drilling equipment and soil sampling methods. Field exploration was performed between March 26 and April 20, 2018.

Fugro performed 15 cone penetration test (CPT) soundings ranging in depth from 40 ft to 60 ft and 15 borings ranging in depth from 16 ft to 60 ft.

Table A-1 summarizes exploration locations, depths, ground surface elevations, and other information. Explorations are approximately located as shown on Plate 2. Explorations were located prior to commencement of the field exploration program.

As-drilled exploration locations and ground surface/mudline elevations were surveyed by Fugro's survey group.

FIELD COORDINATION

Exploration locations were cleared through Louisiana One Call. Apache Louisiana Minerals LLC (2017) provided access permission for Fugro exploration. Land owners were contacted prior to site mobilization, as necessary. The U.S. Army Corps of Engineers and U.S. Coast Guard were notified regarding field exploration.

Prior to drilling or CPT work, exploration locations were surveyed using a magnetometer assess the potential presence of pipelines or other magnetic-susceptible obstructions. A closed loop path was surveyed around each exploration location using a Geometrics 858 cesium vapor magnetometer. The loop path enclosed the exploration location and maintained a minimum 25-ft radius or a 25- by 25-foot rectangular cleared area. Cleared locations were marked with a cane pole or buoy with specific flagging.

Table A-1. Exploration Summary

Exploration ID	LA State Plane South (NAD83)		NAD83 Geographic		Elevation (NAVD88)	Completion		Depth to Mudline	Water Elevation
	Easting	Northing	Latitude	Longitude		Date	Depth		
	ft	ft	deg	deg	ft		ft	ft	ft
B-01	3,417,117.4	320,359.7	29.380211	-90.905437	-0.8	3/27/2018	60.0	1.3	0.5
B-02	3,414,045.8	317,944.2	29.373600	-90.915109	-0.9	3/27/2018	60.0	2.2	1.3
B-03	3,408,578.8	314,205.9	29.363374	-90.932314	-2.2	4/3/2018	60.0	3.2	1.0
B-04	3,411,307.2	318,072.7	29.373980	-90.923705	-0.5	4/3/2018	40.0	1.4	0.9
B-05	3,415,819.4	321,086.2	29.382222	-90.909504	-2.5	3/28/2018	40.0	3.0	0.5
B-06	3,414,677.7	321,220.9	29.382604	-90.913087	-6.1	3/30/2018	60.0	7.0	0.9
B-07	3,413,518.7	321,109.8	29.382310	-90.916728	-1.0	3/30/2018	40.0	1.9	0.9
B-08	3,412,577.1	317,193.9	29.371551	-90.919729	-2.0	4/4/2018	40.0	2.5	0.5
B-09	3,409,394.7	315,092.6	29.365804	-90.929743	-1.4	3/30/2018	40.0	2.0	0.6
B-10	3,421,152.1	321,135.3	29.382302	-90.892760	-4.3	4/2/2018	16.0	6.0	1.7
B-11	3,423,210.3	322,200.4	29.385209	-90.886285	-4.6	4/2/2018	16.0	6.0	1.4
B-12	3,423,211.8	324,020.3	29.390213	-90.886258	-6.6	4/2/2018	16.0	8.0	1.4
B-13	3,424,613.2	323,327.9	29.388294	-90.881866	-5.1	4/2/2018	16.0	6.5	1.4
B-14	3,425,611.5	322,658.2	29.386442	-90.878740	-4.8	3/28/2018	16.0	6.5	1.7
B-15	3,425,616.9	325,355.7	29.393859	-90.878689	-8.1	3/28/2018	18.0	9.0	0.9
CPT-01	3,416,845.3	321,940.5	29.384561	-90.906273	-0.4	4/17/2018	40.0	1.0	0.6
CPT-02	3,416,442.3	319,696.0	29.378393	-90.907565	-0.8	4/17/2018	60.0	1.5	0.7
CPT-03	3,415,653.1	318,995.7	29.376475	-90.910051	-1.7	4/17/2018	40.0	2.0	0.3
CPT-04	3,414,045.8	317,944.2	29.373600	-90.915109	-0.9	4/17/2018	60.0	2.2	1.3
CPT-05	3,412,839.2	317,087.7	29.371257	-90.918907	-0.2	4/18/2018	60.0	1.0	0.8
CPT-06	3,411,478.9	316,169.4	29.368745	-90.923188	-0.2	4/18/2018	40.0	1.0	0.8
CPT-07	3,410,663.9	315,321.4	29.366421	-90.925756	-0.2	4/18/2018	40.0	1.0	0.8
CPT-08	3,409,817.8	314,928.9	29.365350	-90.928416	-1.0	4/19/2018	60.0	1.5	0.5
CPT-09	3,408,113.2	314,913.8	29.365325	-90.933768	-0.6	4/19/2018	60.0	1.5	0.9
CPT-10	3,409,442.4	315,929.8	29.368106	-90.929584	-0.7	4/19/2018	40.0	1.5	0.8
CPT-11	3,411,307.2	318,072.7	29.373980	-90.923705	-0.5	4/19/2018	40.0	1.4	0.9
CPT-12	3,412,176.9	319,390.1	29.377594	-90.920960	-1.4	4/20/2018	40.0	1.5	0.1
CPT-13	3,412,670.8	320,574.8	29.380848	-90.919396	-1.2	4/20/2018	60.0	1.5	0.3
CPT-14	3,415,362.9	322,585.6	29.386350	-90.910920	-0.4	4/20/2018	40.0	1.2	0.8
CPT-15	3,416,769.5	323,055.9	29.387629	-90.906498	-1.0	4/18/2018	40.0	2.0	1.0

CONE PENETRATION TEST SOUNDINGS

CPT Logs

CPT logs follow the appendix text, as Plates A-1 to A-15, along with a key for the CPT logs as Plate A-16. CPT logs present tip resistance, friction ratio (friction resistance/tip resistance), general soils type, pore pressure measured near by a transducer behind the cone tip, and interpreted strength properties.

Cone penetration test (CPT) soundings were conducted using an air boat mounted CPT rig. A CPT unit utilizes the self-weight of the equipment to push a cylindrical steel probe into the ground. CPT data is obtained by pushing a series of cylindrical rods, with an instrumented probe at the base, into the soil at a constant rate. The probe consists of a piezocone tip element and a side-friction sleeve element. Continuous measurements of penetration resistance at the cone tip, friction along the friction sleeve, and pore water pressure were recorded during the penetration tests. During testing, the results were saved electronically for further data reduction in our office.

CPT Hole Completion

CPTs were backfilled upon completion with cement-bentonite grout, using a tremie pipe and topped off at the surface.

BORINGS

Boring Logs

Boring logs are presented as Plates A-17 to A-32, with a key to terms and symbols presented as Plates A-32a and 32b. Boring logs present boring number, coordinates, ground surface/mudline elevation, completion date, logger's name, drilling method, drill rig type, backfill method, material descriptions, sampling method, and point-depth related laboratory test results.

Drilling Methods and Equipment

Borings were drilled with a Robicheaux Air Boat Drill Unit 38 (ABDU-38) drill rig, using wet rotary techniques.

Sampling Equipment and Methods

Cohesive soil samples were generally obtained at a maximum of 5-ft intervals. When sandy/cohesionless materials were encountered, samples were generally obtained at 3-ft-depth intervals for a depth interval of about 10 feet before proceeding with 5-ft-depth intervals. Sampling methods are described in Table A-2.

Table A-2. Sampling Methods

Sampler Type	Dimensions	Description
Thin-wall Tubes	3-inch-OD, 2-7/8-in-ID	Test procedure in general accordance with ASTM D1587. 30-inch-long, thin-wall tubes are attached to the drill string and hydraulically pushed into the borehole bottom about 24 inches (2 ft).
Standard Penetration Test (SPT)	2-inch-OD, 1-3/8-inch-ID	Test procedure in general accordance with ASTM D1586. SPT split-spoon sampler, attached to drill pipe and lowered to borehole bottom, are driven with a cat head and 140-pound manual hammer attached to the top of the drill rod near the ground surface.

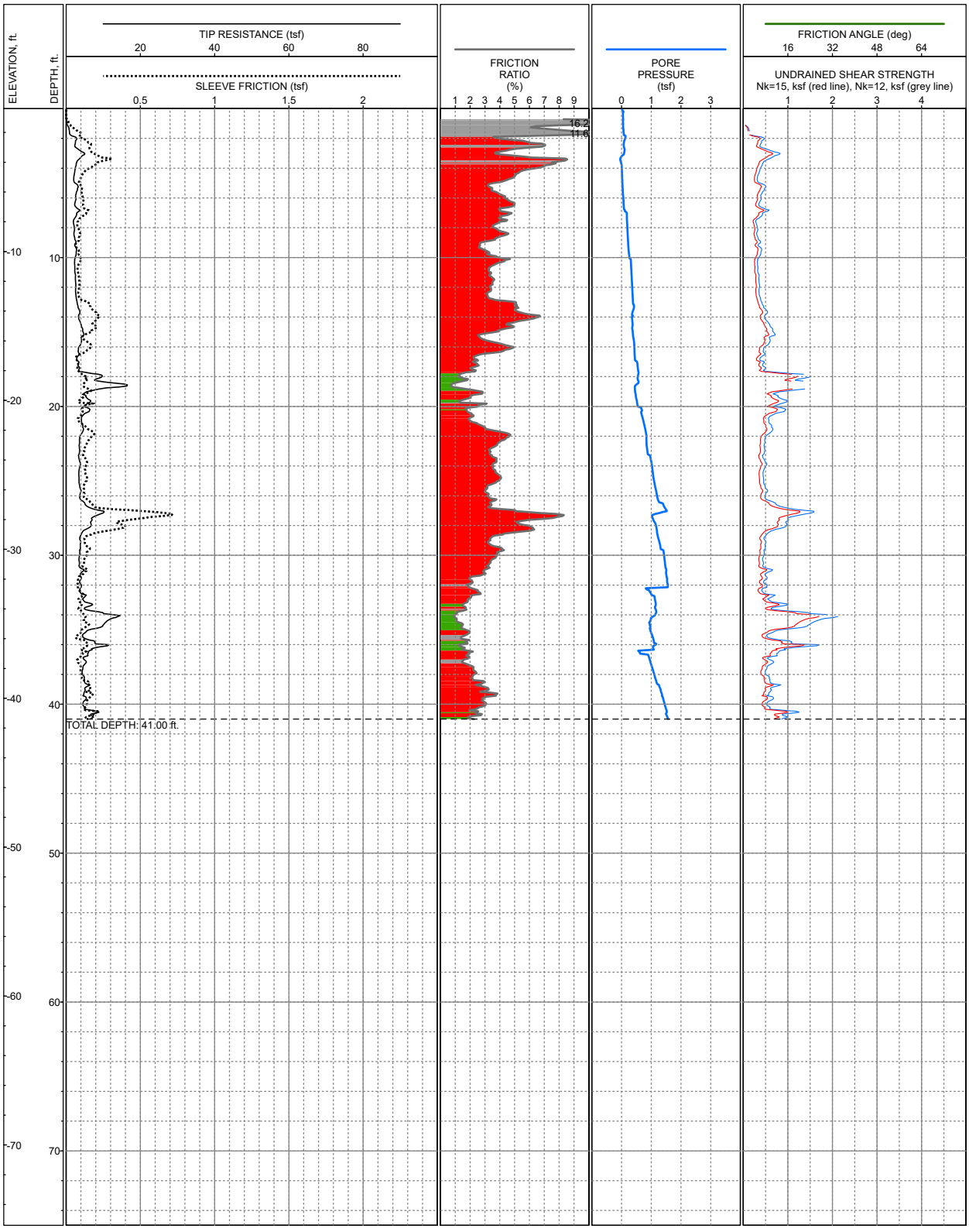
A field technician logged the borings and samples in general accordance with the ASTM D2488 for visual soil classification. Boundaries between soil types shown on the logs are approximate and the transition between different soil layers may be gradational.

Tube samples were extruded in the laboratory with a hydraulic ram. After extrusion, samples were identified according to project number, boring number and depth, then wrapped in aluminum foil and placed in plastic bags to protect against moisture loss.

SPT samples were identified in the same manner as tube samples but were placed in plastic bags in the field and transported to the laboratory. Field SPT blows are recorded as the split-barrel sampler is advanced 18 inches. Blow counts are recorded for three successive 6-inch-depth intervals. Field N-values are calculated by adding the second and third blow count numbers. Field SPT N-values suggest relative density of cohesionless soils and relative consistency of cohesive soils.

Borehole Completion

Borings were backfilled upon completion with cement-bentonite grout using a tremie and topped off at the surface. Cuttings were spread out as the site.



LOCATION: E: 3,416,845, N: 321,941, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.4ft +/- NAVD88
COMPLETION DEPTH: 41.00ft
TESTDATE: 4/17/2018

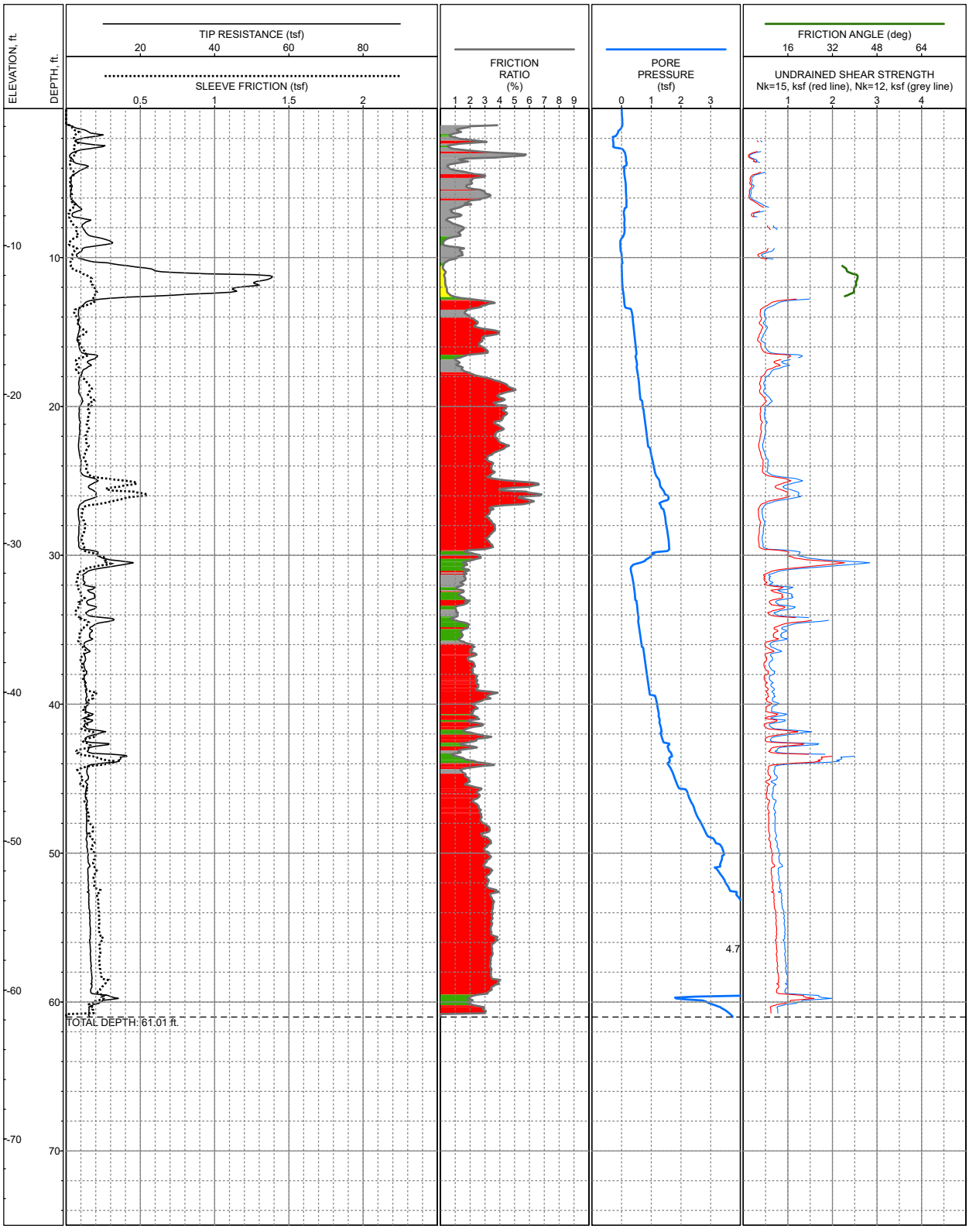
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-01

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-1

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,416,442, N: 319,696, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.8ft +/- NAVD88
COMPLETION DEPTH: 61.01ft
TESTDATE: 4/17/2018

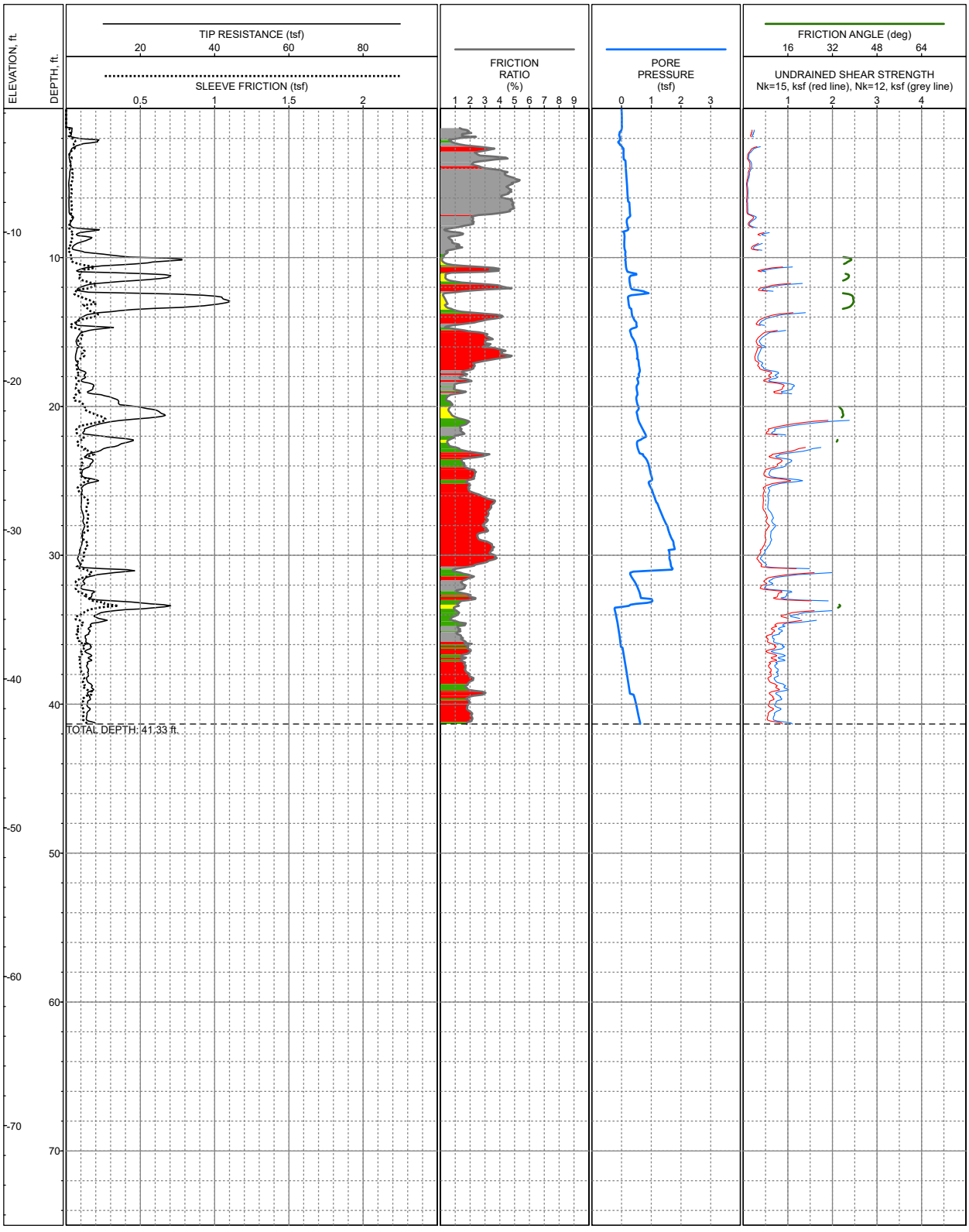
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-02

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-2

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,415,653, N: 318,996, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -1.7ft +/- NAVD88
COMPLETION DEPTH: 41.33ft
TESTDATE: 4/17/2018

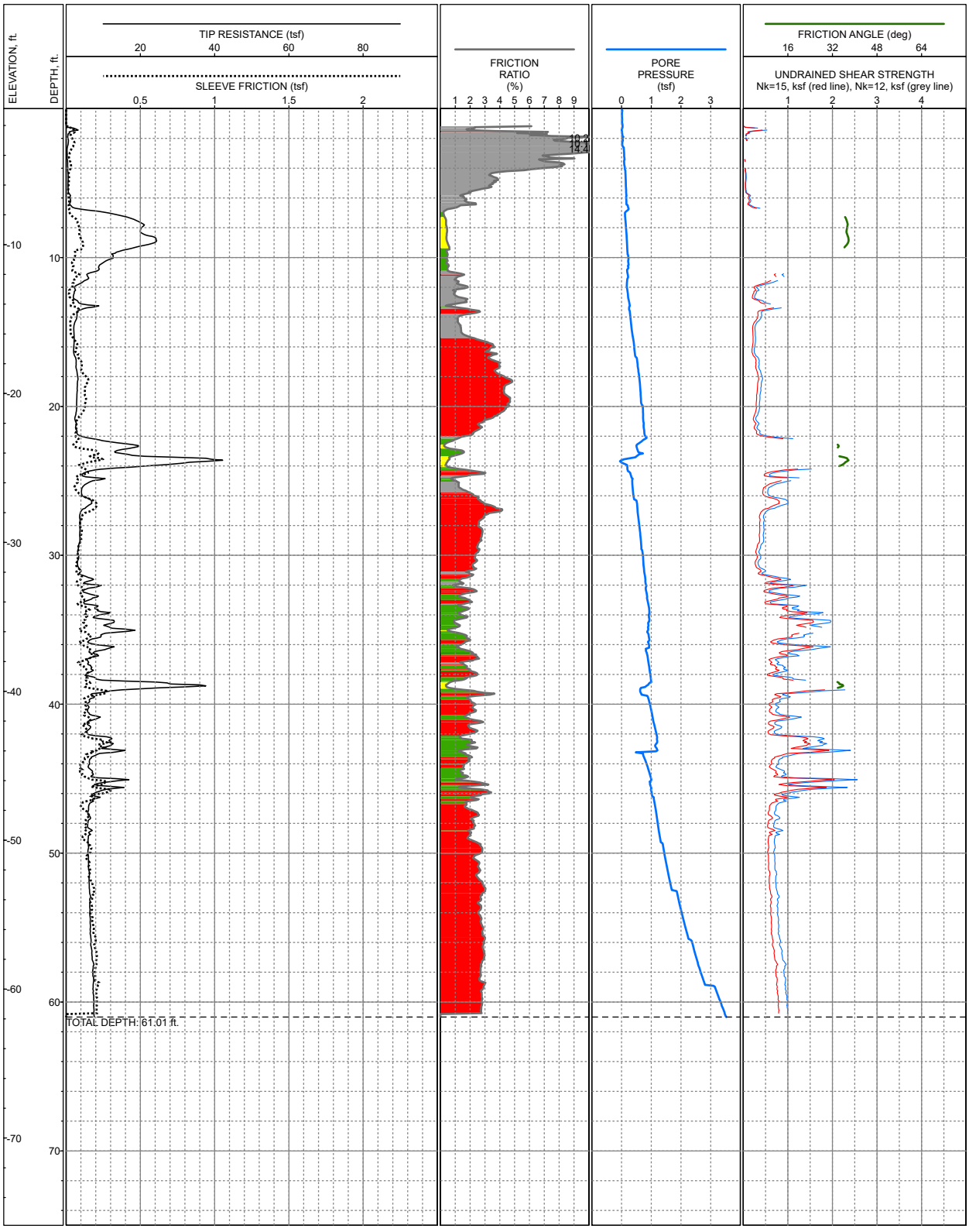
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-03

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-3

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,414,046, N: 317,944, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.9ft +/- NAVD88
COMPLETION DEPTH: 61.01ft
TESTDATE: 4/17/2018

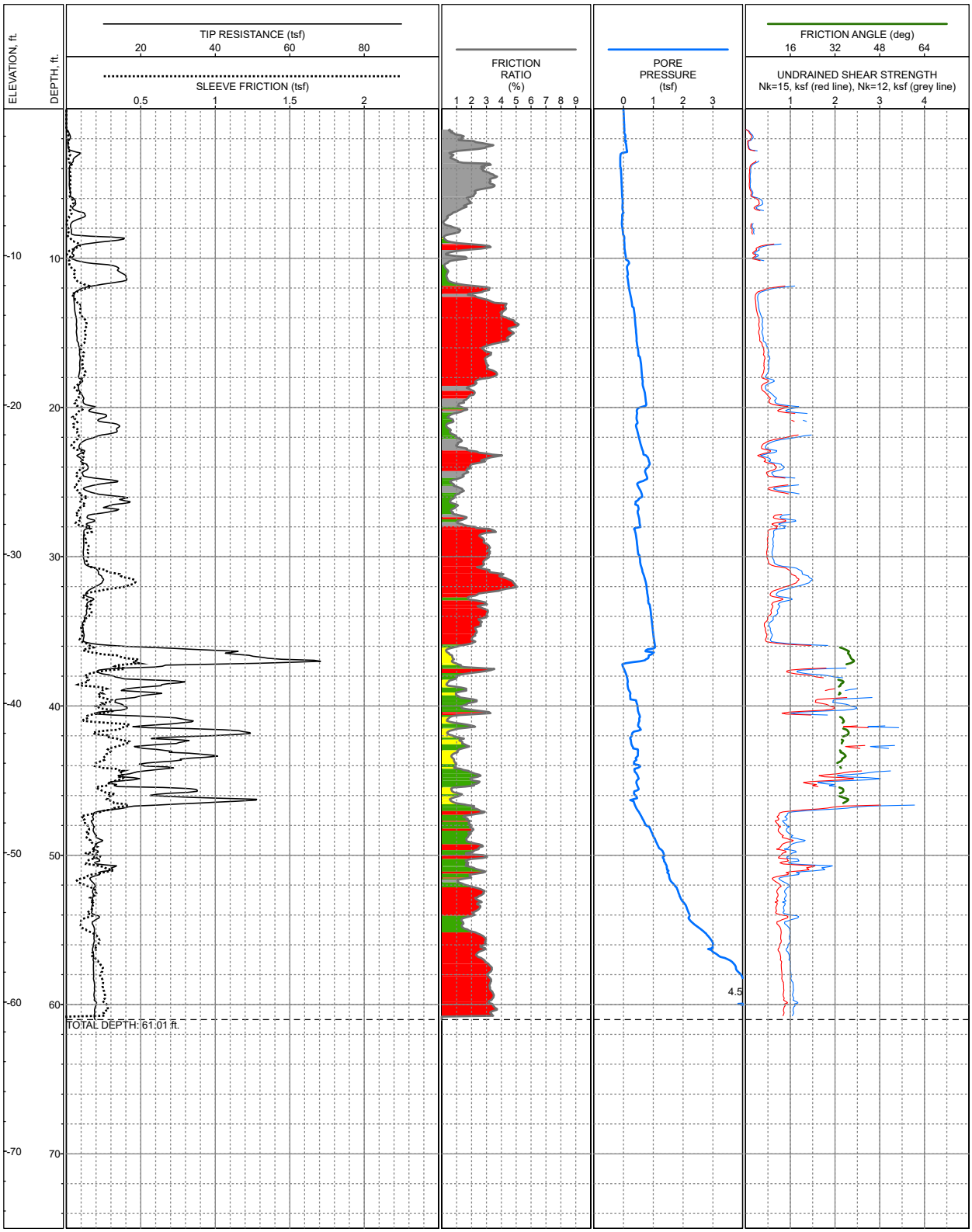
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-04

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-4

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,412,839, N: 317,088, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.2ft +/- NAVD88
COMPLETION DEPTH: 61.01ft
TESTDATE: 4/18/2018

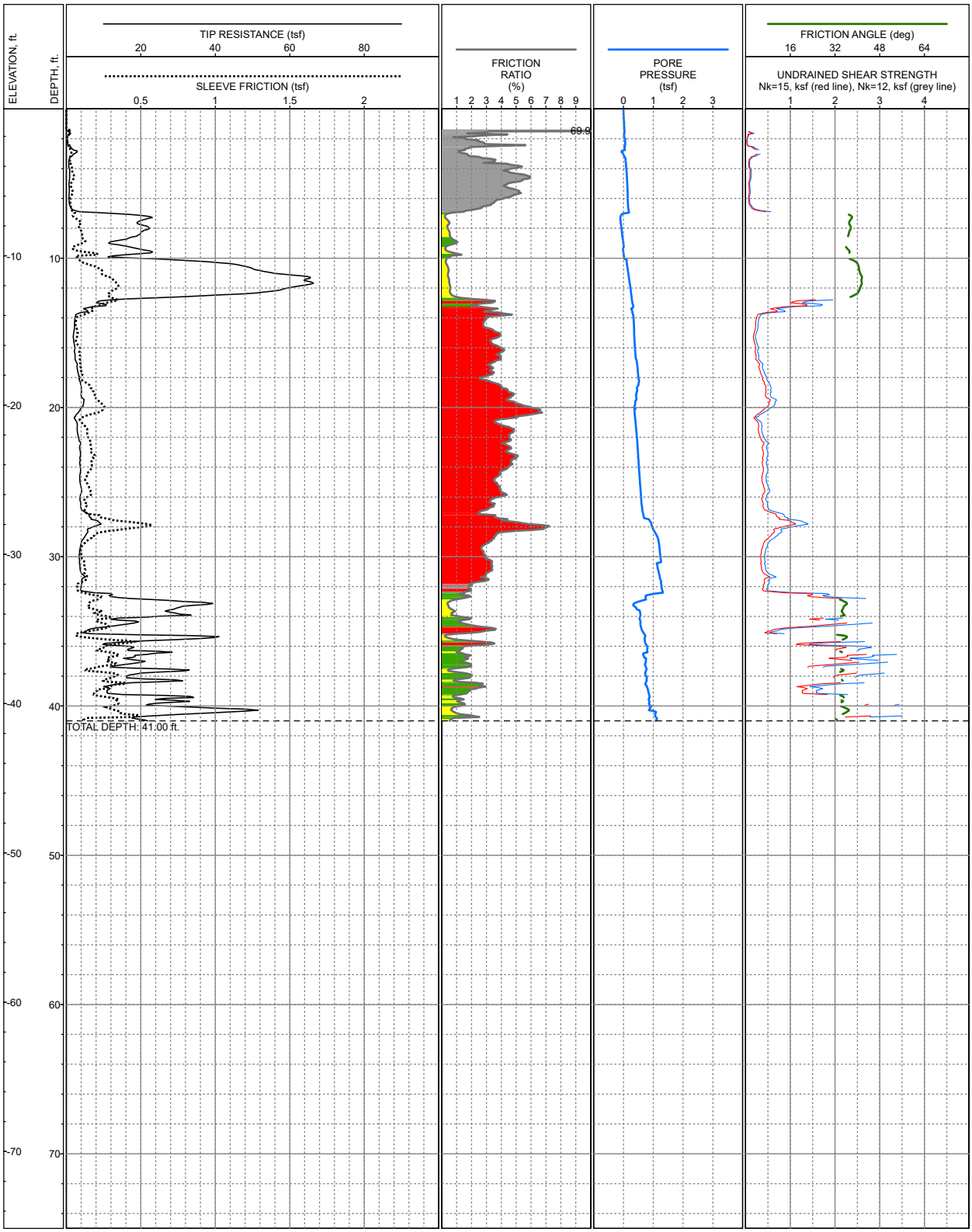
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-05

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-5

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,411,479, N: 316,169, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.2ft +/- NAVD88
COMPLETION DEPTH: 41.00ft
TESTDATE: 4/18/2018

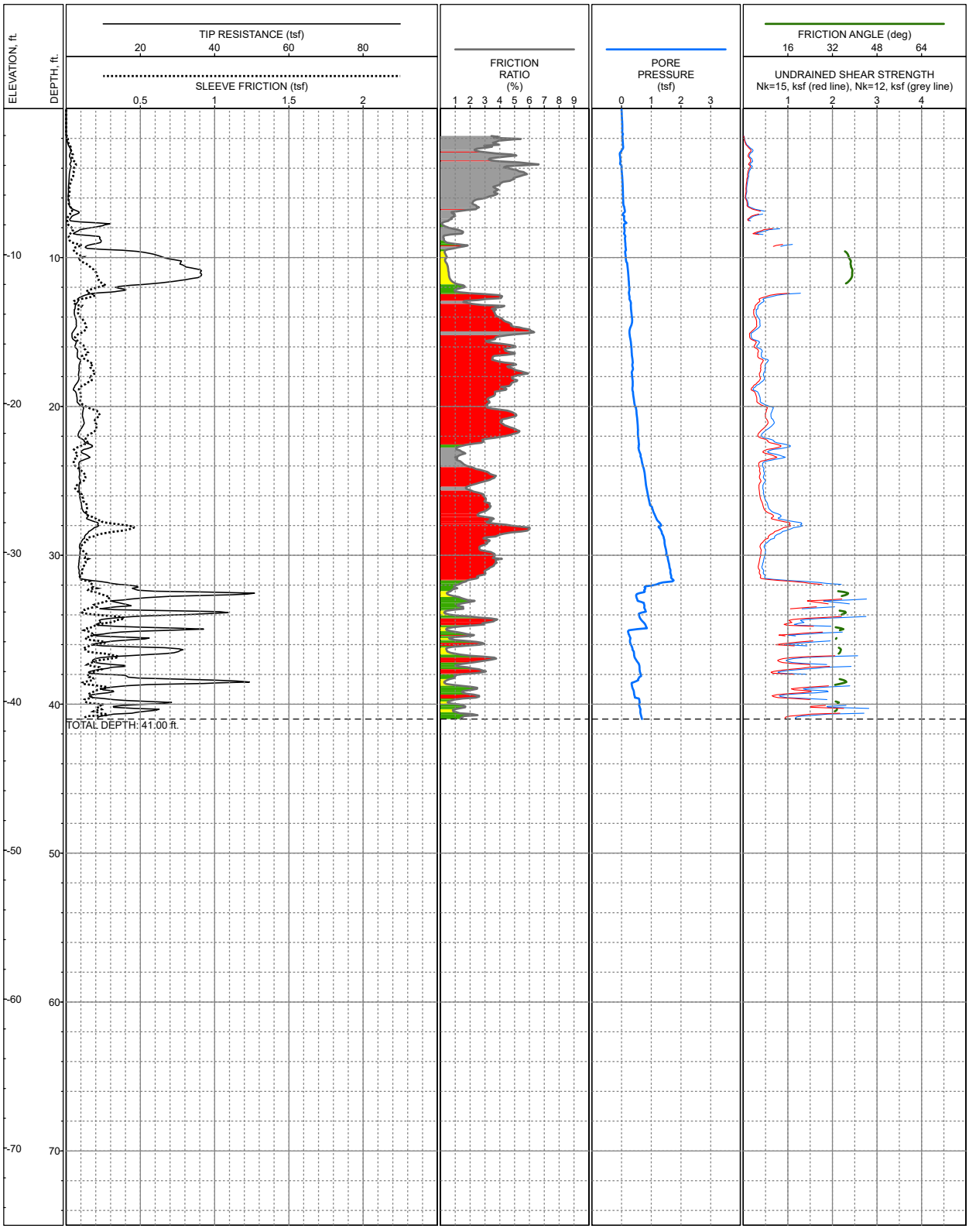
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-06

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-6

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,410,664, N: 315,321, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.2ft +/- NAVD88
COMPLETION DEPTH: 41.00ft
TESTDATE: 4/18/2018

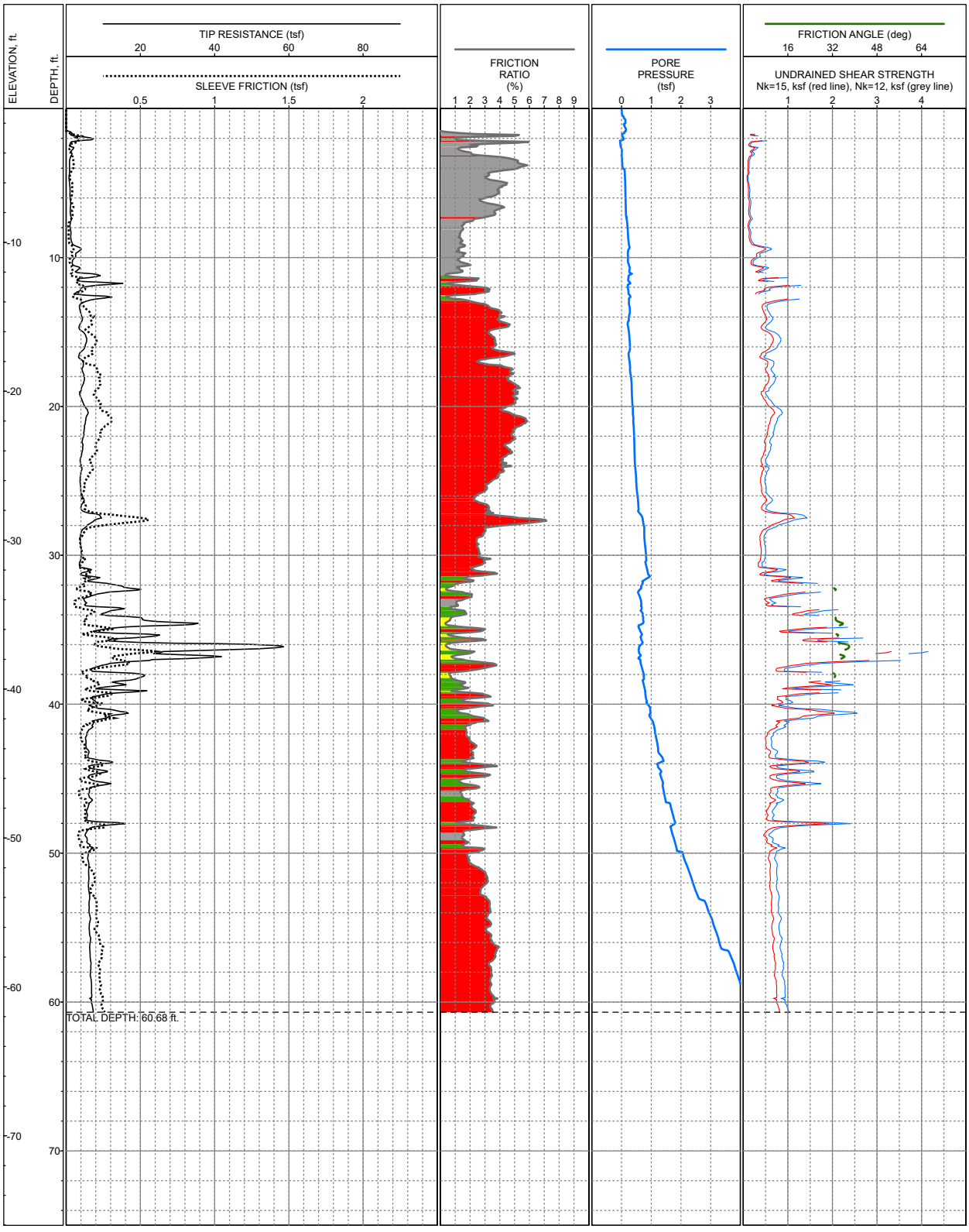
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-07

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-7

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,409,818, N: 314,929, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -1.0ft +/- NAVD88
COMPLETION DEPTH: 60.68ft
TESTDATE: 4/18/2018

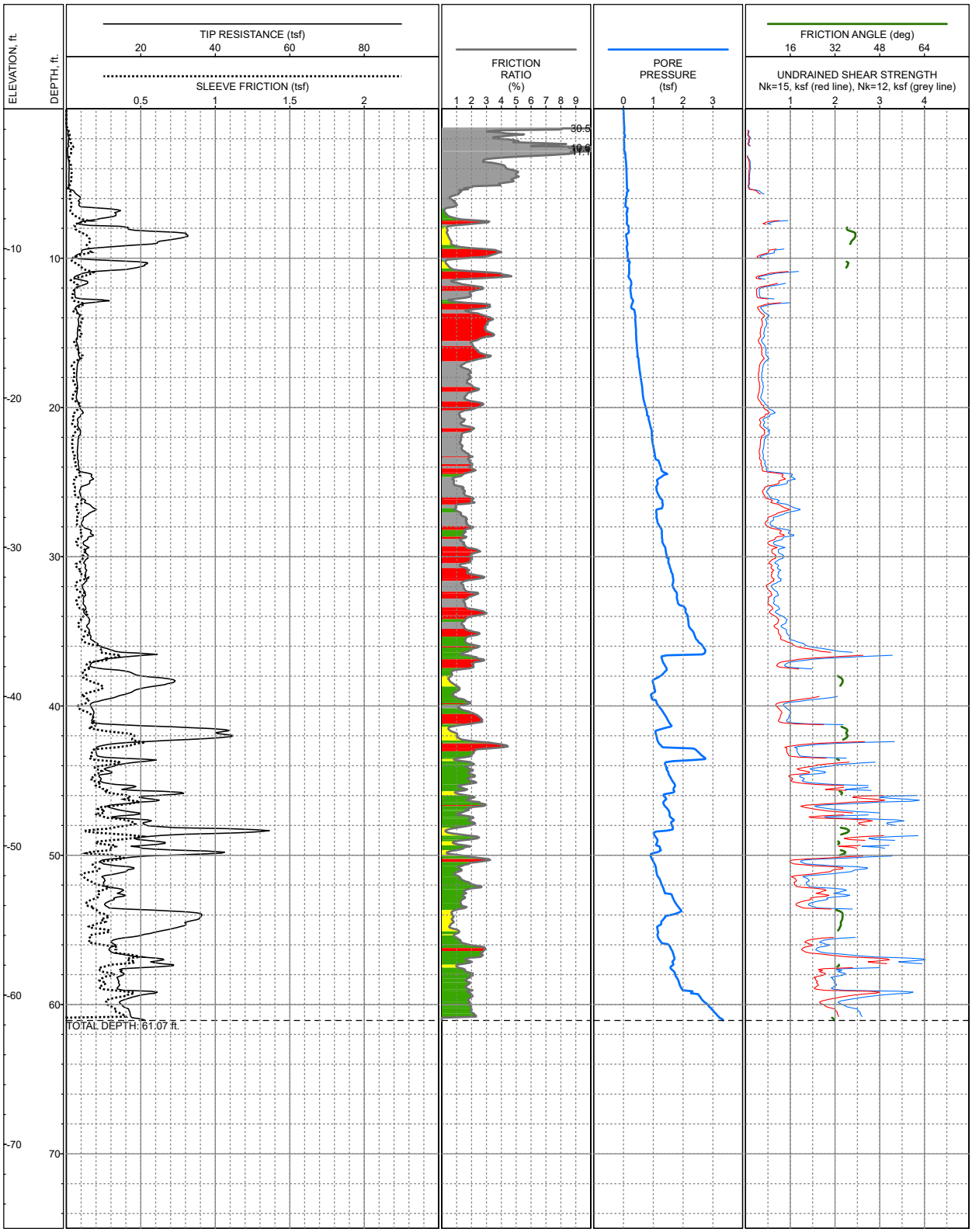
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-08

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-8

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,408,113, N: 314,914, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.6ft +/- NAVD88
COMPLETION DEPTH: 61.07ft
TESTDATE: 4/18/2018

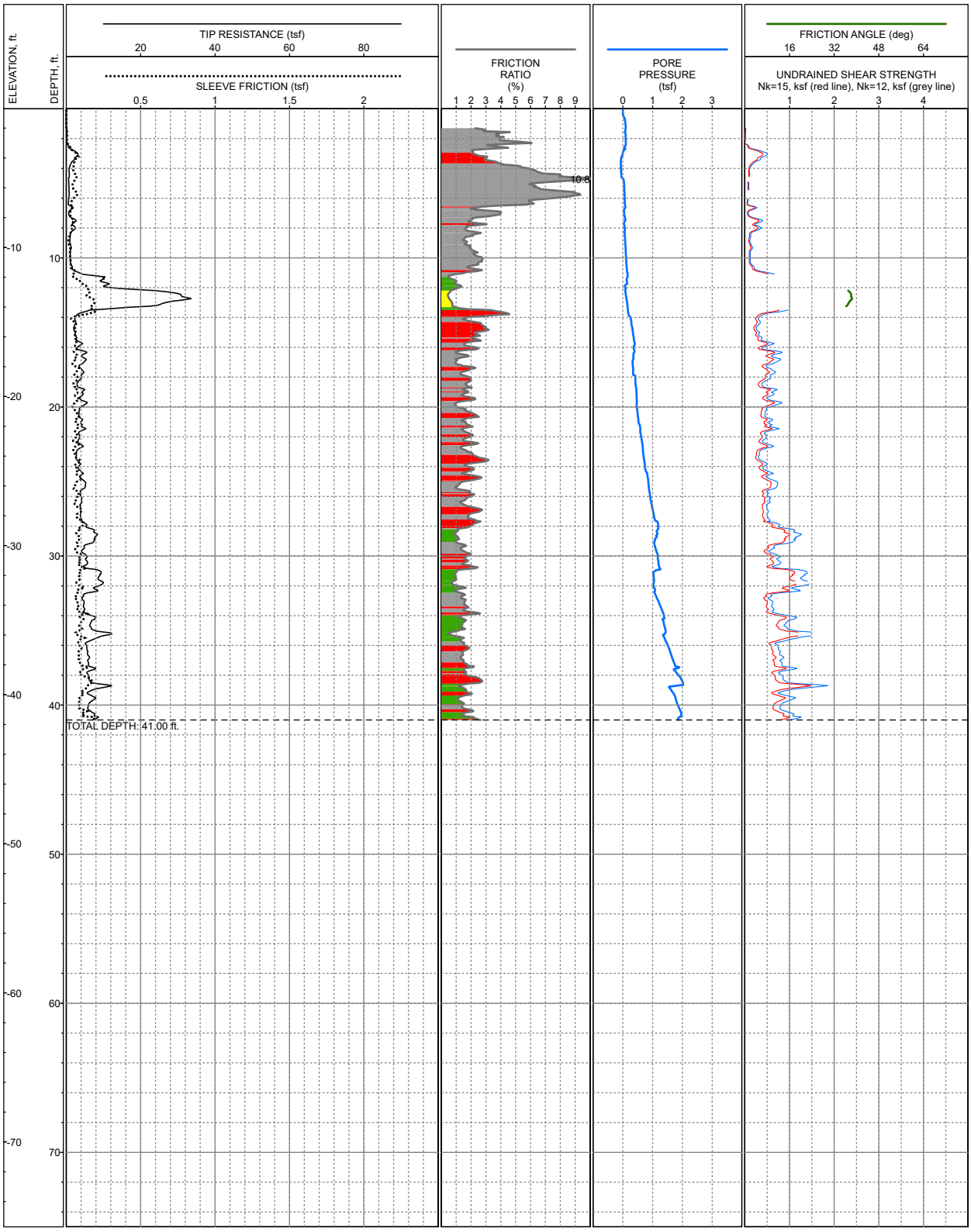
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-09

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-9

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,409,442, N: 315,930, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.7ft +/- NAVD88
COMPLETION DEPTH: 41.00ft
TESTDATE: 4/18/2018

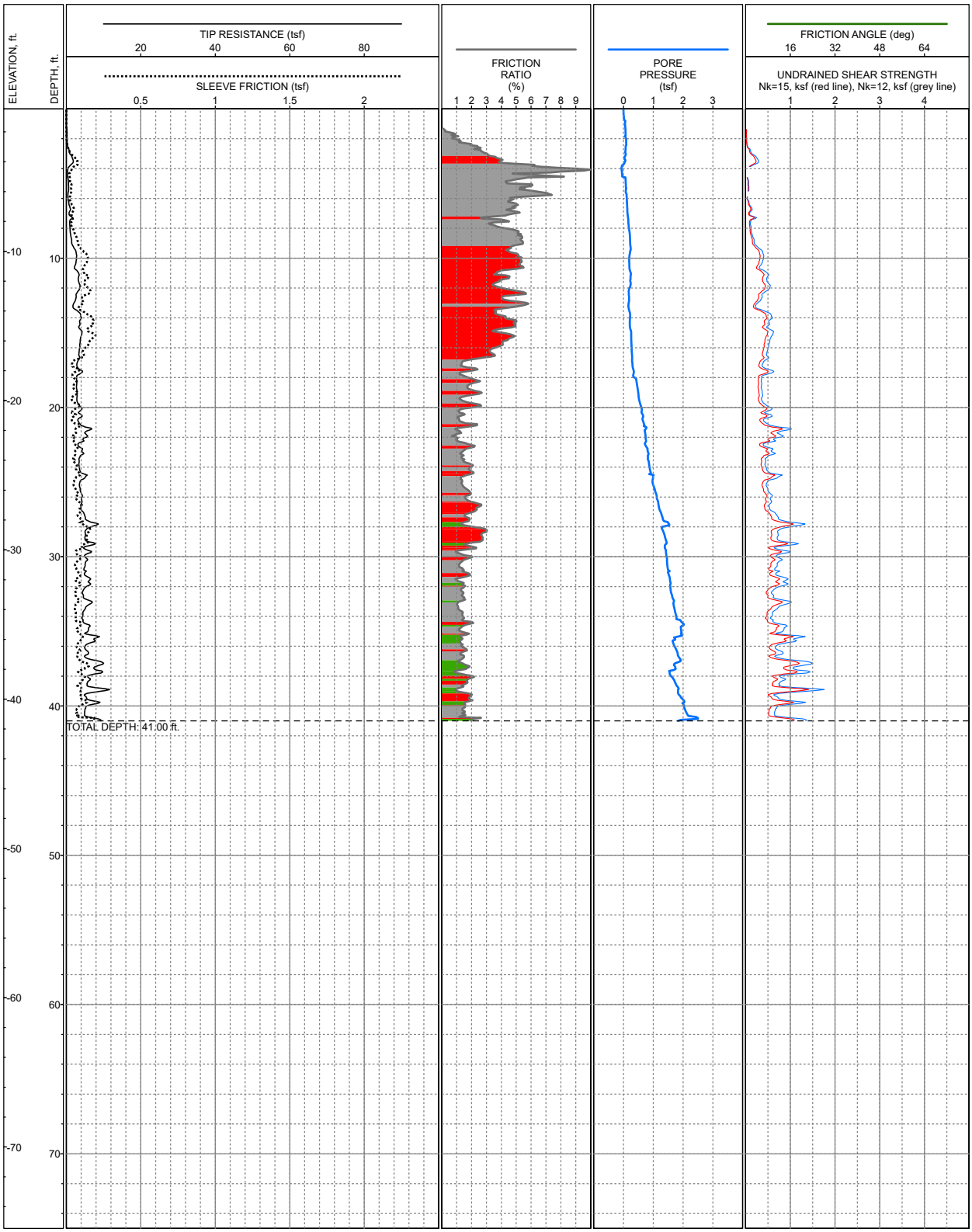
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-10

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-10

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,411,307, N: 318,073, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.5ft +/- NAVD88
COMPLETION DEPTH: 41.00ft
TESTDATE: 4/18/2018

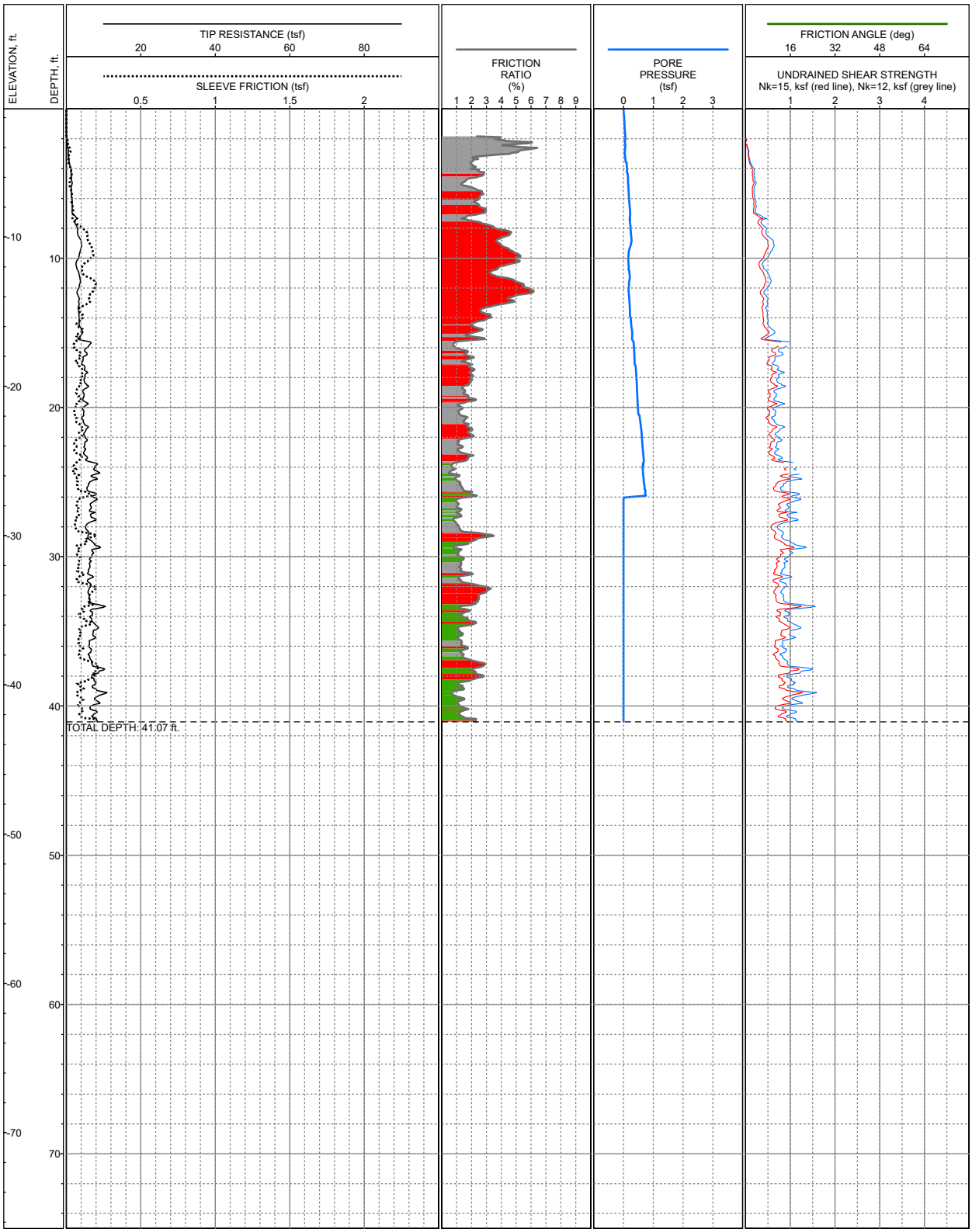
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-11

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-11

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,412,177, N: 319,390, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -1.4ft +/- NAVD88
COMPLETION DEPTH: 41.07ft
TESTDATE: 4/20/2018

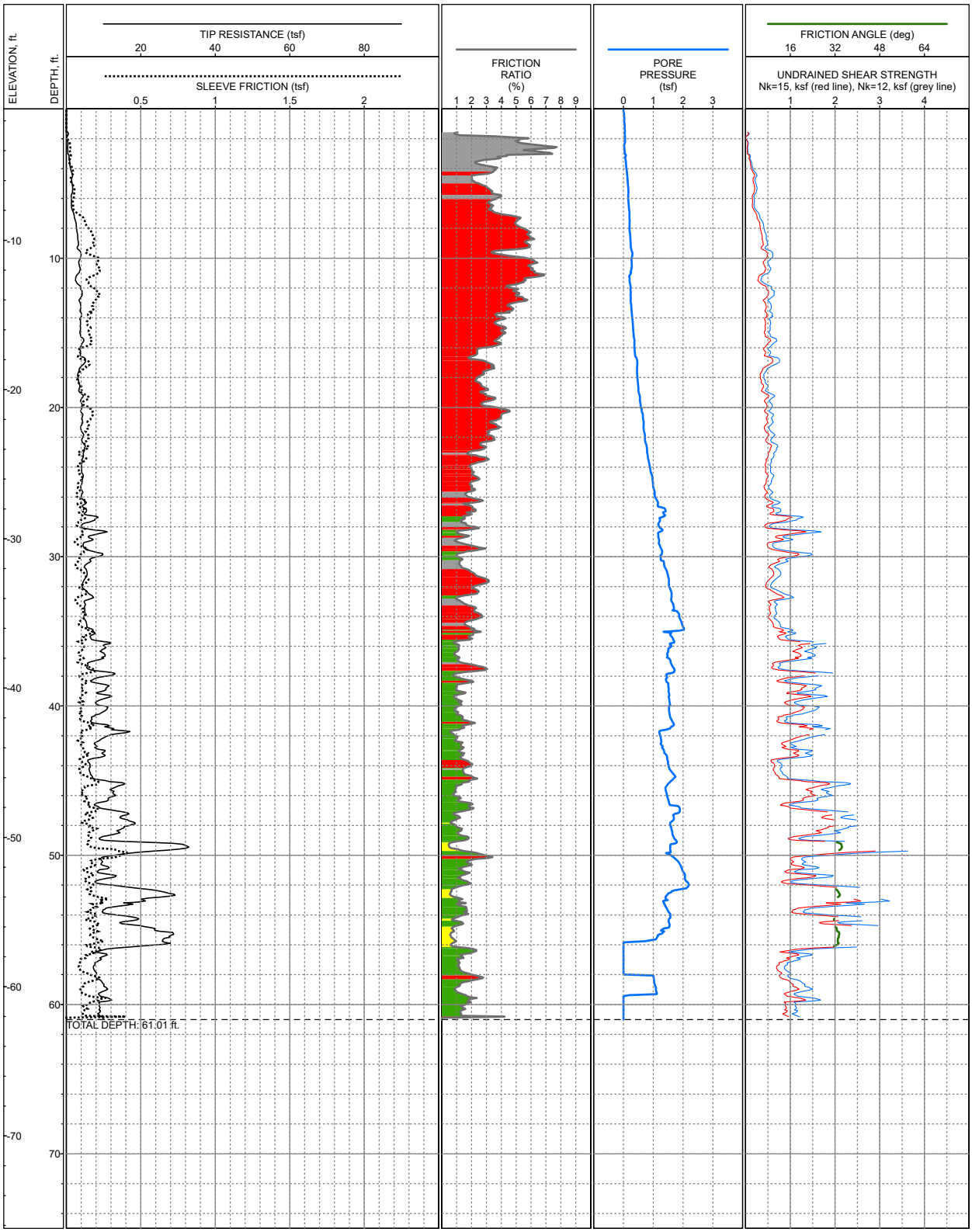
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-12

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-12

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,412,671, N: 320,575, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -1.2ft +/- NAVD88
COMPLETION DEPTH: 61.01ft
TESTDATE: 4/20/2018

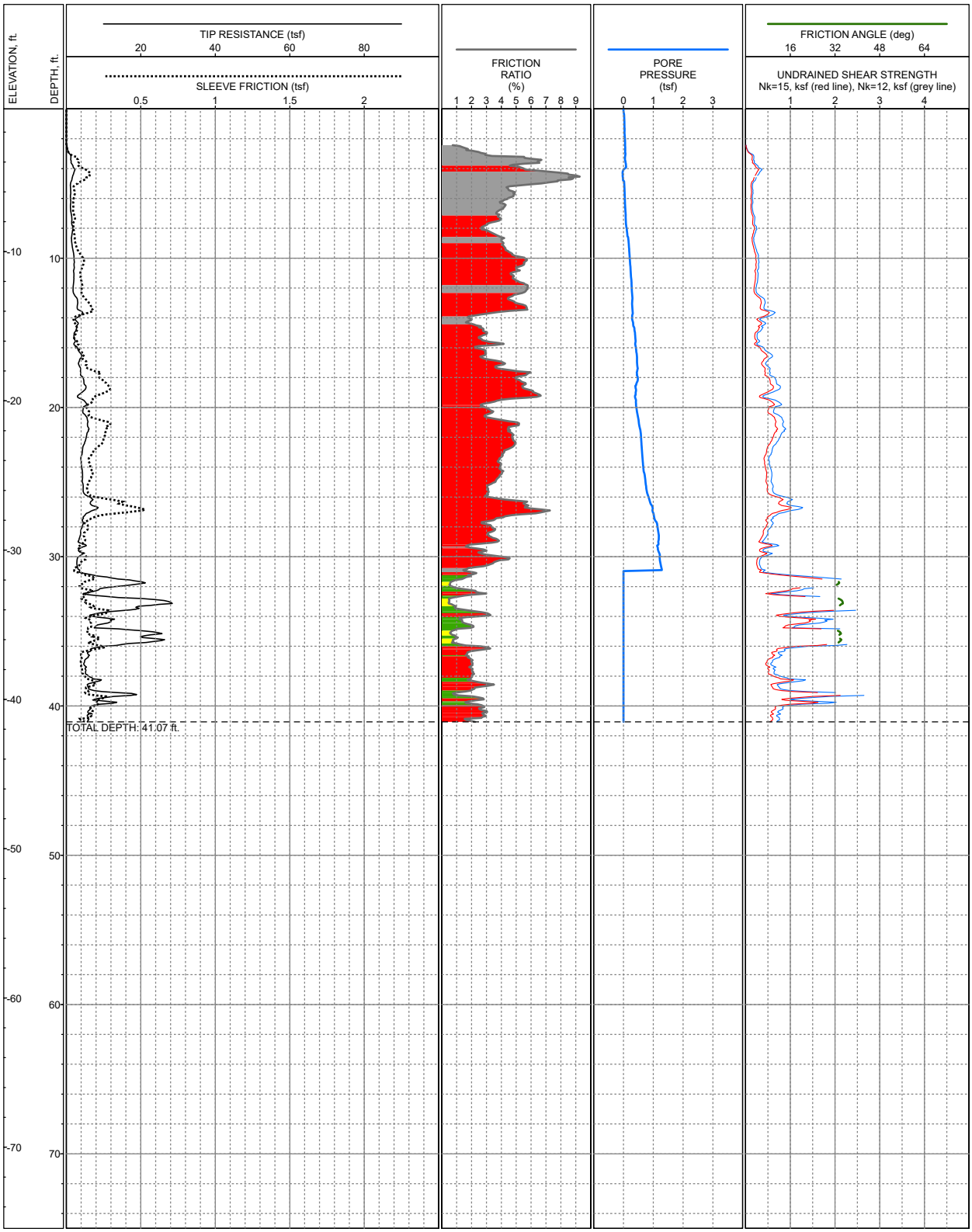
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-13

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-13

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,415,363, N: 322,586, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -0.4ft +/- NAVD88
COMPLETION DEPTH: 41.07ft
TESTDATE: 4/20/2018

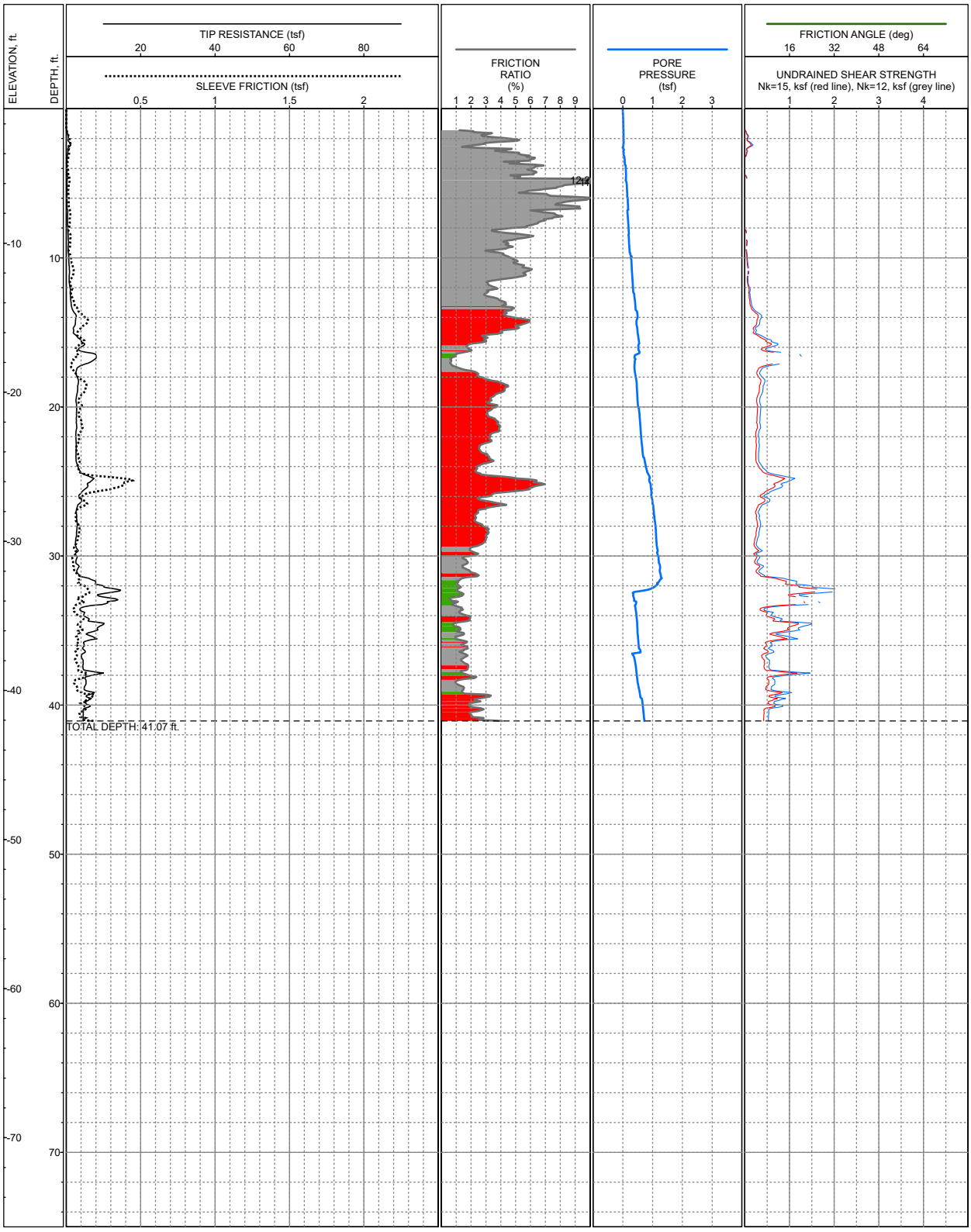
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-14

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-14

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



LOCATION: E: 3,416,770, N: 323,056, Louisiana State Plane South, NAD83, Feet
SURFACE EL: -1.0ft +/- NAVD88
COMPLETION DEPTH: 41.07ft
TESTDATE: 4/18/2018

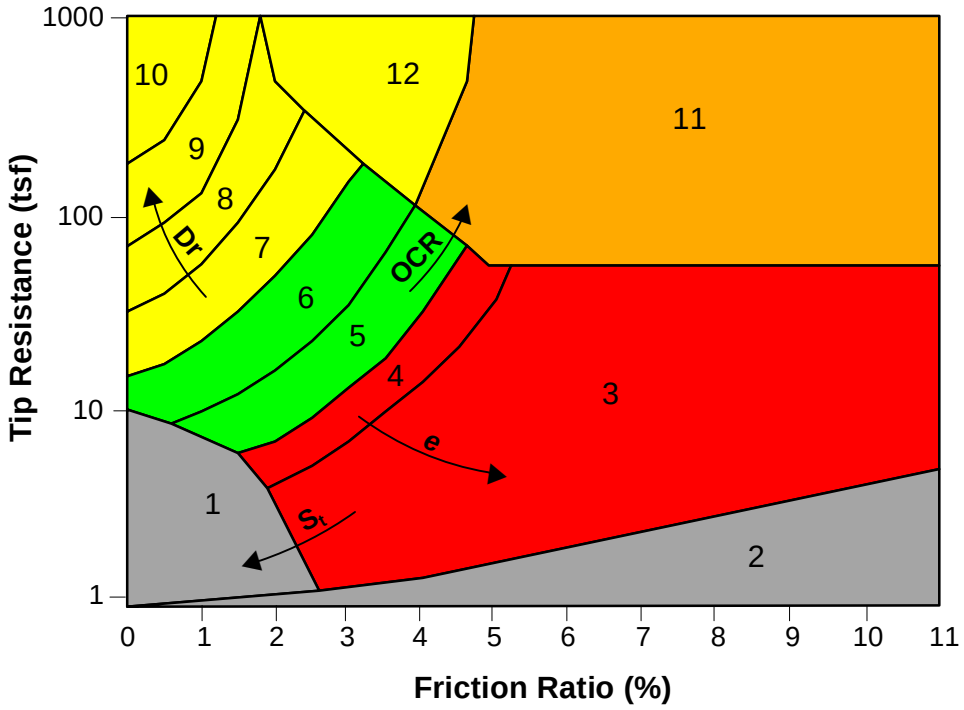
EXPLORATION METHOD: Cone Penetrometer
PERFORMED BY: Fugro
REVIEWED BY: S. Bryant
CONE AREA RATIO: 0.59

LOG OF: CPT-15

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

PLATE A-15

N:\Projects\02_2017\04_5517_4066_Bayou_De_Cade\Explorations\CPT\2018\Logs\Eng_Logs\MXD\CPT_Log.6/7/2018.w.cupples



Zone	Soil Behavior Type	U.S.C.S.
1	Sensitive Fine-grained	OL-CH
2	Organic Material	OL-OH
3	Clay	CH
4	Silty Clay to Clay	CL-CH
5	Clayey Silt to Silty Clay	MH-CL
6	Sandy Silt to Clayey Silt	ML-MH
7	Silty Sand to Sandy Silt	SM-ML
8	Sand to Silty Sand	SM-SP
9	Sand	SW-SP
10	Gravelly Sand to Sand	SW-GW
11	Very Stiff Fine-grained *	CH-CL
12	Sand to Clayey Sand *	SC-SM

*overconsolidated or cemented

SBT CORRELATION CHART
(Robertson and Campanella, 1988)

KEY TO CPT LOGS

Bayou Decade Marsh Creation
and Ridge Restoration
Terrebonne Parish, Louisiana

LOCATION: See Plate 1

COORDINATES: N 29° 22' 48.77"
W 90° 54' 19.56"

SURFACE EL.: -0.8'

DEPTH, FT	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
		SILTY SAND (SM), dark gray, with clay seams and shells	1.0			30	37	22	15
		LEAN CLAY WITH SAND (CL), soft, gray - very soft, with shells at 2' - with a 1' layer of SILTY SAND at 3' - with organics below 3'			74	33			
5		firm below 4'	5.5			28	35	19	16
	N=25	**SILTY SAND (SM)**, dark gray, with organics, and clay partings and pockets - with a 1" peat seam at 6' - medium-dense, gray below 8'				23 21			
10	N=20	**SANDY LEAN CLAY (CL)**, very stiff, gray	10.3			24			
		LEAN CLAY (CL), very soft, gray, with shells	12.0			26			
15	N=13	- stiff below 16'				27	43	21	22
		FAT CLAY (CH), very soft to soft, gray, with sand pockets, organics, and shells	18.0	79		44			
20		**ORGANIC CLAY (OH)**, firm, black and gray, with few peat pockets and seams	23.0			116	126	34	92
25		**PEAT (PT)**, firm, black	28.0			321	473	321	152
30		**FAT CLAY (CH)**, soft to firm, gray - with sand lenses and pockets at 33'	33.0	80		41			
35		- with sand partings at 38'		69		59			
40		- with sand lenses at 43'				57			

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 26, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-01

Project No. 04.55174066

PLATE A-17a

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 48.77"
W 90° 54' 19.56"

SURFACE EL.: -0.8'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	CLASSIFICATION: UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
50	**FAT CLAY (CH)**, soft to firm, gray - with few sand pockets at 48'				59	82	27	55
55			60		67			
60	- with shell traces and shell fragments below 58'	60.0			37	96	27	69
65								
70								
75								
80								
85								

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 26, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-01

Project No. 04.55174066

PLATE A-17b

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 24.77"
W 90° 54' 54.11"

SURFACE EL.: -0.9'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	BLOWS PER FOOT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	LEAN CLAY (CL), very soft, dark gray, with peat pockets, sand pockets and roots					67			
						36	39	23	16
	SANDY LEAN CLAY (CL), soft to firm, dark gray, with roots	4.0			60	28			
	SILTY SAND (SM), loose, gray	6.0	N=7			32			
			N=9		33	34			
	- very loose below 10.5'		N=3			32			
	- with clay pockets below 12'		N=2						
	FAT CLAY (CH), very soft, gray	13.5							
	- gray and dark gray, with organics from 14' to 18'					74	121	36	85
	- firm at 16'					76			
	- soft at 18'								
	- with 2" sand layer at 18'			59		67			
	LEAN CLAY (CL), soft to very soft, gray	24.0				163	39	19	20
	-with an organic layer at 24'								
	- with peat layers at 28'			75		29			
	- with a 2" sand layer at 30'								
	SILT (ML), gray, with clay seams	33.0				34			
					99	41			
	LEAN CLAY (CL), firm, gray, with sand layers	43.0				48	34	20	14

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 27, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-02

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-18a

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 24.77"
W 90° 54' 54.11"

SURFACE EL.: -0.9'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	LEAN CLAY (CL), firm, gray, with sand layers							
		48.0						
50	**FAT CLAY (CH)**, soft, gray - with some sand layers at 48'		68		57			
55	- firm below 53'				66			
					73	100	28	72
60		60.0						
65								
70								
75								
80								
85								

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 27, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-02

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-18b

LOCATION: See Plate 1

COORDINATES: N 29° 21' 48.14"
W 90° 55' 56.36"

SURFACE EL.: -2.2'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					FAT CLAY (CH), gray, with peat and organics				65			
					- with shells at 0'				31			
				N=4	**SILTY SAND (SM)**, very loose, gray	4.0						
5					- with clay pockets and wood at 4'							
				N=3				19	11			
				N=17	- medium-dense below 8'							
10				N=21				17	29			
					LEAN CLAY (CL), soft to firm, gray	12.0	86		39			
15									86	39	18	21
					- with organic traces at 16'		54		81			
					- with peat layers at 18'				65			
20												
					ORGANIC CLAY (OH), brown and gray, with peat	23.0						
					FAT CLAY (CH), soft, gray, with silt pockets and organics	24.2	58		69			
25												
					SILT (ML), gray, with clay and sand seams	28.0		87	28			
30												
					FAT CLAY (CH), very soft, gray	33.0		91	39			
35												
					- soft at 38'							
					- with sand layers from 38' to 43'		71		53			
40												

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 3, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-03

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-19a

LOCATION: See Plate 1

COORDINATES: N 29° 21' 48.14"
W 90° 55' 56.36"

SURFACE EL.: -2.2'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
50	**FAT CLAY (CH)**, very soft, gray							
	- firm, with few sand partings and trace organics at 48'		69		60			
55	- soft at 53'					83	26	57
	- firm below 58'		59		70			
60		60.0						
65								
70								
75								
80								
85								

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 3, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-03

Project No. 04.55174066

PLATE A-19b

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 26.38"
W 90° 55' 25.32"

SURFACE EL.: -0.5'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FAT CLAY (CH), very soft, dark gray and gray				59	127	34	93
	- with peat layers at 0'							
	- with organics from 2' to 8'				54			
	- gray, with peat layers at 4'				50	60	18	42
	- soft, brown and gray, with silt pockets at 6'		85		41			
	- gray below 8'				52			
					34			
	- with silt lenses and partings below 12'		87		33			
					35			
	- soft, with organic traces below 16'				37			
	LEAN CLAY (CL), soft, gray	18.0			34			
	FAT CLAY (CH), very soft, gray	23.0	84		38			
	LEAN CLAY (CL), very soft, gray, with silt and sand pockets	28.0				30	20	10
	- soft below 33'		79		45			
	LEAN CLAY WITH SAND (CL), gray	38.0						
	SILTY SAND (SM), gray	39.5						
		40.0						

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 3, 2018
TOTAL DEPTH: 40.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 40'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-04

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-20

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 56"
W 90° 54' 34.17"

SURFACE EL.: -2.5'

DEPTH, FT	WATER LEVEL SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
				FAT CLAY (CH), very soft to firm, dark gray				60	55	18	37
				- with a 2" organic clay layer at 2'		71		52			
5				- with roots below 4'				45	65	20	45
				LEAN CLAY (CL), soft, gray	6.0			32			
				- with roots at 6'							
				- with sand pockets at 7'		87		33			
				- firm at 8'							
10				- very soft, with sand layers and ferrous nodules at 10'			95	37			
			N=22	- very stiff, with organics at 12.5'				46	36	20	16
				- with silt pockets from 12.5' to 18'							
15						72		52			
				- with wood at 16'				35			
			N=Push	- very soft, with sand pockets at 18'				32	31	22	9
20											
				- firm, with wood and silt pockets below 23'		89		33			
25											
				PEAT (PT), gray	29.0			231			
30											
			N=Push	**LEAN CLAY (CL)**, soft, gray	33.0			36	32	19	13
35											
				- soft, with silt pockets below 38'				42			
40					40.0						

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 28, 2018
TOTAL DEPTH: 40.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 40'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-05

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-21

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 57.4"
W 90° 54' 46.95"

SURFACE EL.: -6.1'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	BLOWS PER FOOT
	LEAN CLAY (CL), very soft to soft, gray				36	42	23	19	
	- with an organic clay layer at 8"				47				
5	- with silt pockets and roots at 4'		88		35				
	- firm from 6.5' to 10'					41	17	24	N=8
	- with silt pockets at 8'		81		43				
10					40				
					66	47	18	29	
	- with silt pockets at 14'		63		66				
15	- with siltstone and roots at 16'				52				
	- firm, with silt pockets below 18'				62	36	19	17	
20		23.0							
	ORGANIC CLAY (OH), firm, dark gray				111				
25									
	- with a clay layer at 28'				31	216	49	167	
30	- with an organic layer at 29.5'								
	SILT (ML), gray, with clay pockets and laminations	33.0			38				
35									
	FAT CLAY (CH), firm, gray, with silt	38.0	73		52				
40	- with silt laminations at 38'								
					53				

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 30, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-06

Project No. 04.55174066

PLATE A-22a

LOCATION: See Plate 1

COORDINATES: N 29° 22' 57.4"
W 90° 54' 46.95"

SURFACE EL.: -6.1'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	CLASSIFICATION: UNIT DRY WT, PCF	CLASSIFICATION: PASSING NO. 200 SIEVE, %	CLASSIFICATION: WATER CONTENT, %	CLASSIFICATION: LIQUID LIMIT	CLASSIFICATION: PLASTIC LIMIT	CLASSIFICATION: PLASTICITY INDEX (PI)
50				N=2	**FAT CLAY (CH)**, firm, gray, with silt - soft at 45' - soft to firm, with silt pockets at 48'		61		67			
55										98	30	68
60					- with shells below 58'	60.0			52			
65												
70												
75												
80												
85												

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 30, 2018
TOTAL DEPTH: 60.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 60'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-06

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-22b

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 56.36"
W 90° 55' 00.18"

SURFACE EL.: -1.0'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FAT CLAY (CH), very soft, gray, with silt pockets		66		59			
	- with a 4" organic clay layer with peat at 0'				45			
	- with organics from 0.25' to 12'				42	63	20	43
	- firm from 2' to 12'				38			
			91		32			
					41	41	20	21
	- soft at 12'				45			
	- firm of 14'				34			
	- soft below 16'		90		35			
					50			
	LEAN CLAY (CL), soft to firm, gray, with some sand pockets	23.0				43	21	22
	FAT CLAY (CH), soft, gray	28.0	56		74			
	- with organics at 28'							
	- with silt and sand seams at 33'							
	SILT (ML), gray, with sand pockets and clay seams	38.0		92	31			
		40.0						

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 30, 2018
TOTAL DEPTH: 40.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 40'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-07

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-23

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 22' 17.61"
W 90° 55' 11.02"

SURFACE EL.: -2.0'

DEPTH, FT	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
		SANDY SILT (ML), gray, with clay layers			59	12			
		- with organics at 0'				27	23	21	2
5	N=22	**SILTY SAND (SM)**, medium-dense, gray, with clay pockets	4.0		29	31			
	N=20	**FAT CLAY (CH)**, soft to firm, gray	6.8						
		- with a 3-inch layer of silt at 8'				45	56	19	37
10		- with a 2-inch sand layer and shells at 10'		86		38			
		LEAN CLAY (CL), firm, gray	12.0			38			
		- with trace sand pockets at 12'							
		- soft at 14'				35	43	20	23
15		- very soft below 16'				38			
		FAT CLAY (CH), soft, gray, with organics	18.0	80		43			
		- with a 1" silt layer at 18'							
20									
							80	26	54
25									
				60		73			
30									
		- with a 6-inch peat layer at 33'							
		- with a 4-inch silt layer at 35.5'							
35									
		SILT (ML), gray	38.0				23	21	2
40		- with a 3-inch peat and organic layer at 38'	40.0						

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 4, 2018
TOTAL DEPTH: 40.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 40'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-08

Project No. 04.55174066

PLATE A-24

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 21' 56.94"
W 90° 55' 47.05"

SURFACE EL.: -1.4'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	BLOWS PER FOOT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	PEAT (PT), gray	0.5				44	82	24	58
	FAT CLAY (CH), very soft, gray, with organics	2.0							
	SILTY SAND (SM), very loose, gray, with clay pockets					20			
5			N=2/12"		33	14			
			N=Push						
		8.0	N=9				47	22	25
10	**LEAN CLAY (CL)**, firm, gray								
	- very soft at 10'					31	46	21	25
	- soft below 12'			88		39			
	FAT CLAY (CH), firm, gray	14.0				49			
15						53	62	24	38
	- soft below 18'			75		48			
20									
				65		60			
25									
30	- with a 4" peat layer at 29.5'								
	- with a 1" peat layer at 33'			91		35			
35									
	SANDY LEAN CLAY (CL), soft, gray, with silt seams	38.0							
40		40.0							

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT
0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 30, 2018
TOTAL DEPTH: 40.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 40'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-09

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-25

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 23' 01.59"
W 90° 53' 33.96"

SURFACE EL.: -4.3'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	BLOWS PER FOOT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	LEAN CLAY WITH SAND (CL), very soft, gray					31			
	SILTY SAND (SM), gray, with clay pockets	2.0			50	28			
5	- loose below 4'		N=7						
	SANDY SILT (ML), loose, gray, with clay pockets	6.0	N=5				25	24	1
						61			
10	**FAT CLAY (CH)**, soft, gray, with wood and organics	9.0				111	81	27	54
	SILTY SAND (SM), gray, with clay pockets and shells	12.3				30			
15	**FAT CLAY (CH)**, soft, dark gray, with sand seams	14.0				113			
		16.0							
20									
25									
30									
35									
40									

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 2, 2018
TOTAL DEPTH: 16.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 16'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-10

Project No. 04.55174066

PLATE A-26

LOCATION: See Plate 1

COORDINATES: N 29° 23' 06.77"
W 90° 53' 10.61"

SURFACE EL.: -4.6'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FAT CLAY (CH), very soft to soft, gray				86			
	- with shells from 0' to 0.5'							
	- with wood from 0.5' to 1.2'							
	- with sand from 1.2' to 1.8'			83	26			
	- with 1' LEAN CLAY with SAND, gray at 3'							
	- with peat at 4'				85	84	25	59
5	- with sand traces at 6'				64			
					74			
10	- with wood and sand traces at 10'				63			
	- with sand seams at 12'				62	56	20	36
15		16.0			61			
20								
25								
30								
35								
40								

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 2, 2018
TOTAL DEPTH: 16.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 16'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

LOG OF BORING NO. B-11

Project No. 04.55174066

PLATE A-27

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 23' 24.77"
W 90° 53' 10.51"

SURFACE EL.: -6.6'

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
					FAT CLAY (CH), very soft, dark gray - with some shells at 0' - gray below 2'				82			
5									35	61	23	38
									32			
				N=6	**SILTY SAND (SM)**, loose, gray, with clay and wood	6.0		35	30			
					FAT CLAY (CH), gray	8.0						
					SANDY SILT (ML), medium-dense, gray, with clay pockets and peat layers	9.0			28			
10				N=13				53	32			
				N=8	**FAT CLAY (CH)**, firm to stiff, gray, with wood and organics	12.5						
						14.0						
15					**PEAT (PT)**, very soft to soft, black, with clay seams and an organic odor	16.0			386			
20												
25												
30												
35												
40												

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 2, 2018
TOTAL DEPTH: 16.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 16'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-12

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-28

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 23' 17.88"
W 90° 52' 54.71"

SURFACE EL.: -5.1'

DEPTH, FT	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
		SILT WITH SAND (ML), stiff, gray, with clay lenses and organics			84	25			
	N=9	**SILTY SAND (SM)**, loose, gray	2.0						
5	N=4	**LEAN CLAY (CL)**, very soft to soft, gray - with peat layers and sand layers at 5.5'	4.5		52	28			
		SHELLS	8.0						
		LEAN CLAY (CL), soft, gray, with organics	9.0			40			
10		**ORGANIC CLAY (OH)**, soft, gray	10.0			82	123	38	85
		- with wood below 12'				162			
		PEAT (PT), very soft to soft, black and brown, with clay layers, rootlets, and an organic odor	14.0			206			
15			16.0						
20									
25									
30									
35									
40									

CLASSIFICATION

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: April 2, 2018
TOTAL DEPTH: 16.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 16'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-13

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-29

LOCATION: See Plate 1

COORDINATES: N 29° 23' 37.93"
W 90° 52' 43.31"

SURFACE EL.: -4.8'

DEPTH, FT	WATER LEVEL SYMBOL	SAMPLES	BLOWS PER FOOT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
				FAT CLAY (CH), very soft, gray - with shells and roots at 0'				48			
								86	79	26	53
5							99	53			
			N=Push	- with a sand seam at 7' - with a 0.5" silt seam and shells at 8'							
								93			
10								144			
				ORGANIC CLAY (OH), very soft, dark gray	12.0			185	165	47	118
				- with wood and peat below 14'							
15								170			
					16.0						
20											
25											
30											
35											
40											

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 28, 2018
TOTAL DEPTH: 16.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 16'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-14

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

Project No. 04.55174066

PLATE A-30

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

LOCATION: See Plate 1

COORDINATES: N 29° 23' 11.23"
W 90° 52' 43.43"

SURFACE EL.: -8.1'

DEPTH, FT	STRATUM DESCRIPTION	STRATUM DEPTH, FT	BLOWS PER FOOT	UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)
	FAT CLAY (CH), very soft, gray, with silt layers and shells					71			
	- with gravel and roots at 2'				93	40			
5	- with a 4" silty sand layer at 4.5'		N=4						
	- with ferrous nodules below 6'					103			
	FAT CLAY WITH SAND (CH), soft, gray	8.0			79	36			
10	**FAT CLAY (CH)**, very soft, gray	10.0				102			
						71	87	28	59
15									
						64			
		18.0							
20									
25									
30									
35									
40									

SHEAR STRENGTH

□ Penetrometer ▼ Unconfined
◇ Torvane ● Triaxial
△ Hand Vane ▲ Miniature Vane

KIPS PER SQ FT

0.5 1.0 1.5 2.0 2.5

NOTES:

1. Terms and symbols defined on Plates A-32a and A-32b.

COMPLETION DATE: March 28, 2018
TOTAL DEPTH: 18.0'
CAVED DEPTH: Not Applicable
DRY AUGER: Not Applicable
WET ROTARY: 0' to 18'
BACKFILL: Cement-Bentonite Grout
LOGGER: R. Fasone
DRILL RIG: ABDU-38
HAMMER TYPE: Manual

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

LOG OF BORING NO. B-15

(TE-0138, Task 1)

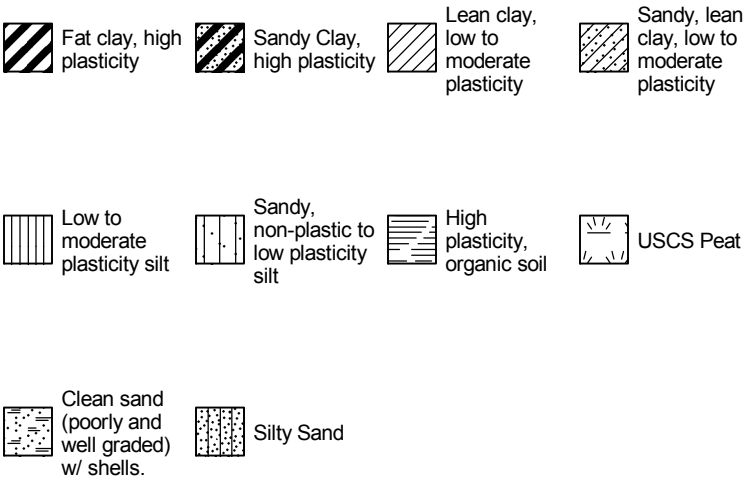
Terrebonne Parish, Louisiana

Project No. 04.55174066

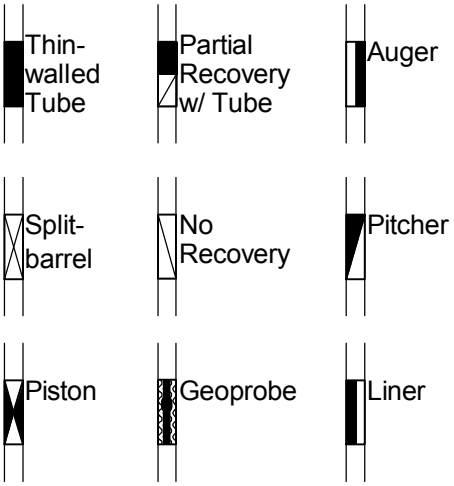
PLATE A-31

FCBR_LOG (FINAL) 2016 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/07/18

SOIL TYPES



SAMPLER TYPES

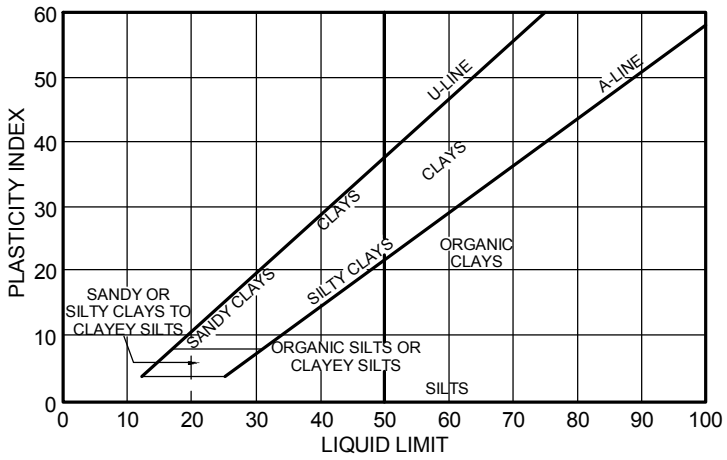


SOIL GRAIN SIZE

U.S. Standard Sieve

6"	3"	3/4"	4	10	40	200		
Boulders	Cobbles	Gravel		Sand			Silt	Clay
		Coarse	Fine	Coarse	Medium	Fine		
152	75.0	19.0	4.75	2.00	0.425	0.075	0.005	(mm)

PLASTICITY CHART



SOIL STRUCTURE

Slickensided	Having planes of weakness that appear slick and glossy.
Fissured	Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
Pocket	Inclusion of material of different texture that is smaller than the diameter of the sample.
Parting	Inclusion less than 1/8 inch thick extending through the sample.
Seam	Inclusion 1/8 inch to 3 inches thick extending through the sample.
Layer	Inclusion greater than 3 inches thick extending through the sample.
Laminated	Soil sample composed of alternating partings or seams of different soil type.
Interlayered	Soil sample composed of alternating layers of different soil type.
Intermixed	Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
Calcareous	Having appreciable quantities of carbonate.
Carbonate	Having more than 50% carbonate content.

FUGRO

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (1 of 2)

Project No. 04.55174066

PLATE A-32a

STANDARD PENETRATION TEST (SPT)

A 2-in.-OD, 1-3/8-ID split spoon sampler is driven 1.5 ft into undisturbed soil with a 140-pound hammer free falling 30 in. After the sampler is seated 6 in. into undisturbed soil, the number of blows required to drive the sampler the last 12 in. is the Standard Penetration Resistance or "N" value, which is recorded as blows per foot as described below.

SPLIT-BARREL SAMPLER DRIVING RECORD

Blows Per Foot	Description
25	25 blows drove sampler 12 inches, after initial 6 inches of seating.
50/7"	50 blows drove sampler 7 inches, after initial 6 inches of seating.
Ref/3"	50 blows drove sampler 3 inches during initial 6-inch seating interval.

NOTE: To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

DENSITY OF GRANULAR SOILS

Descriptive Term	*Relative Density, %	**Blows Per Foot (SPT)
Very Loose	< 15	0 to 4
Loose	15 to 35	5 to 10
Medium Dense	35 to 65	11 to 30
Dense	65 to 85	31 to 50
Very Dense	> 85	> 50

*Estimated from sampler driving record.

**Requires correction for depth, groundwater level, and grain size.

STRENGTH OF COHESIVE SOILS

Term	Undrained Shear Strength, ksf	Blows Per Foot (SPT) (approximate)
Very Soft	< 0.25	0 to 2
Soft	0.25 to 0.50	2 to 4
Firm	0.50 to 1.00	4 to 8
Stiff	1.00 to 2.00	8 to 16
Very Stiff	2.00 to 4.00	16 to 32
Hard	> 4.00	> 32

SHEAR STRENGTH TEST METHOD

U = Unconfined Q = Unconsolidated - Undrained Triaxial

P = Pocket Penetrometer T = Torvane V = Miniature Vane F = Hand Vane

HAND PENETROMETER CORRECTION

Our experience has shown that the hand penetrometer generally overestimates the in-situ undrained shear strength of over consolidated Pleistocene Gulf Coast clays. These strengths are partially controlled by the presence of macroscopic soil defects such as slickensides, which generally do not influence smaller scale tests like the hand penetrometer. Based on our experience, we have adjusted these field estimates of the undrained shear strength of natural, overconsolidated Pleistocene Gulf Coast soils by multiplying the measured penetrometer reading by a factor of 0.6. These adjusted strength estimates are recorded in the "Shear Strength" column on the boring logs. Except as described in the text, we have not adjusted estimates of the undrained shear strength for projects located outside of the Pleistocene Gulf Coast formations.

Information on each boring log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the time and places indicated, and can vary with time, geologic condition, or construction activity.

APPENDIX B

LABORATORY TESTING

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1a	1.0-2.0	37	22	15	30						0.50	0.20	0.38					
2	2.0-3.0				33					74		0.20	0.22					
3	4.0-6.0	35	19	16	28						1.00	0.30	0.82					
4	6.0-8.0				23						0.50	0.20	0.92					
5	8.0-9.5				21													
6	10.0-11.5				24													
7	12.0-14.0				26						0.25	0.15	0.13					
9	16.0-17.5	43	21	22	27													
10	18.0-20.0				44	79	113					0.20	0.25	UU	5	0.26	A	
11	23.0-25.0	126	34	92	116			2.472			0.25	0.23	0.68					C
12	28.0-30.0	473	321	152	321						1.25	0.53	2.58					
13	33.0-35.0				41	80	114				0.25	0.20	0.29	UU	9	0.29	A	
14	38.0-40.0				59	69	109				0.25	0.18	0.68	UU	11	0.45	A	
15	43.0-45.0				57						0.25	0.20	0.57					
16	48.0-50.0	82	27	55	59						0.25	0.20	0.53					
17	53.0-55.0				67	60	100				0.25	0.20	0.57	UU	15	0.45	C	
18	58.0-60.0	96	27	69	37						0.25	0.43	0.91					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-01

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1a

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				67							0.05	0.08					
2	2.0-4.0	39	23	16	36							0.20	0.09					
3	4.0-6.0				28					60	0.50	0.10						
4	6.0-7.5				32													
5	8.5-10.0				34					33								
6	10.5-12.0				32													
7	12.0-14.0				44								0.26					
8	14.0-16.0	121	36	85	74							0.10	0.14					
9	16.0-18.0				76			2.689			0.25	0.18	0.57					C
10	18.0-20.0				67	59	99					0.18	0.34	UU	5	0.32	A,C	
	24.0-25.0	39	19	20	163						0.75	0.18	0.45					
12	28.0-30.0				29	75	97					0.40	0.40	UU	8	0.20	C	
13	33.0-35.0				34						0.25	0.28						
14	38.0-40.0				41					99	0.25	0.11	0.29					
15	43.0-45.0	34	20	14	48						0.25	0.20	0.55					
16	48.0-50.0				57	68	106				0.25	0.10	0.54	UU	13	0.40	A	
17	53.0-55.0				66						0.25	0.15	0.59					
18	58.0-60.0	100	28	72	73						0.75	0.20	0.73					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-02

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1b

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				65							0.30	0.11					
2	2.0-4.0				31							0.30	0.19					C
4	6.0-7.5				11					19								
6	10.0-11.5				29					17								
7	12.0-14.0				39	86	120						0.57	UU	5	0.34	A	
8	14.0-16.0	39	18	21	86								0.50					
9	16.0-18.0				81	54	98					0.20	1.12	UU	6	0.39	C	
10	18.0-20.0				65							0.25	0.40					
11	23.0-24.2								38.94									
	24.2-25.0				69	58	98		6.28			0.30		UU	9	0.30	A	
12	28.0-30.0				28					87		0.10						
13	33.0-35.0				39					91		0.10						
14	38.0-40.0				53	71	108					0.10		UU	14	0.47	A	
15	43.0-45.0											0.45						
16	48.0-50.0				60	69	110					0.15		UU	17	0.57	A,B	
17	53.0-55.0	83	26	57								0.15						
18	58.0-60.0				70	59	100					0.20		UU	21	0.59		

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-03

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1c

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0	127	34	93	59							0.35	0.14					
2	2.0-4.0				54				3.70			0.40	0.14					
3	4.0-6.0	60	18	42	50			2.569				0.55	0.25					C
4	6.0-8.0				41	85	119					0.25	0.69	UU	3	0.38	A	
5	8.0-10.0				52							0.15	0.25					
6	10.0-12.0				34							0.10	0.20					
7	12.0-14.0				33	87	116					0.10	0.14	UU	5	0.25	A	
8	14.0-16.0				35							0.10	0.18					
9	16.0-18.0				37							0.10	0.27					
10	18.0-20.0				34							0.10	0.26					
11	23.0-25.0				38	84	117				0.50	0.20		UU	9	0.22	A	
12	28.0-29.5	30	20	10								0.10						
13	33.0-35.0				45	79	115				0.75			UU	12	0.34	C	
14	48.0-50.0	46	20	26														

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-04

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1d

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0	55	18	37	60							0.10	0.14					
2	2.0-4.0				52	71	108					0.20	0.73	UU	3	0.39	A	
3	4.0-6.0	65	20	45	45			2.606				0.30	0.72					C
4	6.0-8.0				32							0.15	0.47					
5	8.0-10.0				33	87	117					0.25	0.52	UU	3	0.70	A	
6	10.0-12.0				37					95		0.20	0.12					
7	12.5-14.0	36	20	16	46													
8	14.0-16.0				52	72	110					0.15	0.44	UU	5	0.35	A	
9	16.0-18.0				35							0.10	0.40					
10	18.0-20.0	31	22	9	32													
11	23.0-25.0				33	89	118					0.10	0.29	UU	7	0.83	A	
12	29.0-30.0				231							0.60	2.74					
13	33.0-35.0	32	19	13	36													
14	38.0-40.0				42							0.20	0.42					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-05

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1e

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0	42	23	19	36							0.15	0.14					
2	2.0-4.0				47			2.533				0.05	0.14					C
3	4.0-6.0				35	88	119					0.10	2.17	UU	3	0.33	A	
4	6.5-8.0	41	17	24														
5	8.0-10.0				43	81	115						0.47	UU	3	0.60	C	
6	10.0-12.0				40							0.20	0.43					
7	12.0-14.0	47	18	29	66							0.20	0.14					
8	14.0-16.0				66	63	104					0.25	0.18	UU	5	0.30	A	
9	16.0-18.0				52							0.25	0.21					
10	18.0-20.0	36	19	17	62							0.25	0.54					
11	23.0-25.0				111							0.20	0.58					
12	28.0-30.0	216	49	167	31								0.61					
13	33.0-35.0				38							0.15	0.18					
14	38.0-40.0				52	73	110					0.20	0.51	UU	11	0.54	C	
15	43.0-45.0				53							0.20	0.66					
17	48.0-50.0				67	61	101					0.20	0.72	UU	14	0.47	C	
18	53.0-55.0	98	30	68								0.25	0.99					
19	58.0-60.0				52							0.20	0.75					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-06

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1f

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				59	66	105					0.20	0.34	UU	3	0.22	A	
2	2.0-4.0				45							0.35	0.64					
3	4.0-6.0	63	20	43	42							0.30	0.58					
4	6.0-8.0				38							0.40	0.51					
5	8.0-10.0				32	91	120					0.40	1.02	UU	3	0.69	A	
6	10.0-12.0	41	20	21	41			2.617				0.40	0.76					C
7	12.0-14.0				45							0.20	0.29					
8	14.0-16.0				34							0.15	0.76					
9	16.0-18.0				35	90	121					0.15	0.57	UU	6	0.35	A	
10	18.0-20.0				50							0.20	0.33					
11	23.0-25.0	43	21	22								0.25						
12	28.0-30.0				74	56	98					0.25		UU	10	0.33	A	
13	33.0-35.0											0.15						
14	38.0-40.0				31					92		0.10						

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

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Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-07

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1g

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				12					59			0.58					
2	2.0-4.0	23	21	2	27								0.44					
4	6.0-6.0				31					29								
5	8.0-10.0	56	19	37	45							0.25	0.58					
6	10.0-12.0				38	86	118					0.20	0.33	UU	3	0.37	A	
7	12.0-14.0				38							0.50	0.55					
8	14.0-16.0	43	20	23	35			2.599				0.35	0.31					C
9	16.0-18.0				38							0.40	0.18					
10	18.0-20.0				43	80	115					0.25	0.41	UU	7	0.35	A	
11	23.0-25.0	80	26	54								0.30						
12	28.0-30.0				73	60	103					0.50		UU	10	0.38	B	
13	33.0-35.0											0.20						
14	38.0-40.0	23	21	2								0.20						

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-08

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1h

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0	82	24	58	44							0.08	0.18					
2	2.0-4.0				20													
3	4.0-5.5				14					33								
5	8.0-9.5	47	22	25														
6	10.0-12.0	46	21	25	31							0.15	0.24					C
7	12.0-14.0				39	88	122					0.15	0.43	UU	5	0.48	A	
8	14.0-16.0				49							0.30	0.72					
9	16.0-18.0	62	24	38	53							0.20	0.75					
10	18.0-20.0				48	75	112					0.15	0.58	UU	7	0.47	A	
11	23.0-25.0				60	65	104					0.20		UU	9	0.31	A	
12	28.0-30.0											0.20						
13	33.0-35.0				35	91	123					0.15		UU	12	0.44	A	
14	38.0-40.0											0.20						

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

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Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-09

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1i

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				31								0.07					
2	2.0-4.0				28					50								
3	4.0-5.5																	
4	6.0-7.5	25	24	1														
5	8.0-9.0				61													
	9.0-10.0											0.10	0.34					
6	10.0-12.0	81	27	54	111							0.18	0.49					
7	12.0-14.0				30							0.35						
8	14.0-16.0				113							0.60	0.32					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-10

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1j

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				86							0.20	0.07					
2	2.0-4.0				26					83		0.20	0.08					
3	4.0-6.0	84	25	59	85							0.20	0.11					
4	6.0-8.0				64							0.30	0.14					
5	8.0-10.0				74							0.40	0.19					
6	10.0-12.0				63							0.40	0.18					
7	12.0-14.0	56	20	36	62							0.35	0.27					
8	14.0-16.0				61							0.30	0.34					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-11

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1k

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				Other Tests
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	
1	0.0-2.0				82							0.20	0.14					
2	2.0-4.0	61	23	38	35							0.30	0.10					
3	4.0-6.0				32							0.25	0.18					
4	6.0-7.5				30					35								
5	8.0-9.0																	
	9.0-10.0				28													
6	10.0-11.5				32					53								
7	12.0-13.5																	
8	14.0-16.0				386				24.28			0.30	0.61					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

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Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-12

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1I

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				Other Tests
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	
1	0.0-2.0				25					84			1.43					
2	2.0-3.5																	
3	4.0-5.5																	
4	6.0-8.0				28					52		0.25	0.23					
5	8.0-9.0																	
	9.0-10.0				40							0.50	0.33					
6	10.0-12.0	123	38	85	82							0.20	0.41					
7	12.0-14.0				162							0.20	0.38					
8	14.0-16.0				206				42.98			0.25	0.59					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-13

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1m

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				48							0.15	0.16					
2	2.0-4.0	79	26	53	86							0.05	0.09					
3	4.0-6.0				53					99		0.05	0.07					
5	8.0-10.0				93							0.20	0.05					
6	10.0-12.0				144							0.30	0.02					
7	12.0-14.0	165	47	118	185							0.30	0.14					
8	14.0-16.0				170							0.35	0.14					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-14

(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1n

Sample No.	Depth (ft)	Identification Tests									Field Shear Strength Estimate		Miniature Vane Tests	Compression Tests				
		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (PI)	Moisture Content (%)	Dry Unit Weight (pcf)	Total Unit Weight (pcf)	Specific Gravity	Organic Content (%)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Type Test	Confining Pressure (psi)	Shear Strength (ksf)	Type of Failure	Other Tests
1	0.0-2.0				71							0.30	0.11					
2	2.0-4.0				40					93			0.17					
4	4.0-6.0	87	26	61														
4	6.0-8.0				103							0.40	0.21					
5	8.0-10.0				36					79		0.40	0.29					
6	10.0-12.0				102							0.40	0.14					
7	12.0-14.0	87	28	59	71							0.45	0.18					
9	16.0-18.0				64							0.30	0.19					

Notes:

NP = Non-Plastic Material

TYPE OF TEST
U - Unconfined Compression
UU - Unconsolidated - Undrained Triaxial
CU - Consolidated - Undrained Triaxial

TYPE OF FAILURE
A - Bulge
B - Single Shear Plane
C - Multiple Shear Plane
D - Vertical Fracture

OTHER TEST TYPES
C = Consolidation SO = Sulfates
pH = pH
R = Resistivity
Cl = Chlorides

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

SUMMARY OF TEST RESULTS - BORING B-15

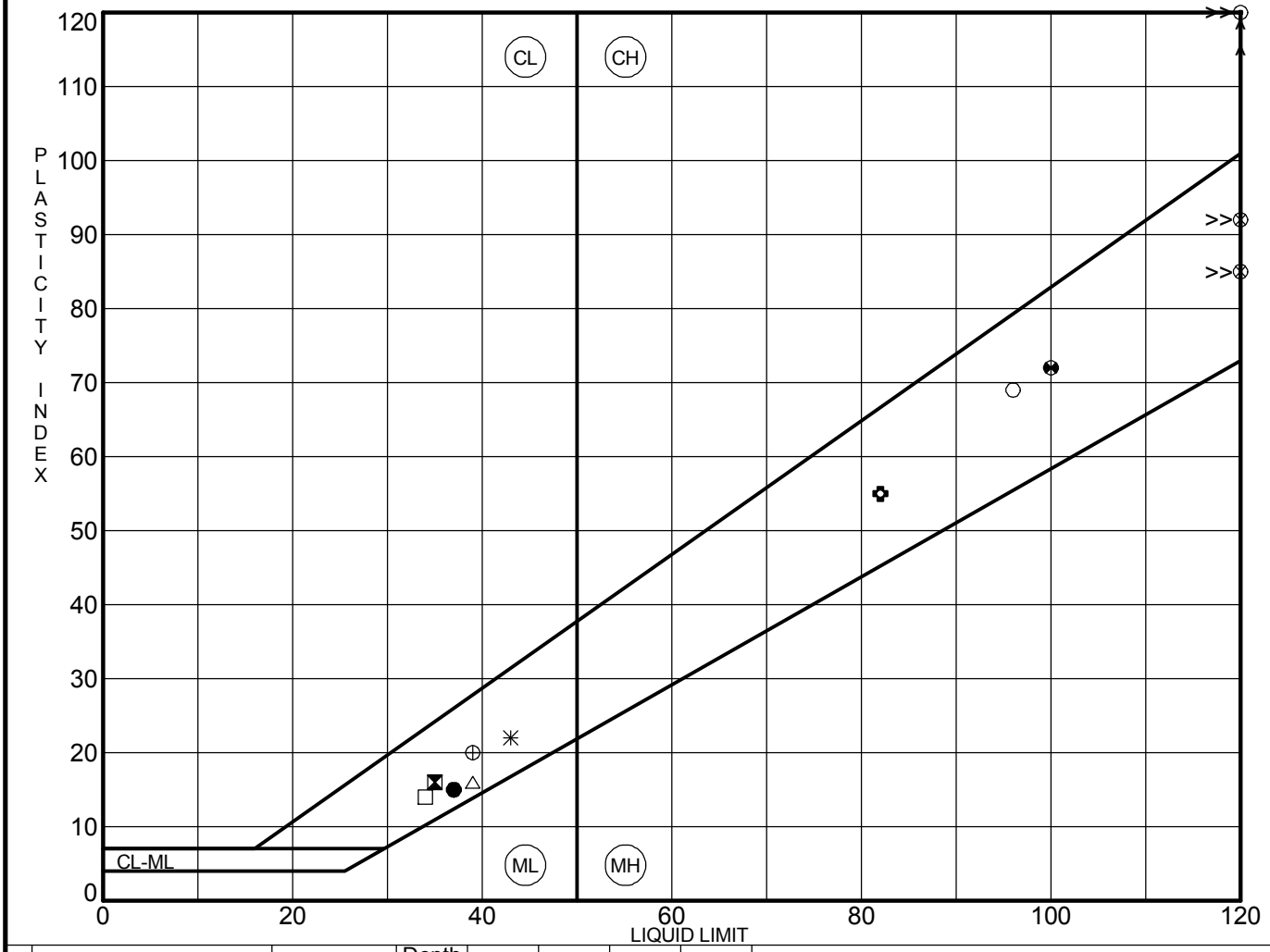
(TE-0138, Task 1)

LELAP Lab ID #10001

Terrebonne Parish, Louisiana

Project No. **04.55174066**

PLATE B-1o



	Sample Source	Sample ID	Depth (ft)	LL	PL	PI	Fines	Visual Classification
●	**B-01**	**1a**	**1.00**	**37**	**22**	**15**		LEAN CLAY WITH SAND, gray, with silt pockets
⊠	**B-01**	**3**	**4.00**	**35**	**19**	**16**		
✳	**B-01**	**9**	**16.00**	**43**	**21**	**22**		SILTY, SANDY CLAY, gray
⊗	**B-01**	**11**	**23.00**	**126**	**34**	**92**		ORGANIC CLAY, black and gray
⊙	**B-01**	**12**	**28.00**	**473**	**321**	**152**		
✿	**B-01**	**16**	**48.00**	**82**	**27**	**55**		
○	**B-01**	**18**	**58.00**	**96**	**27**	**69**		
△	**B-02**	**2**	**2.00**	**39**	**23**	**16**		LEAN CLAY, gray
⊗	**B-02**	**8**	**14.00**	**121**	**36**	**85**		ORGANIC CLAY, black
⊕	**B-02**		**24.00**	**39**	**19**	**20**		LEAN CLAY, gray
□	**B-02**	**15**	**43.00**	**34**	**20**	**14**		LEAN CLAY, gray
❽	**B-02**	**18**	**58.00**	**100**	**28**	**72**		FAT CLAY, gray

Remarks: All tests were performed in general accordance with ASTM Standards D4318, D421, D2217, and D1140. Fines column represent % passing No. 200 sieve.

Note:

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

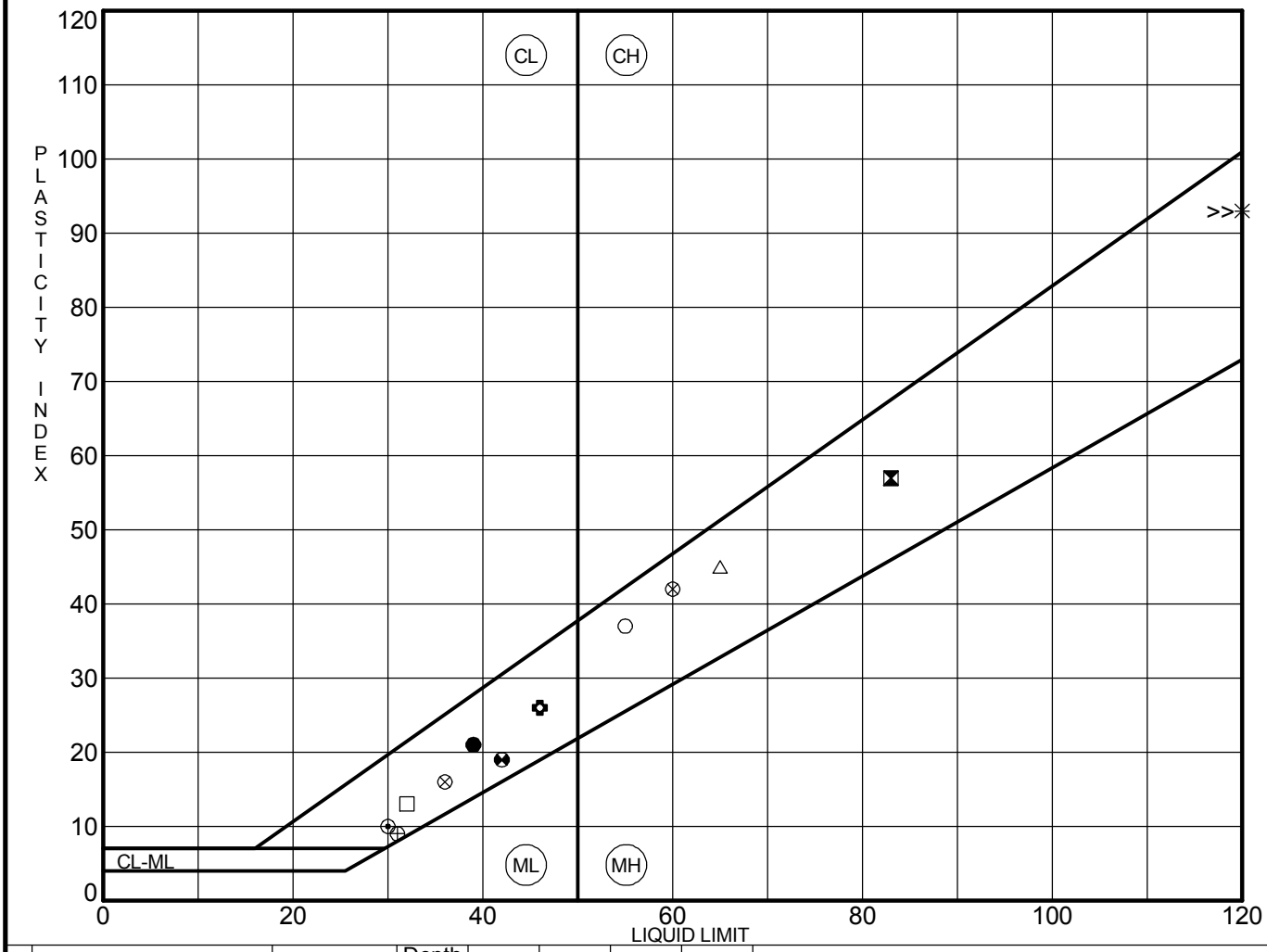
Terrebonne Parish, Louisiana

ATTERBERG LIMITS' RESULTS

Project No. **04.55174066**

PLATE B-2a

ATTERBERG LIMITS CHART 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18



	Sample Source	Sample ID	Depth (ft)	LL	PL	PI	Fines	Visual Classification
●	**B-03**	**8**	**14.00**	**39**	**18**	**21**		LEAN CLAY, gray
⧓	**B-03**	**17**	**53.00**	**83**	**26**	**57**		FAT CLAY, dark gray
✳	**B-04**	**1**	**0.00**	**127**	**34**	**93**		ORGANIC CLAY, black
⊗	**B-04**	**3**	**4.00**	**60**	**18**	**42**		FAT CLAY, gray
⊙	**B-04**	**12**	**28.00**	**30**	**20**	**10**		LEAN CLAY, gray, with silt
✿	**B-04**	**14**	**48.00**	**46**	**20**	**26**		LEAN CLAY, gray
○	**B-05**	**1**	**0.00**	**55**	**18**	**37**		FAT CLAY, dark gray
△	**B-05**	**3**	**4.00**	**65**	**20**	**45**		FAT CLAY, dark gray
⊗	**B-05**	**7**	**12.50**	**36**	**20**	**16**		LEAN CLAY, gray, with silt pockets and organics
⊕	**B-05**	**10**	**18.00**	**31**	**22**	**9**		SILT, gray, with clay pockets
□	**B-05**	**13**	**33.00**	**32**	**19**	**13**		SILT, gray, with clay pockets
⊠	**B-06**	**1**	**0.00**	**42**	**23**	**19**		LEAN CLAY, gray with sand

Remarks: All tests were performed in general accordance with ASTM Standards D4318, D421, D2217, and D1140. Fines column represent % passing No. 200 sieve.

Note:

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

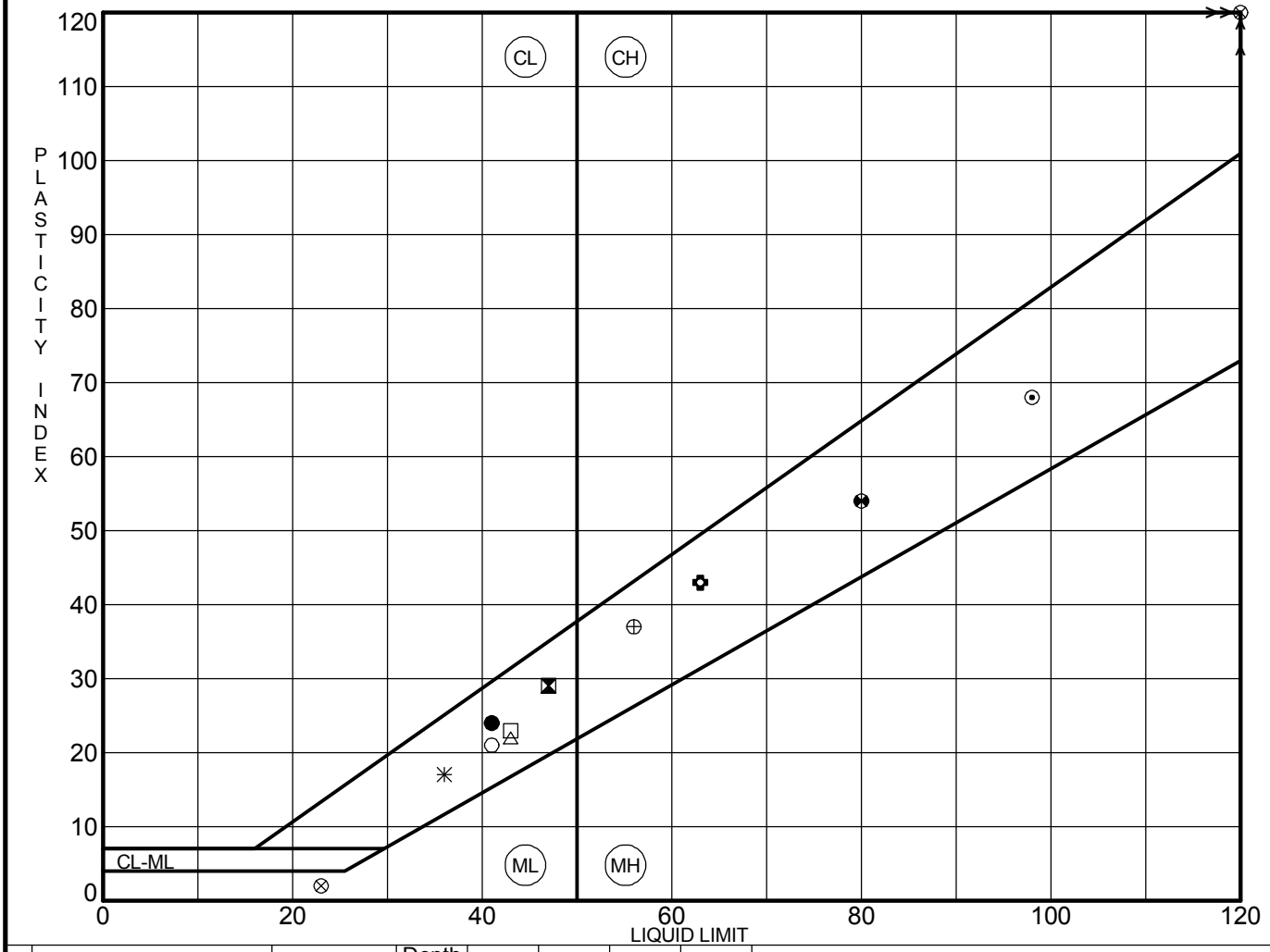
Terrebonne Parish, Louisiana

ATTERBERG LIMITS' RESULTS

Project No. **04.55174066**

PLATE B-2b

ATTERBERG LIMITS CHART 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18



	Sample Source	Sample ID	Depth (ft)	LL	PL	PI	Fines	Visual Classification
●	**B-06**	**4**	**6.50**	**41**	**17**	**24**		LEAN CLAY, gray
⊠	**B-06**	**7**	**12.00**	**47**	**18**	**29**		
✳	**B-06**	**10**	**18.00**	**36**	**19**	**17**		LEAN CLAY, gray, with silt
⊗	**B-06**	**12**	**28.00**	**216**	**49**	**167**		PEAT, black
⊙	**B-06**	**18**	**53.00**	**98**	**30**	**68**		FAT CLAY, gray
✿	**B-07**	**3**	**4.00**	**63**	**20**	**43**		FAT CLAY, gray
○	**B-07**	**6**	**10.00**	**41**	**20**	**21**		LEAN CLAY, gray, with silt
△	**B-07**	**11**	**23.00**	**43**	**21**	**22**		LEAN CLAY, gray
⊗	**B-08**	**2**	**2.00**	**23**	**21**	**2**		SILT, gray, with clay
⊕	**B-08**	**5**	**8.00**	**56**	**19**	**37**		FAT CLAY, gray
□	**B-08**	**8**	**14.00**	**43**	**20**	**23**		LEAN CLAY, gray
⊛	**B-08**	**11**	**23.00**	**80**	**26**	**54**		FAT CLAY, gray

Remarks: All tests were performed in general accordance with ASTM Standards D4318, D421, D2217, and D1140. Fines column represent % passing No. 200 sieve.

Note:

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

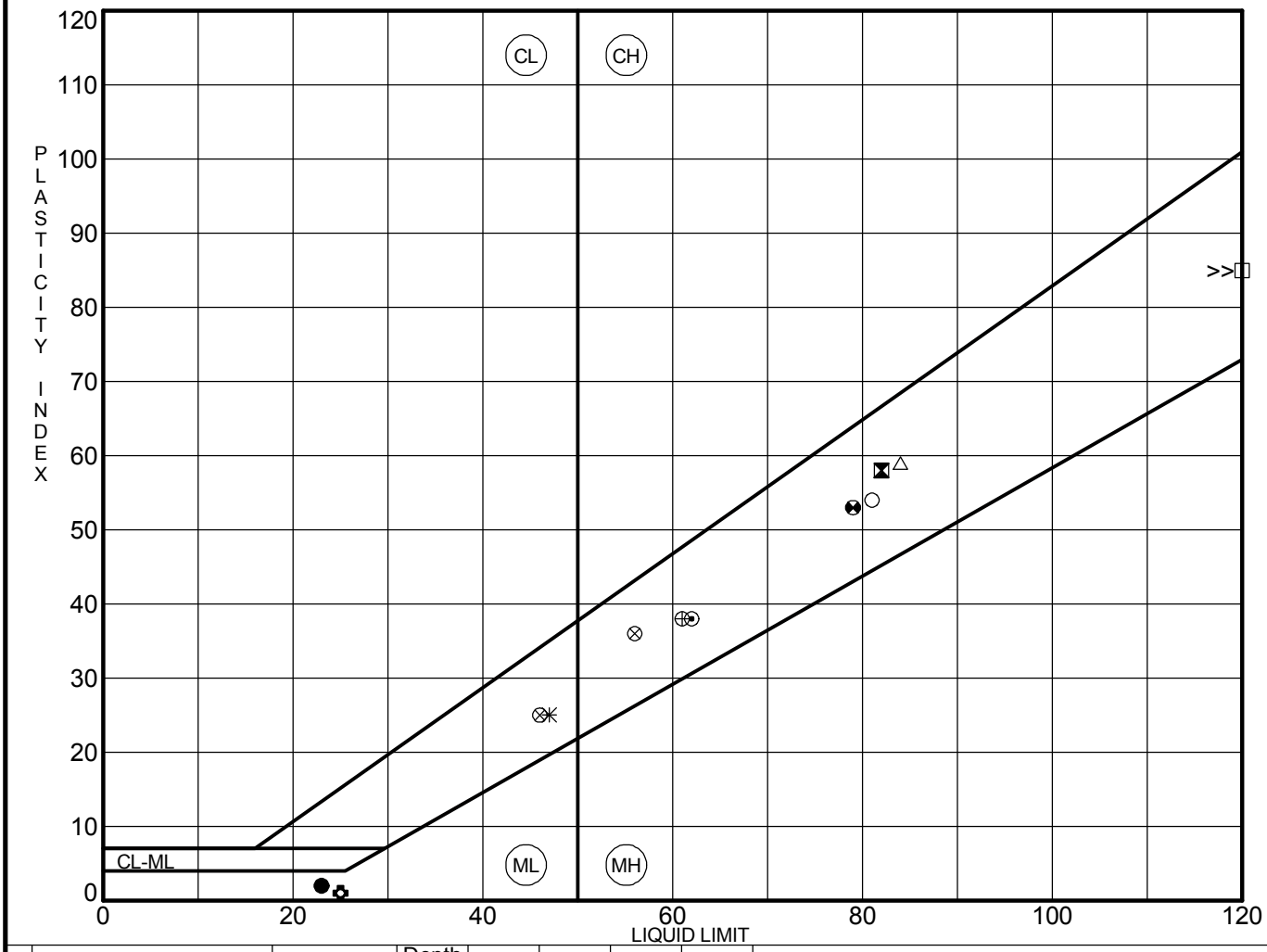
(TE-0138, Task 1)

Terrebonne Parish, Louisiana

ATTERBERG LIMITS' RESULTS

Project No. **04.55174066**

PLATE B-2c



	Sample Source	Sample ID	Depth (ft)	LL	PL	PI	Fines	Visual Classification
●	**B-08**	**14**	**38.00**	**23**	**21**	**2**		SILT, gray, with some clay
⊠	**B-09**	**1**	**0.00**	**82**	**24**	**58**		FAT CLAY, black, with organics
✳	**B-09**	**5**	**8.00**	**47**	**22**	**25**		LEAN CLAY, gray
⊗	**B-09**	**6**	**10.00**	**46**	**21**	**25**		
⊙	**B-09**	**9**	**16.00**	**62**	**24**	**38**		FAT CLAY, gray
✿	**B-10**	**4**	**6.00**	**25**	**24**	**1**		SILT, gray, with clay
○	**B-10**	**6**	**10.00**	**81**	**27**	**54**		FAT CLAY, gray, with organics
△	**B-11**	**3**	**4.00**	**84**	**25**	**59**		FAT CLAY, gray, with sand
⊗	**B-11**	**7**	**12.00**	**56**	**20**	**36**		FAT CLAY, gray
⊕	**B-12**	**2**	**2.00**	**61**	**23**	**38**		FAT CLAY, gray
□	**B-13**	**6**	**10.00**	**123**	**38**	**85**		FAT CLAY, dark gray, with organics
⊛	**B-14**	**2**	**2.00**	**79**	**26**	**53**		FAT CLAY, gray

Remarks: All tests were performed in general accordance with ASTM Standards D4318, D421, D2217, and D1140. Fines column represent % passing No. 200 sieve.

Note:

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Bayou De Cade Marsh Creation and Ridge Restoration

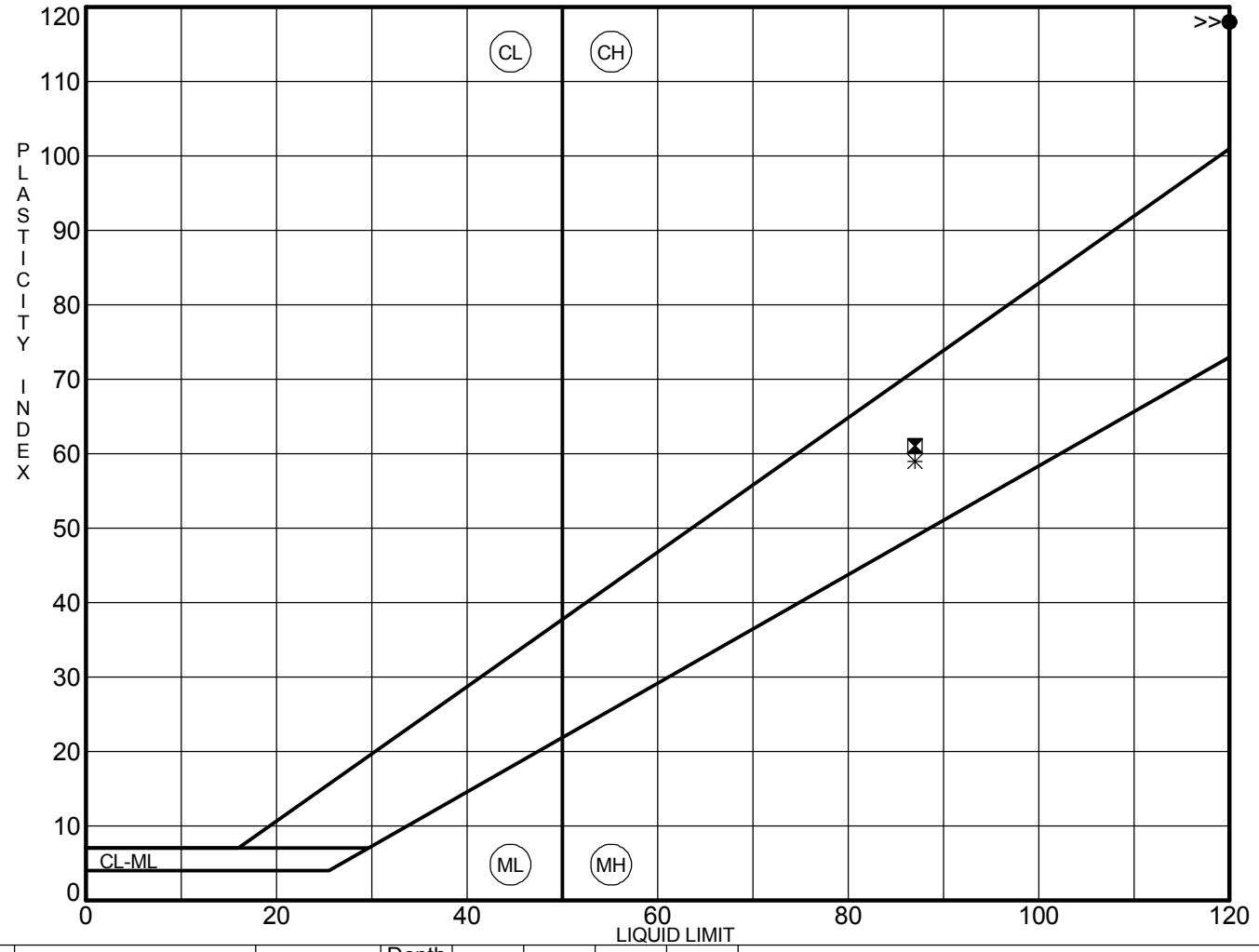
(TE-0138, Task 1)

Terrebonne Parish, Louisiana

ATTERBERG LIMITS' RESULTS

Project No. **04.55174066**

PLATE B-2d



	Sample Source	Sample ID	Depth (ft)	LL	PL	PI	Fines	Visual Classification
●	**B-14**	**7**	**12.00**	**165**	**47**	**118**		ORGANIC CLAY, dark gray
⧓	**B-15**	**4**	**4.00**	**87**	**26**	**61**		FAT CLAY, gray, with sand
✳	**B-15**	**7**	**12.00**	**87**	**28**	**59**		FAT CLAY, gray

Remarks: All tests were performed in general accordance with ASTM Standards D4318, D421, D2217, and D1140. Fines column represent % passing No. 200 sieve.

Note:

FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

(TE-0138, Task 1)

Terrebonne Parish, Louisiana

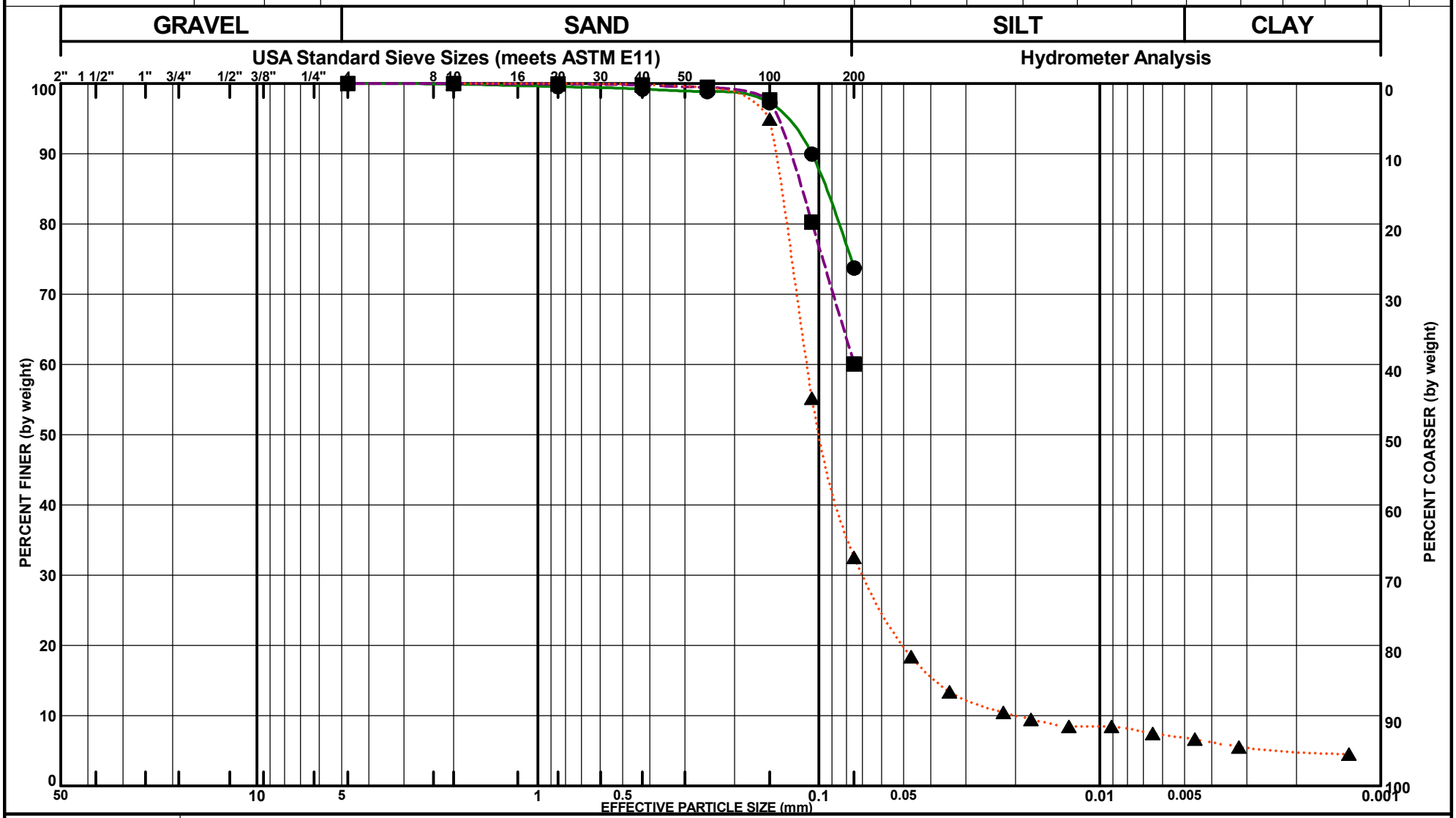
ATTERBERG LIMITS' RESULTS

Project No. **04.55174066**

PLATE B-2e

ATTERBERG LIMITS CHART 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-01	2a	2-3	LEAN CLAY WITH SAND (CL), gray, with silt pockets	0.0	26.3			4.75								
■ B-02	3	4-6	SANDY LEAN CLAY (CL), dark gray	0.0	39.9			4.75								
▲ B-02	5	8.5-10	SILTY SAND (SM), gray	0.0	67.4	25.7	6.8	2	0.111	0.069	0.02	2.15	5.53			



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Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

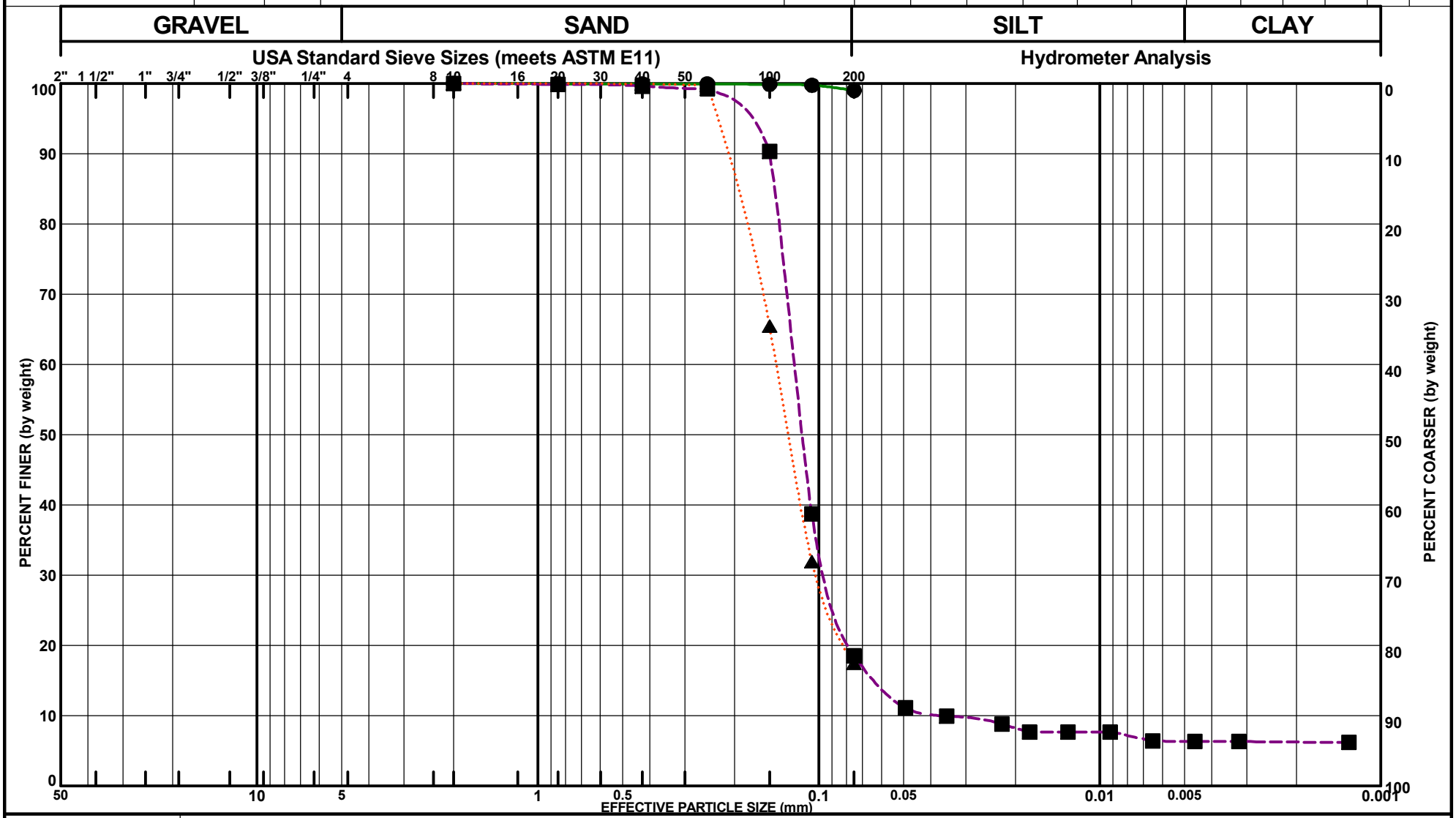
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Allen Bentley	4/23/2018	Adam Linson	4/26/2018	04.55174066	PLATE B-3a

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-02	14	38-40	SILT (ML), gray, with clay laminations	0.0	1.0			2								
■ B-03	4	6-7.5	SILTY SAND (SM), gray	0.0	81.5	12.2	6.3	2	0.122	0.091	0.035	1.92	3.45			
▲ B-03	6	10-11.5	SILTY SAND (SM), gray	0.0	82.5			2	0.142	0.101						



FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

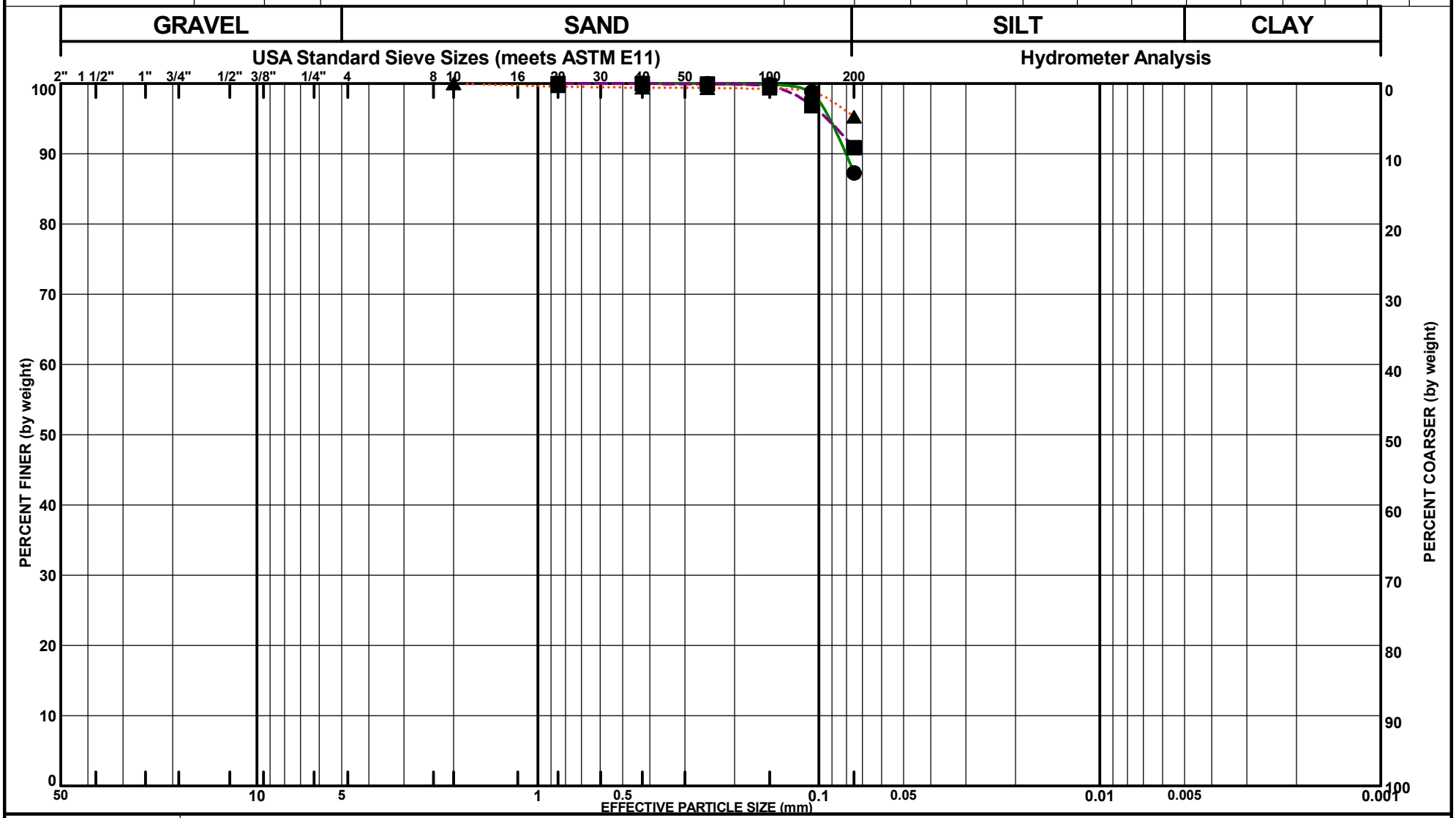
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	5/1/2018	Adam Linson	5/3/2018	04.55174066	PLATE B-3b

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-03	12	28-30	SILT (ML), gray, with clay and sand seams	0.0	12.7			0.425								
■ B-03	13	33-35	FAT CLAY (CH), gray	0.0	9.1			0.85								
▲ B-05	6	10-12	LEAN CLAY (CL), gray, with sand layers and ferrous nodules	0.0	4.7			2								



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Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

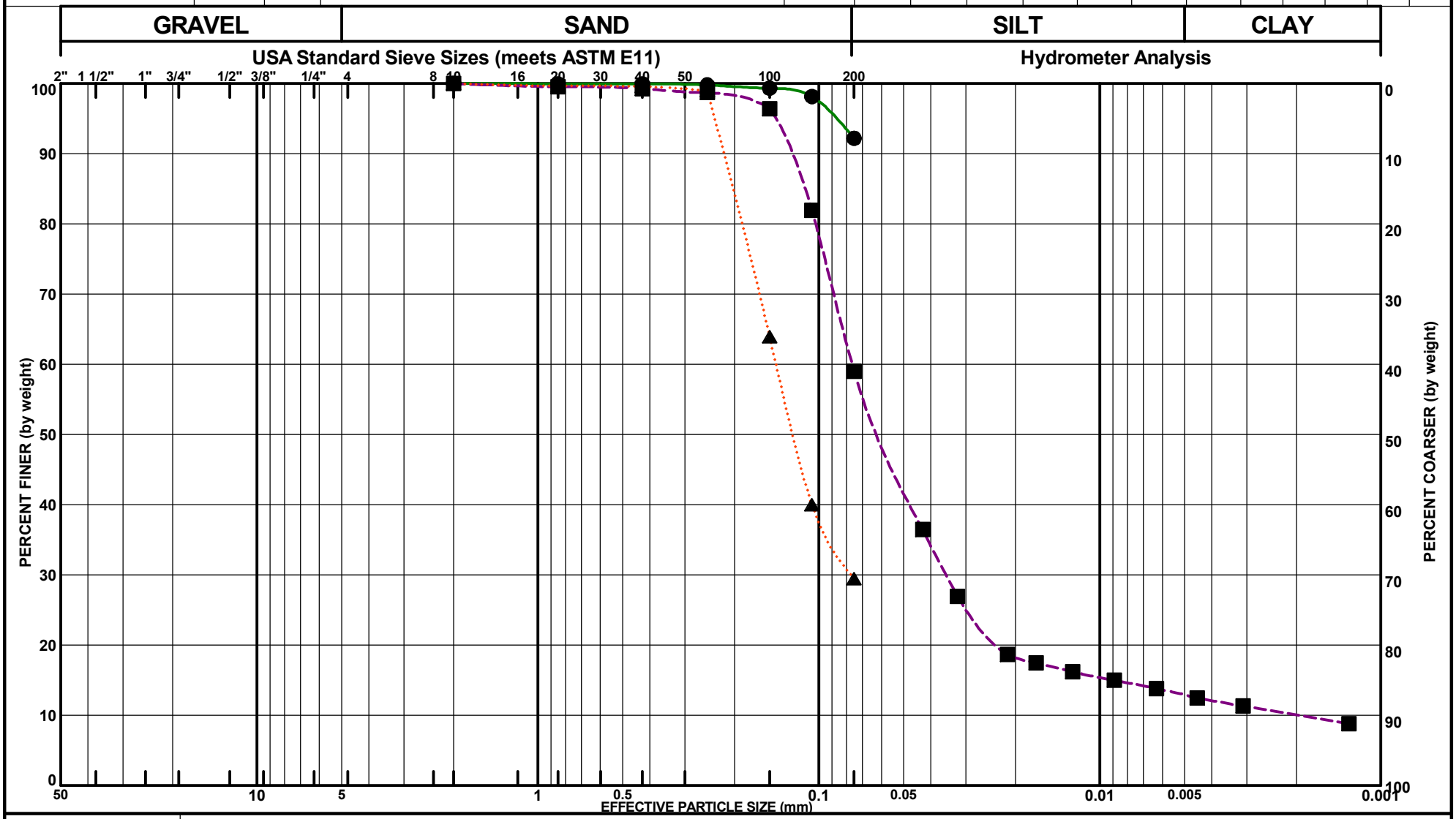
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	4/20/2018	Adam Linson	4/26/2018	04.55174066	PLATE B-3c

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-07	14	38-40	SILT (ML), gray, with sand pockets and clay seams	0.0	7.8			2								
■ B-08	1	0-2	SANDY SILT (ML), gray, with clay traces	0.0	41.0	46.1	12.9	2	0.076	0.035	0.002	8.25	38.58			
▲ B-08	4	5.99-6	SILTY SAND (SM), gray, with clay pockets	0.0	70.5			2	0.142	0.076						



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Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

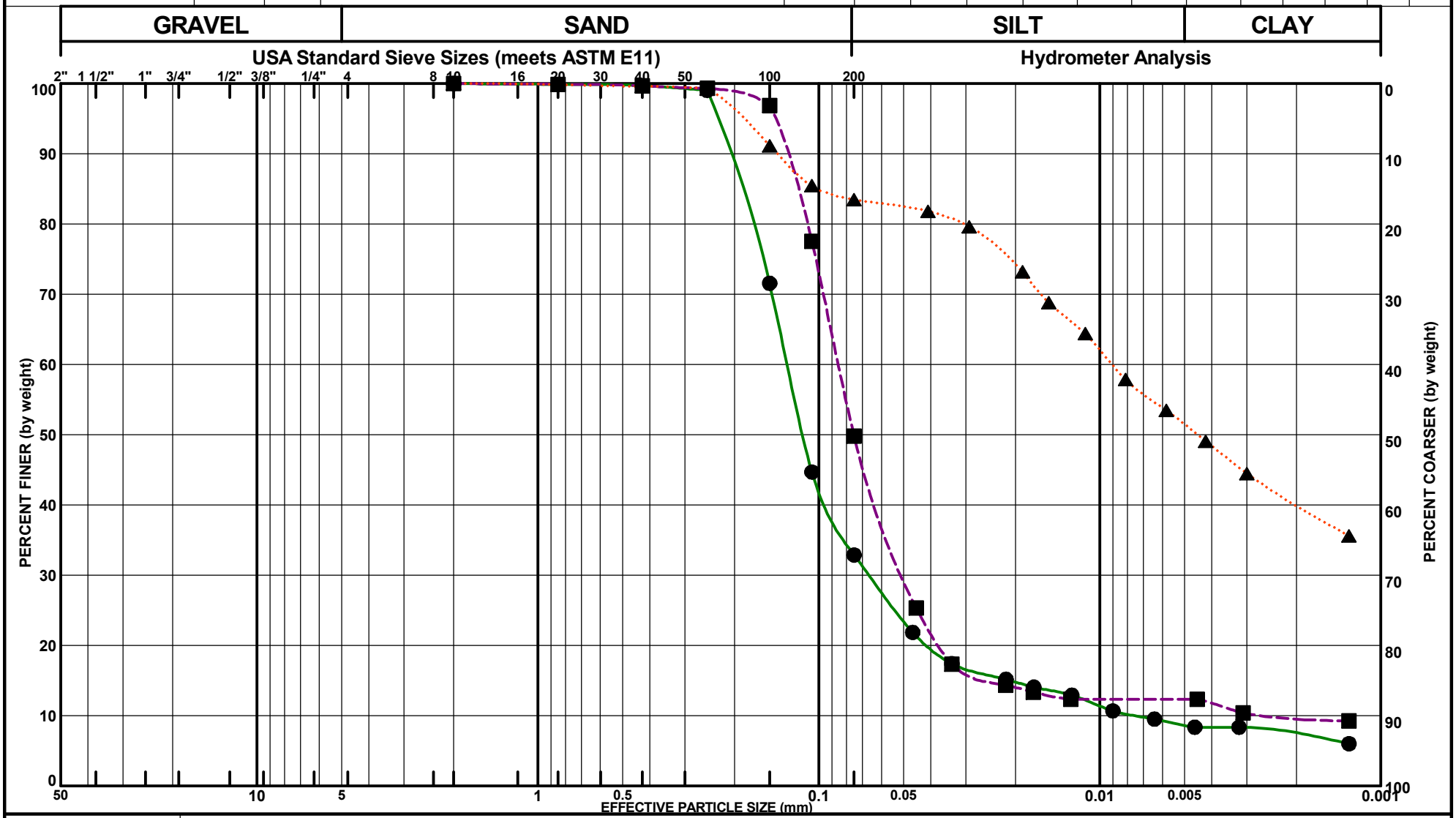
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Allen Bentley	5/3/2018	Adam Linson	5/7/2018	04.55174066	PLATE B-3d

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-09	3	4-5.5	SILTY SAND (SM), gray, with clay pockets	0.0	67.1	24.2	8.6	2	0.129	0.066	0.007	4.59	17.50			
■ B-10	2	2-4	SILTY SAND (SM), gray, with clay pockets	0.0	50.2	37.5	12.3	2	0.085	0.05	0.002	12.46	36.62			
▲ B-11	2	2-4	FAT CLAY (CH), gray	0.0	16.5	32.0	51.4	2	0.009							



FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

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Bayou De Cade Marsh Creation and Ridge Restoration

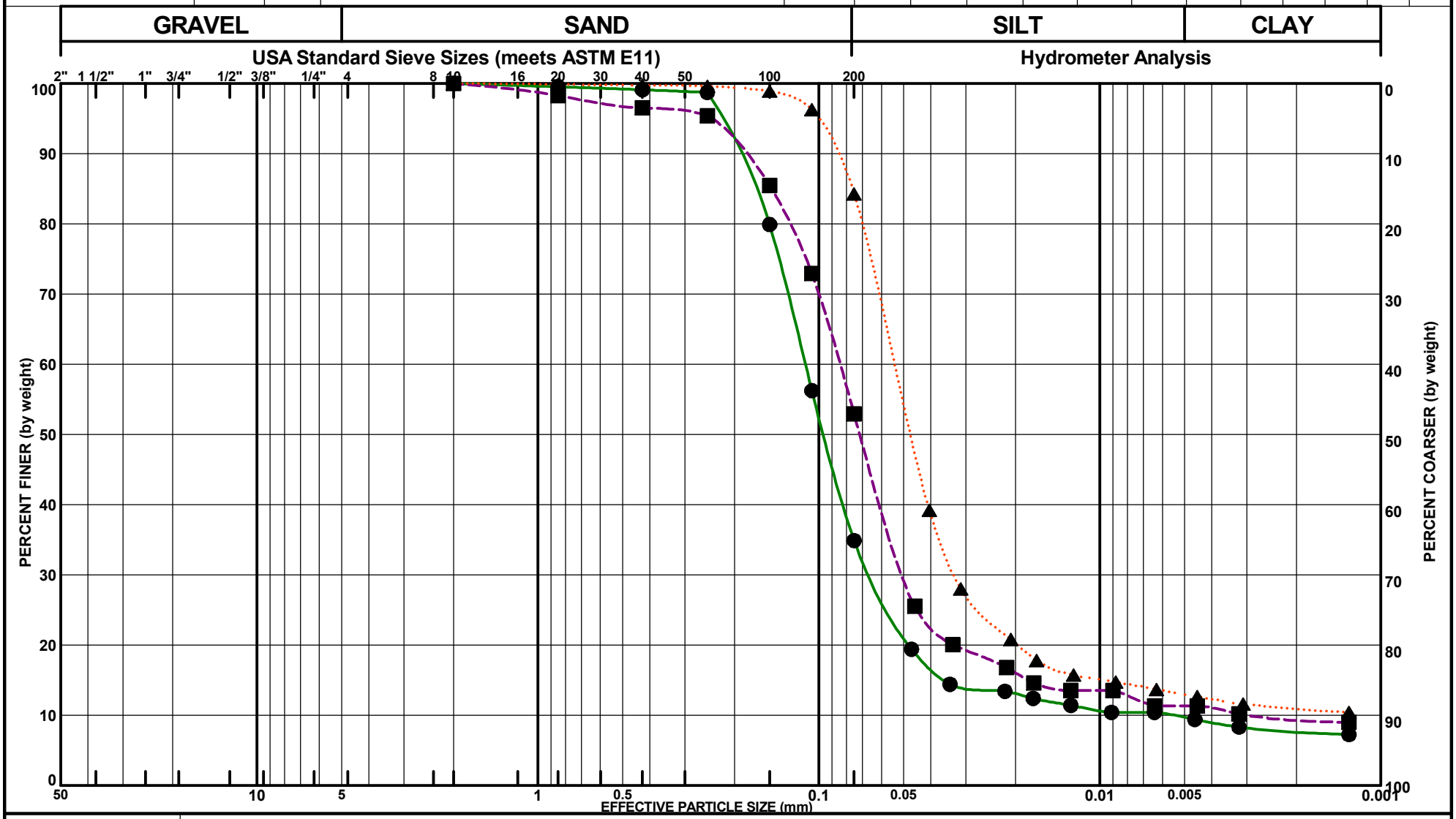
Terrebonne Parish, Louisiana

PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	4/14/2018	Adam Linson	4/20/2018	04.55174066	PLATE B-3e

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-12	4	6-7.5	SILTY SAND (SM), gray, with clay and wood	0.0	65.1	25.2	9.7	2	0.112	0.065	0.006	6.67	20.02			
■ B-12	6	10-11.5	SANDY SILT (ML), gray, with clay pockets and peat layers	0.0	47.1	41.6	11.3	2	0.085	0.049	0.003	10.34	30.37			
▲ B-13	1	0-2	SILT WITH SAND (ML), gray, with clay lenses and organics	0.0	15.7	71.3	13.0	2	0.054	0.033						



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Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

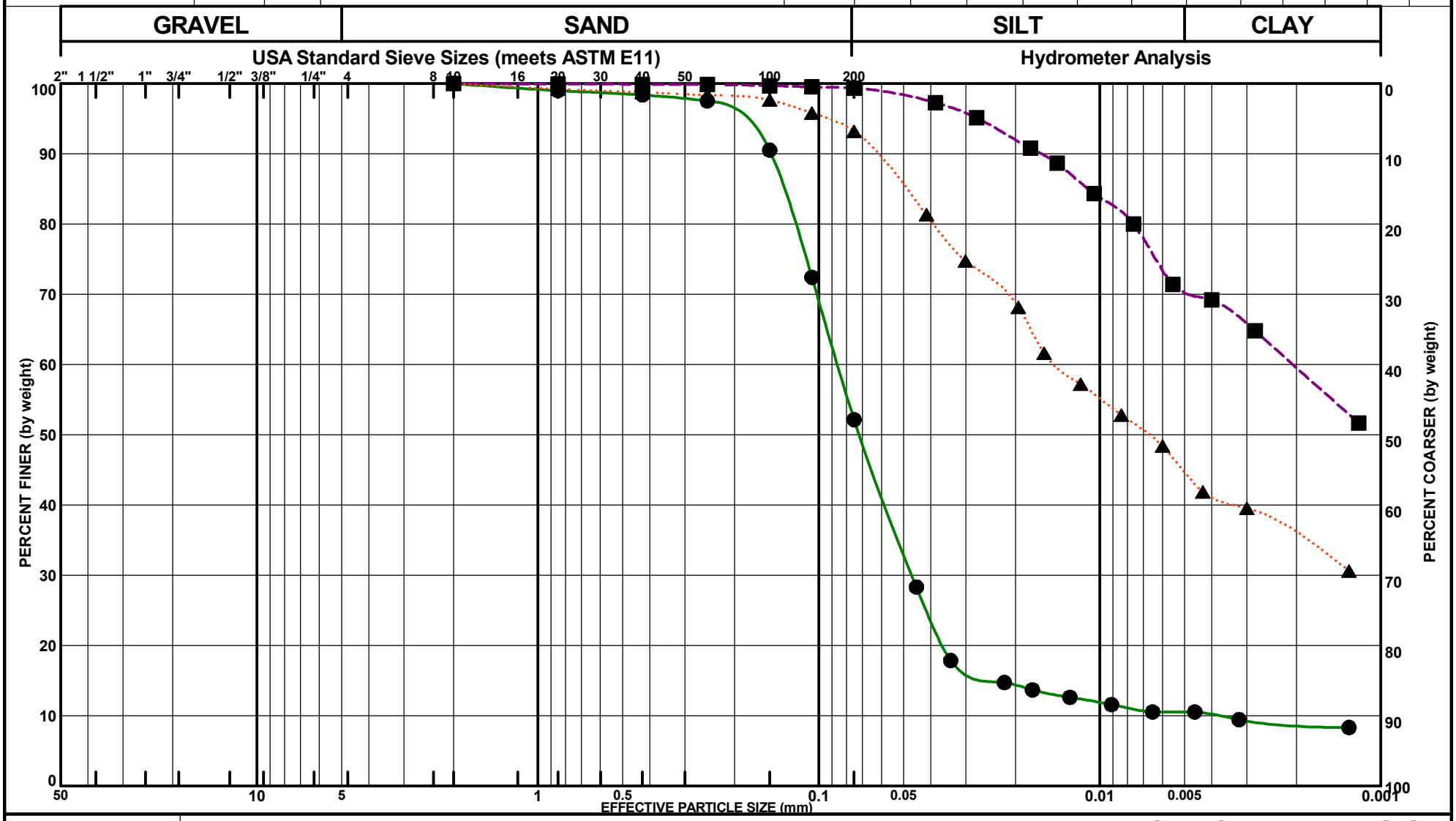
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	4/16/2018	Adam Linson	4/20/2018	04.55174066	PLATE B-3f

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-13	4	6-8	LEAN CLAY (CL), gray	0.0	47.9	41.6	10.5	2	0.086	0.047	0.004	6.59	22.25			
■ B-14	3	4-6	FAT CLAY (CH), gray	0.0	0.7	28.6	70.7	2	0.002							
▲ B-15	2	2-4	FAT CLAY (CH), gray, with gravel and roots	0.0	6.8	48.4	44.8	2	0.014							



FUGRO

Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

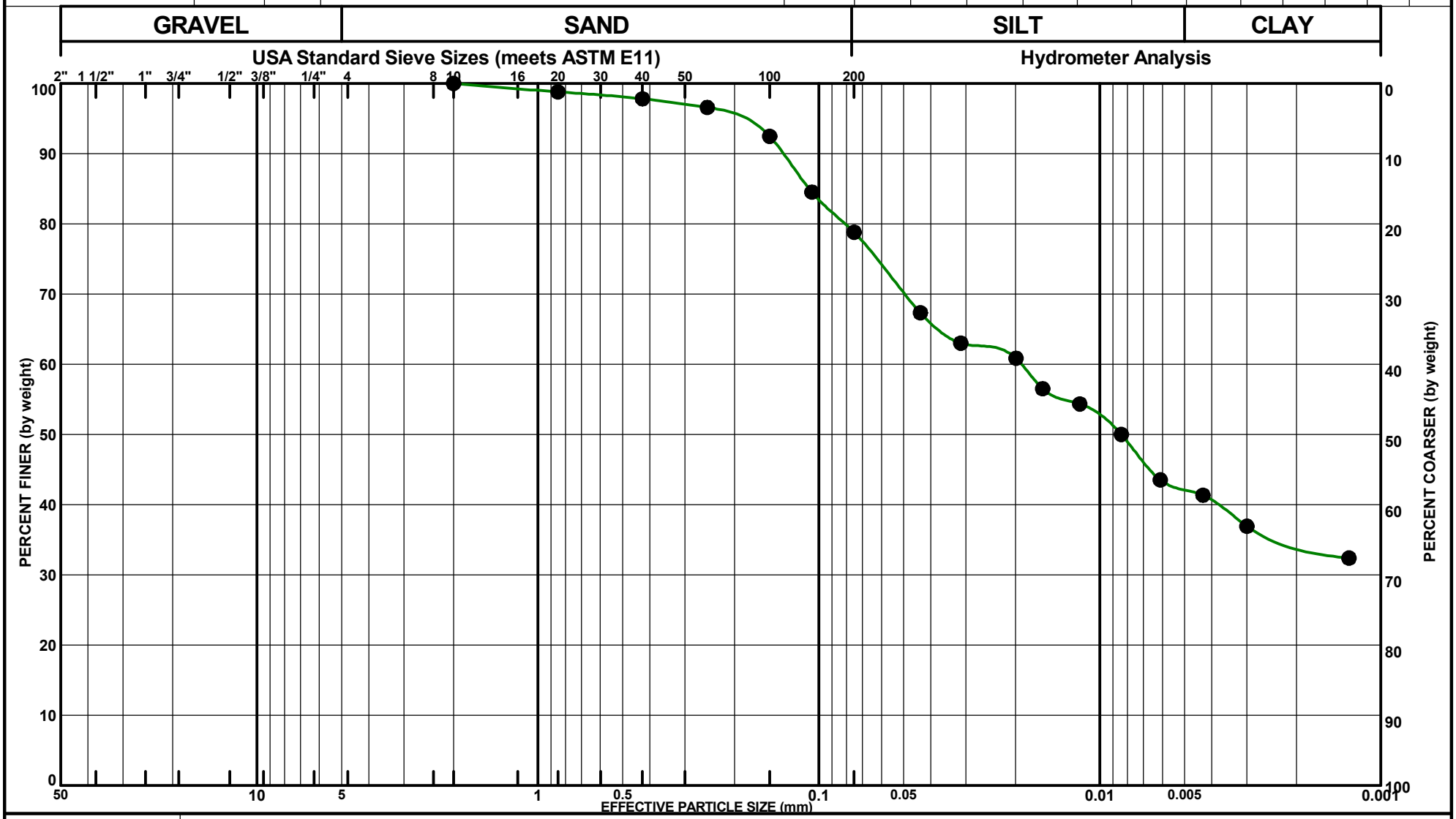
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	4/16/2018	Adam Linson	4/20/2018	04.55174066	PLATE B-3g

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

Boring Number	Sample Number	Depth (ft)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-15	5	8-10	FAT CLAY WITH SAND (CH), gray	0.0	21.2	36.5	42.3	2	0.019							
■																
▲																



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Bayou De Cade Marsh Creation and Ridge Restoration

Terrebonne Parish, Louisiana

PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Tested By:	Date Tested:	Reviewed By:	Date Reviewed:	Project No.	
Shamira Serf	4/16/2018	Adam Linson	4/20/2018	04.55174066	PLATE B-3h

FCBR GSA LANDSCAPE 04.55174066.GPJ FUGRO DATA TEMPLATE 042610.GDT 06/05/18

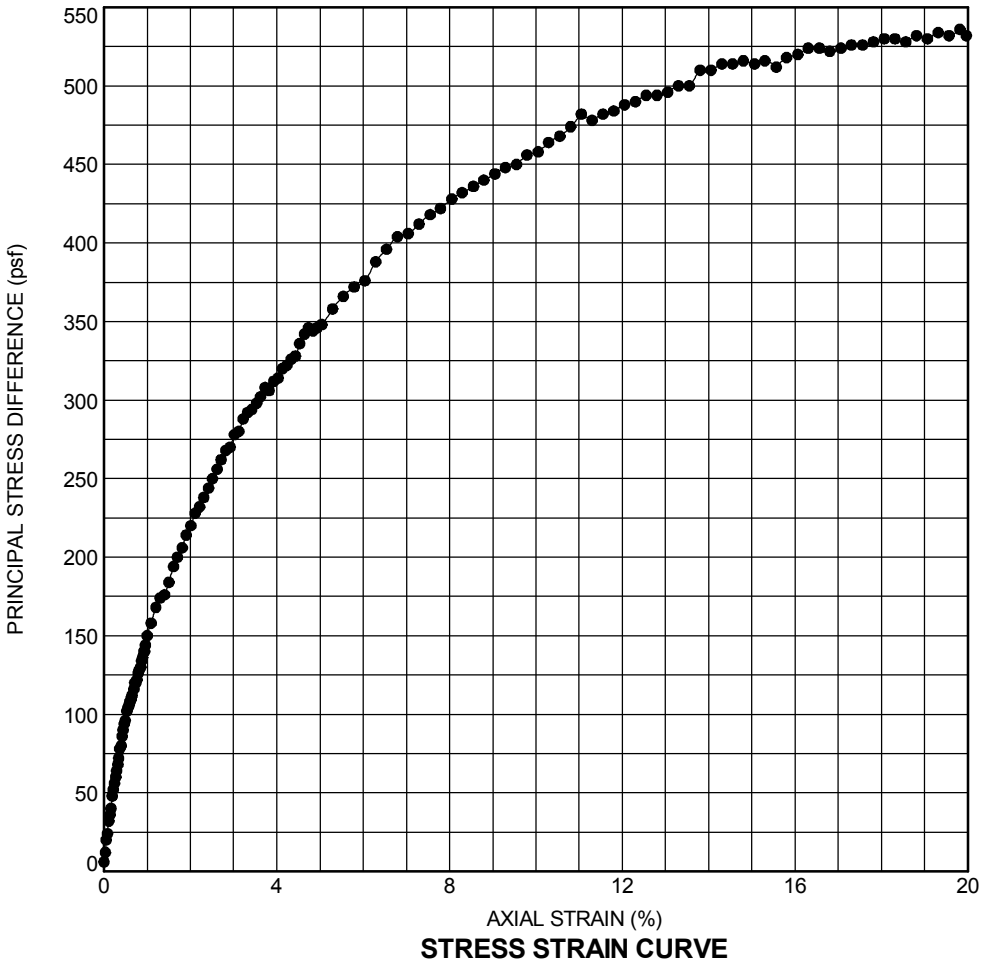
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-01 Depth: 18-20 ft. Sample Number: 10	Visual Classification: FAT CLAY (CH), gray, with silty sand pockets
Project No.: 04.55174066 Test Date.: 4/17/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	43.9		
	Dry Density (pcf)	78.7		
	Saturation (%)	100.0		
	Void Ratio	1.14		
	Diameter (inches)	2.84		
	Height (inches)	5.77		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	5.00		
	Deviator Stress (psf)	516		
	Shear Strength (psf)	258		
	Failure Strain (%)	14.8		
	σ_1 Failure (psf):	1236		
	σ_3 Failure (psf):	720		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4a

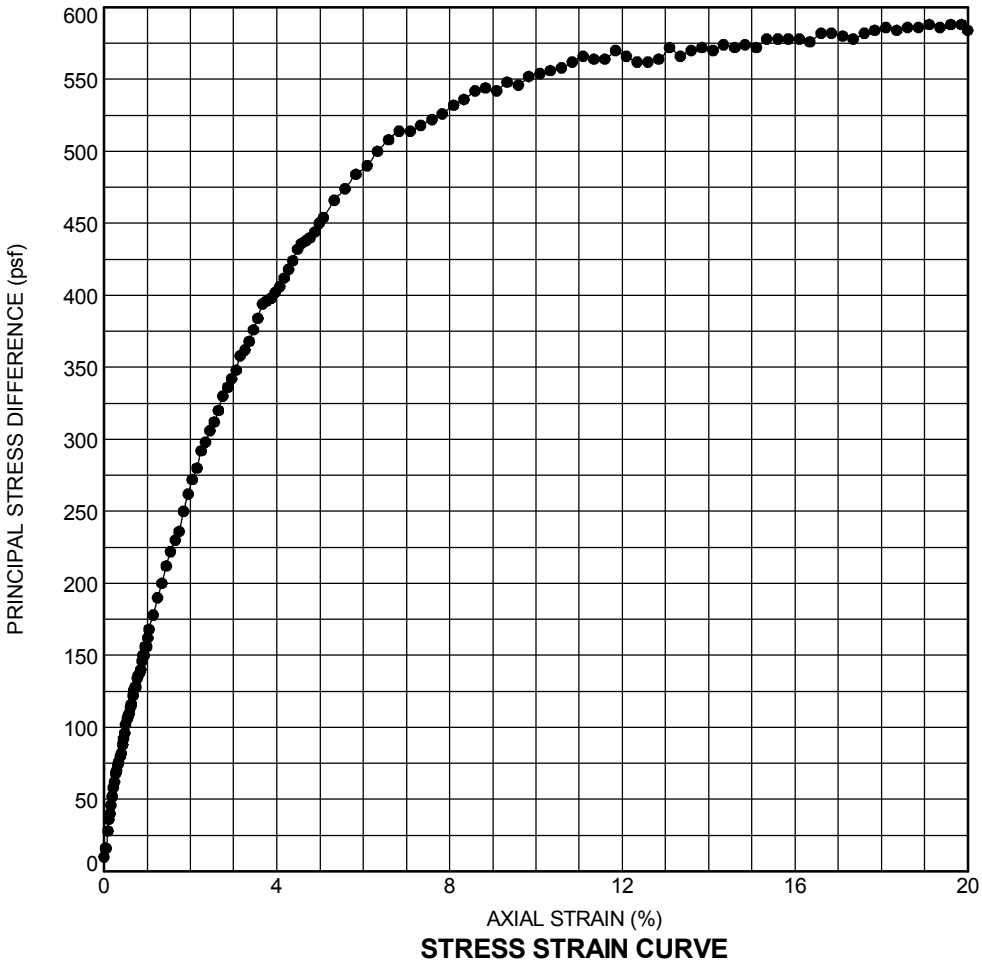
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-01 Depth: 33-35 ft. Sample Number: 13	Visual Classification: FAT CLAY (CH), gray, with sand lenses and pockets
Project No.: 04.55174066 Test Date.: 4/20/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	41.2		
	Dry Density (pcf)	80.4		
	Saturation (%)	100.0		
	Void Ratio	1.10		
	Diameter (inches)	2.83		
	Height (inches)	5.57		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	9.00		
	Deviator Stress (psf)	574		
	Shear Strength (psf)	287		
	Failure Strain (%)	14.3		
	σ_1 Failure (psf):	1870		
	σ_3 Failure (psf):	1296		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4b

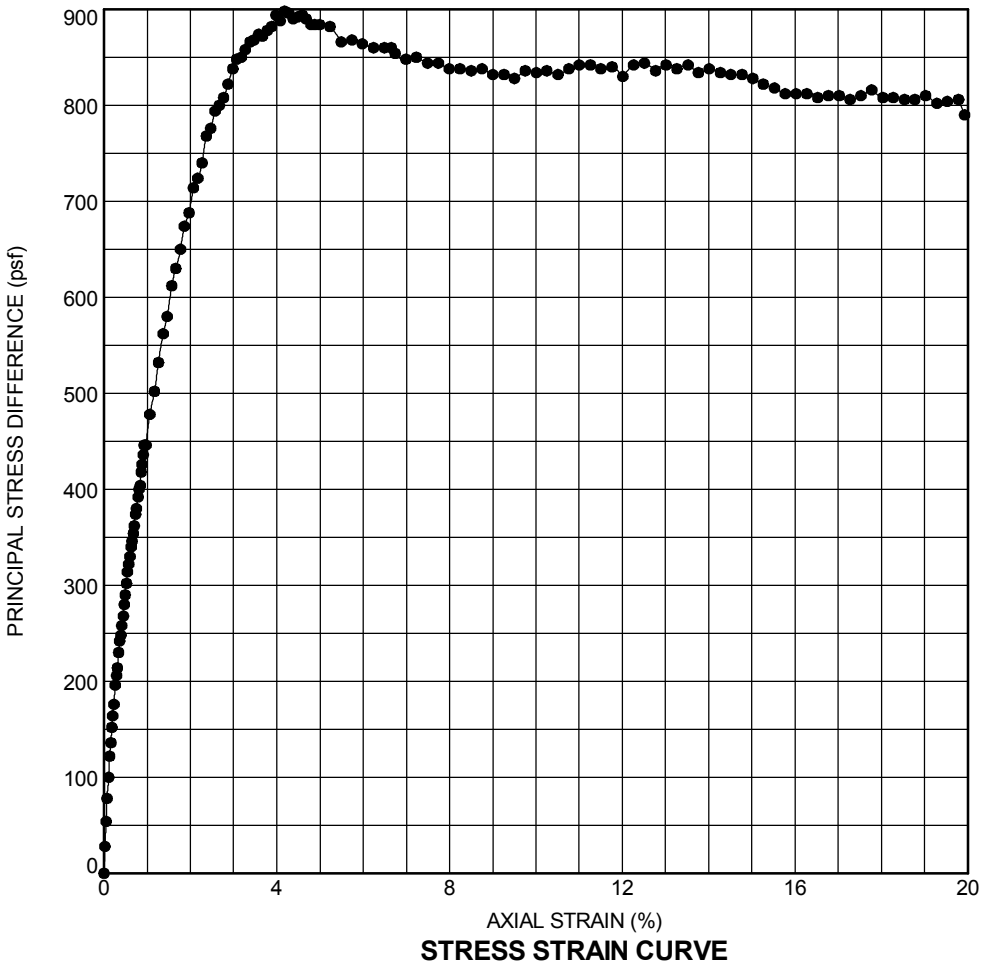
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-01 Depth: 38-40 ft. Sample Number: 14	Visual Classification: FAT CLAY (CH), gray, with sand lenses and pockets
Project No.: 04.55174066 Test Date.: 4/20/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	58.9		
	Dry Density (pcf)	68.9		
	Saturation (%)	100.0		
	Void Ratio	1.45		
	Diameter (inches)	1.41		
	Height (inches)	2.96		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	11.00		
	Deviator Stress (psf)	898		
	Shear Strength (psf)	449		
	Failure Strain (%)	4.2		
	σ_1 Failure (psf):	2482		
	σ_3 Failure (psf):	1584		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4c

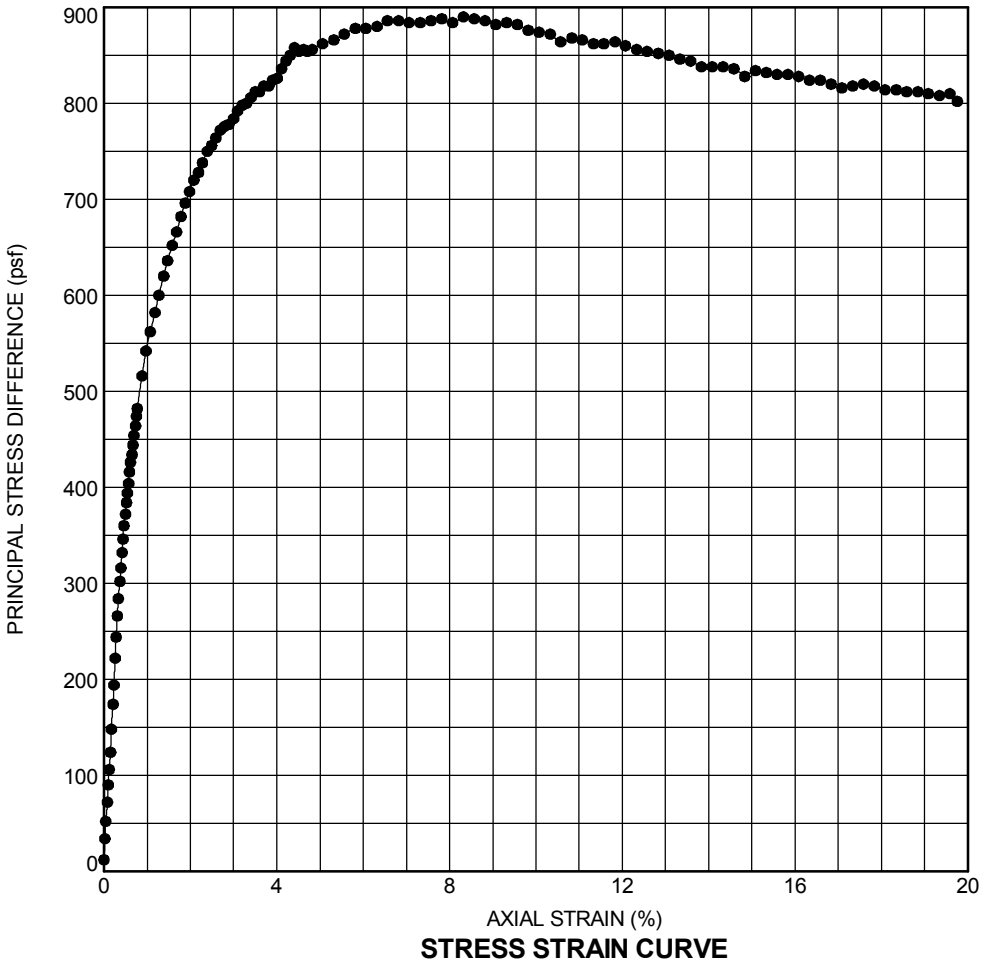
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-01 Depth: 53-55 ft. Sample Number: 17	Visual Classification: FAT CLAY (CH), gray
Project No.: 04.55174066 Test Date.: 4/20/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	67.3		
	Dry Density (pcf)	59.5		
	Saturation (%)	99.2		
	Void Ratio	1.83		
	Diameter (inches)	2.84		
	Height (inches)	5.58		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	15.00		
	Deviator Stress (psf)	890		
	Shear Strength (psf)	445		
	Failure Strain (%)	8.3		
	σ_1 Failure (psf):	3050		
	σ_3 Failure (psf):	2160		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4d

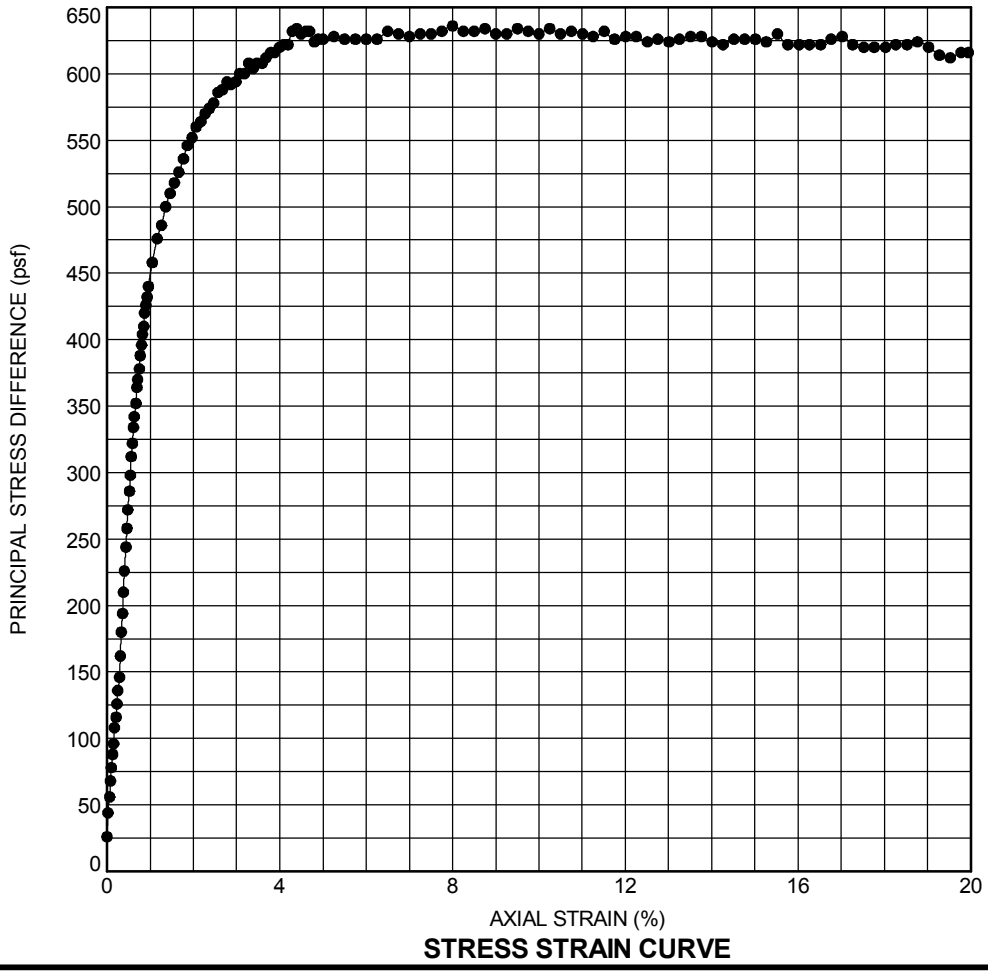
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-02 Depth: 18-20 ft.	Visual Classification: FAT CLAY (CH), gray, with a 2-inch sand layer
Sample Number: 10	
Project No.: 04.55174066 Test Date.: 4/20/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	67.0		
	Dry Density (pcf)	59.1		
	Saturation (%)	97.8		
	Void Ratio	1.85		
	Diameter (inches)	2.85		
	Height (inches)	5.58		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	5.00		
	Deviator Stress (psf)	636		
	Shear Strength (psf)	318		
	Failure Strain (%)	8.0		
	σ_1 Failure (psf):	1356		
	σ_3 Failure (psf):	720		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4e

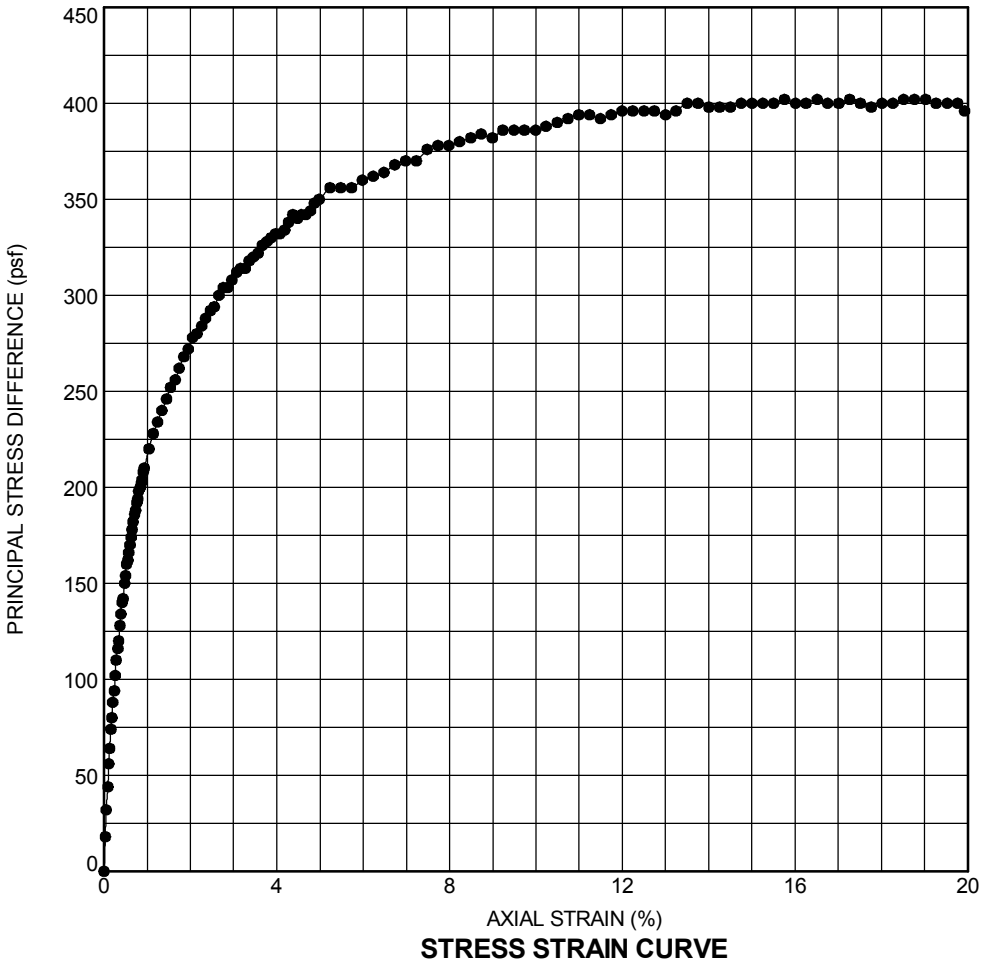
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-02 Depth: 28-30 ft.	Visual Classification: LEAN CLAY (CL), gray, with peat layers
Sample Number: 12	
Project No.: 04.55174066 Test Date.: 4/25/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	29.3		
	Dry Density (pcf)	74.9		
	Saturation (%)	63.3		
	Void Ratio	1.25		
	Diameter (inches)	2.84		
	Height (inches)	5.55		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	8.00		
	Deviator Stress (psf)	400		
	Shear Strength (psf)	200		
	Failure Strain (%)	13.5		
	σ_1 Failure (psf):	1552		
	σ_3 Failure (psf):	1152		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4f

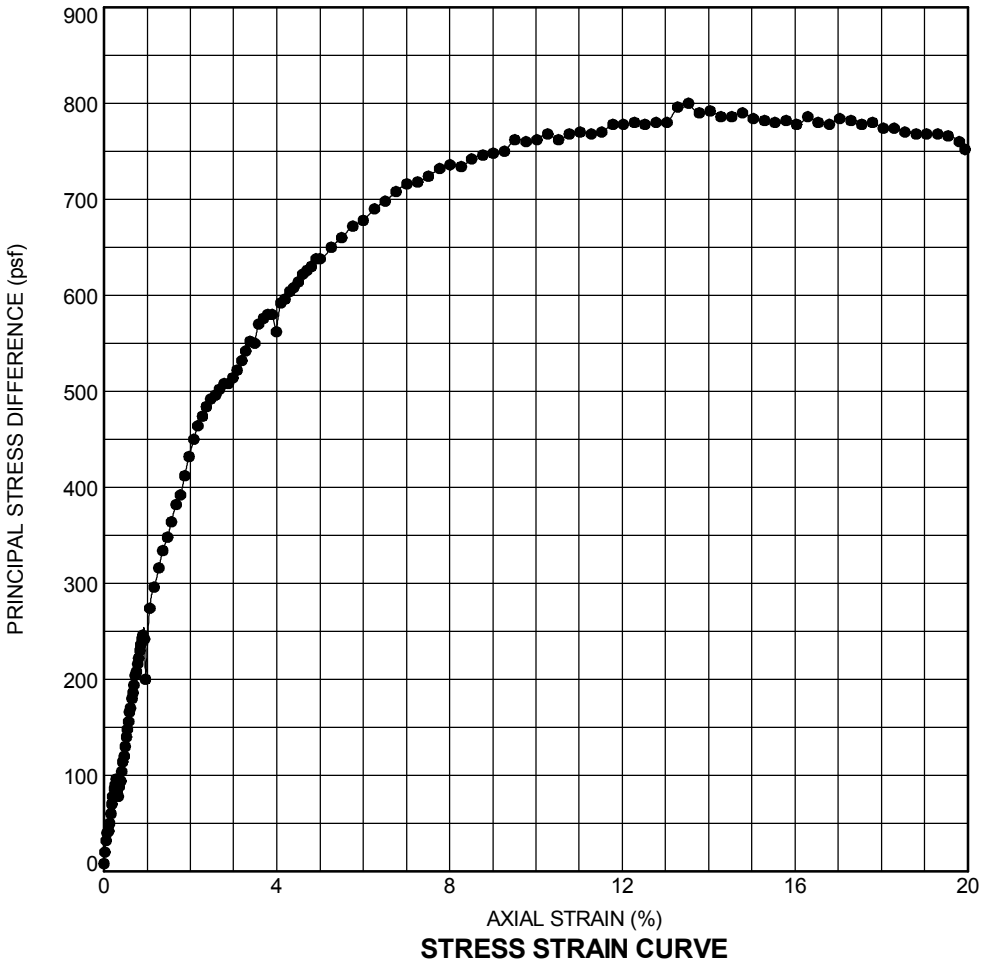
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-02 Depth: 48-50 ft. Sample Number: 16	Visual Classification: FAT CLAY (CH), gray, with silty sand layers
Project No.: 04.55174066 Test Date.: 4/25/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	56.6		
	Dry Density (pcf)	67.6		
	Saturation (%)	100.0		
	Void Ratio	1.49		
	Diameter (inches)	2.82		
	Height (inches)	5.57		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	13.00		
	Deviator Stress (psf)	800		
	Shear Strength (psf)	400		
	Failure Strain (%)	13.5		
	σ_1 Failure (psf):	2672		
	σ_3 Failure (psf):	1872		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



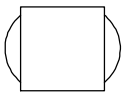
STRESS STRAIN CURVE

PLATE B-4g

TRIAXIAL SHEAR TEST

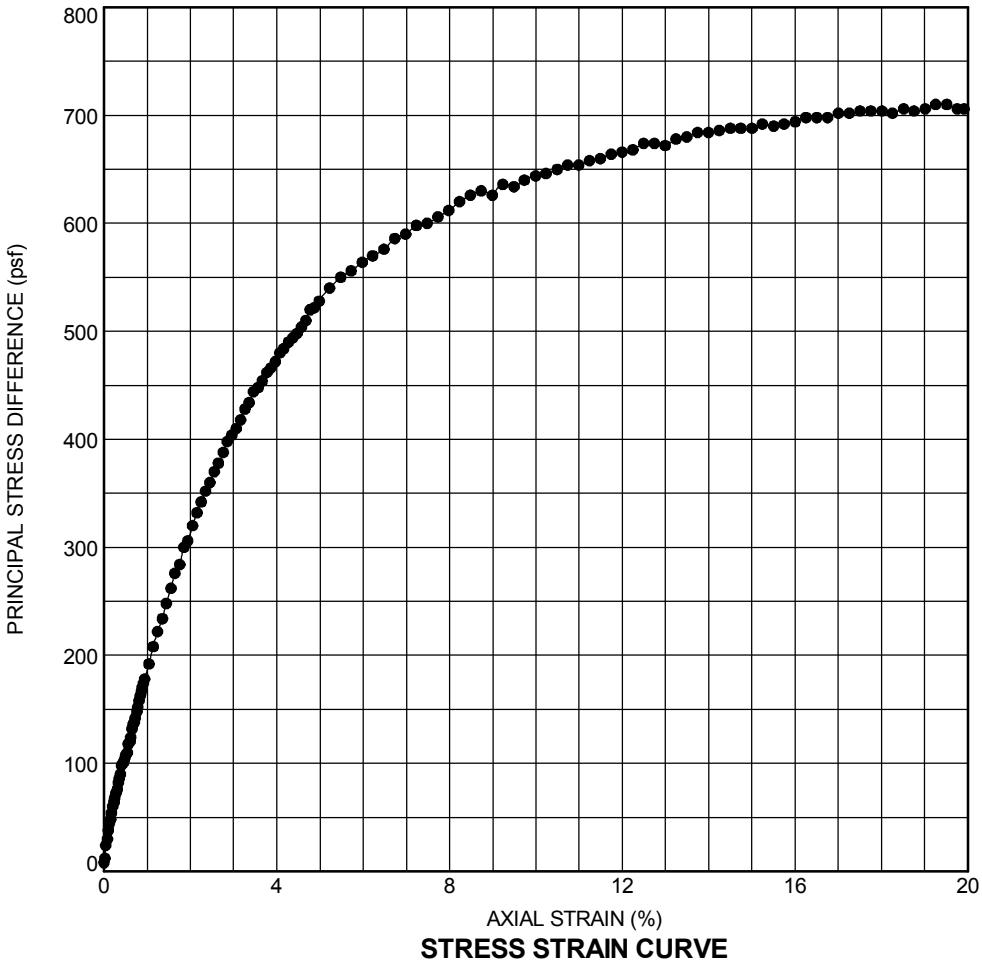
Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 12-14 ft.	Visual Classification: LEAN CLAY (CL), gray
Sample Number: 7	
Project No.: 04.55174066 Test Date.: 4/27/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	39.4		
Dry Density (pcf)	86.1		
Saturation (%)	100.0		
Void Ratio	0.96		
Diameter (inches)	2.83		
Height (inches)	5.40		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	5.00		
Deviator Stress (psf)	688		
Shear Strength (psf)	344		
Failure Strain (%)	14.5		
σ_1 Failure (psf):	1408		
σ_3 Failure (psf):	720		
Failure Type:	Bulging		



Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4h

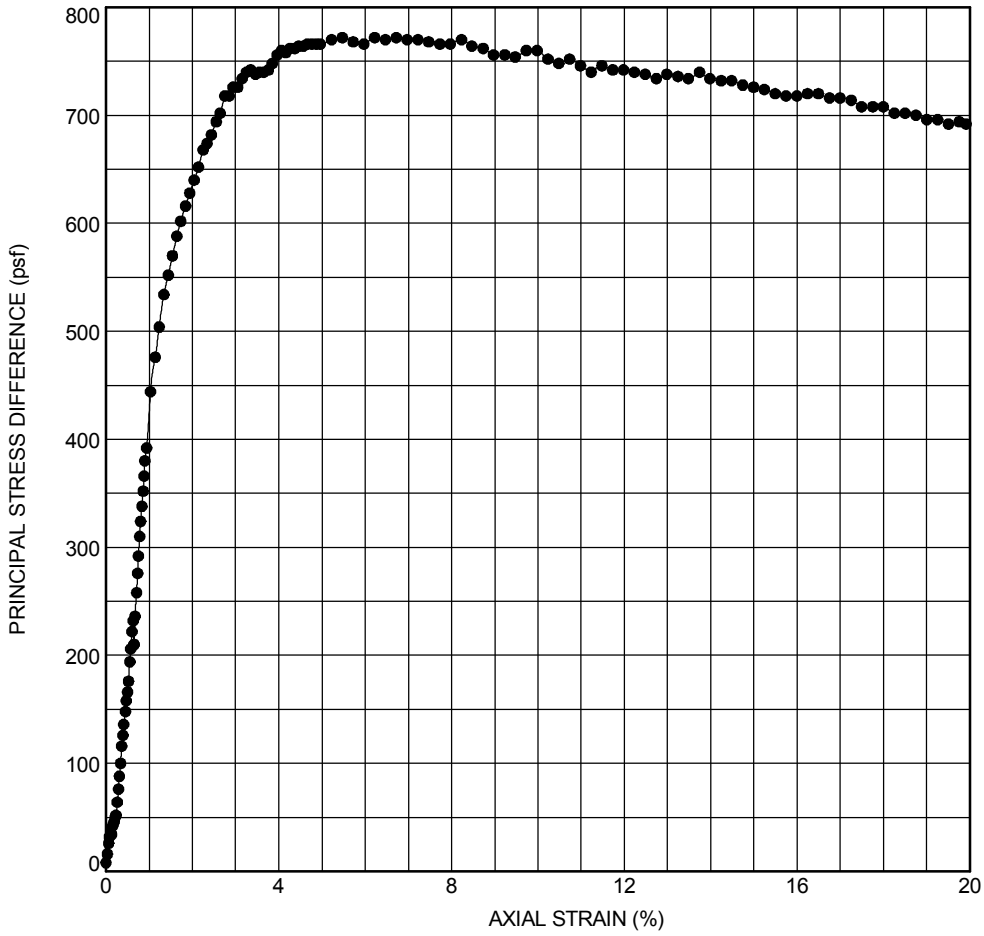
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 16-18 ft.	Visual Classification: LEAN CLAY (CL), gray, with organic traces
Sample Number: 9	
Project No.: 04.55174066 Test Date.: 4/27/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	80.7		
Dry Density (pcf)	54.3		
Saturation (%)	100.0		
Void Ratio	2.11		
Diameter (inches)	2.82		
Height (inches)	5.61		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	6.00		
Deviator Stress (psf)	772		
Shear Strength (psf)	386		
Failure Strain (%)	5.5		
σ_1 Failure (psf):	1636		
σ_3 Failure (psf):	864		
Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4i

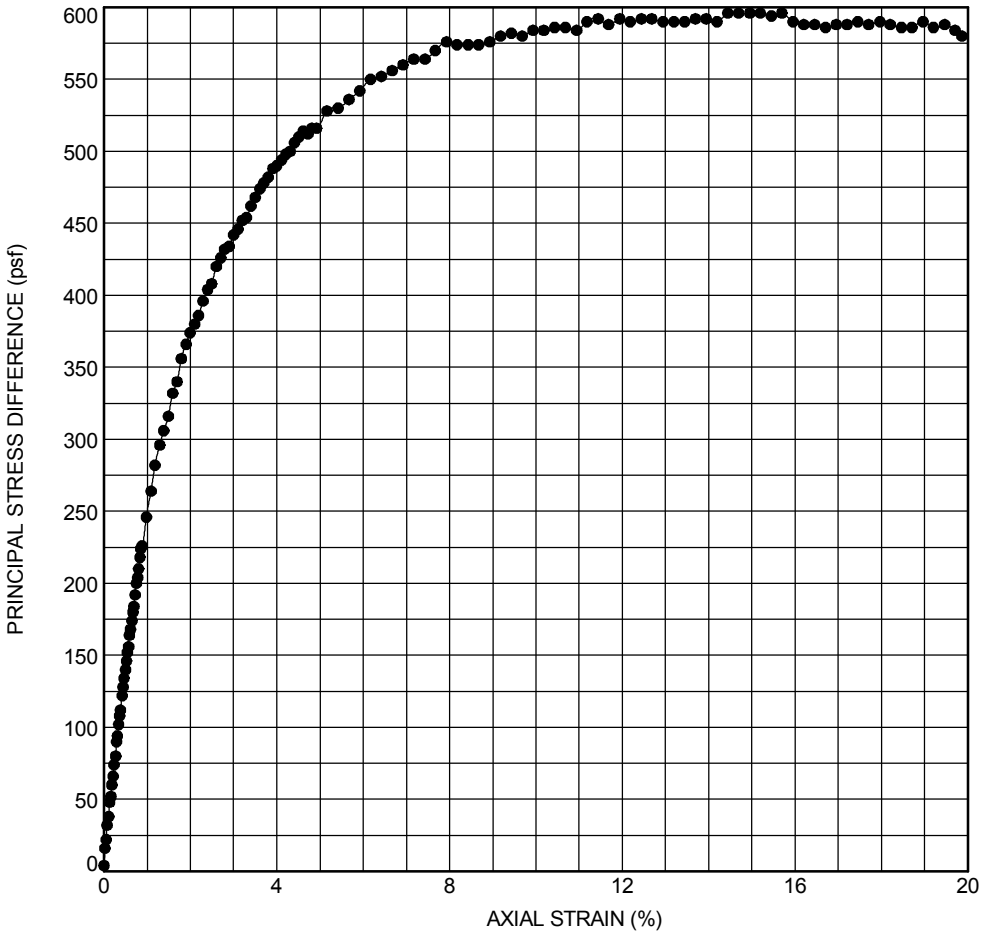
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 24.2-25 ft.	Visual Classification: FAT CLAY (CH), gray, with silt pockets and organics
Sample Number:	
Project No.: 04.55174066 Test Date.: 4/27/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	68.7		
Dry Density (pcf)	58.3		
Saturation (%)	98.0		
Void Ratio	1.89		
Diameter (inches)	2.82		
Height (inches)	5.58		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	9.00		
Deviator Stress (psf)	596		
Shear Strength (psf)	298		
Failure Strain (%)	14.4		
σ_1 Failure (psf):	1892		
σ_3 Failure (psf):	1296		
Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



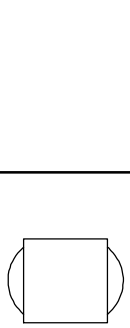
STRESS STRAIN CURVE

PLATE B-4j

TRIAXIAL SHEAR TEST

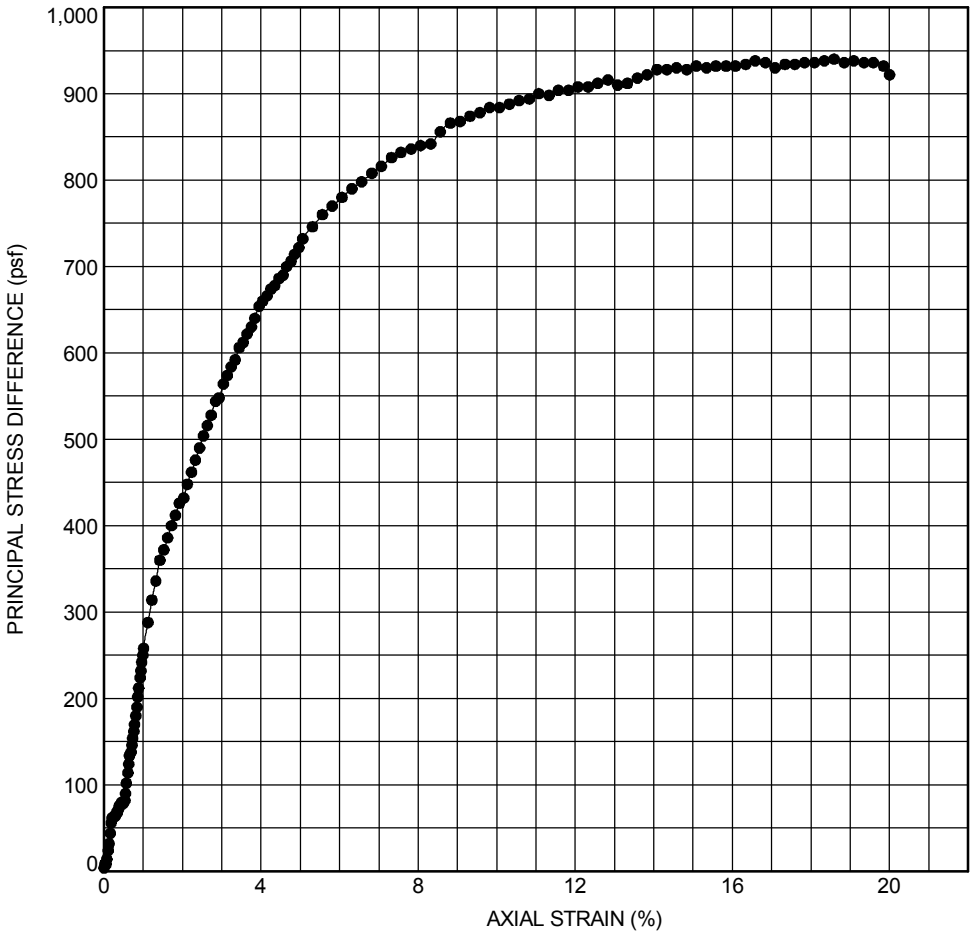
Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 38-40 ft.	Visual Classification: FAT CLAY (CH), gray, with sand layers
Sample Number: 14	
Project No.: 04.55174066 Test Date.: 4/27/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	52.8		
Dry Density (pcf)	70.6		
Saturation (%)	100.0		
Void Ratio	1.39		
Diameter (inches)	2.80		
Height (inches)	5.59		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	14.00		
Deviator Stress (psf)	931		
Shear Strength (psf)	465		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	2947		
σ_3 Failure (psf):	2016		
Failure Type:	Bulging		



Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4k

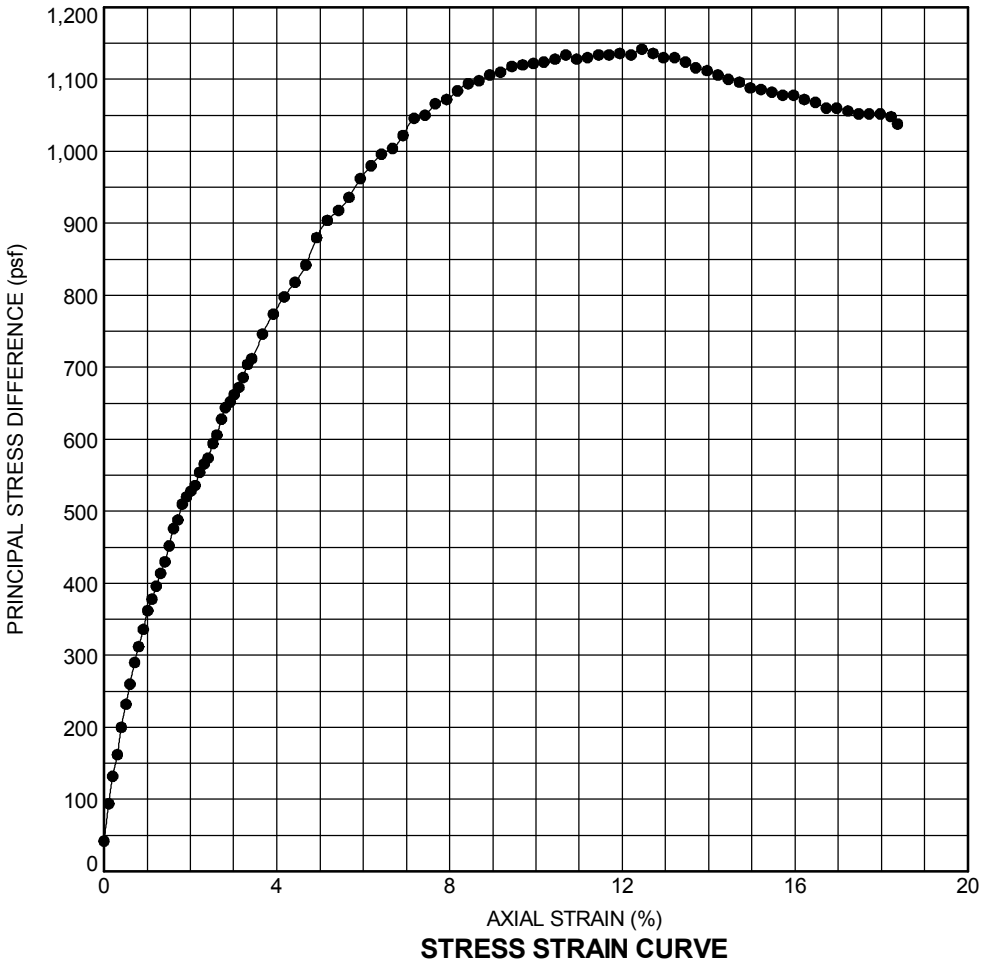
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 48-50 ft.	Visual Classification: FAT CLAY (CH), gray, with organic traces
Sample Number: 16	
Project No.: 04.55174066 Test Date.: 5/3/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	59.7		
	Dry Density (pcf)	68.9		
	Saturation (%)	100.0		
	Void Ratio	1.45		
	Diameter (inches)	1.46		
	Height (inches)	2.83		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	17.00		
	Deviator Stress (psf)	1142		
	Shear Strength (psf)	571		
	Failure Strain (%)	12.5		
	σ_1 Failure (psf):	3590		
	σ_3 Failure (psf):	2448		
	Failure Type:	45° Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4I

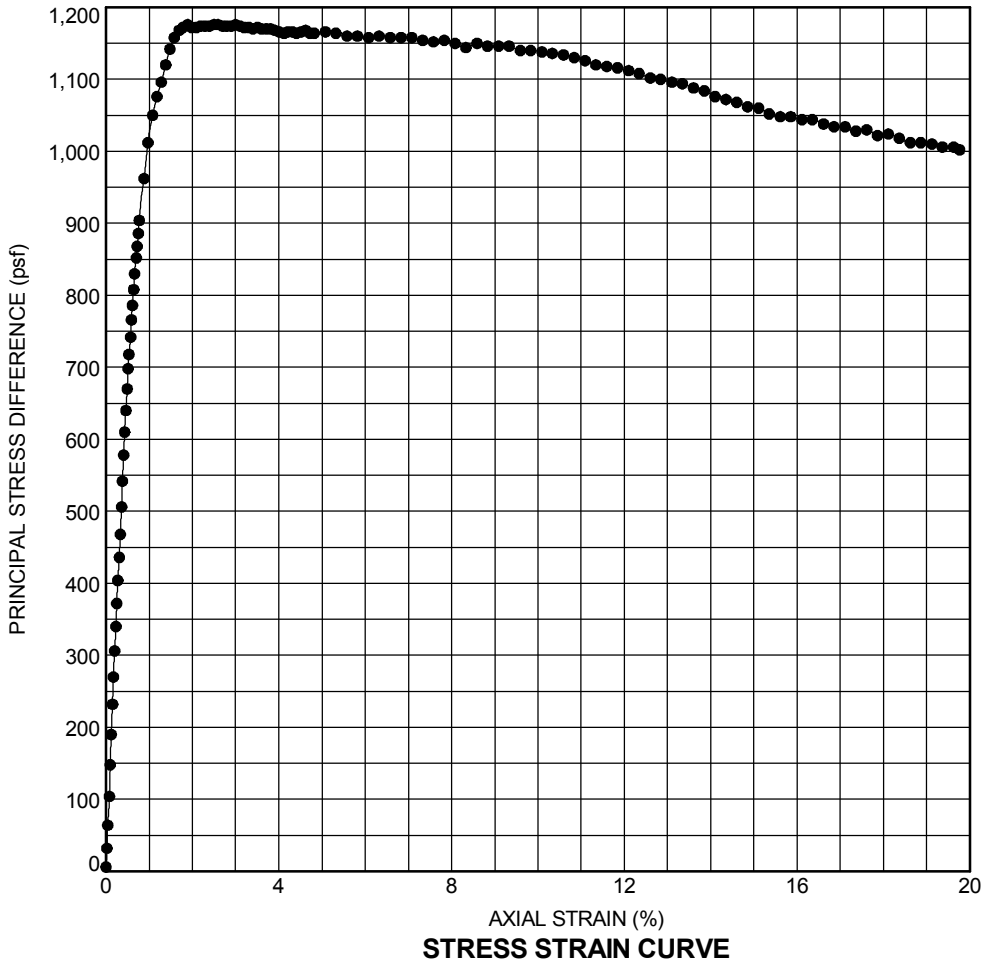
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-03 Depth: 58-60 ft.	Visual Classification: FAT CLAY (CH), gray
Sample Number: 18	
Project No.: 04.55174066 Test Date.: 5/3/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	69.7		
	Dry Density (pcf)	59.1		
	Saturation (%)	100.0		
	Void Ratio	1.85		
	Diameter (inches)	2.83		
	Height (inches)	5.65		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	21.00		
	Deviator Stress (psf)	1176		
	Shear Strength (psf)	588		
	Failure Strain (%)	1.9		
	σ_1 Failure (psf):	4200		
	σ_3 Failure (psf):	3024		
	Failure Type:	45° Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4m

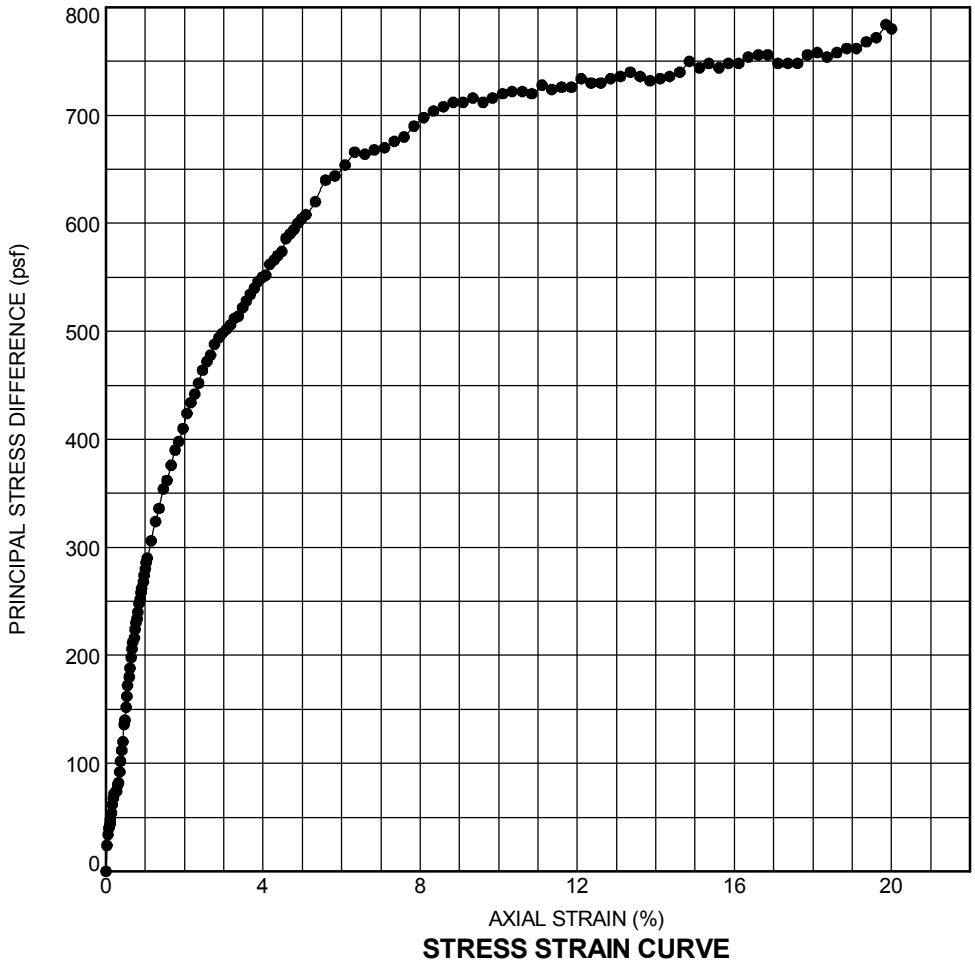
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-04 Depth: 6-8 ft.	Visual Classification: FAT CLAY (CH), brown and gray, with silt pockets and layers
Sample Number: 4	
Project No.: 04.55174066 Test Date.: 5/3/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	40.8		
Dry Density (pcf)	84.8		
Saturation (%)	100.0		
Void Ratio	0.99		
Diameter (inches)	2.79		
Height (inches)	5.63		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	3.00		
Deviator Stress (psf)	750		
Shear Strength (psf)	375		
Failure Strain (%)	14.9		
σ_1 Failure (psf):	1182		
σ_3 Failure (psf):	432		
Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4n

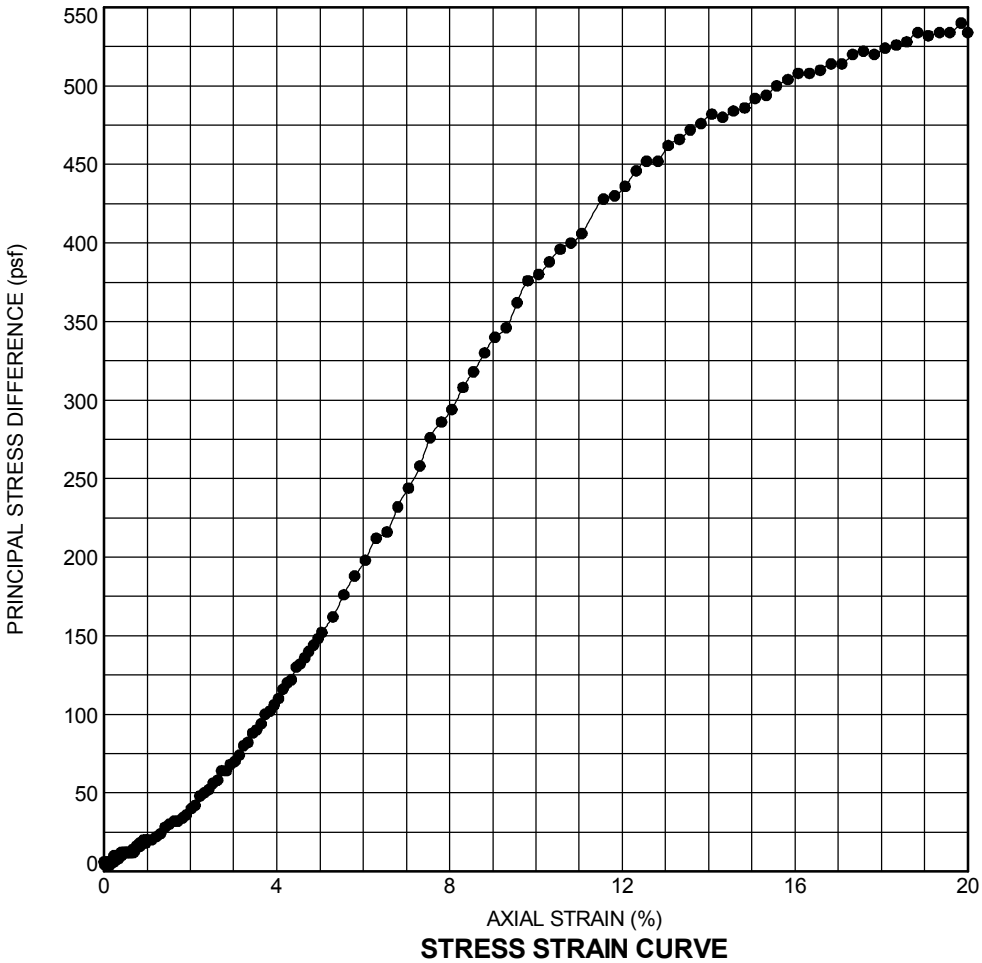
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-04 Depth: 12-14 ft. Sample Number: 7	Visual Classification: FAT CLAY (CH), gray
Project No.: 04.55174066 Test Date.: 5/4/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.0		
	Dry Density (pcf)	87.2		
	Saturation (%)	95.6		
	Void Ratio	0.93		
	Diameter (inches)	2.87		
	Height (inches)	5.16		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	5.00		
	Deviator Stress (psf)	490		
	Shear Strength (psf)	245		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1210		
	σ_3 Failure (psf):	720		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4o

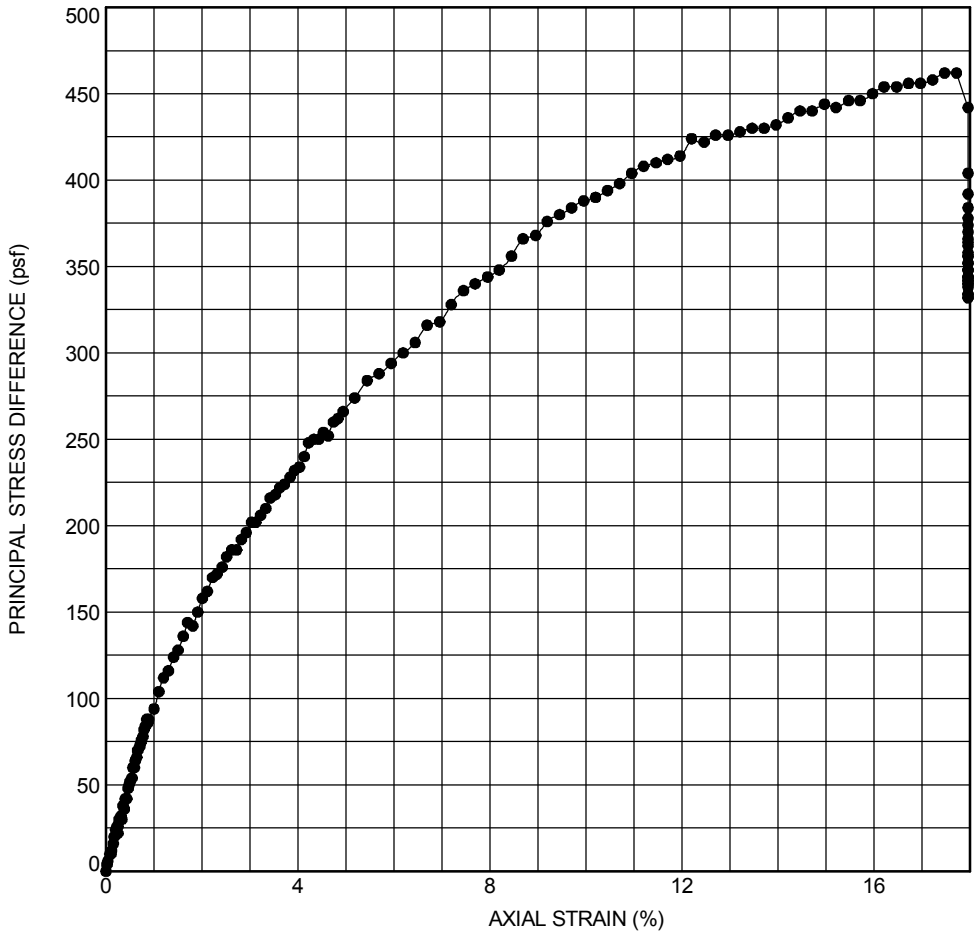
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-04 Depth: 23-25 ft.	Visual Classification: FAT CLAY (CH), gray
Sample Number: 11	
Project No.: 04.55174066 Test Date.: 5/4/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	38.0		
	Dry Density (pcf)	84.4		
	Saturation (%)	100.0		
	Void Ratio	1.00		
	Diameter (inches)	2.84		
	Height (inches)	5.45		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	9.00		
	Deviator Stress (psf)	444		
	Shear Strength (psf)	222		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1740		
	σ_3 Failure (psf):	1296		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4p

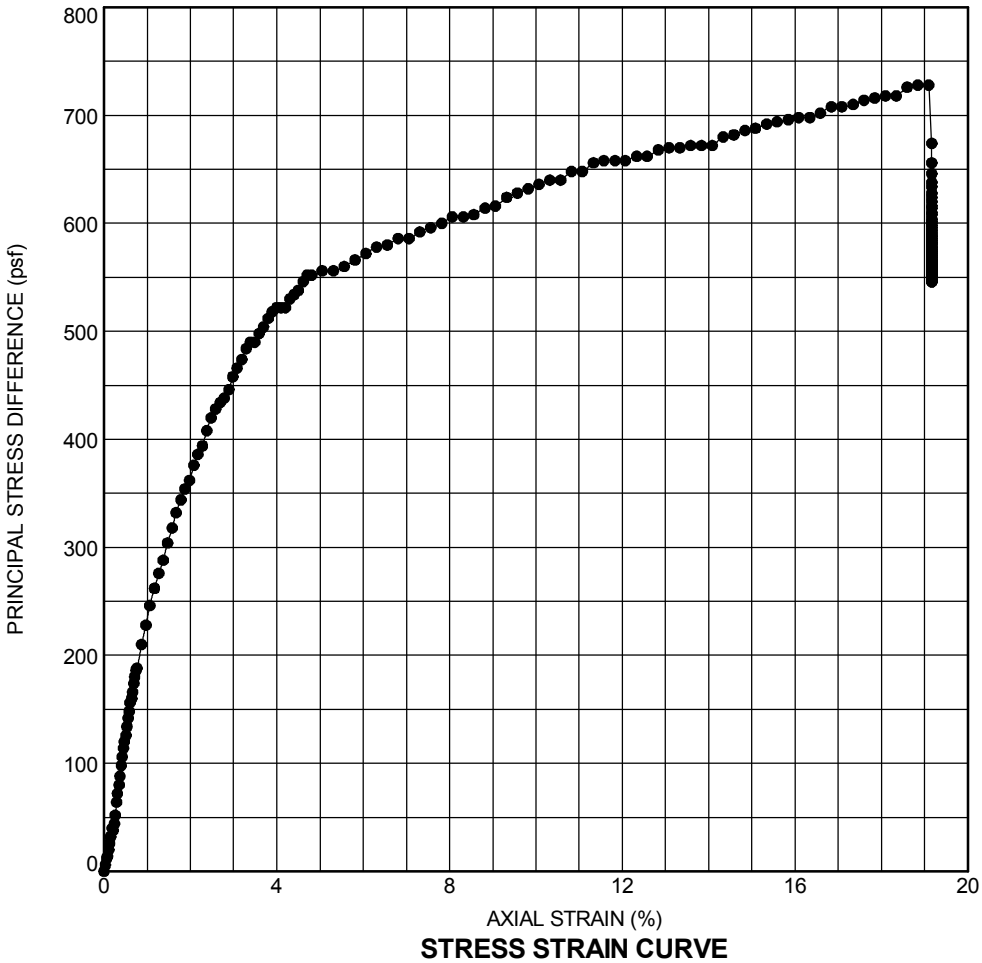
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-04 Depth: 33-35 ft. Sample Number: 13	Visual Classification: LEAN CLAY (CL), gray, with silt and sand pockets
Project No.: 04.55174066 Test Date.: 5/7/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	45.2		
	Dry Density (pcf)	79.0		
	Saturation (%)	100.0		
	Void Ratio	1.13		
	Diameter (inches)	2.79		
	Height (inches)	5.52		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	12.00		
	Deviator Stress (psf)	687		
	Shear Strength (psf)	344		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	2415		
	σ_3 Failure (psf):	1728		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4q

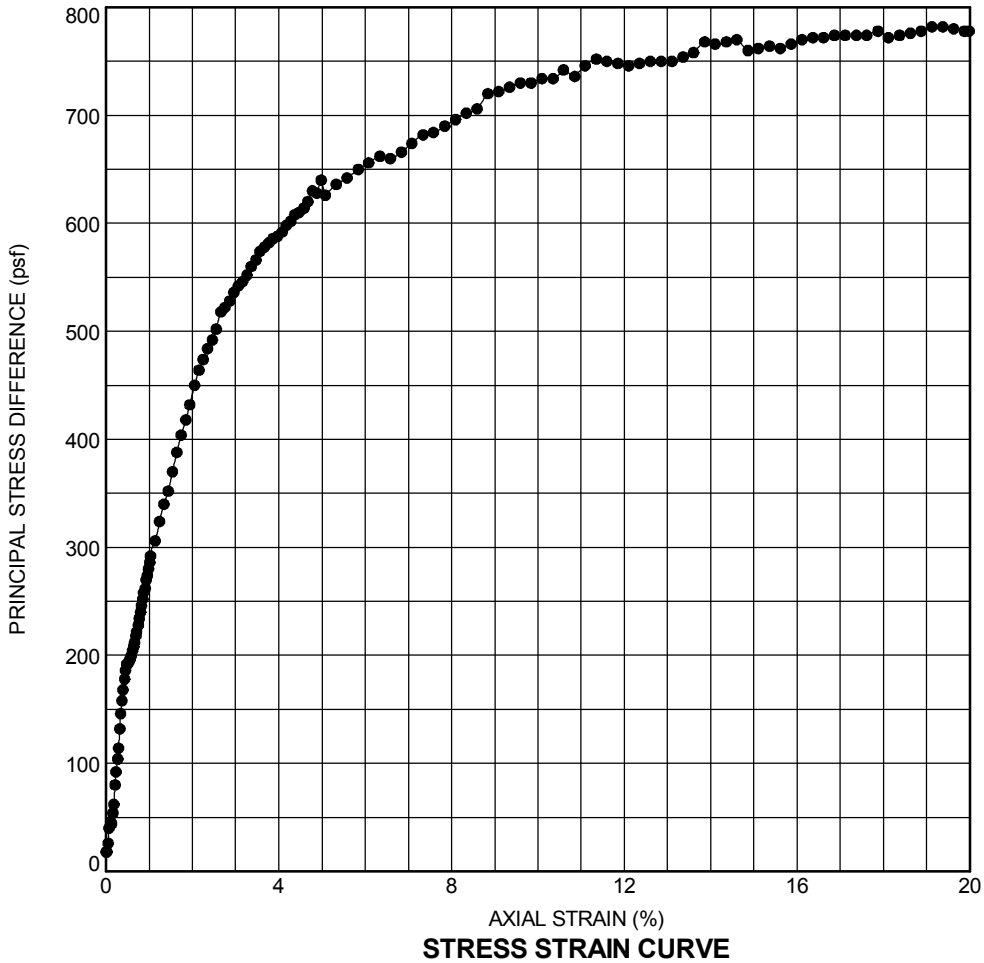
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-05 Depth: 2-4 ft.	Visual Classification: FAT CLAY (CH), gray, with organics
Sample Number: 2	
Project No.: 04.55174066 Test Date.: 4/24/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	51.8		
Dry Density (pcf)	71.2		
Saturation (%)	100.0		
Void Ratio	1.37		
Diameter (inches)	2.81		
Height (inches)	5.60		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	3.00		
Deviator Stress (psf)	770		
Shear Strength (psf)	385		
Failure Strain (%)	14.6		
σ_1 Failure (psf):	1202		
σ_3 Failure (psf):	432		
Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4r

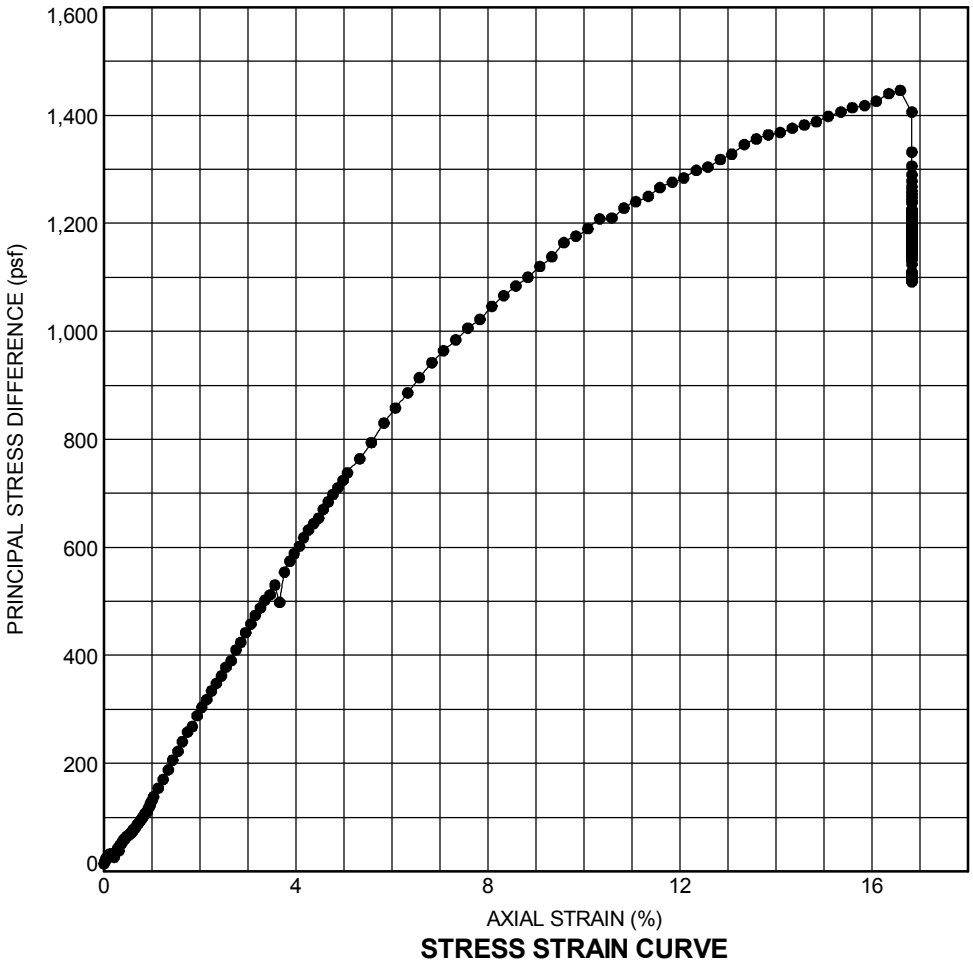
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-05 Depth: 8-10 ft.	Visual Classification: LEAN CLAY (CL), gray
Sample Number: 5	
Project No.: 04.55174066 Test Date.: 4/24/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.3		
	Dry Density (pcf)	87.5		
	Saturation (%)	97.1		
	Void Ratio	0.93		
	Diameter (inches)	2.81		
	Height (inches)	5.58		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	3.00		
	Deviator Stress (psf)	1394		
	Shear Strength (psf)	697		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1826		
	σ_3 Failure (psf):	432		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4s

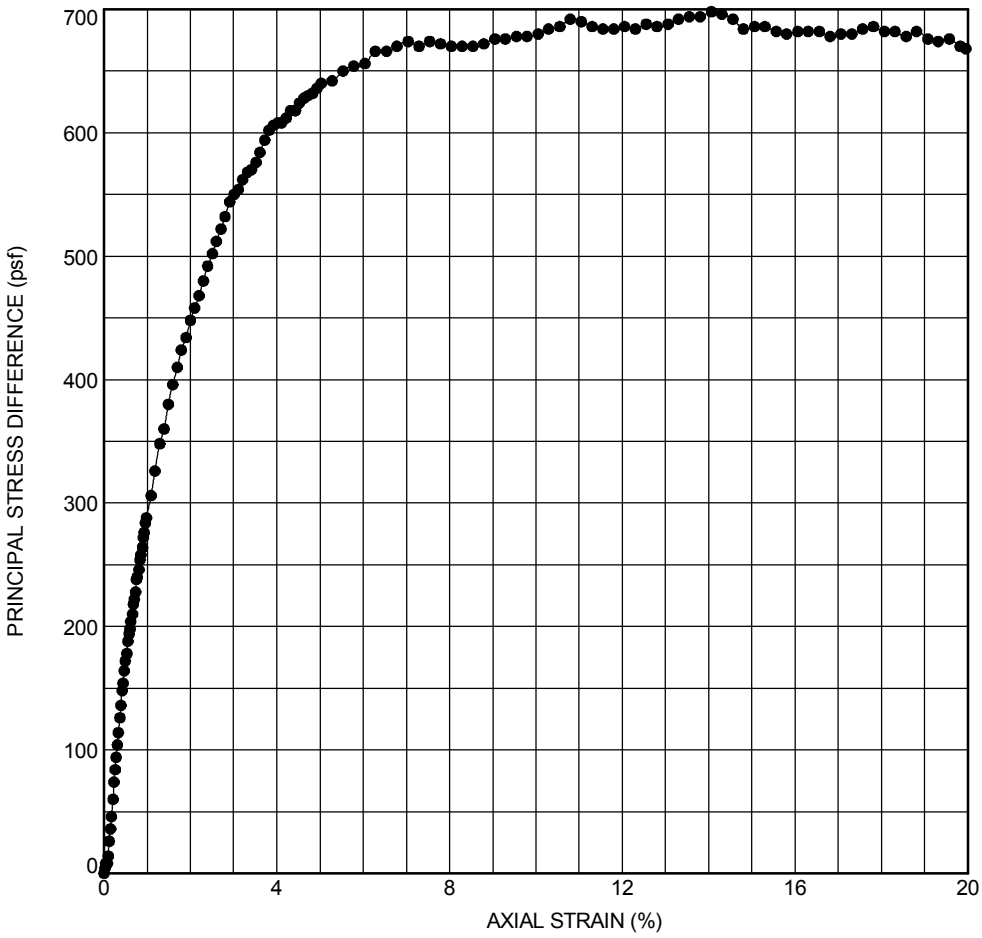
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-05 Depth: 14-16 ft.	Visual Classification: LEAN CLAY (CL), gray, with silt pockets
Sample Number: 8	
Project No.: 04.55174066 Test Date.: 4/24/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	52.2		
Dry Density (pcf)	72.0		
Saturation (%)	100.0		
Void Ratio	1.34		
Diameter (inches)	2.83		
Height (inches)	5.57		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	5.00		
Deviator Stress (psf)	698		
Shear Strength (psf)	349		
Failure Strain (%)	14.1		
σ_1 Failure (psf):	1418		
σ_3 Failure (psf):	720		
Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4t

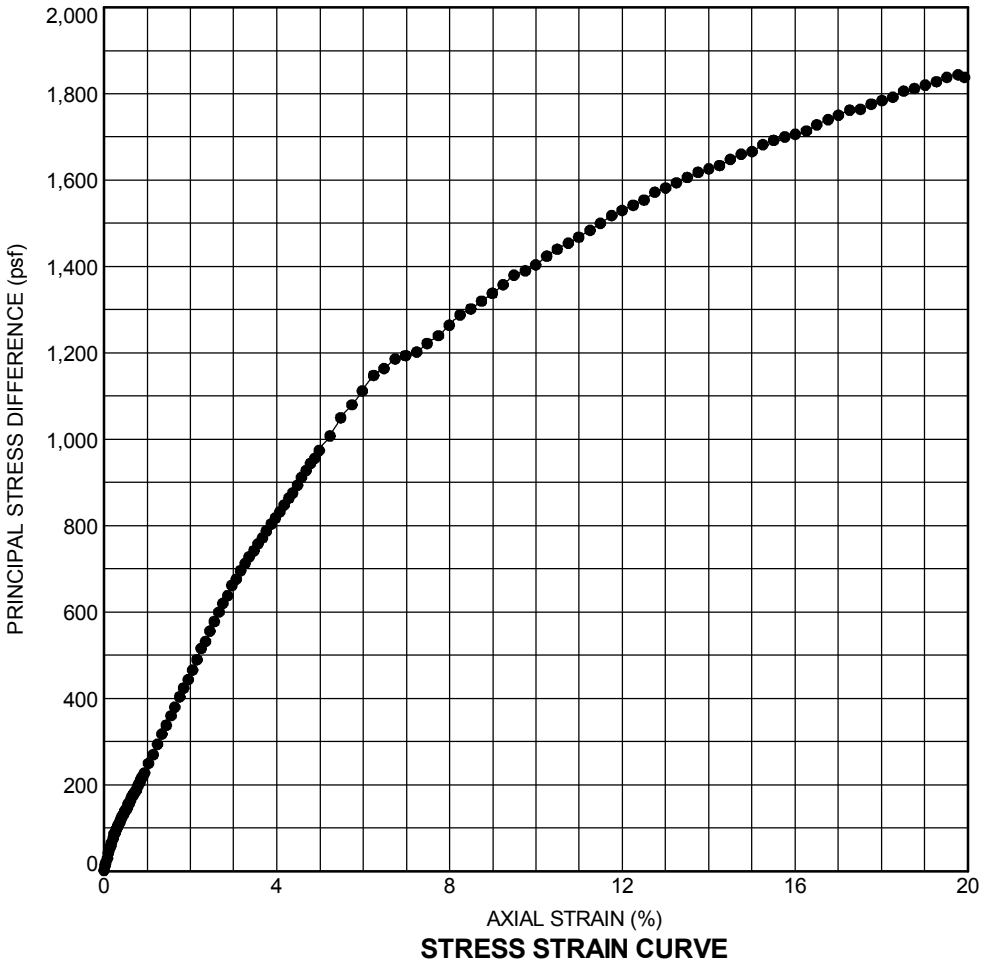
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-05 Depth: 23-25 ft. Sample Number: 11	Visual Classification: LEAN CLAY (CL), gray, with wood and silt pockets
Project No.: 04.55174066 Test Date.: 4/25/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.4		
	Dry Density (pcf)	88.6		
	Saturation (%)	100.0		
	Void Ratio	0.90		
	Diameter (inches)	2.83		
	Height (inches)	5.53		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	7.00		
	Deviator Stress (psf)	1666		
	Shear Strength (psf)	833		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	2674		
	σ_3 Failure (psf):	1008		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4u

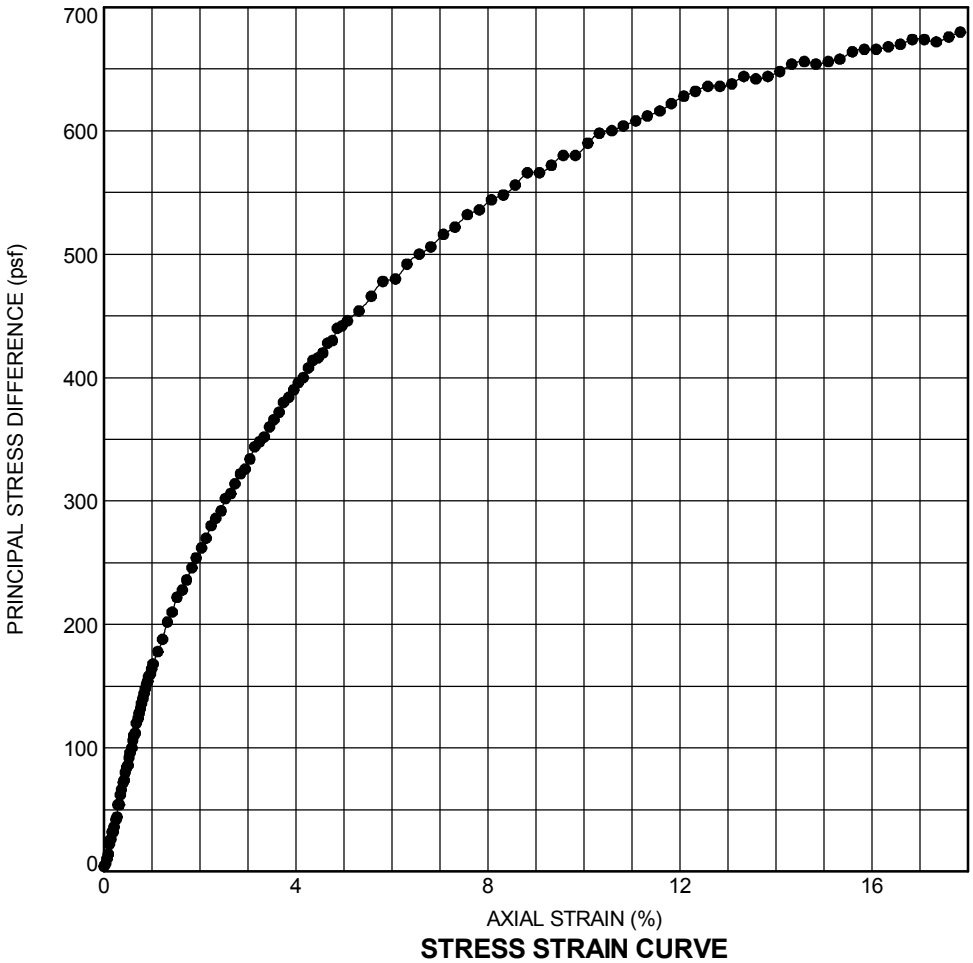
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-06 Depth: 4-6 ft.	Visual Classification: LEAN CLAY (CL), gray, with silt pockets and roots
Sample Number: 3	
Project No.: 04.55174066 Test Date.: 4/25/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	35.4		
	Dry Density (pcf)	87.5		
	Saturation (%)	100.0		
	Void Ratio	0.92		
	Diameter (inches)	2.84		
	Height (inches)	5.56		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	3.00		
	Deviator Stress (psf)	656		
	Shear Strength (psf)	328		
	Failure Strain (%)	14.6		
	σ_1 Failure (psf):	1088		
	σ_3 Failure (psf):	432		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4v

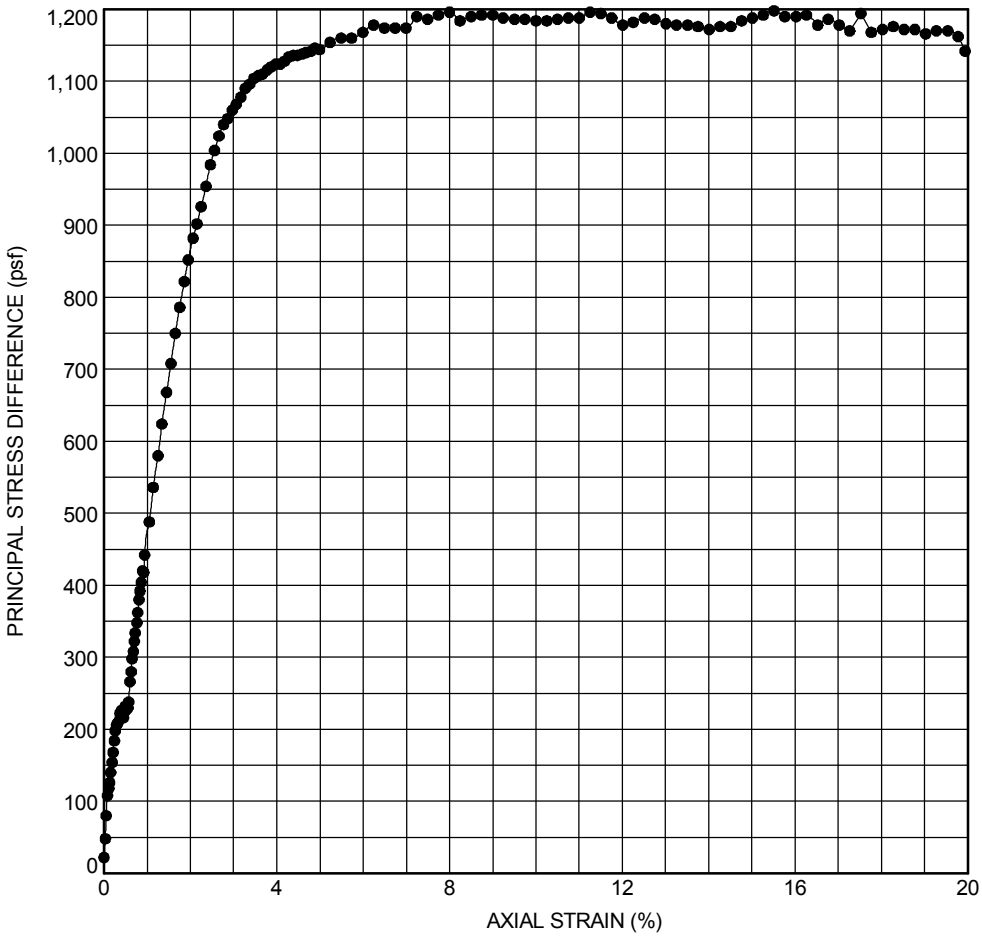
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-06 Depth: 8-10 ft.	Visual Classification: LEAN CLAY (CL), gray, with silt pockets
Sample Number: 5	
Project No.: 04.55174066 Test Date.: 4/26/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	42.7		
	Dry Density (pcf)	80.7		
	Saturation (%)	100.0		
	Void Ratio	1.09		
	Diameter (inches)	2.81		
	Height (inches)	5.56		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	3.00		
	Deviator Stress (psf)	1196		
	Shear Strength (psf)	598		
	Failure Strain (%)	8.0		
	σ_1 Failure (psf):	1628		
	σ_3 Failure (psf):	432		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4w

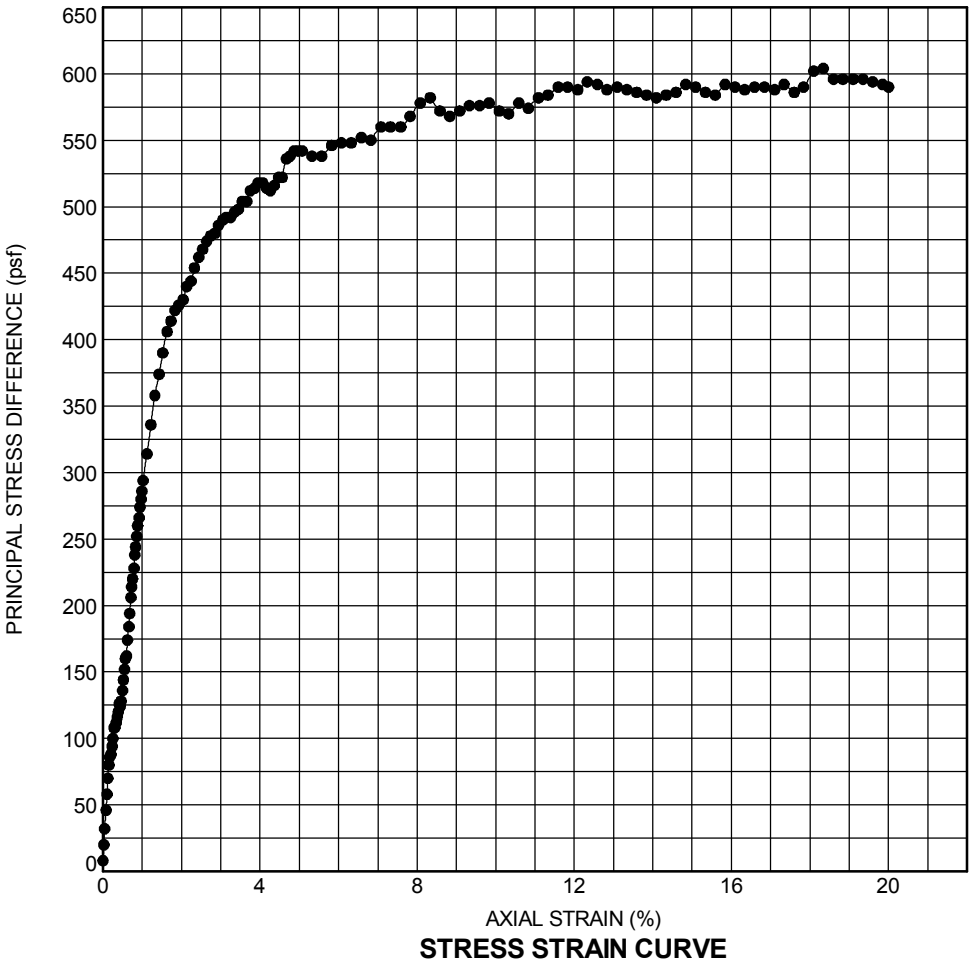
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-06 Depth: 14-16 ft. Sample Number: 8	Visual Classification: LEAN CLAY (CL), gray, with silt pockets
Project No.: 04.55174066 Test Date.: 4/26/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	65.6		
	Dry Density (pcf)	63.0		
	Saturation (%)	100.0		
	Void Ratio	1.67		
	Diameter (inches)	2.83		
	Height (inches)	5.58		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	5.00		
	Deviator Stress (psf)	594		
	Shear Strength (psf)	297		
	Failure Strain (%)	12.3		
	σ_1 Failure (psf):	1314		
	σ_3 Failure (psf):	720		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4x

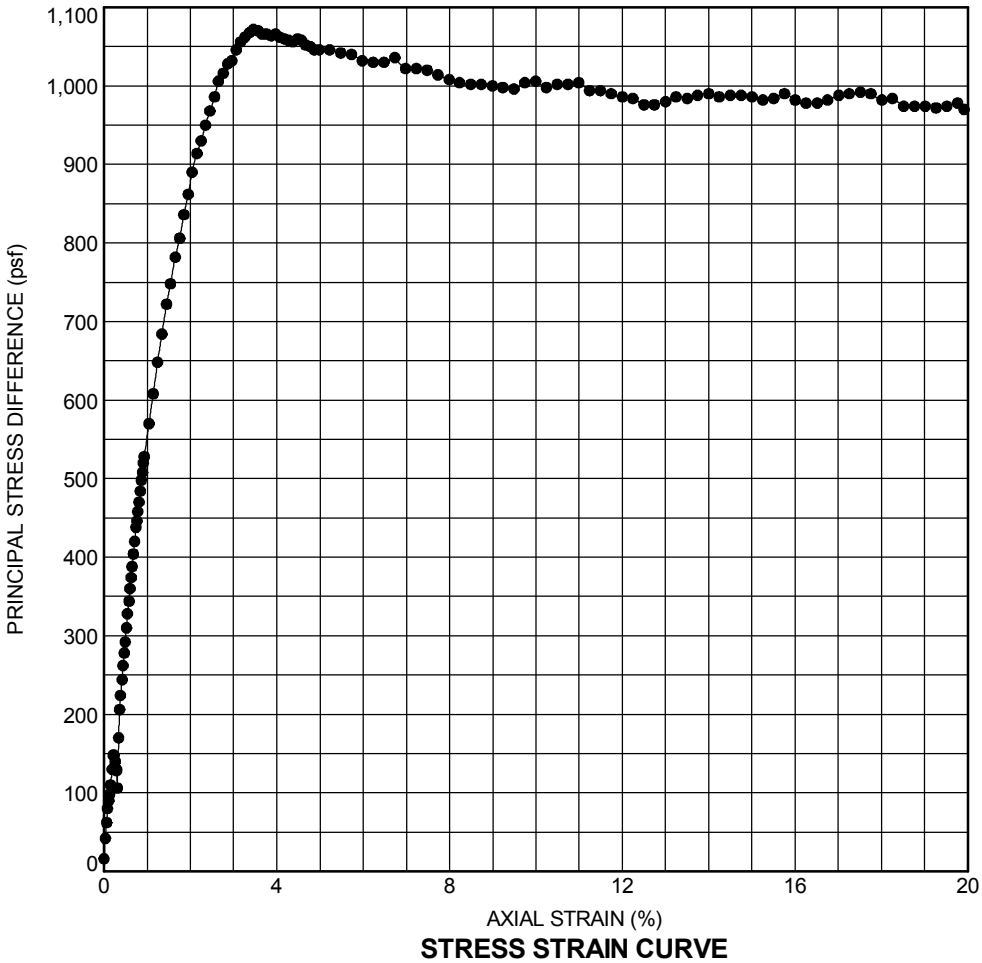
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-06 Depth: 38-40 ft.	Visual Classification: FAT CLAY (CH), gray, with silt pockets
Sample Number: 14	
Project No.: 04.55174066 Test Date.: 4/26/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	51.7		
	Dry Density (pcf)	72.5		
	Saturation (%)	100.0		
	Void Ratio	1.32		
	Diameter (inches)	2.81		
	Height (inches)	5.62		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	11.00		
	Deviator Stress (psf)	1072		
	Shear Strength (psf)	536		
	Failure Strain (%)	3.5		
	σ_1 Failure (psf):	2656		
	σ_3 Failure (psf):	1584		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4y

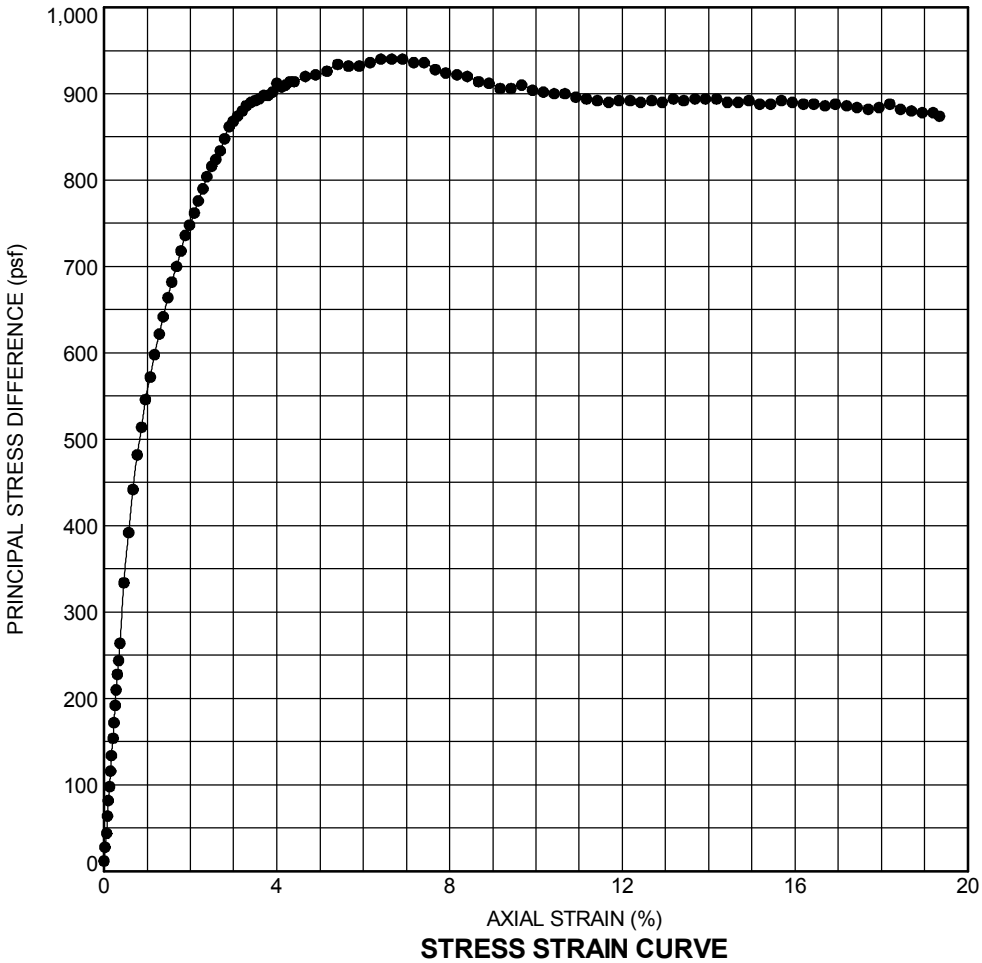
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-06 Depth: 48-50 ft. Sample Number: 17	Visual Classification: FAT CLAY (CH), gray, with silt pockets
Project No.: 04.55174066 Test Date.: 4/26/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	66.7		
	Dry Density (pcf)	60.8		
	Saturation (%)	100.0		
	Void Ratio	1.77		
	Diameter (inches)	2.83		
	Height (inches)	5.62		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	14.00		
	Deviator Stress (psf)	940		
	Shear Strength (psf)	470		
	Failure Strain (%)	6.4		
	σ_1 Failure (psf):	2956		
	σ_3 Failure (psf):	2016		
	Failure Type:	Multi Shear		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4z

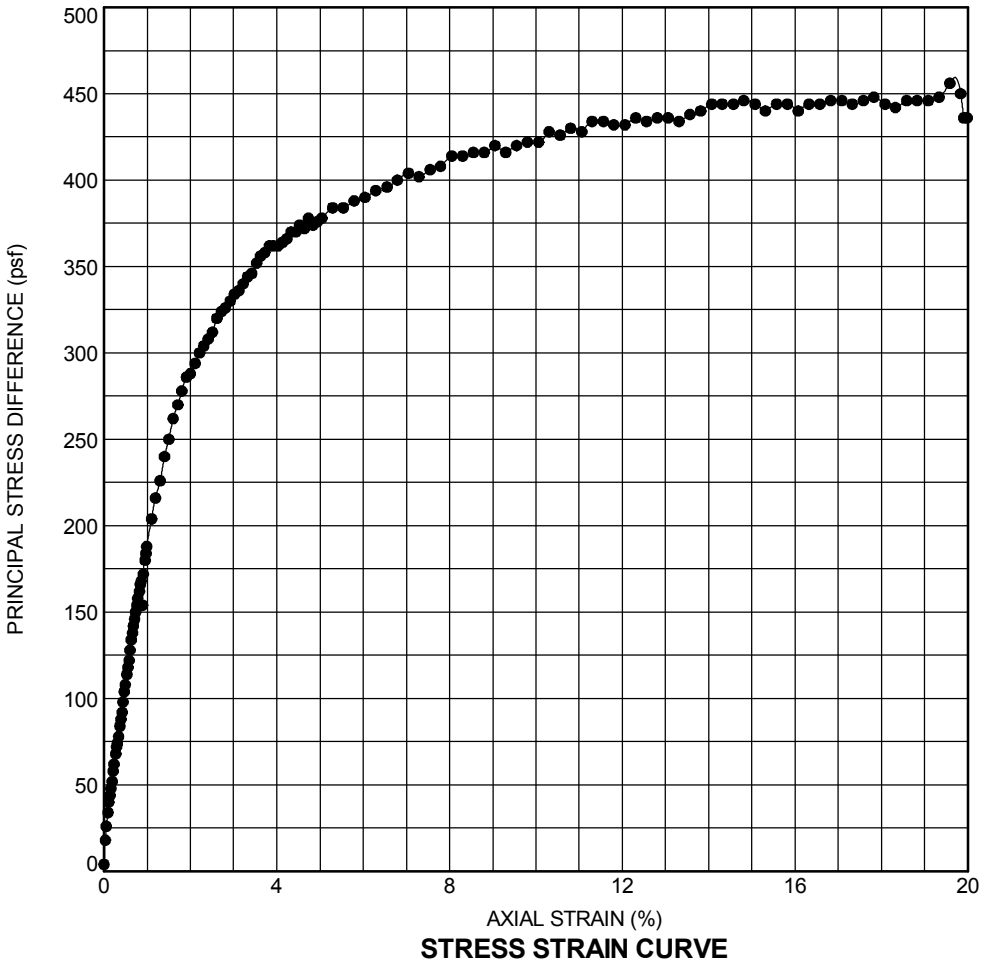
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-07 Depth: 0-2 ft.	Visual Classification: FAT CLAY (CH), gray, with silt pockets
Sample Number: 1	
Project No.: 04.55174066 Test Date.: 5/7/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	59.1		
Dry Density (pcf)	65.9		
Saturation (%)	100.0		
Void Ratio	1.56		
Diameter (inches)	2.82		
Height (inches)	5.57		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	3.00		
Deviator Stress (psf)	446		
Shear Strength (psf)	223		
Failure Strain (%)	14.8		
σ_1 Failure (psf):	878		
σ_3 Failure (psf):	432		
Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4aa

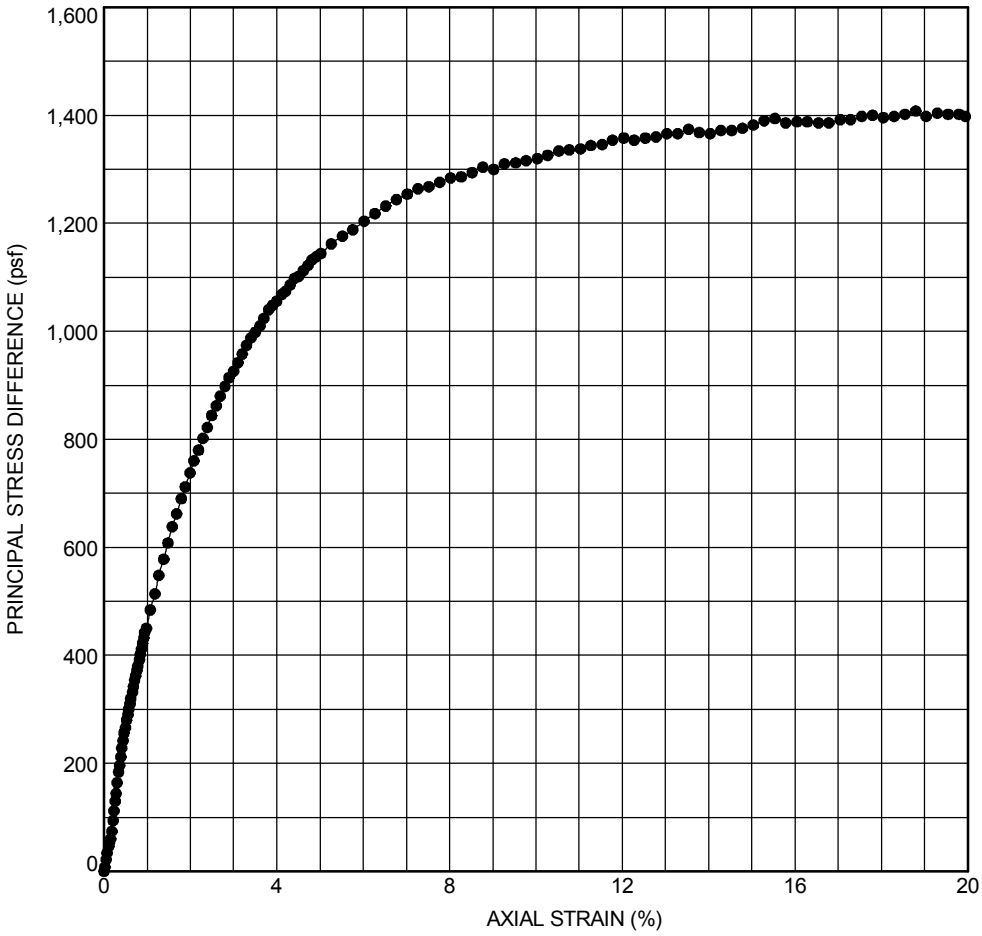
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-07 Depth: 8-10 ft.	Visual Classification: FAT CLAY (CH), gray, with silt pockets
Sample Number: 5	
Project No.: 04.55174066 Test Date.: 5/7/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	32.1		
	Dry Density (pcf)	90.9		
	Saturation (%)	100.0		
	Void Ratio	0.85		
	Diameter (inches)	2.84		
	Height (inches)	5.59		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	3.00		
	Deviator Stress (psf)	1381		
	Shear Strength (psf)	691		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1813		
	σ_3 Failure (psf):	432		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ab

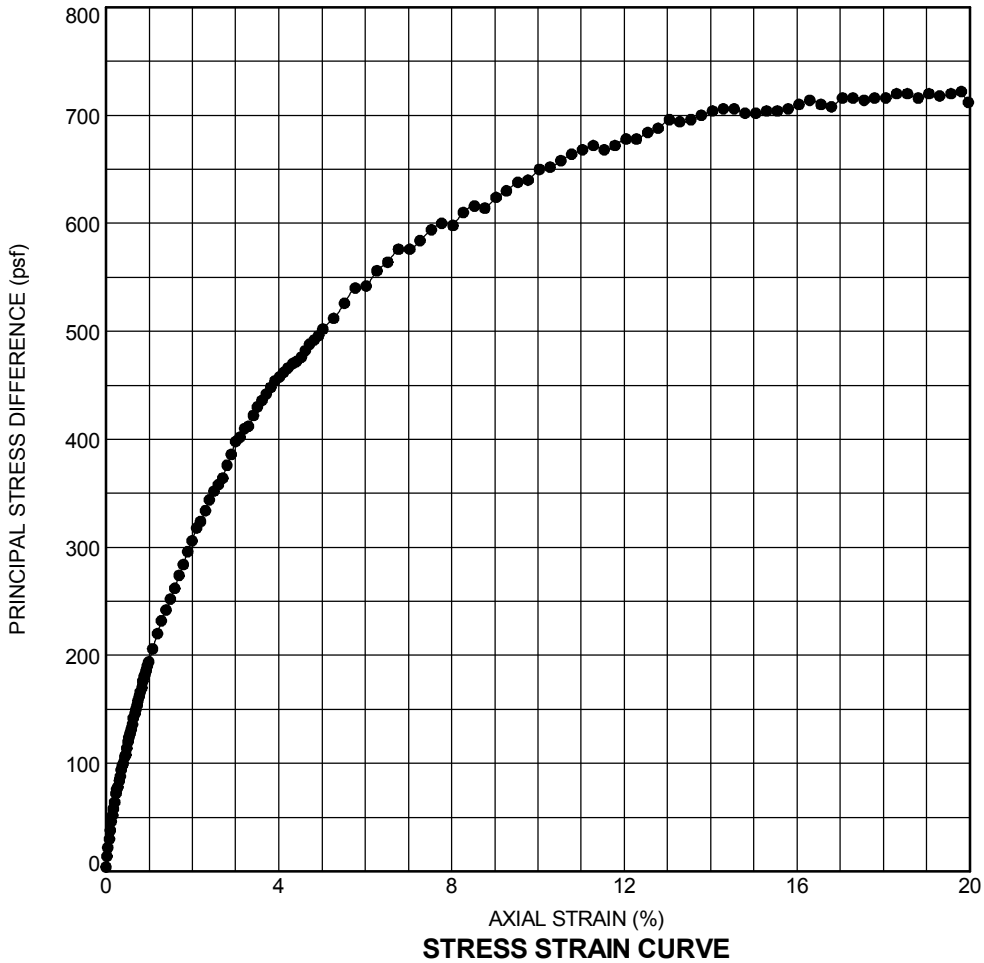
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-07 Depth: 16-18 ft.	Visual Classification: FAT CLAY (CH), gray, with silt pockets
Sample Number: 9	
Project No.: 04.55174066 Test Date.: 5/7/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	35.1		
	Dry Density (pcf)	89.7		
	Saturation (%)	100.0		
	Void Ratio	0.88		
	Diameter (inches)	2.79		
	Height (inches)	5.53		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	6.00		
	Deviator Stress (psf)	706		
	Shear Strength (psf)	353		
	Failure Strain (%)	14.3		
	σ_1 Failure (psf):	1570		
	σ_3 Failure (psf):	864		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



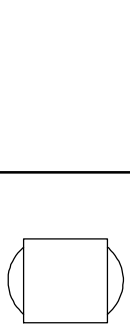
STRESS STRAIN CURVE

PLATE B-4ac

TRIAXIAL SHEAR TEST

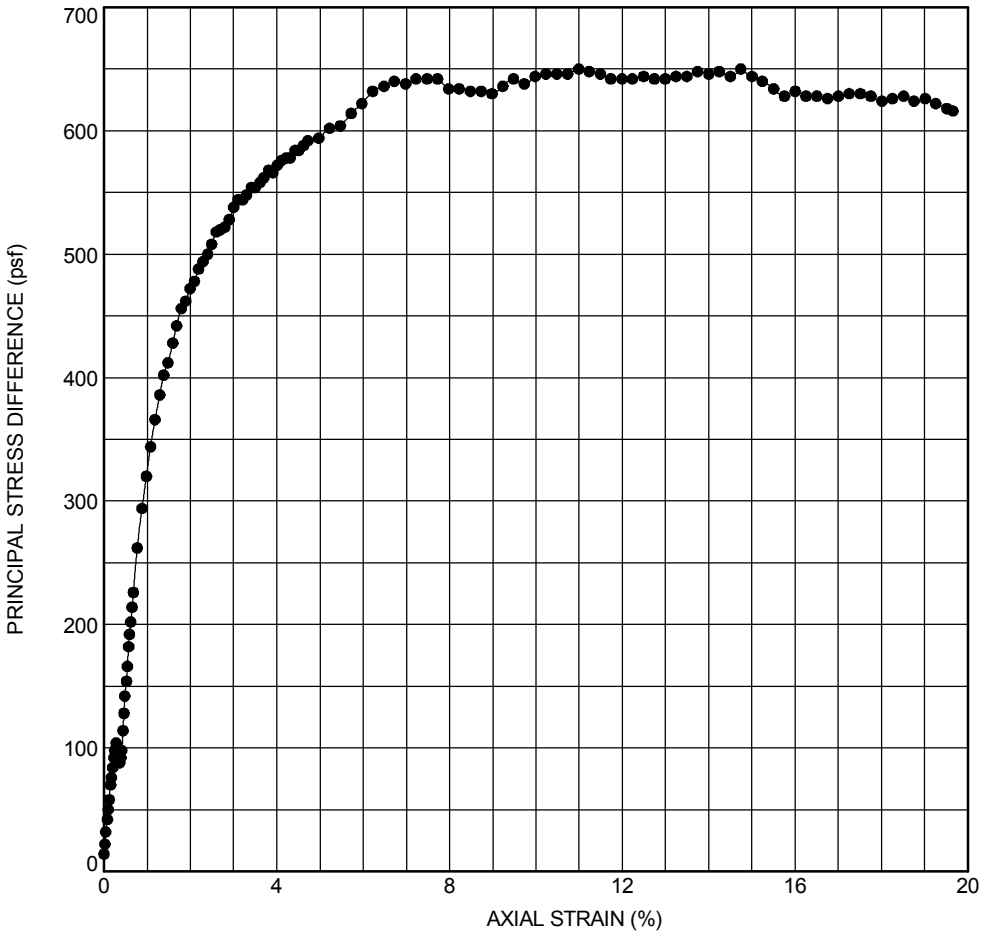
Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-07 Depth: 28-30 ft.	Visual Classification: FAT CLAY (CH), gray, with organics
Sample Number: 12	
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

Sample No.	1 ●	2 ■	3 ▲
INITIAL Water Content (%)	73.6		
Dry Density (pcf)	56.3		
Saturation (%)	99.5		
Void Ratio	2.00		
Diameter (inches)	2.82		
Height (inches)	5.56		
% Passing #200 Sieve			
Specific Gravity (assumed)	2.70		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	10.00		
Deviator Stress (psf)	650		
Shear Strength (psf)	325		
Failure Strain (%)	11.0		
σ_1 Failure (psf):	2090		
σ_3 Failure (psf):	1440		
Failure Type:	Bulging		



Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ad

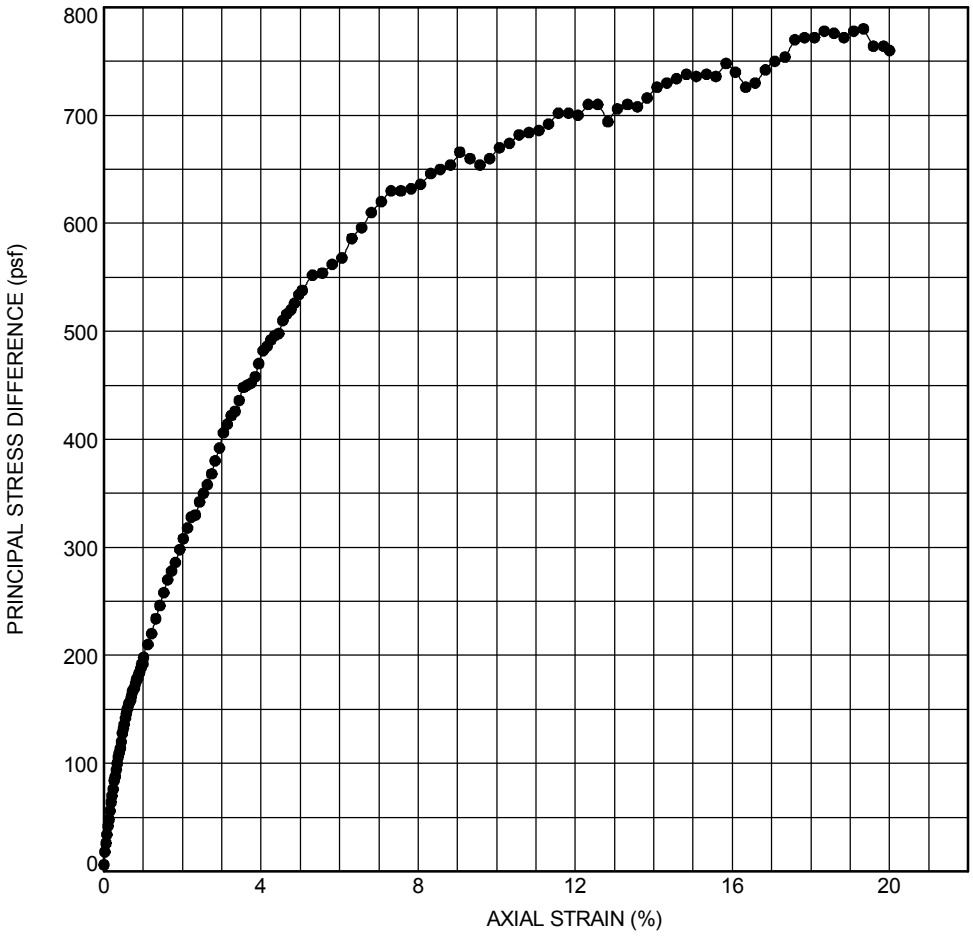
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-08 Depth: 10-12 ft.	Visual Classification: FAT CLAY (CH), gray
Sample Number: 6	
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	37.6		
	Dry Density (pcf)	85.9		
	Saturation (%)	100.0		
	Void Ratio	0.96		
	Diameter (inches)	2.80		
	Height (inches)	5.59		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	3.00		
	Deviator Stress (psf)	738		
	Shear Strength (psf)	369		
	Failure Strain (%)	14.8		
	σ_1 Failure (psf):	1170		
	σ_3 Failure (psf):	432		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ae

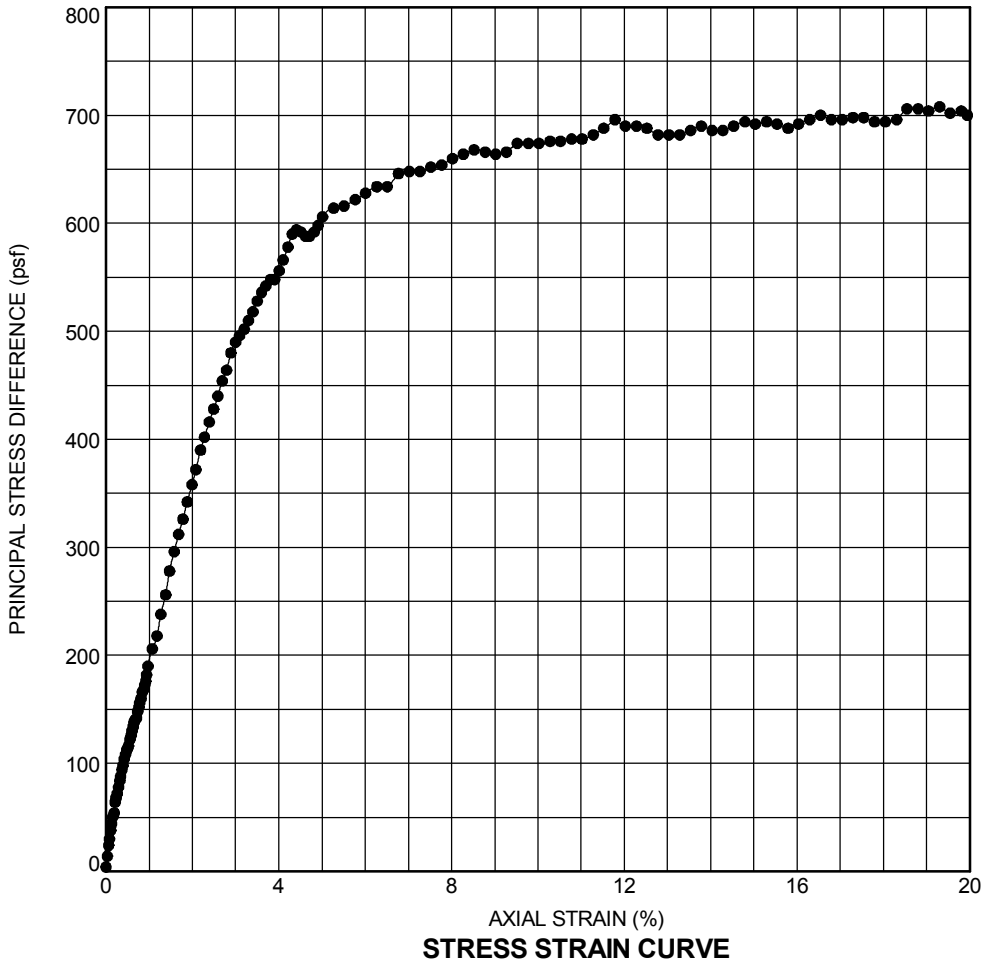
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-08 Depth: 18-20 ft. Sample Number: 10	Visual Classification: FAT CLAY (CH), gray, with organics
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	43.1		
	Dry Density (pcf)	80.1		
	Saturation (%)	100.0		
	Void Ratio	1.10		
	Diameter (inches)	2.80		
	Height (inches)	5.59		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	7.00		
	Deviator Stress (psf)	696		
	Shear Strength (psf)	348		
	Failure Strain (%)	11.8		
	σ_1 Failure (psf):	1704		
	σ_3 Failure (psf):	1008		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

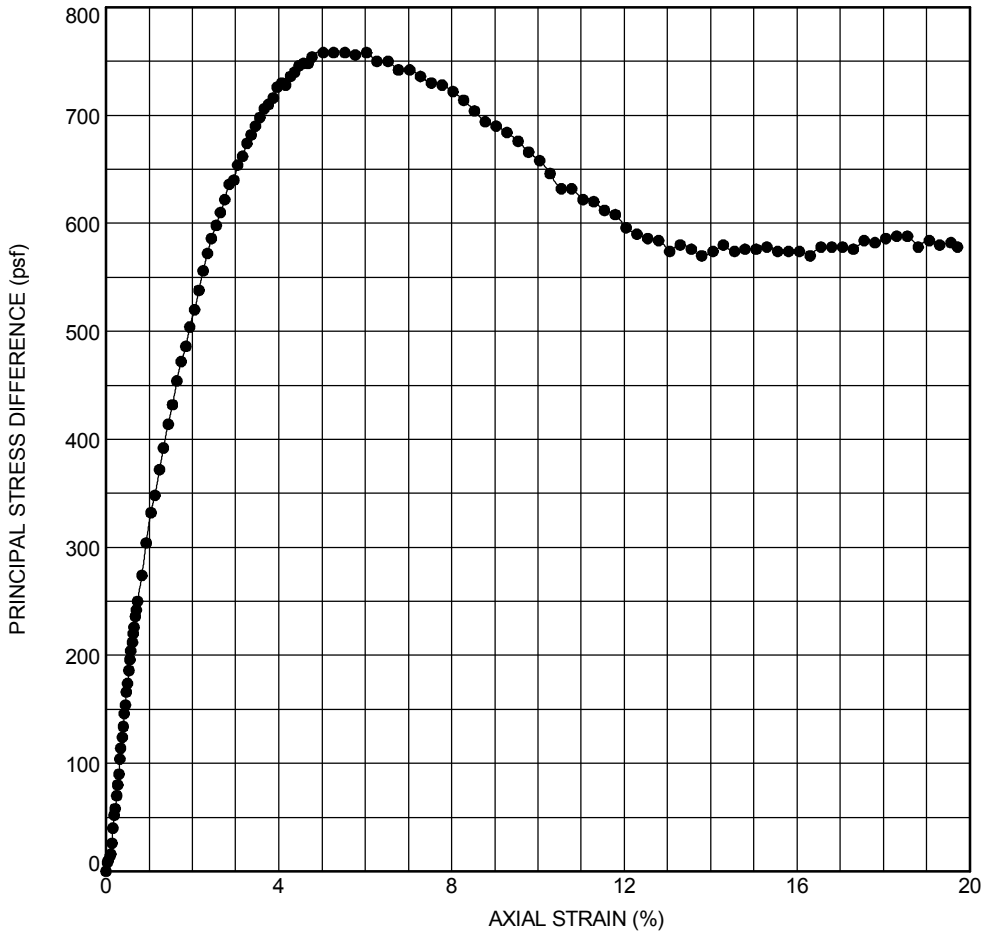
PLATE B-4af

TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-08 Depth: 28-30 ft.	Visual Classification: FAT CLAY (CH), gray, with organics
Sample Number: 12	
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	72.8		
	Dry Density (pcf)	59.5		
	Saturation (%)	100.0		
	Void Ratio	1.83		
	Diameter (inches)	2.78		
	Height (inches)	5.62		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	10.00		
	Deviator Stress (psf)	758		
	Shear Strength (psf)	379		
	Failure Strain (%)	5.0		
	σ_1 Failure (psf):	2198		
	σ_3 Failure (psf):	1440		
	Failure Type:	Shear Plane	Failure Sketch	

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ag

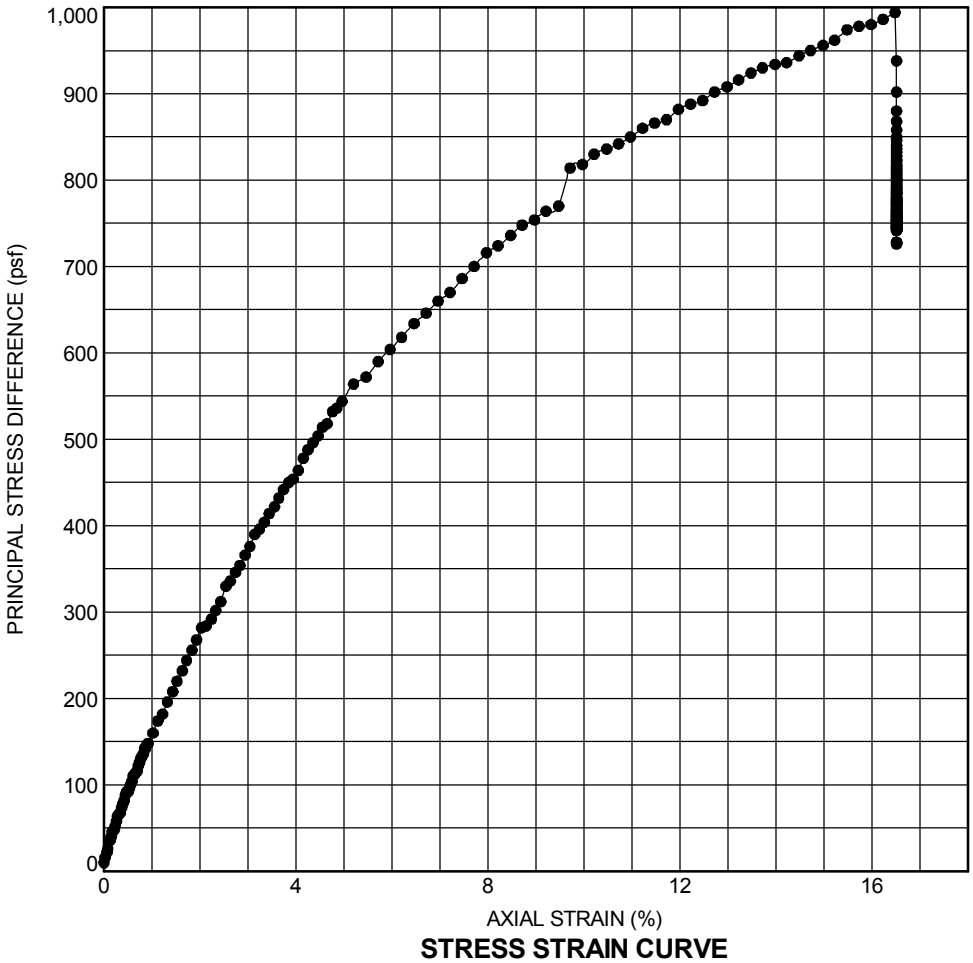
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-09 Depth: 12-14 ft.	Visual Classification: LEAN CLAY (CL), gray
Sample Number: 7	
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	39.4		
	Dry Density (pcf)	87.6		
	Saturation (%)	100.0		
	Void Ratio	0.92		
	Diameter (inches)	2.82		
	Height (inches)	5.39		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	5.00		
	Deviator Stress (psf)	957		
	Shear Strength (psf)	478		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1677		
	σ_3 Failure (psf):	720		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ah

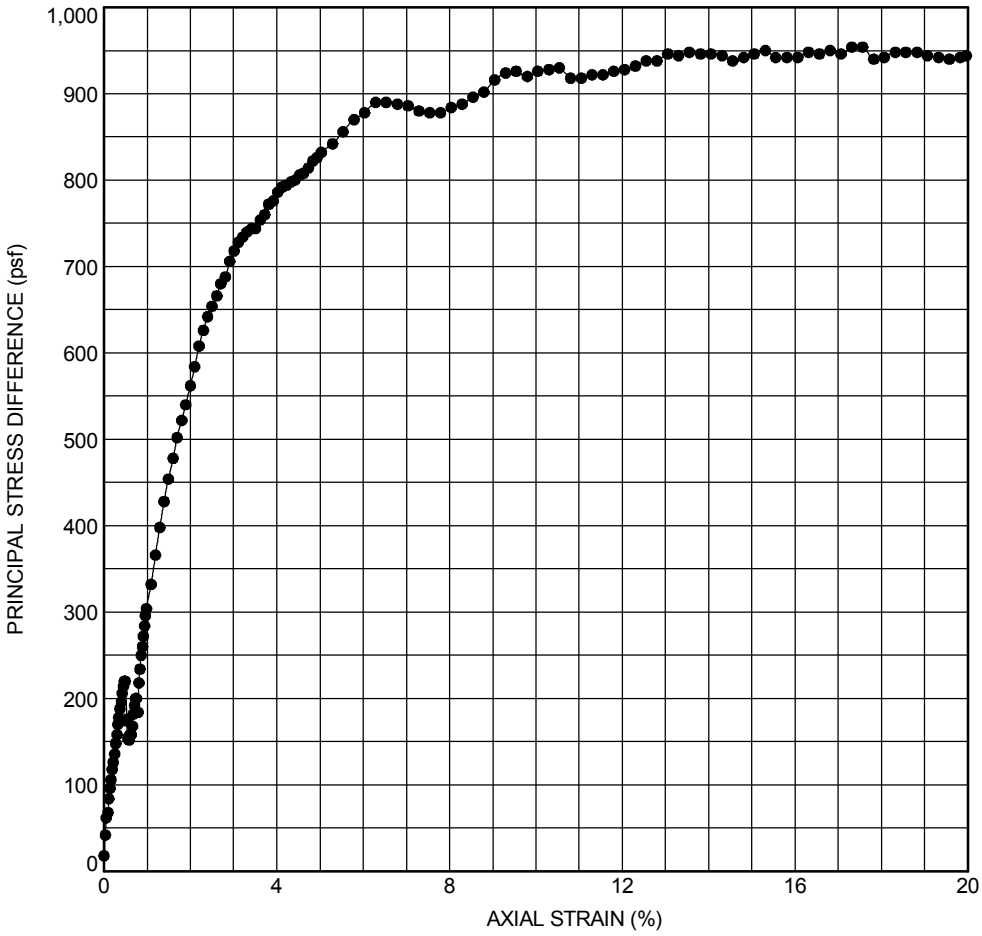
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-09 Depth: 18-20 ft. Sample Number: 10	Visual Classification: FAT CLAY (CH), gray
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	48.5		
	Dry Density (pcf)	75.2		
	Saturation (%)	100.0		
	Void Ratio	1.24		
	Diameter (inches)	2.81		
	Height (inches)	5.61		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	7.00		
	Deviator Stress (psf)	948		
	Shear Strength (psf)	474		
	Failure Strain (%)	13.6		
	σ_1 Failure (psf):	1956		
	σ_3 Failure (psf):	1008		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ai

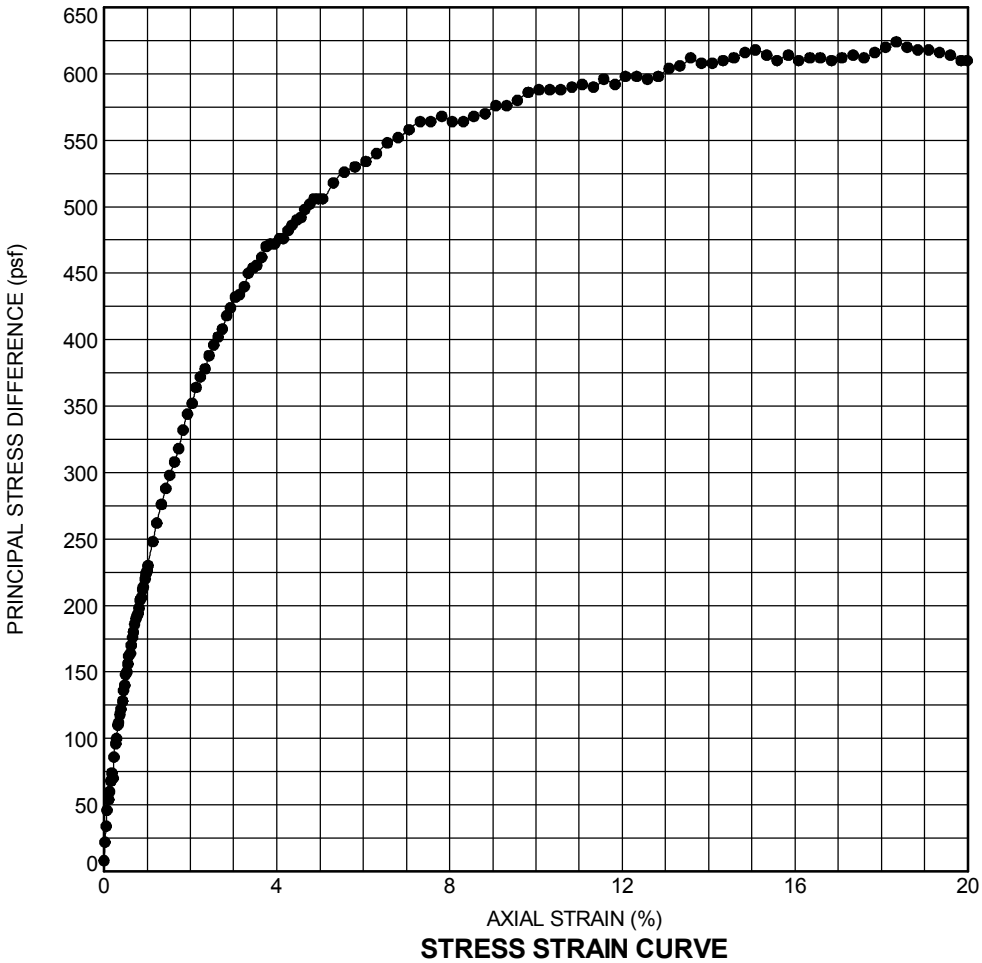
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-09 Depth: 23-25 ft.	Visual Classification: FAT CLAY (CH), gray
Sample Number:	
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	59.9		
	Dry Density (pcf)	65.3		
	Saturation (%)	100.0		
	Void Ratio	1.58		
	Diameter (inches)	2.84		
	Height (inches)	5.59		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	9.00		
	Deviator Stress (psf)	617		
	Shear Strength (psf)	309		
	Failure Strain (%)	15.0		
	σ_1 Failure (psf):	1913		
	σ_3 Failure (psf):	1296		
	Failure Type:	Bulging		

Failure Sketch

Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4aj

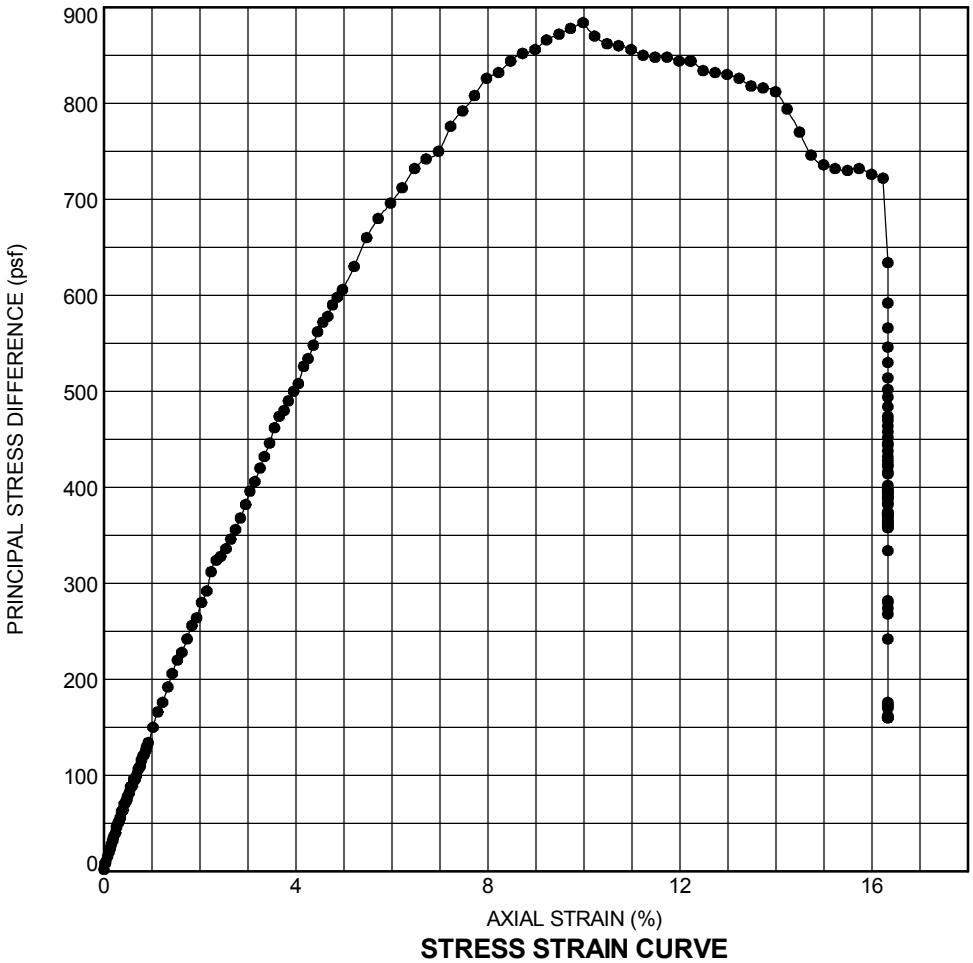
TRIAXIAL SHEAR TEST

Project Name: Bayou De Cade Marsh Creation and Ridge Restoration Terrebonne Parish, Louisiana	Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-09 Depth: 33-35 ft. Sample Number: 13	Visual Classification: FAT CLAY (CH), gray
Project No.: 04.55174066 Test Date.: 5/8/2018	Organic Content (%) ASTM D2974: N/A

	Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	35.4		
	Dry Density (pcf)	90.9		
	Saturation (%)	100.0		
	Void Ratio	0.85		
	Diameter (inches)	2.75		
	Height (inches)	5.53		
	% Passing #200 Sieve			
	Specific Gravity (assumed)	2.70		
	Strain Rate (%/min.)	1.0		
	Cell Pressure (psi)	12.00		
	Deviator Stress (psf)	884		
	Shear Strength (psf)	442		
	Failure Strain (%)	10.0		
	σ_1 Failure (psf):	2612		
	σ_3 Failure (psf):	1728		
	Failure Type:	Bulging		

Failure Sketch

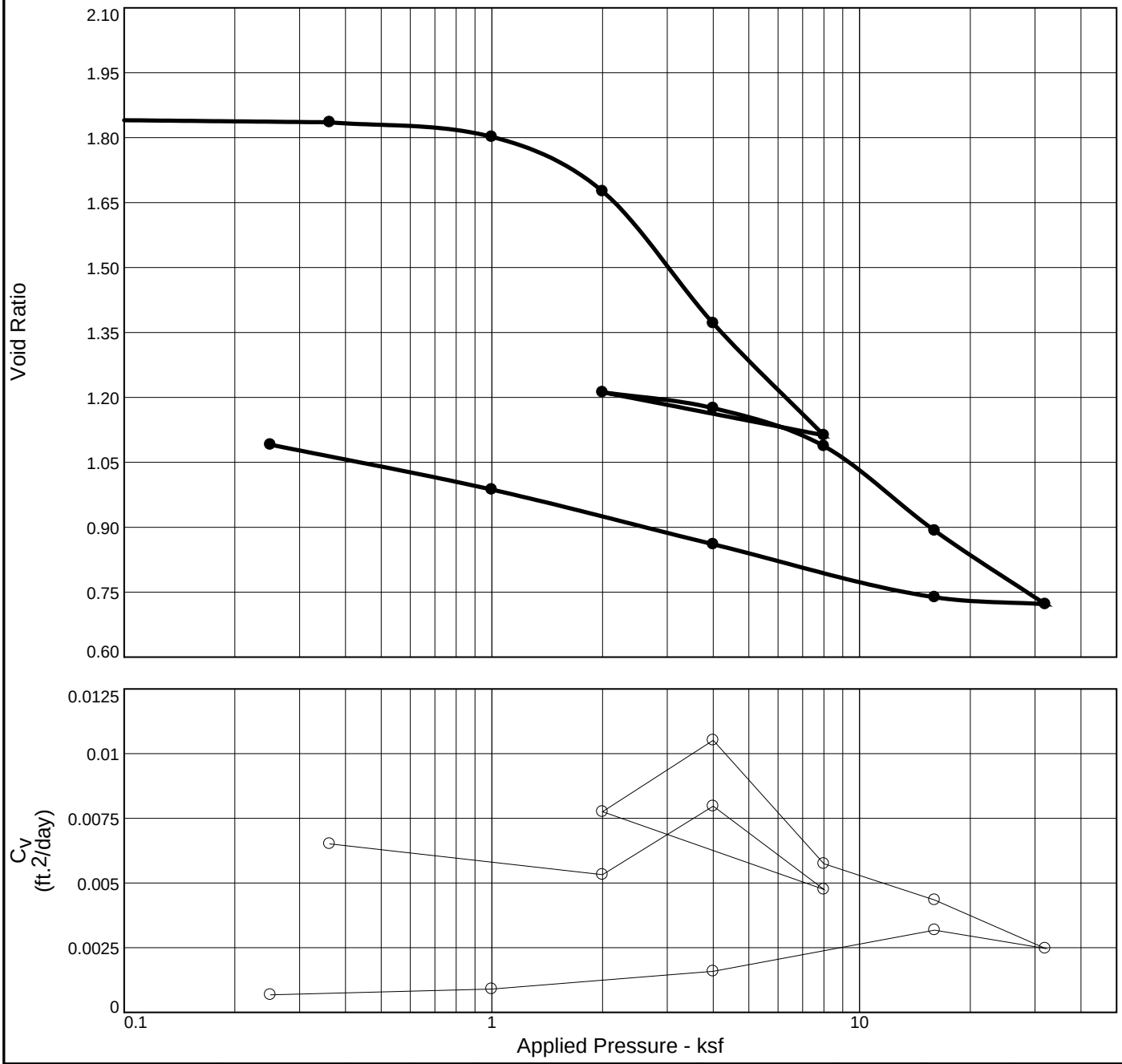
Remarks:
Visual classification in general accordance with ASTM Standard D2487.



STRESS STRAIN CURVE

PLATE B-4ak

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
102.6 %	76.4 %	54.3	126	92	2.472	1.25	1.9	0.93	0.10	1.840

MATERIAL DESCRIPTION	USCS	AASHTO
ORGANIC CLAY, black and gray, with few peat pockets and seams	OH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-01 **Depth:** 23.0 **Sample Number:** 11

Fugro USA Land, Inc.

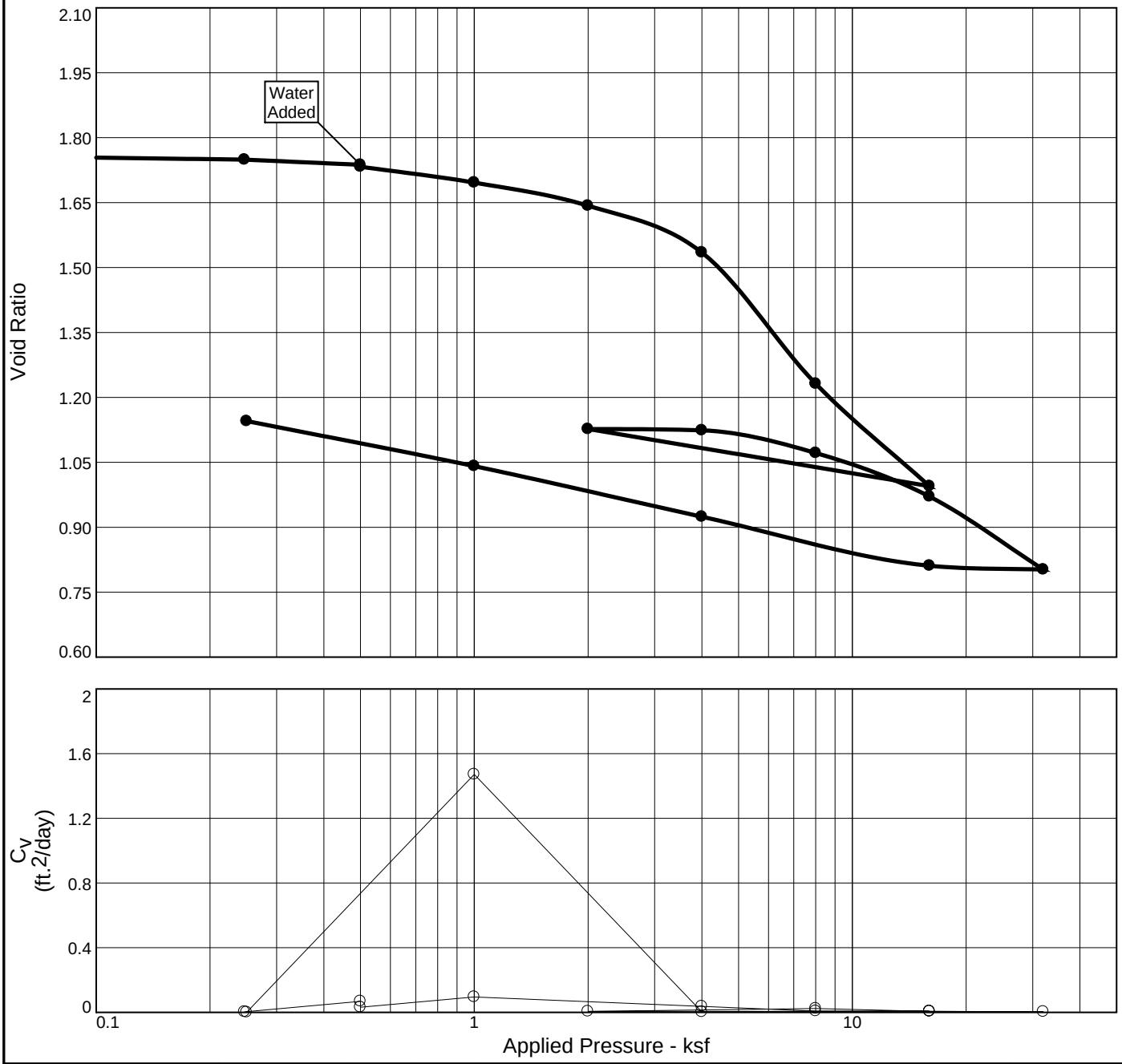
Baton Rouge, LA

Remarks:

Date Tested: 05/24/2018
Tested by: JK
Reviewed by: ERM

Plate B-5a

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.8 %	64.5 %	61.0	121	85	2.689	0.76	3.5	0.90	0.08	1.754

MATERIAL DESCRIPTION	USCS	AASHTO
FAT CLAY, gray and dark gray, with organics	CH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-02 **Depth:** 16.0 **Sample Number:** 9

Fugro USA Land, Inc.

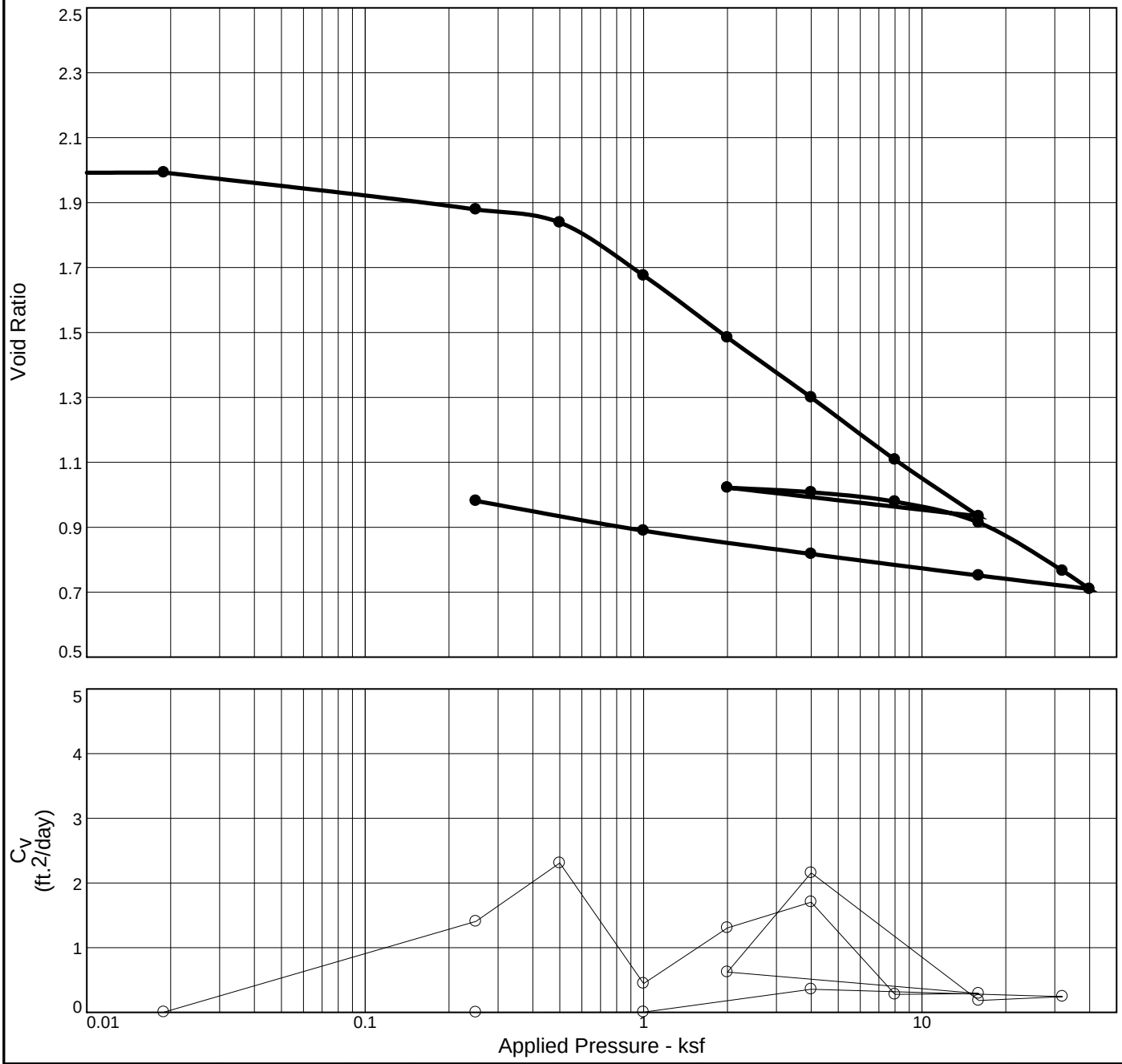
Baton Rouge, LA

Remarks:

Date Tested: 05/07/2018
Tested by: JK
Reviewed by: ERM

Plate B-5b

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
97.3 %	71.8 %	56.3			2.70	0.10	0.3	0.61	0.06	1.992

MATERIAL DESCRIPTION	USCS	AASHTO
FAT CLAY, gray, with peat and organics	CH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-03 **Depth:** 2.0 **Sample Number:** 2

Fugro USA Land, Inc.

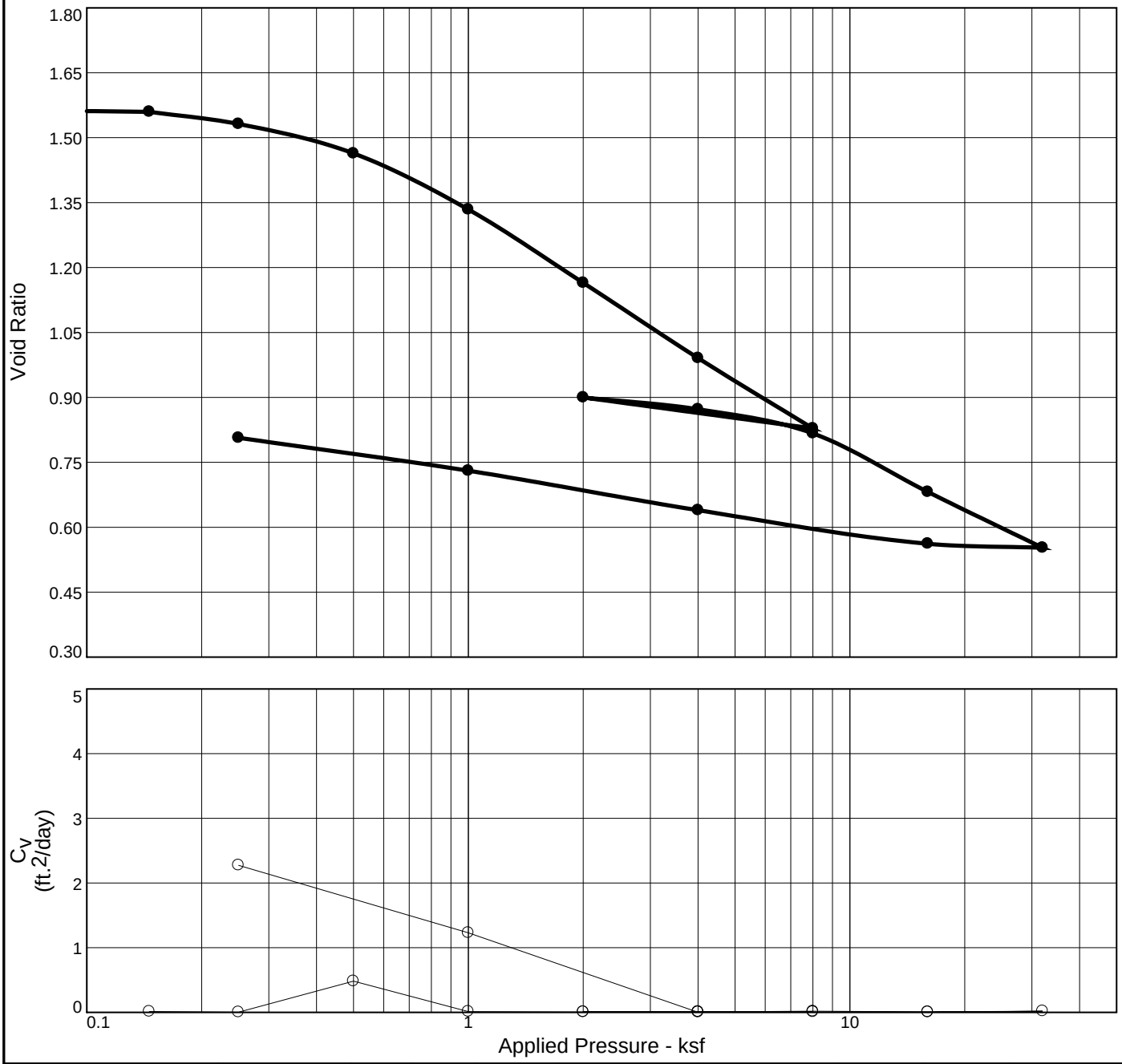
Baton Rouge, LA

Remarks:

Date Tested: 06/04/2018
Tested by: JK
Reviewed by: ERM
Atterber Limit and Specific Gravity test pending.

Plate B-5c

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
105.5 %	64.1 %	62.6	60	42	2.569	0.21	0.52	0.53	0.06	1.561

MATERIAL DESCRIPTION	USCS	AASHTO
FAT CLAY, gray, with peat layers	CH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-04 **Depth:** 4.0 **Sample Number:** 3

Fugro USA Land, Inc.

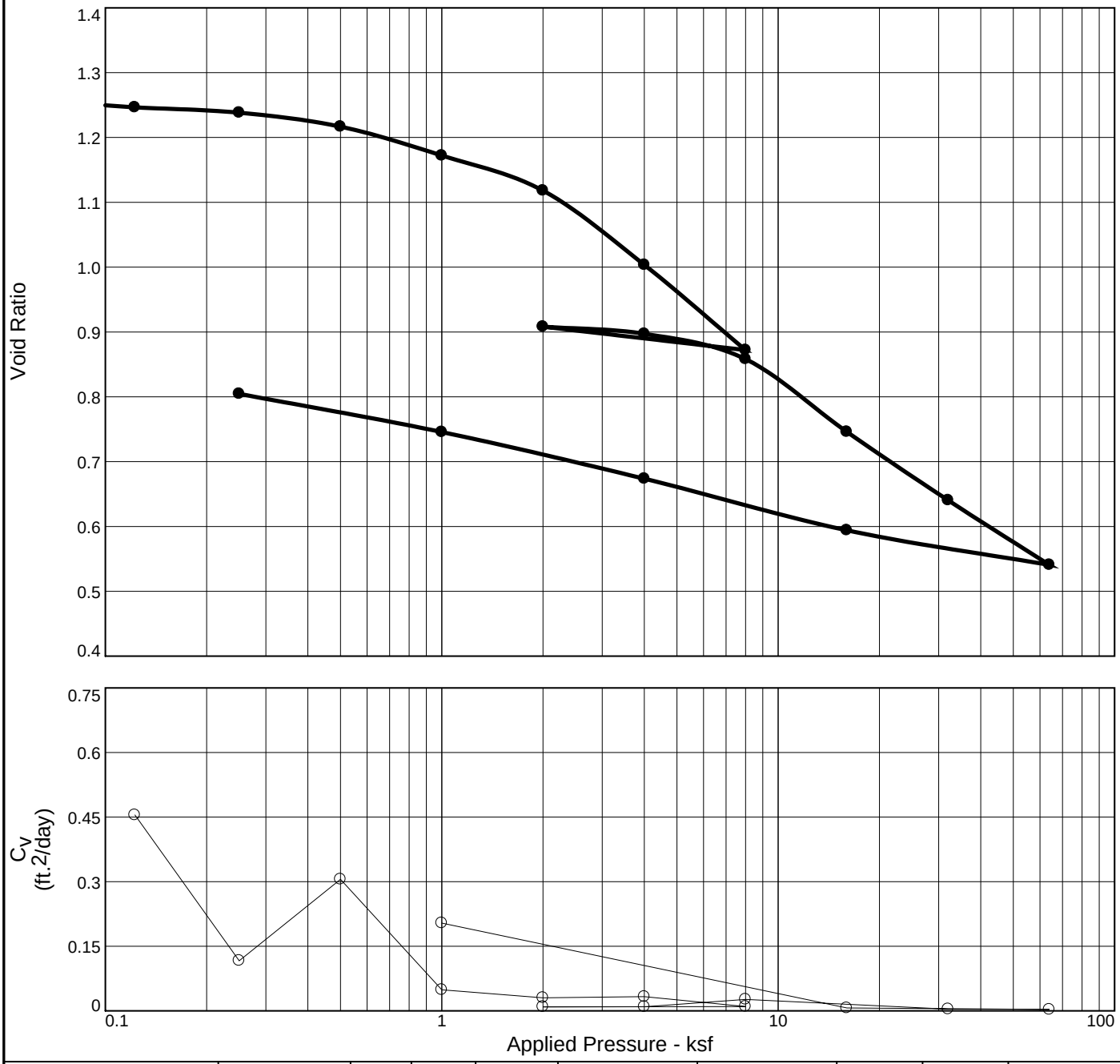
Baton Rouge, LA

Remarks:

Date Tested: 05/24/2018
Tested by: JK
Reviewed by: ERM

Plate B-5d

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
102.7 %	49.2 %	72.3	65	45	2.606	0.18	1.5	0.38	0.04	1.250

MATERIAL DESCRIPTION	USCS	AASHTO
FAT CLAY, dark gray, with roots	CH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-05 **Depth:** 4.0 **Sample Number:** 3

Fugro USA Land, Inc.

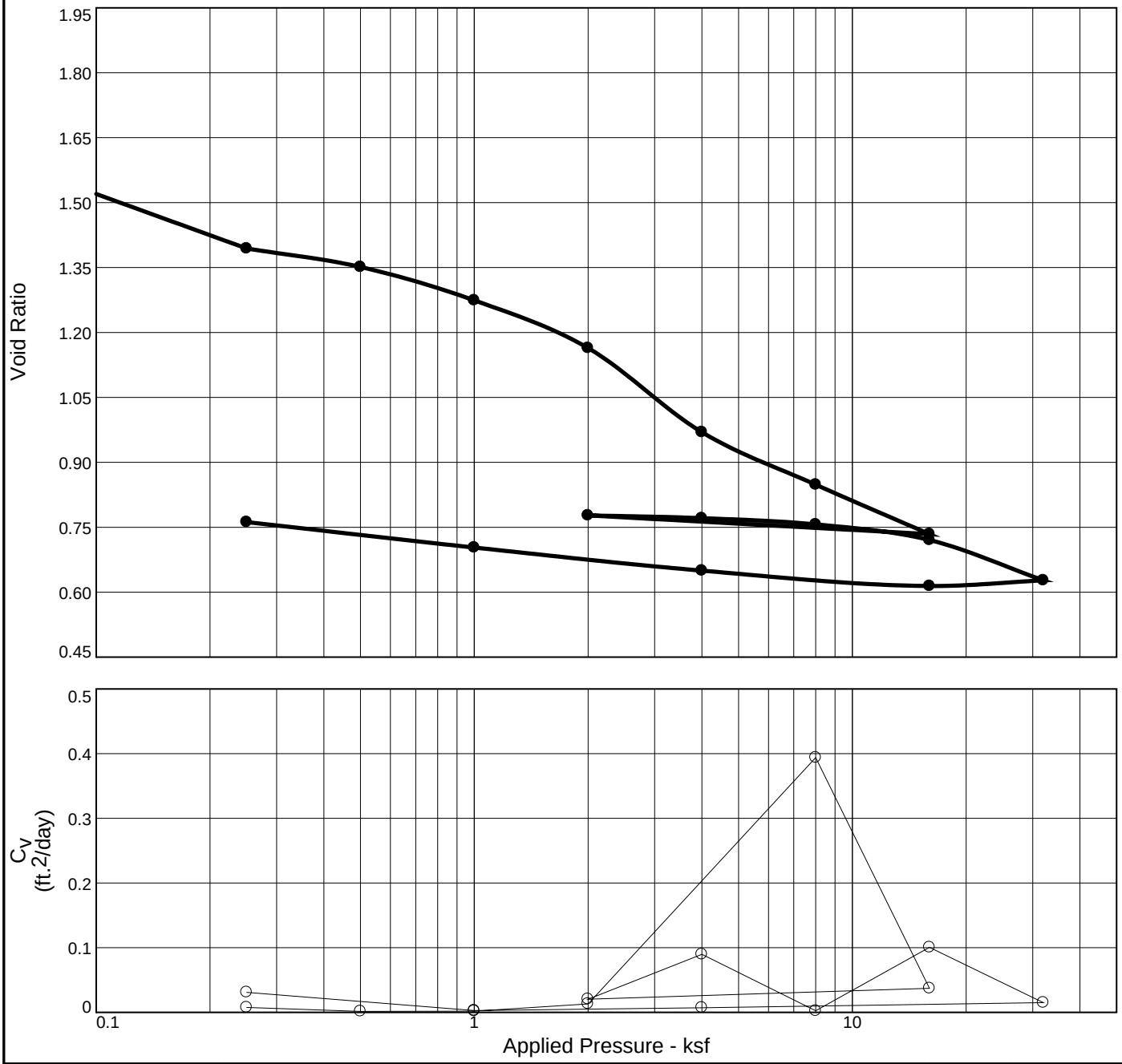
Baton Rouge, LA

Remarks:

Date Tested: 05/07/2018
Tested by: JK
Reviewed by: ERM

Plate B-5e

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
111.5 %	66.9 %	62.8	42	19	2.533	0.10	1.0	0.50	0.05	1.520

MATERIAL DESCRIPTION	USCS	AASHTO
LEAN CLAY, gray	CL	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-06 **Depth:** 2.0 **Sample Number:** 2

Fugro USA Land, Inc.

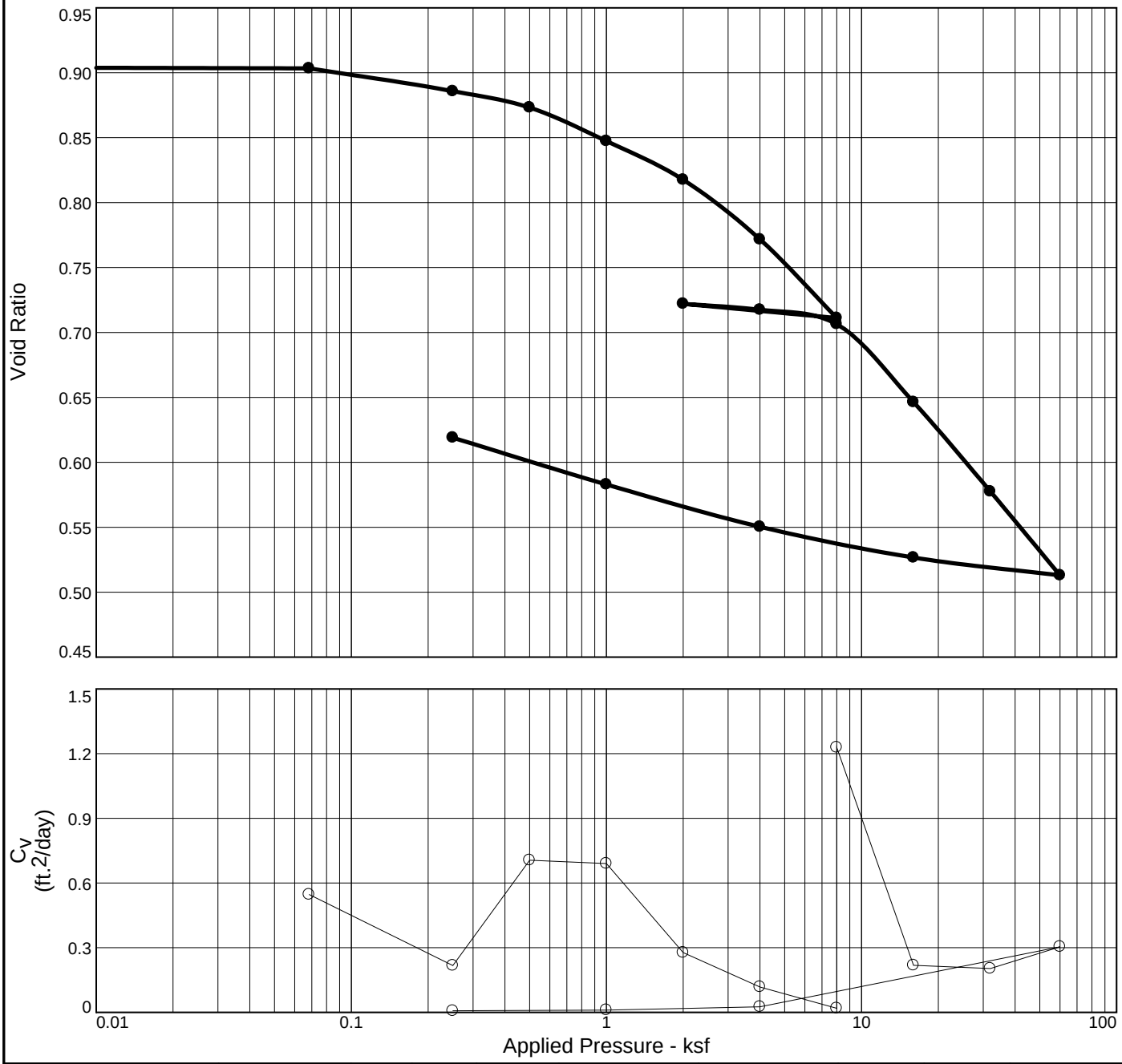
Baton Rouge, LA

Remarks:

Date Tested: 06/04/2018
Tested by: JK
Reviewed by: ERM

Plate B-5f

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
102.0 %	35.2 %	85.8	41	21	2.617	0.53	2.0	0.24	0.05	0.904

MATERIAL DESCRIPTION	USCS	AASHTO
FAT CLAY, gray, with silt pockets and organics	CH	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-07 **Depth:** 10.0 **Sample Number:** 6

Fugro USA Land, Inc.

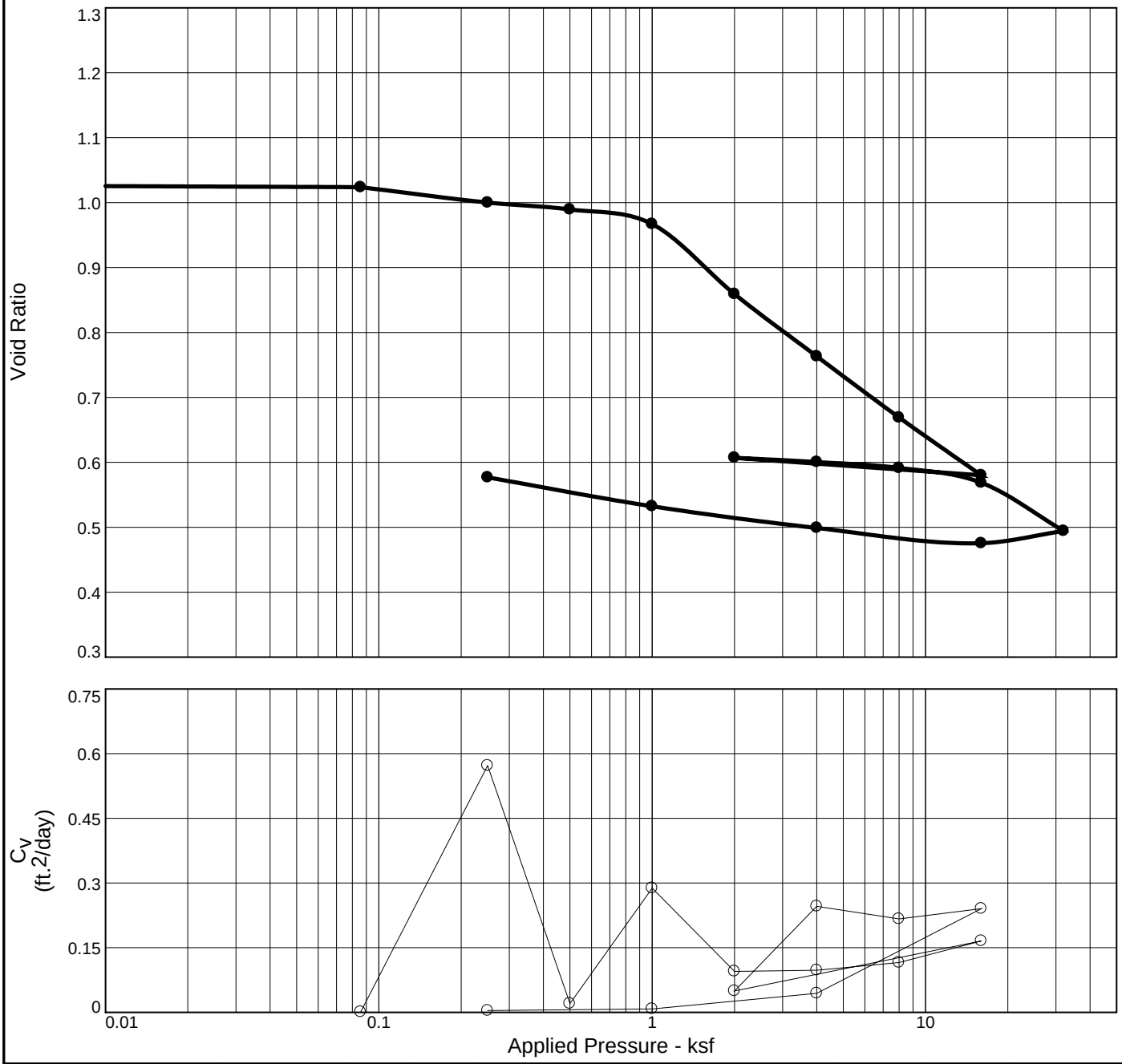
Baton Rouge, LA

Remarks:

Date Tested: 05/24/2018
Tested by: JK
Reviewed by: ERM

Plate B-5g

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
99.4 %	39.2 %	80.1	43	23	2.599	0.74	1.0	0.33	0.03	1.025

MATERIAL DESCRIPTION	USCS	AASHTO
LEAN CLAY, gray	CL	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-08 **Depth:** 14.0 **Sample Number:** 8

Fugro USA Land, Inc.

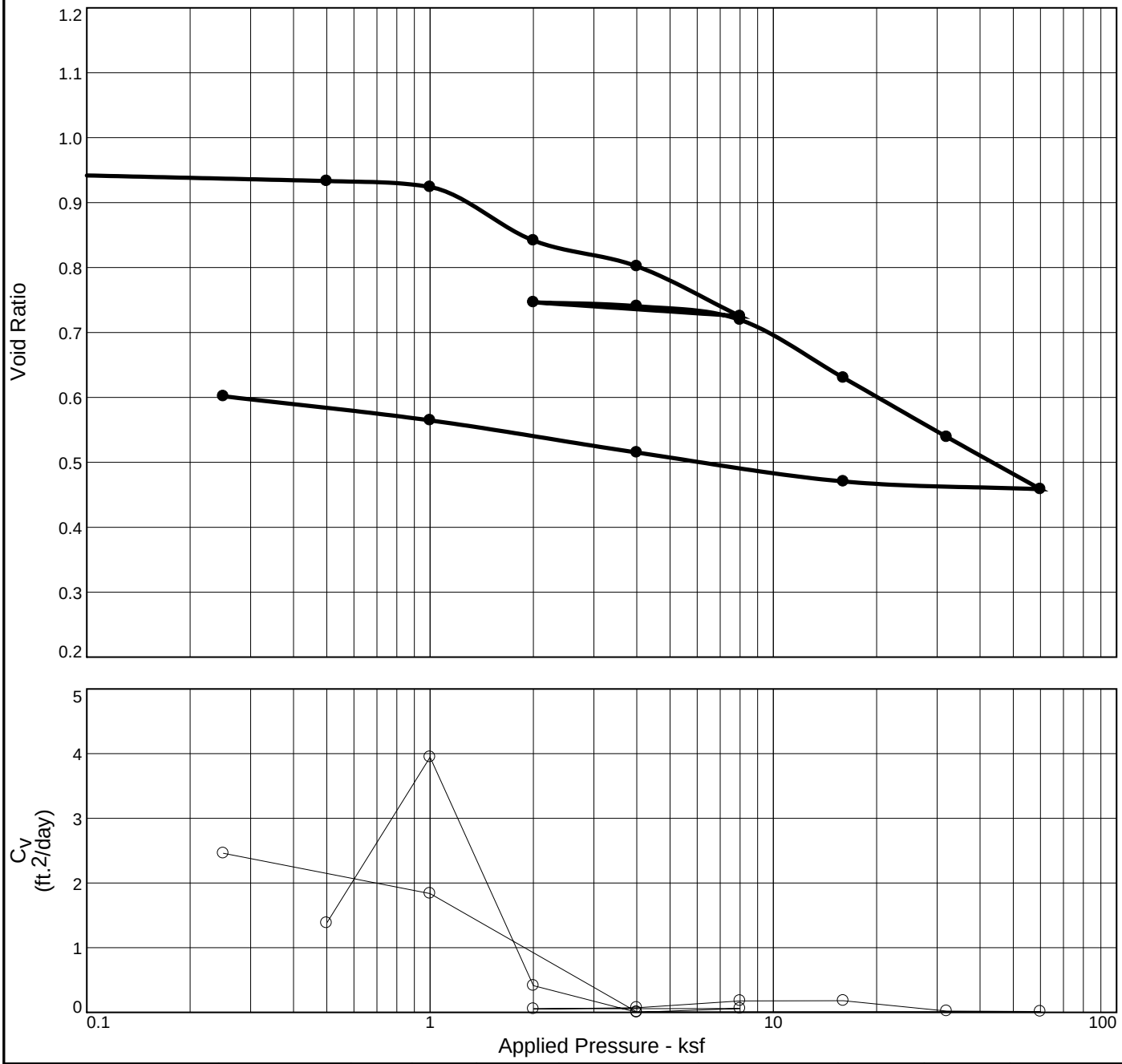
Baton Rouge, LA

Remarks:

Date Tested: 05/25/2018
Tested by: JK
Reviewed by: ERM

Plate B-5h

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (ksf)	P_c (ksf)	C_c	C_r	Initial Void Ratio
Saturation	Moisture									
98.6 %	35.0 %	85.2	46	25	2.65	0.50	2.0	0.32	0.08	0.942

MATERIAL DESCRIPTION	USCS	AASHTO
LEAN CLAY, gray	CL	

Project No. 04.55174066 **Client:** CPRA

Project: BAYOU DE CADE MARSH CREATION AND RIDGE RESTORATION

Source of Sample: B-09 **Depth:** 10.0 **Sample Number:** 6

Fugro USA Land, Inc.

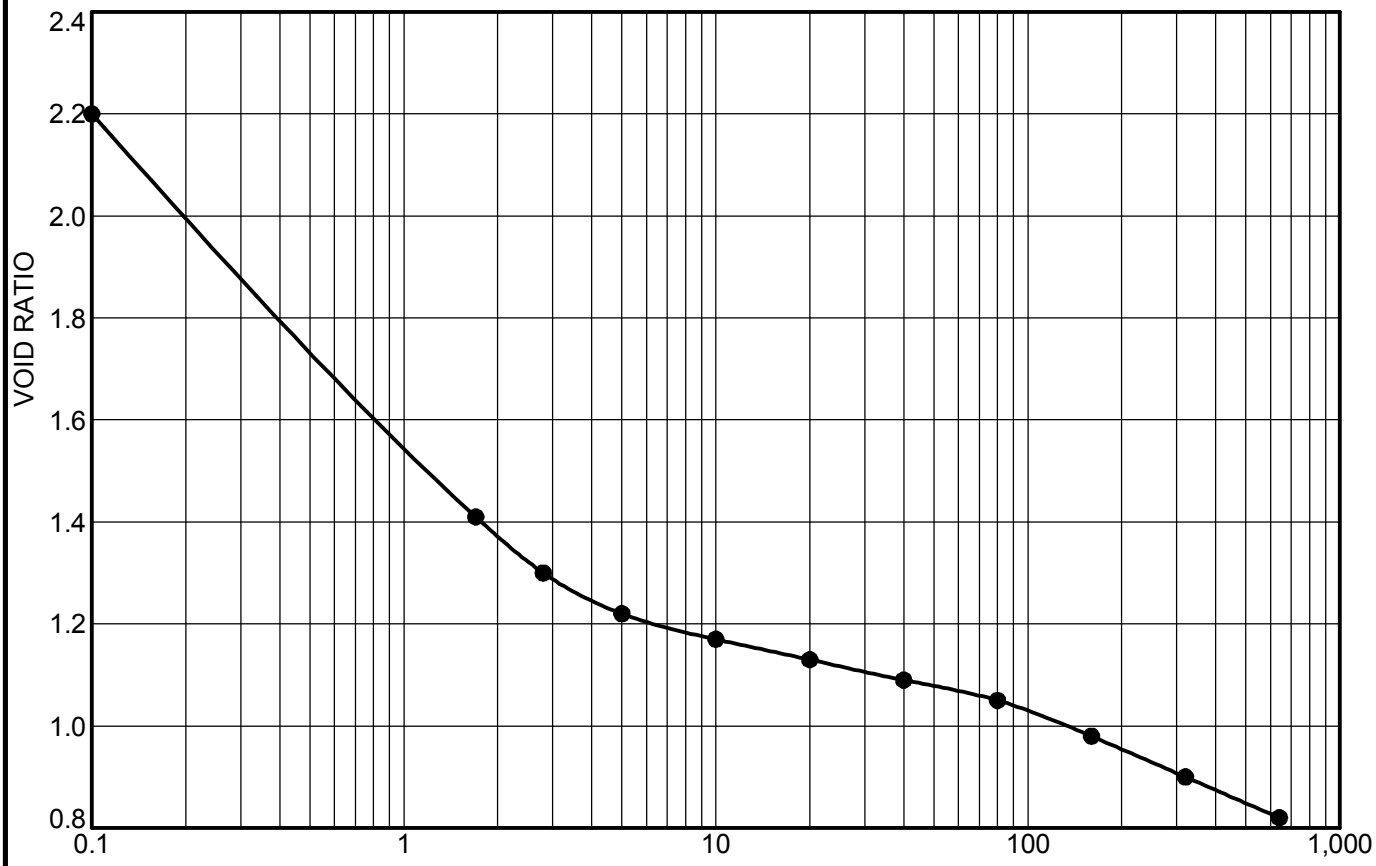
Baton Rouge, LA

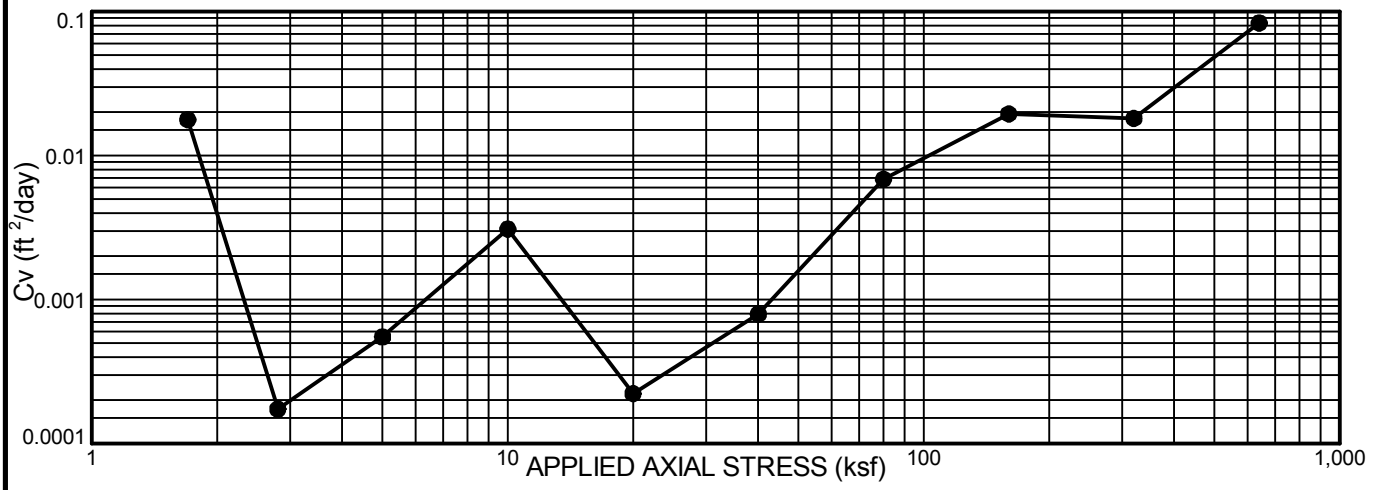
Remarks:

Date Tested: 06/04/2018
Tested by: JK
Reviewed by: ERM
Specific Gravity test pending.

Plate B-5i

SELF-WEIGHT CONSOLIDATION TEST REPORT





Initial			LL	PI	Sp. Gr.	Pc (ksf)	Cc	Initial Void Ratio
Saturation %	Moisture %	Dry Dens.(pcf)						
100.0	93.7%	46.2			2.35	N/A	N/A	2.202

MATERIAL DESCRIPTION

FAT CLAY (CH)

Project No. 04.55174066 Client: CPRA

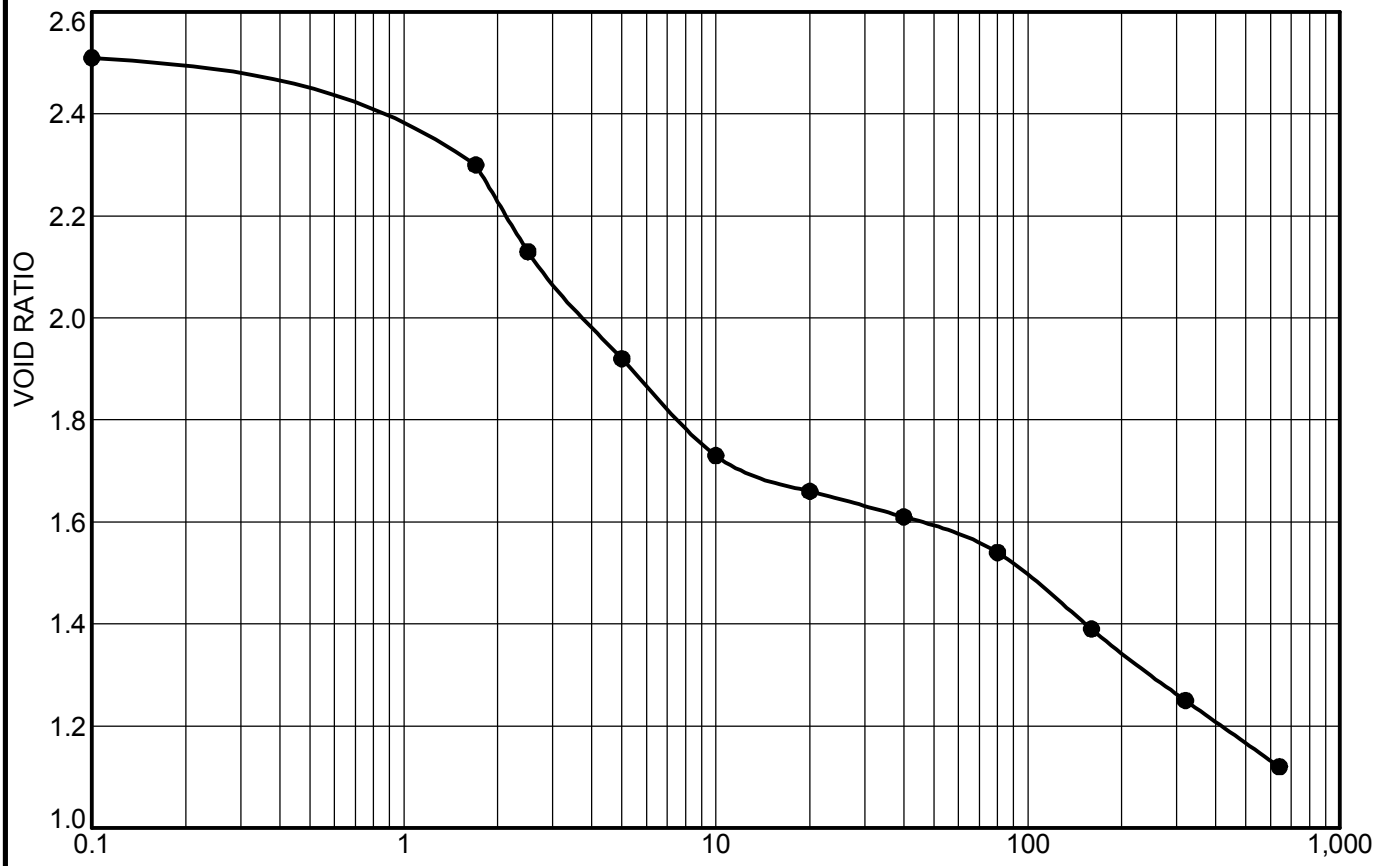
Project: Bayou De Cade Marsh Creation and Ridge Restoration

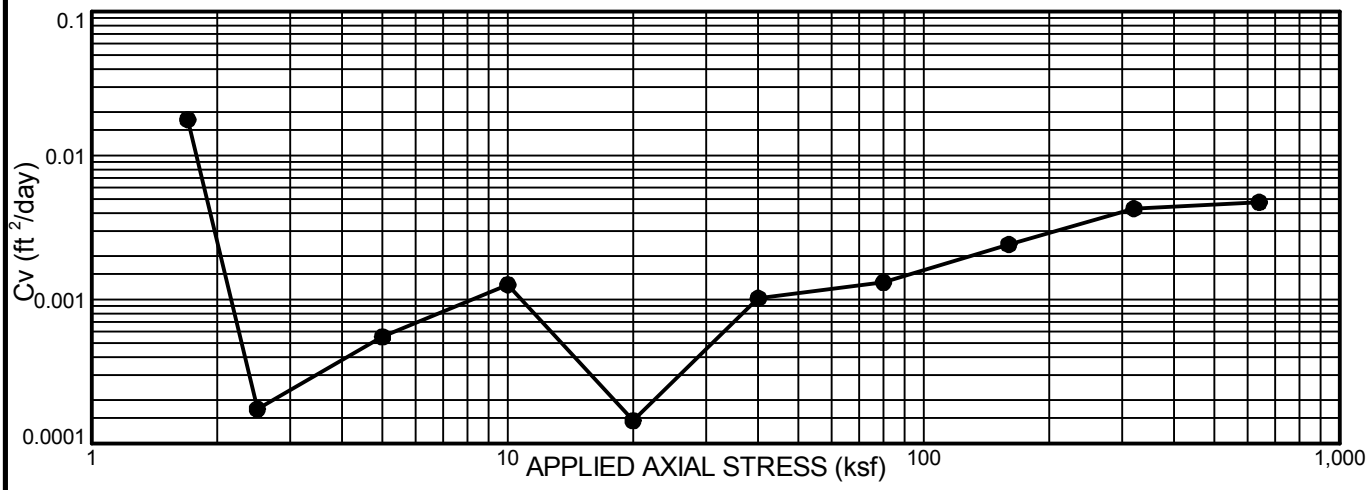
Source of Sample: Composite B-10 B-12 B-13 from mudline to depth of 10 ft

Remarks:
Test Date: 6/5/2018
Tested by: Jack Koban
Reviewed by: Sam Bryant
Specific Gravity test pending.

PLATE B-6a

SELF-WEIGHT CONSOLIDATION TEST REPORT





Initial			LL	PI	Sp. Gr.	Pc (ksf)	Cc	Initial Void Ratio
Saturation %	Moisture %	Dry Dens.(pcf)						
86.0	107.0%	37.4			2.35	N/A	N/A	2.515

MATERIAL DESCRIPTION

FAT CLAY (CH)

Project No. 04.55174066 Client: CPRA

Project: Bayou De Cade Marsh Creation and Ridge Restoration

Source of Sample: Composite B-11 B-14 B-15 from mudline to depth of 10 ft

Remarks:
Test Date: 6/5/2018
Tested by: Jack Koban
Reviewed by: Sam Bryant
Specific Gravity test pending.

PLATE B-6b

APPENDIX B1

COLUMN SETTLING TESTS

Final Report:

Settling Properties of Fine-Grained Sediments: Bayou De Cade Marsh Creation and Ridge Restoration (TE-0138) (Fugro Project No. 04.55174066)

Submitted to:

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Vice President
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June 6, 2018

1.0 Introduction, Scope, and Objectives

The objective of the testing reported here was to evaluate the settling properties of fine-grained sediments which may be hydraulically dredged in support of the Bayou De Cade Marsh Creation and Ridge Restoration (TE-0138) project (Fugro Project No. 04.55174066).

2.0 Experimental Procedures and Results

2.1 Materials Provided for Testing

Two composited sediment samples, each comprised of sediment from three separate borings in the proposed dredging area, were provided by Fugro USA Land, Inc. for pilot-scale settling column testing (see Appendix A for chain of custody forms).

Table 1. Sediment core samples used to prepare fine-grained sediment slurry for pilot-scale settling column testing

Composited Sediment Boring IDs
B-10, B-12, B-13
B-11, B-14, B-15

A five-gallon bucket of water from the proposed dredging area was also provided by Fugro USA Land, Inc. for laboratory testing. The salinity of the water sample, measured gravimetrically with drying at 180 ºC[1], was 0.39 parts per thousand (ppt) indicative of a freshwater environment.

As requested by Fugro USA Land, Inc., a separate settling column test was conducted using each of the composited sediment samples. Testing procedures and results from each of the two tests are presented in the following sections.

2.2 Pilot-Scale Settling Column Test Results for Composite of Sediment from Boring ID Numbers B-10, B-12, and B-13

The first settling column test utilized sediment composited from boring ID numbers B-10, B-12, and B-13. Slurry was prepared by mixing homogenized sediment from the three borings with tap water supplemented with a small amount of synthetic sea salts (Instant Ocean) to match the average salinity of the site water sample [salinity of 0.39 parts per thousand (ppt)]. Slurry containing the fine-grained fraction of sediments was obtained by thoroughly mixing the slurry and then allowing coarse grained materials (e.g., sand and shells), to separate by differential settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. Preliminary solids concentrations measured in the fine-grained sediment slurry revealed that the particulate concentration was below the initial target concentration of 150 g/L. In consultation with Fugro, a decision was made to proceed with testing at the highest fine-grained particulate concentration that could be achieved with the materials provided.

The fine-grained sediment slurry was transferred to a second mixing barrel, thoroughly mixed, and then loaded into a large-scale (8.0 inch ID) column while mixing with air sparging as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. Solids concentrations in the slurry at the start of the settling test were measured in samples collected along the height of the column at one foot intervals (see Table B1 in Appendix B for tabulated data). The average particulate concentration at the start of the settling test was 71.0 g/L.

A readily visible sediment-water interface was observed less than one hour after the start of the settling test, indicating zone settling. The height of the sediment-water interface above the bottom of the column was measured and recorded over a period lasting more than 30 days as depicted in Figure 1 (see Table C1 in Appendix C for tabulated data). As shown in Figure 1, zone settling was observed during the first portion of the settling test, followed by compression settling thereafter.

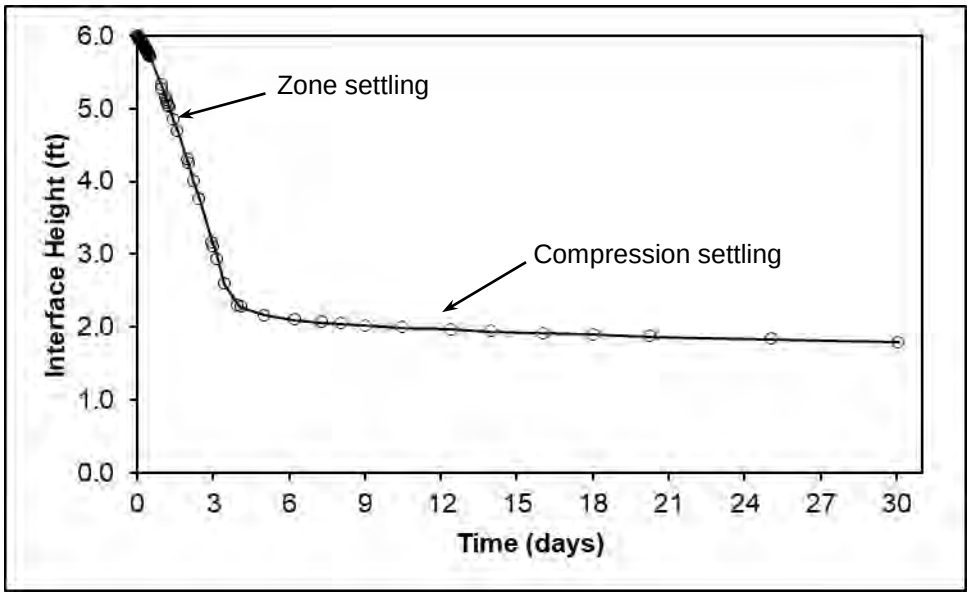

Figure 1. Interface height as a function of time during the pilot-scale settling test with composite of sediment from borings B-10, B-12, and B-13.

Interface heights from the first 90 hours of the settling test, during which zone settling was observed, are depicted separately in Figure 2. A linear regression was performed for settling data in this time interval with the resulting equation and correlation coefficient shown on the graph. The slope of the regression line, which corresponds to the zone settling velocity, was 0.0406 ft/hr (0.97 ft/day).

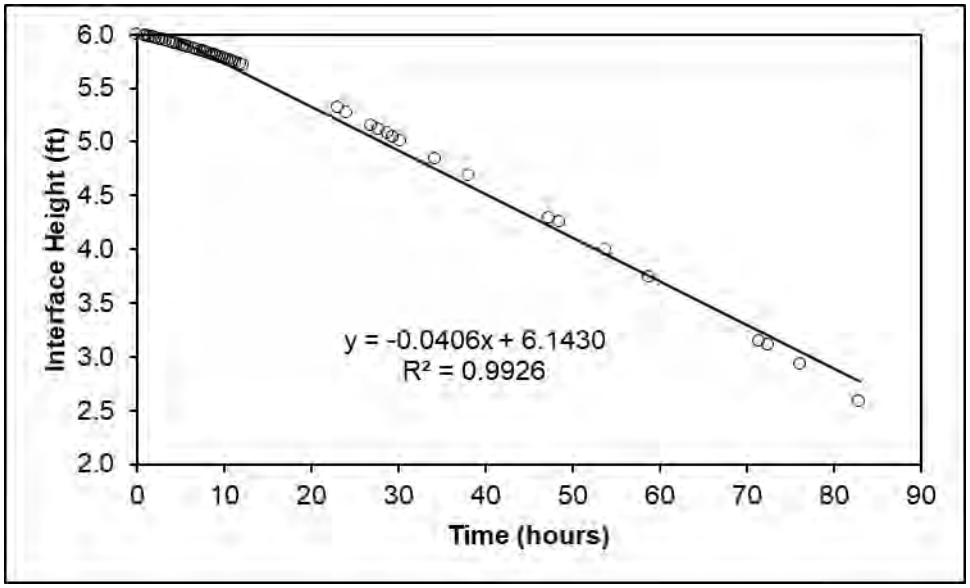

Figure 2. Interface height as a function of time during the zone settling portion of the pilot-scale settling test with composite of borings B-10, B-12, and B-13.

For the portion of the settling test during which compression settling was observed, the concentration in the settled solids at each time interval was calculated using the following equation (equation 3-11 in ref. 1).

$$C = \frac{C_o H_i}{H_t}$$

Where:

C = slurry suspended solids concentration at time t (g/L)
C_o = initial slurry suspended solids concentration (g/L)
H_i = initial slurry height (ft)
H_t = height of the interface at time t (ft)

The corresponding particulate concentration in the settled sediment as a function of time during compression settling is depicted in Figure 3.

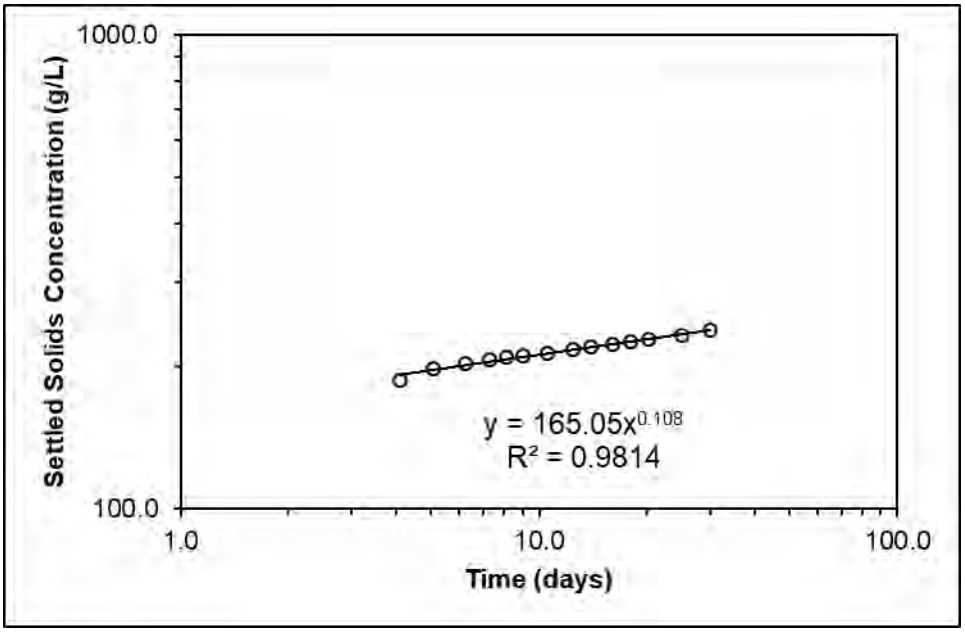

Figure 3. Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling test with composite of borings B-10, B-12, and B-13.

For analysis of flocculent settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1], water samples were collected from the clarified layer above the sediment-water interface for measurement of total suspended (TSS) following Standard Method 2450D[2]. The first of these samples, collected 24 hours after the start of settling when the sediment-water interface was sufficiently below the uppermost sample port (height of 5.5 ft) to allow sample collection, had a TSS concentration of 740 mg/L. TSS concentrations decreased over time but remained above 100 mg/L after 176 hours (7.3 days) and above 50 mg/L even after 434 hours (18.1 days) settling. Tabulated data are provided in Table D1 in Appendix D.

2.3 Pilot-Scale Settling Column Test using Composite of Sediment from Boring ID Numbers B-11, B-14, and B-15

The second pilot-scale settling column test utilized sediment composited from boring ID numbers B-11, B-14, and B-15. Slurry was prepared by mixing homogenized sediment from the three borings with tap water supplemented with a small amount of synthetic sea salts (Instant Ocean) to match the average salinity of the site water sample [salinity of 0.39 parts per thousand (ppt)]. Slurry containing the fine-grained fraction of sediments was obtained by thoroughly mixing the slurry and then allowing coarse grained materials (e.g., sand and shells), to separate by differential settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. The fine-grained sediment slurry was transferred to a second mixing barrel, thoroughly mixed, and then loaded into a large-scale (8.0 inch ID) column while mixing with air sparging as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1]. Solids concentrations in the slurry at the start of the settling test were measured in samples collected along the height of the column at one foot intervals (see Table B2 in Appendix B for tabulated data). The average particulate concentration at the start of the settling test was 139.5 g/L.

A readily visible sediment-water interface was observed shortly (<2 hours) after the start of the settling test, indicating zone settling. The height of the sediment-water interface above the bottom of the column was measured and recorded over a period lasting more than 30 days as depicted in Figure 4 (see Table C2 in Appendix C for tabulated data). As shown in Figure 4, zone settling was observed during the initial portion of the settling test, followed by compression settling.

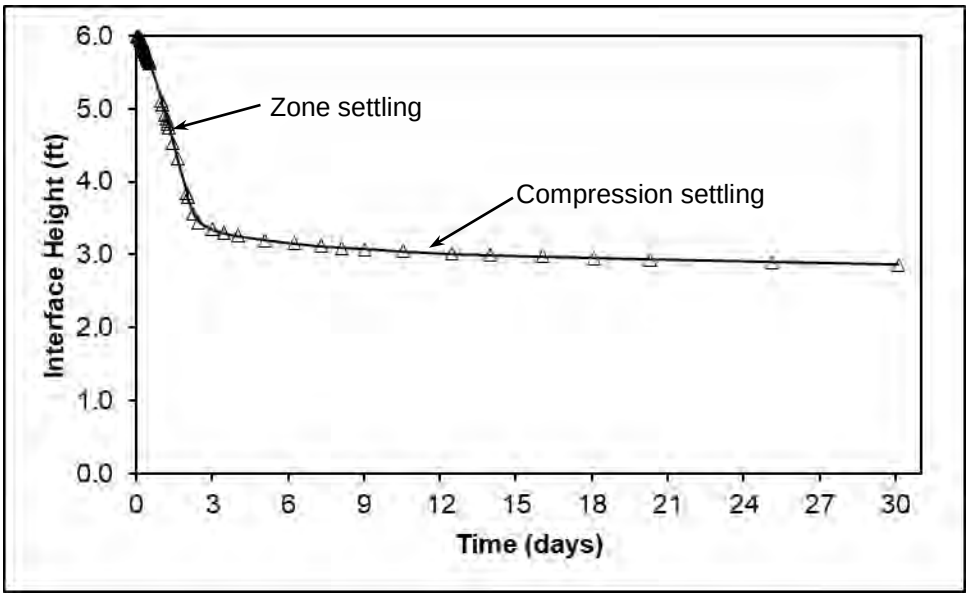

Figure 4. Interface height as a function of time during the pilot-scale settling test with fine grained sediment prepared using a composite of sediment from borings B-11, B-14, and B-15.

Data from the first 60 hours of the settling test are depicted separately in Figure 5. A linear regression was performed for settling data in the time interval of 3 to 60 hours (during which zone settling was observed) with the resulting equation and correlation coefficient shown on the graph. The slope of the regression line, which corresponds to the zone settling velocity, was 0.047 ft/hr (1.13 ft/day).

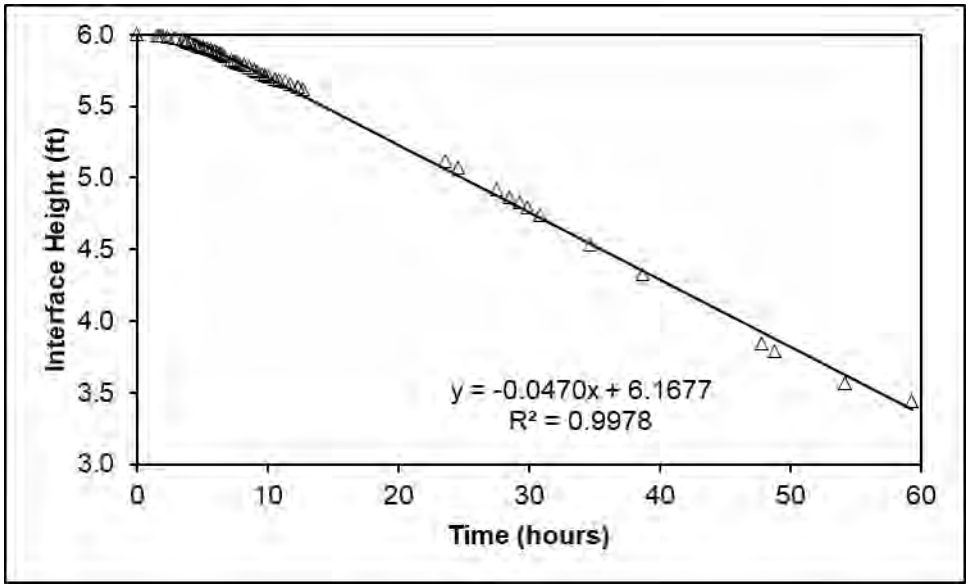

Figure 5. Interface height as a function of time during the zone settling portion of the pilot-scale settling test with composite of borings B-11, B-14, and B-15.

For the portion of the settling test during which compression settling was observed, the concentration in the settled solids at each time interval was calculated as described previously (using equation 3-11 in ref. 1). The corresponding suspended solids concentration as a function of time during compression settling is depicted in Figure 6.

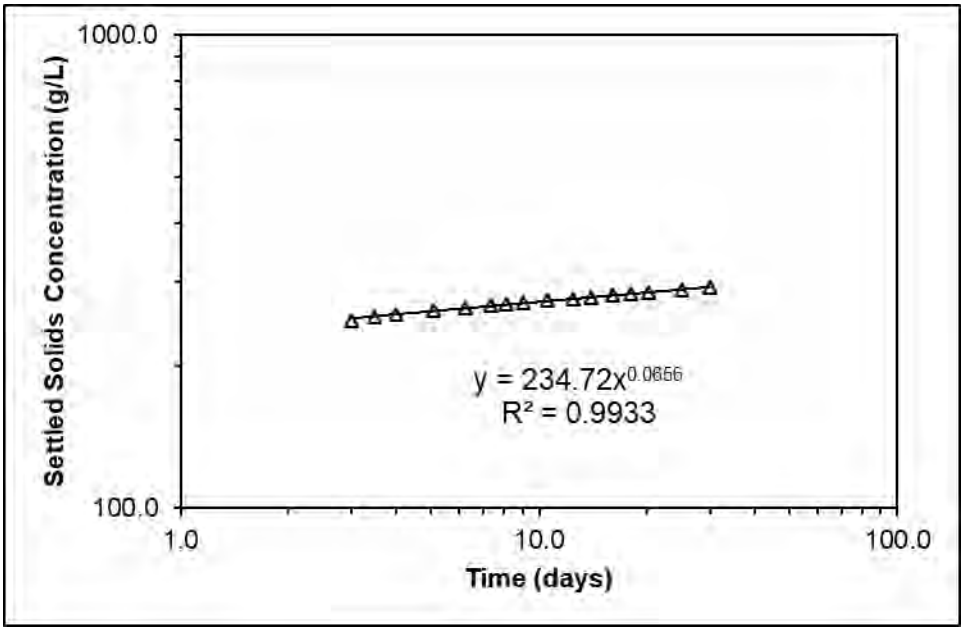

Figure 6: Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling test with composite of borings B-11, B-14, and B-15.

For analysis of flocculent settling as described in the US Army Corps of Engineers Manual No. 1110-2-5027[1], water samples were collected from the clarified layer above the sediment-water interface for measurement of total suspended (TSS) following Standard Method 2450D[2]. The first of these samples, collected 24 hours after the start of settling, had a TSS concentration of 180 mg/L. Concentrations decreased over time, and all elevations sampled (i.e., water from all ports above the sediment-water interface) had TSS concentrations <100 mg/L after 96 hours (4 days) and <50 mg/L after 336 hours (14 days) settling time. Tabulated data are provided in Table D2 in Appendix D.

2.4 Data Comparisons

For comparison purposes, the settling behavior observed during the zone settling interval for composited sediment from borings B-10, B-12, and B-13 (C_o=71.0 g/L)] is shown along with zone settling data collected during testing of composited sediment from borings B-11, B-14, and B-15 (C_o= 139.5 g/L). As shown in Figure 7, the zone settling behavior was similar for both samples but with slightly faster zone settling with the B-11, B-14, and B-15 composite (0.0470 ft/hr, 1.13 ft/day) than the B-10, B-12, and B-13 composite (0.0406 ft/hr, 0.97 ft/day).

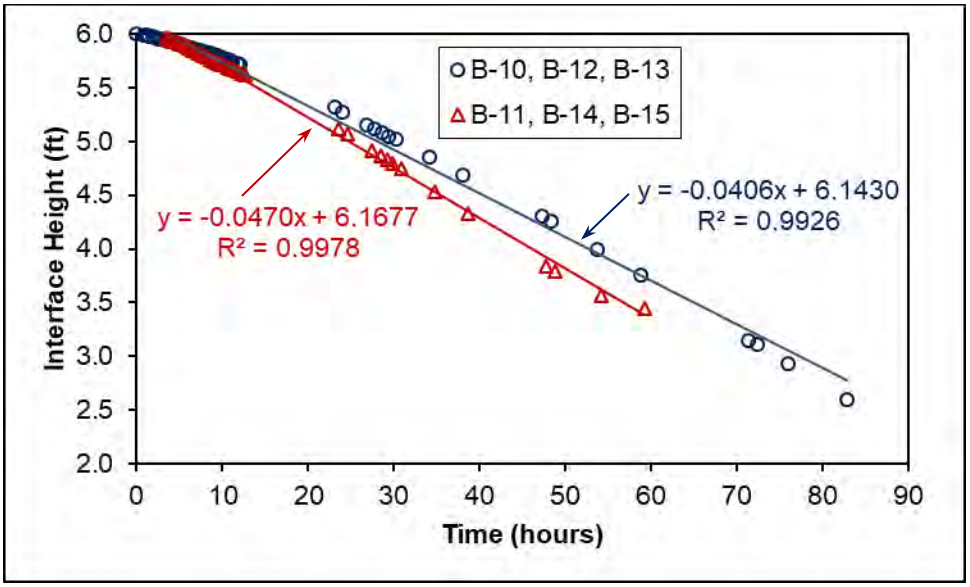

Figure 7: Interface height as a function of time during the zone settling portion of the two pilot-scale settling column tests.

Also for comparison purposes, the compression settling behavior of the settled solids in the two pilot-scale settling column tests is shown below in Figure 8. As shown in the figure, the two composited sediment samples exhibited markedly different compression settling, with the fine-grained sediments from the B-11, B-14, and B-15 composite compacting to a much higher solids concentration than the B-10, B-12, and B-13 composite.

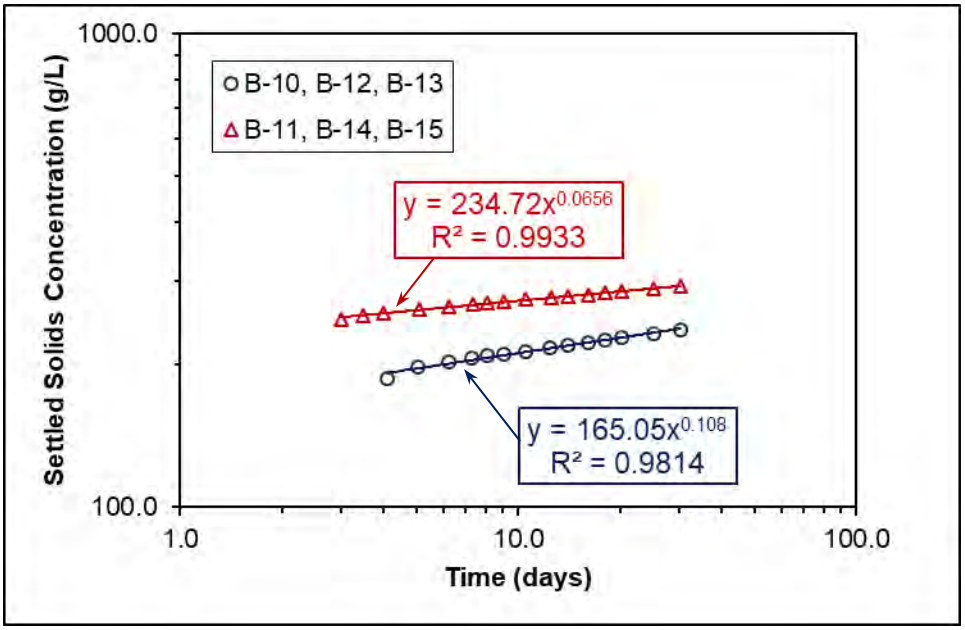

Figure 8: Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling tests conducted with fine-grained sediment slurry.

3.0 References

[1] US Army Corps of Engineers (1987) *Engineering and Design - Confined Disposal of Dredged Material*, Engineer Manual No. 1110-2-5027.

[2] American Public Health Association (1998) *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, American Water Works Association, Water Pollution Control Federation, Washington, DC.

Appendix A

CHAIN OF CUSTODY

Fugro Consultants, Inc.
4233 Rhoda Dr., Baton Rouge, LA 70816
Telephone 225.292.5084
Fax 225.292.8084

FUGRO

Project No. 55174066	Project Name BDC					Location							
Sample ID (Fugro Lab/Client Sample ID)	**Date**	**Time**	**Sample Container (Size/Type)**	**Sample Type (liquid, Soil, etc.)**	**Preser-vative**	**Analyses Requested A**	**B**	**C**	**D**	**E**	**F**	**G**	**Comments**
B-10	4/27			Soil		X							
@ B 0-2	↓			↓									
2-4													
4-5.5													
6-7.5													
8-10 8-10(2)													
—													
B-12													
@ B													
0-2 0-2													
2-4													
4-6													
6-7.5													
8-10 8-10	↓			↓									

Relinquished By:	Date	Time	Received By:
[signature]	4/30/18	10:45	William Mae

Remarks 1 of 3

	Analyses:
A	Col. Settling
B	
C	
D	
E	
F	
G	

Port 4482

White - Orginal Yellow - DFR Pink - Lab Binder Gold - Deliverer

Fugro Consultants, Inc.
4233 Rhoda Dr., Baton Rouge, LA 70816
Telephone 225.292.5084
Fax 225.292.8084

CHAIN OF CUSTODY

Project No.	Project Name	Location
55174066	BDC	

Sample ID (Fugro Lab/Client Sample ID)	Date	Time	Sample Container (Size/Type)	Sample Type (liquid, Soil, etc.)	Preser-vative	A	B	C	D	E	F	G	Comments
B-13	4/27			Soil		X							
Q B													
0-2 0-2													
2-3.5													
4-4.5													
4.5-5													
6-8 6-8													
8-10 8-10													
—													
B-14													
Q B													
2-4 0-2													
2-4													
4-6 (2)													
6.5-8													
8-10 8-10													

Relinquished By:	Date	Time	Received By:
[illegible signature]	4/30/16	10:45	William Moe

Remarks: 2 of 3

Analyses:
A Col Settling
B
C
D
E
F
G

Form 4482   White - Orginal   Yellow - DFR   Pink - Lab Binder   Gold - Deliverer

Fugro Consultants, Inc.
4233 Rhoda Dr., Baton Rouge, LA 70816
Telephone 225.292.5084
Fax 225.292.8084

CHAIN OF CUSTODY

Project No. 55174066 | Project Name BDC | Location

Sample ID (Fugro Lab/Client Sample ID)	Date	Time	Sample Container (Size/Type)	Sample Type (liquid, Soil, etc.)	Preservative	Analyses Requested A	B	C	D	E	F	G	Comments
B-15	4/27			Soil		X							
4 B													
0-2													
2-4 (2)													
4-6.5													
4.5-6													
6-8 6-8													
8-10 8-10													
—													
B-11													
4 B													
0-2 (A,B,C,D)													
2-4 (A,B)													
4-6 4-6													
6-8 6-8													
8-10 8-10													
/													

Relinquished By:	Date	Time	Received By:
[signature]	4/30/12	11:45	William Moore

Remarks 3 of 3

Analyses:
A Col. Settling
B
C
D
E
F
G

Form 4482

White - Orginal Yellow - DFR Pink - Lab Binder Gold - Deliverer

Appendix B

Table B1. Particulate concentrations measured in samples collected from side ports at the start (t=0) of the pilot-scale settling column test using composited sediment from borings B-10, B-12, and B-13.

Port height (ft)[a]	Particulate Conc. (g/L)
1.0	72.1
2.0	70.5
3.0	70.5
4.0	70.7
5.0	71.1
6.0	71.4
Average	**71.0**

[a] As measured from the bottom of the column

Table B2. Particulate concentrations measured in samples collected from side ports at the start (t=0) of the pilot-scale settling column test using composited sediment from borings B-11, B-14, and B-15.

Port height (ft)[a]	Particulate Conc. (g/L)
1.0	140.0
2.0	140.0
3.0	139.3
4.0	139.6
5.0	138.7
6.0	139.1
Average	**139.5**

[a] As measured from the bottom of the column

Appendix C

Table C1. Interface height as a function of time during the pilot-scale column settling test using composited sediment from B-10, B-12, and B-13.

The height of the sediment-water interface above the bottom of the column was recorded as a function of time as summarized in the table below.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
0.00	0.000	6.000	6.000	71.0
0.88	0.037	5.992	6.000	71.1
1.15	0.048	5.988	6.000	71.1
1.45	0.060	5.979	6.000	71.2
1.90	0.079	5.975	6.000	71.3
2.18	0.091	5.967	6.000	71.4
2.55	0.106	5.958	6.000	71.5
2.93	0.122	5.950	6.000	71.6
3.33	0.139	5.942	6.000	71.7
3.73	0.156	5.933	6.000	71.8
4.17	0.174	5.925	6.000	71.9
4.48	0.187	5.917	6.000	72.0
4.92	0.205	5.908	6.000	72.1
5.22	0.217	5.900	6.000	72.2
5.57	0.232	5.892	6.000	72.3
5.85	0.244	5.883	6.000	72.4
6.57	0.274	5.867	6.000	72.6
6.88	0.287	5.858	6.000	72.7
7.25	0.302	5.850	6.000	72.8
7.60	0.317	5.842	6.000	72.9
7.93	0.331	5.833	6.000	73.0
8.32	0.347	5.825	6.000	73.1
8.60	0.358	5.817	6.000	73.2
8.93	0.372	5.808	6.000	73.3
9.23	0.385	5.800	6.000	73.4
9.50	0.396	5.792	6.000	73.6
9.78	0.408	5.783	6.000	73.7
10.05	0.419	5.775	6.000	73.8

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C1. Continued from previous page

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
10.33	0.431	5.767	6.000	73.9
10.67	0.444	5.758	6.000	74.0
10.95	0.456	5.750	6.000	74.1
11.23	0.468	5.742	6.000	74.2
11.83	0.493	5.725	6.000	74.4
12.10	0.504	5.717	6.000	74.5
23.08	0.962	5.317	6.000	80.1
24.05	1.002	5.275	5.983	80.8
26.92	1.122	5.154	5.983	82.7
27.80	1.158	5.117	5.983	83.3
28.70	1.196	5.079	5.983	83.9
29.42	1.226	5.050	5.983	84.4
30.23	1.260	5.017	5.975	84.9
34.18	1.424	4.850	5.975	87.8
38.10	1.588	4.688	5.975	90.9
47.33	1.972	4.300	5.975	99.1
48.43	2.018	4.254	5.975	100.1
53.70	2.238	4.000	5.975	106.5
58.78	2.449	3.750	5.975	113.6
71.43	2.976	3.150	5.975	135.2
72.45	3.019	3.108	5.867	137.1
76.07	3.169	2.933	5.867	145.2
82.95	3.456	2.592	5.867	164.4
95.45	3.977	2.304	5.867	184.9
98.47	4.103	2.275	5.783	187.3
121.22	5.051	2.158	5.783	197.4
149.42	6.226	2.100	5.704	202.9
175.32	7.305	2.063	5.621	206.5
193.88	8.078	2.042	5.529	208.7
216.43	9.018	2.023	5.529	210.6
252.28	10.51	1.996	5.442	213.4
298.33	12.43	1.963	5.442	217.1
335.43	13.98	1.942	5.442	219.4

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C1. Continued from previous page

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
385.38	16.06	1.917	5.338	222.3
433.43	18.06	1.893	5.338	225.0
486.50	20.27	1.871	5.258	227.7
602.10	25.09	1.829	5.258	232.9
722.22	30.09	1.792	5.258	237.8

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Interface height as a function of time during the pilot-scale column settling test using composited sediment from borings B-11, B-14, and B-15.

The height of the sediment-water interface above the bottom of the column was recorded as a function of time as summarized in the table below.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
0.00	0.000	6.000	6.000	139.5
1.52	0.063	5.996	6.000	139.6
1.72	0.072	5.996	6.000	139.6
1.93	0.081	5.992	6.000	139.7
2.33	0.097	5.983	6.000	139.9
2.87	0.119	5.975	6.000	140.1
3.45	0.144	5.967	6.000	140.3
3.65	0.152	5.958	6.000	140.5
3.82	0.159	5.950	6.000	140.7
4.12	0.172	5.942	6.000	140.9
4.50	0.188	5.933	6.000	141.1
4.67	0.194	5.925	6.000	141.3
4.87	0.203	5.917	6.000	141.5
5.07	0.211	5.908	6.000	141.7
5.32	0.222	5.900	6.000	141.9
5.60	0.233	5.892	6.000	142.1
5.90	0.246	5.883	6.000	142.3
6.12	0.255	5.875	6.000	142.5
6.28	0.262	5.867	6.000	142.7
6.42	0.267	5.858	6.000	142.9
6.60	0.275	5.850	6.000	143.1
7.17	0.299	5.825	6.000	143.7
7.40	0.308	5.817	6.000	143.9
7.58	0.316	5.808	6.000	144.1
7.78	0.324	5.800	6.000	144.3
8.15	0.340	5.783	6.000	144.7
8.58	0.358	5.767	6.000	145.1
8.98	0.374	5.750	6.000	145.6
9.17	0.382	5.742	6.000	145.8
9.60	0.400	5.725	6.000	146.2

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Continued from previous page.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
9.78	0.408	5.717	6.000	146.4
10.07	0.419	5.708	6.000	146.6
10.52	0.438	5.692	6.000	147.1
10.83	0.451	5.683	6.000	147.3
11.30	0.471	5.667	6.000	147.7
11.75	0.490	5.650	6.000	148.1
12.28	0.512	5.633	6.000	148.6
12.68	0.528	5.617	6.000	149.0
23.62	0.984	5.117	6.000	163.6
24.55	1.023	5.067	5.983	165.2
27.48	1.145	4.917	5.983	170.2
28.45	1.185	4.867	5.983	172.0
29.28	1.220	4.825	5.983	173.5
29.90	1.246	4.792	5.983	174.7
30.87	1.286	4.742	5.958	176.5
34.72	1.447	4.538	5.958	184.5
38.67	1.611	4.325	5.958	193.5
47.83	1.993	3.842	5.958	217.9
48.83	2.035	3.792	5.892	220.7
54.17	2.257	3.563	5.892	234.9
59.30	2.471	3.442	5.892	243.2
71.93	2.997	3.350	5.892	249.9
83.50	3.479	3.296	5.817	254.0
95.98	3.999	3.258	5.817	256.9
121.78	5.074	3.196	5.754	261.9
149.93	6.247	3.150	5.692	265.7
175.88	7.328	3.117	5.629	268.6
194.42	8.101	3.096	5.567	270.4
216.98	9.041	3.075	5.567	272.2
252.82	10.53	3.046	5.492	274.8
298.87	12.45	3.017	5.492	277.5
335.98	14.00	2.996	5.492	279.4
385.88	16.08	2.974	5.442	281.4

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Table C2. Continued from previous page.

Elapsed Time (hr)	Elapsed Time (days)	Solids Interface Height (ft)	Head height (ft)	Settled Solids Conc. (g/L)[a]
433.93	18.08	2.954	5.442	283.3
487.00	20.29	2.933	5.363	285.3
602.65	25.11	2.896	5.363	289.0
722.77	30.12	2.863	5.363	292.4

[a] Calculated using equation 3-11 in ref. 1 based on the measured particulate concentrations at t=0 and the height of the sediment-water interface at each time interval.

Appendix D

Table D1. Total suspended solids (TSS) concentrations measured above the sediment-water interface for characterization of flocculent settling during the pilot-scale column settling test using composited sediment from borings B-10, B-12, and B-13.

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
24	5.50	6.00	0.50	740
30	5.50	5.98	0.48	662
48	5.50	5.98	0.48	364
48	5.00	5.98	0.98	420
48	4.50	5.98	1.48	731
72	5.50	5.98	0.48	252
72	5.00	5.98	0.98	258
72	4.50	5.98	1.48	276
72	4.00	5.98	1.98	366
72	3.50	5.98	2.48	531
96	5.50	5.87	0.37	148
96	5.00	5.87	0.87	200
96	4.50	5.87	1.37	210
96	4.00	5.87	1.87	234
96	3.50	5.87	2.37	240
96	3.00	5.87	2.87	264
96	2.50	5.87	3.37	338
122	5.50	5.78	0.28	89
122	5.00	5.78	0.78	171
122	4.50	5.78	1.28	179
122	4.00	5.78	1.78	180
122	3.50	5.78	2.28	180
122	3.00	5.78	2.78	188
122	2.50	5.78	3.28	196
150	5.50	5.70	0.20	59
150	5.00	5.70	0.70	112
150	4.50	5.70	1.20	137
150	4.00	5.70	1.70	142
150	3.50	5.70	2.20	143
150	3.00	5.70	2.70	143
150	2.50	5.70	3.20	147

[a] As measured from the bottom of the column; [b] Relative to the top liquid level

Table D1. Continued from previous page

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
176	5.50	5.62	0.12	29
176	5.00	5.62	0.62	101
176	4.50	5.62	1.12	108
176	4.00	5.62	1.62	109
176	3.50	5.62	2.12	113
176	3.00	5.62	2.62	117
176	2.50	5.62	3.12	119
217	5.50	5.53	0.03	27
217	5.00	5.53	0.53	77
217	4.50	5.53	1.03	78
217	4.00	5.53	1.53	86
217	3.50	5.53	2.03	93
217	3.00	5.53	2.53	95
217	2.50	5.53	3.03	94
336	5.00	5.44	0.44	28
336	4.50	5.44	0.94	60
336	4.00	5.44	1.44	65
336	3.50	5.44	1.94	65
336	3.00	5.44	2.44	69
336	2.67	5.44	2.78	70
336	2.00	5.44	3.44	72
434	5.00	5.34	0.34	26
434	4.50	5.34	0.84	35
434	4.00	5.34	1.34	54
434	3.50	5.34	1.84	59
434	3.00	5.34	2.34	60
434	2.50	5.34	2.84	62
434	2.00	5.34	3.34	63

[a] As measured from the bottom of the column

[b] Relative to the top liquid level

Table D2. Total suspended solids (TSS) concentrations measured above the sediment-water interface for characterization of flocculent settling during pilot-scale column settling test using composited sediment from borings B-11, B-14, and B-15.

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
24	5.50	6.00	0.50	188
30	5.50	5.98	0.48	116
30	5.00	5.98	0.98	182
48	5.50	5.96	0.46	68
48	5.00	5.96	0.96	80
48	4.50	5.96	1.46	116
48	4.00	5.96	1.96	283
72	5.50	5.89	0.39	67
72	5.00	5.89	0.89	73
72	4.50	5.89	1.39	75
72	4.00	5.89	1.89	88
72	3.50	5.89	2.39	124
96	5.50	5.82	0.32	51
96	5.00	5.82	0.82	69
96	4.50	5.82	1.32	72
96	4.00	5.82	1.82	73
96	3.50	5.82	2.32	89
122	5.50	5.75	0.25	26
122	5.00	5.75	0.75	54
122	4.50	5.75	1.25	60
122	4.00	5.75	1.75	61
122	3.50	5.75	2.25	75
150	5.50	5.69	0.19	<25[c]
150	5.00	5.69	0.69	50
150	4.50	5.69	1.19	52
150	4.00	5.69	1.69	53
150	3.50	5.69	2.19	59

[a] As measured from the bottom of the column

[b] Relative to the top liquid level

[c] The mass of dry residue retained on the filter was less than 2.5 mg (the minimum required for an acceptable analysis). The result is reported here as <25 mg/L [calculated as the minimum residue mass required for acceptable analysis, 2.5 mg, divided by the sample volume filtered (0.10 L)].

Table D2. Continued from previous page

Sample Extraction Time (hr)	Port Height (ft)[a]	Head Height (ft)[a]	Depth of Sample Extraction (ft)[b]	TSS (mg/L)
176	5.50	5.63	0.13	<25[c]
176	5.00	5.63	0.63	32
176	4.50	5.63	1.13	52
176	4.00	5.63	1.63	56
176	3.50	5.63	2.13	57
217	5.50	5.57	0.07	<25[c]
217	5.00	5.57	0.57	34
217	4.50	5.57	1.07	54
217	4.00	5.57	1.57	55
217	3.50	5.57	2.07	54
336	5.00	5.49	0.49	<25[c]
336	4.50	5.49	0.99	33
336	4.00	5.49	1.49	37
336	3.50	5.49	1.99	47
434	5.00	5.44	0.44	<25[c]
434	4.50	5.44	0.94	27
434	4.00	5.44	1.44	28
434	3.50	5.44	1.94	31
434	3.00	5.44	2.44	32

[a] As measured from the bottom of the column

[b] Relative to the top liquid level

[c] The mass of dry residue retained on the filter was less than 2.5 mg (the minimum required for an acceptable analysis). The result is reported here as <25 mg/L [calculated as the minimum residue mass required for acceptable analysis, 2.5 mg, divided by the sample volume filtered (0.10 L)].