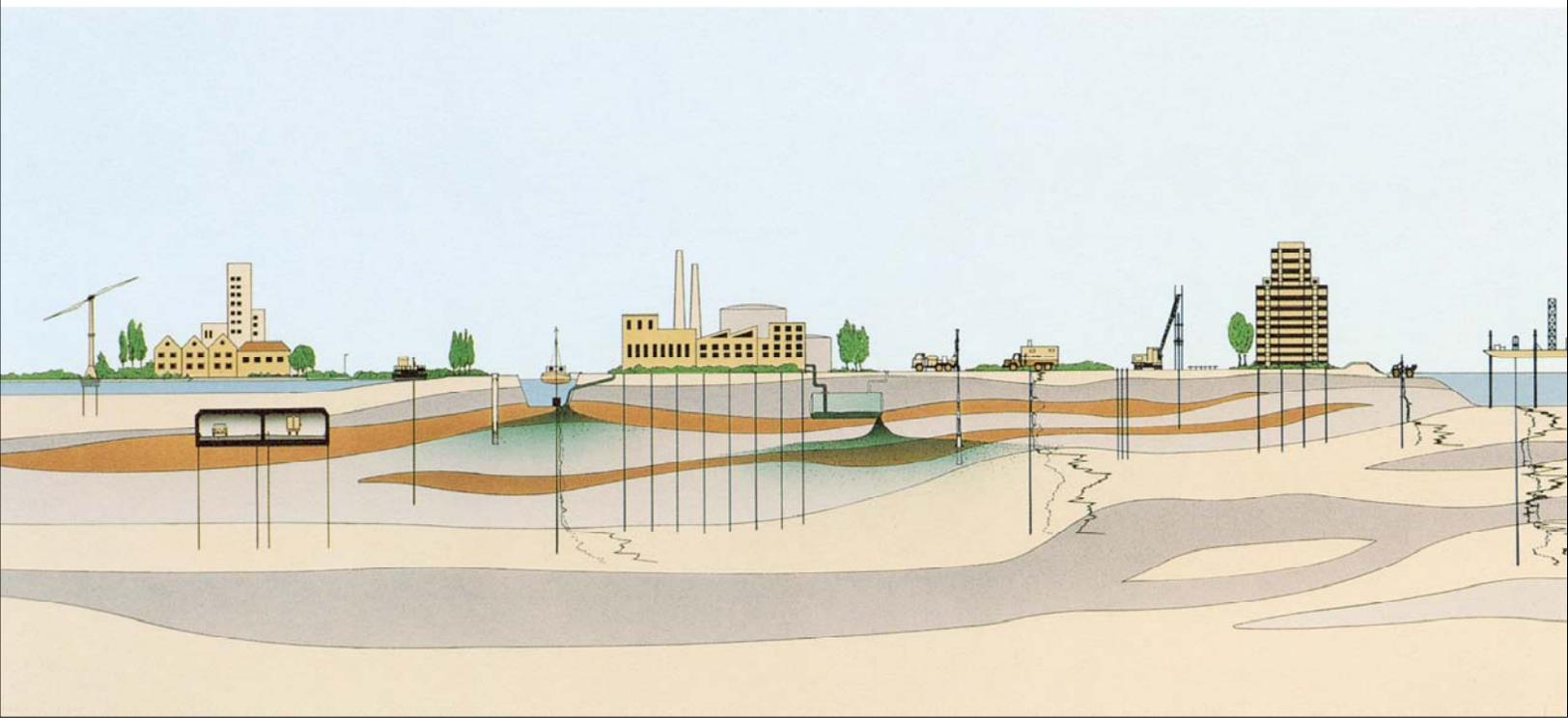




**GEOTECHNICAL DATA REPORT
CAMERON-CREOLE WATERSHED GRAND BAYOU MARSH
CREATION PROJECT (CS-54)
LOUISIANA DEPARTMENT OF NATURAL RESOURCES CONTRACT
NO. 2503-10-12
CAMERON PARISH, LOUISIANA**

COASTAL PROTECTION AND RESTORATION AUTHORITY OF LOUISIANA
BATON ROUGE, LOUISIANA



Report No. 04.55124002-1
May 24, 2012

COASTAL PROTECTION AND RESTORATION AUTHORITY OF LOUISIANA

Post Office Box 44027

Baton Rouge, Louisiana 70804-4027

Attention: Ms. Anna Wojtanowicz, E.I.
Project Engineer

**Geotechnical Data Report
Cameron-Creole Watershed Grand Bayou Marsh Creation Project (CS-54)
Louisiana Department of Natural Resources Contract No. 2503-10-12
Cameron Parish, Louisiana**

Introduction

Fugro Consultants, Inc. (Fugro) is pleased to present this data report of our geotechnical services for the above referenced project. Our services were authorized by the Coastal Protection and Restoration Authority of Louisiana (CPRA) on February 8, 2012 under a Task Order to Retainer Contract No. 2503-10-12 with the Louisiana Department of Natural Resources. Our services were performed in general accordance with our Proposal No. 04.55124002 dated January 31, 2012. This report includes data only. Engineering analyses of proposed design alternatives will be submitted under a separate cover.

Project Description. The Cameron-Creole Watershed has undergone marsh reduction due to subsidence and saltwater intrusion from the Calcasieu Ship Channel. USGS data between 1985 and 2009 predicts a land loss rate of 1.33 percent/year in this area. We understand that the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) and the United States Fish and Wildlife Service (USFWS) have jointly sponsored this project to restore the Cameron-Creole Watershed area. This project will focus on increasing the area by restoring the marsh platforms at the project site. Two separate marsh creation areas are planned for this project, designated Marsh Creation Area 1 and Marsh Creation Area 2. Approximately 609 acres of marsh habitat will be created and approximately 7 acres will be restored. Material for the restoration will be obtained from dredging within Calcasieu Lake immediately adjacent to the project site. An illustration of the two marsh creation areas and proposed dredge area is included on Plate 1.

Scope of Services. Our scope of services for the project consisted of the following:

- drilling 2 geotechnical soil borings to a depth of about 60-ft each and 3 geotechnical soil borings to a depth of about 40-ft each below grade/mudline in

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the vicinity of the north marsh restoration area (Marsh Creation Area 1) at locations proposed by CPRA (total of 240 lineal feet);

- drilling 3 geotechnical soil borings to a depth of about 60-ft each and 4 geotechnical soil borings to a depth of about 40-ft each below grade/mudline in the vicinity of the south marsh restoration area (Marsh Creation Area 2) at locations proposed by CPRA (total of 340 lineal feet);
- drilling 12 geotechnical soil borings to a depth of about 20-ft each in the vicinity of the borrow source area (Calcasieu Lake) at locations proposed by CPRA (total of 240 lineal feet);
- performing laboratory tests on selected soil samples to evaluate geotechnical engineering properties of the subsurface soils; and,
- preparing this data report summarizing our data collection and observations.

Environmental assessment, compliance with state and federal regulatory requirements, assessment of potential migration, and/or environmental analyses, including the investigation, detection, or design related to biological pollutants such as mold, fungus, spores, etc., were beyond the scope of this study. A fault study was also beyond the scope of our services.

Applicability of Report. The explorations and analyses for this study were selected or developed based on our understanding of the project as described previously and in later sections of this report. The observations presented in this data report may not apply to locations not explored by our borings or areas outside the project boundaries.

We have prepared this data report exclusively for CPRA to present geotechnical information related to the marsh areas discussed herein. No engineering analyses or engineering recommendations are provided in this data report. We have performed our services using the standard level of care and diligence normally practiced by recognized engineering firms now performing similar services under similar circumstances. We intend for this report, including all illustrations, to be used in its entirety. This report should be made available for information only and not as a warranty of subsurface conditions.

Field Exploration

Our field exploration is discussed in this section. We have included a discussion on the drilling methods, boring locations, sampling methods, and water depth observations used in our study.

Drilling Methods and Boring Locations. The twelve sample borings for the borrow source area were drilled between March 6 and 9, 2012 using drilling equipment mounted on a spud barge. The twelve sample borings for the marsh creation areas were drilled between April 12 and 18, 2012 using drilling equipment mounted on a marsh buggy. The approximate boring locations are



presented on the Plan of Borings and Site/Vicinity Map on Plate 1. CPRA selected the location and depths of the borings. John Chance Land Surveyors (a Fugro company) staked the borings in the field prior to our drill crew's mobilization. The marsh borings were designated B-1 through B-12 and the lake borings were designated B-13 through B-18 and C-1 through C-6 as shown on the boring logs presented on Plates 2 through 25.

Soil Borings B-1 through B-12 were drilled using a marsh buggy-mounted drilling rig using wet-rotary drilling techniques. Borings B-13 through B-18 and C-1 through C-6 were drilled using a truck mounted drilling rig mounted on a spud barge. Borings B-1 through B-5 were located inside the north Marsh Creation Area 1. Borings B-6 through B-12 were located in the south Marsh Creation Area 2. Borings B-13 through B-18 and C-1 through B-6 were located on the east side of Lake Calcasieu.

Soil Sampling Methods. Soil samples were generally taken at about 2-ft intervals to a depth of 20-ft in accordance with CPRA's specifications. Below the depth of continuous sampling, soil samples were taken at 5-ft intervals to the completion depth of the borings as indicated on the boring logs. Undisturbed samples of cohesive soils were obtained by hydraulically pushing a 3-inch-diameter, thin-walled tube a distance of about 24-inches. Our field procedure for cohesive soil sampling was conducted in general accordance with the *Standard Practice for Thin-Walled Tube Sampling of Soils* (ASTM D1587). For the marsh borings, the thin-walled tubes were capped and sealed in the field and then transported back to our laboratory in the vertical position. The samples were extruded in our laboratory and visually classified by one of our senior geotechnical personnel. The samples from the lake borings were extruded in the field and visually classified by one of our senior geotechnical personnel. Portions of each recovered soil sample were placed into appropriate containers for transportation to our laboratory. We obtained estimates of the undrained shear strength of the recovered samples using a calibrated torvane.

At certain depths within our soil borings, we were unable to recover any material in our thin-walled tubes due to the very soft nature of the cohesive material. At these depths, the sample was recovered by pushing our split-barrel sampler. The soil samples recovered with the split-barrel sampler were visually classified and packaged for transportation to our laboratory.

Water Depth Observations. The soil borings performed in Marsh Creation Areas 1 and 2 (B-1 through B-12, with the exception of Boring B-6) were drilled in standing water varying from 0.2- to 0.6-ft above the mudline at the time of drilling. The soil borings performed in Calcasieu Lake (B-13 through B-18 and C-1 through C-6) were drilled in water approximately 7- to 7.5-ft above the mudline at the time of drilling. The depth of water at each boring location is noted on the boring logs presented on Plates 2 through 25.



Laboratory Testing

Our laboratory tests were performed in general accordance with the appropriate standards as tabulated at the end of this section. The results of our laboratory tests are presented on the boring logs on Plates 2 through 25. A key to the terms and symbols used on the boring logs is presented on Plates 26a and 26b.

Classification Tests. The classification tests included tests for natural moisture content, liquid and plastic limits (collectively termed Atterberg Limits), particle size distribution, and percent passing a single sieve. These tests aid in classifying the soils and are used to correlate the results of other tests performed on samples taken from different borings and/or different depths. The results of the classification tests are presented on the boring logs on Plates 2 through 25. The particle size analyses are presented on Plate 27.

Undrained Shear Strength Tests. We measured the undrained shear strength of select undisturbed samples of cohesive soils by performing undisturbed and remolded miniature vane shear tests and undisturbed unconsolidated-undrained triaxial compression tests. Miniature vane shear tests were generally performed on each sample in the top 20-ft of Borings B-1 through B-12 prior to extrusion. Natural moisture contents and dry unit weights were determined as routine portions of the compression tests. The results of the undisturbed shear strength tests are presented on the boring logs on Plates 2 through 25. The results of the undisturbed and remolded shear strength tests are presented in the Summary of Test Results in Appendix A. The stress-strain curves for the undrained shear strength tests are presented in Appendix B. The soil borings performed in Calcasieu Lake (B-13 through B-18 and C-1 through C-6) were performed for classification purposes only. Therefore, no strength tests were performed on samples obtained in Calcasieu Lake.

One-Dimensional Consolidation Tests. We measured the compressibility characteristics of the soils in the marsh restoration area by performing twelve incremental one-dimensional consolidation tests. Undisturbed soil samples from various soil borings were selected at depths ranging from 2-ft to 58-ft below existing grade for consolidation testing. We performed each test with a rebound-reload cycle. Natural moisture contents and dry unit weights were determined as routine portions of the consolidation tests. Consolidation test reports for 5 of the 12 tests are presented in Appendix C. The other 7 consolidation tests are still in progress in our laboratory. We will present the results of the 12 consolidation tests in our final engineering report.

Low Pressure Consolidation Tests. Three low-pressure consolidation tests were performed to evaluate the settlement characteristics of hydraulically placed dredge material. The low-pressure consolidation tests were performed using the guidance of the procedure outlined in the University of Texas Technical Memorandum, Self-Weight Consolidation of Large Laboratory Deposits of Clay by Olson, Rauch, Mecham, and Luke. Composite samples from the proposed dredge area near





Borings B-13 through B-18 and C-1 through C-6 were obtained to perform the tests. Specifically, we used a composite sample from Borings B-13 through B-18 and C-1 through C-6 using material obtained from the mudline to a depth of 10-ft for the first specimen, a composite sample from material obtained from a depth of 10-ft to 20-ft for the second specimen, and a composite sample from the mudline to a depth of 20-ft for the third specimen. The results of the low pressure consolidation tests are included in Appendix D.

Column Settling Test. One column settling test was performed on a composite sample from Borings B-13 through B-18 and C-1 through C-6 to evaluate the self-weight compression characteristics of the proposed dredge material. The column settling test was performed in general accordance with the Corps of Engineers procedure EM-1110-2-5027. The test was performed by SCTCS Group, LLC. The results of the column settling test are included in Appendix E.

Summary of Test Methods. The laboratory testing program conducted for this study is summarized in the table below. The results of our laboratory tests are presented on the boring logs on Plates 2 through 25 and also in the Summary of Test Results in Appendix A.

<u>Type of Test</u>	<u>Number of Tests</u>	<u>Test Designation</u>
Moisture Content	248	ASTM D 2216
Atterberg Limits	65	ASTM D 4318
Particle Size Distribution	35	ASTM D 6913
Material Finer than a No. 200 Sieve	6	ASTM D 1140
Miniature Vane Shear (undisturbed and remolded)	124	ASTM D 2166
Unconsolidated-Undrained Triaxial Compression (undisturbed)	23	ASTM D 2850
One-Dimensional Consolidation	12	ASTM D 2435
Column Settling Test	1	USACE Manual No. 1110-2-5027
Low-Pressure Consolidation Test	3	Technical Memorandum by the University of Texas

General Site Conditions

The general site and subsurface conditions based on our field exploration and laboratory testing are discussed in this section.

Site Location and Description. Borings B-1 through B-5 were located in the north area selected to be restored (Marsh Creation Area 1). The water depth at these locations varied from 0.4- to 1.4-ft at the time of our field exploration. Borings B-6 through B-12 were located in the south area





selected to be restored (Marsh Creation Area 2). The water depth at these locations varied from 0- to 1.6-ft at the time of our field exploration. Borings B-13 through B-18 and C-1 through C-6 were drilled in Lake Calcasieu, west of the restoration areas. The water depth at these locations was about 7- to 7.5-ft at the time of our exploration. The approximate boring locations are shown on the Plan of Borings and Site Vicinity Map on Plate 1.

Subsurface Conditions. Based on a review of the field and laboratory data, we delineated the subsurface soil conditions at each of the areas studied for the project. A summary for each area is included within.

Marsh Creation Area 1. In Marsh Creation Area 1, organic material varying in thickness from 2- to 8-ft was encountered at the surface at 4 of the 5 boring locations. The organic layer was not encountered at the B-3 location. A layer of very soft fat clay to a depth ranging from 12- to 33-ft was encountered beneath the organic clay layer and at the surface to a depth of 13-ft at the Boring B-3 location. Underlying the fat clay stratum, lean clay was encountered to a depth of 28- to 48-ft in 4 of 5 boring locations and to the termination depth of Boring B-1. Beneath the lean clay, fat clay was encountered to the completion depth of Borings B-2 through B-5.

Marsh Creation Area 2. In Marsh Creation Area 2, a very soft fat clay layer was encountered to a depth of 10- to 23-ft. Underneath the fat clay, lean clay was encountered between a depth of 10- to 48-ft at to the termination depth of Borings B-6 and B-10. Below the lean clay, fat clay was encountered to the termination depth of the Borings B-7 through B-9, B-11 and B-12.

Dredge Borrow Area. In the dredge borrow area, fat clay was encountered to the completion depth of the borings with the exception of a few intermittent thin layers of lean clay.

Additional subsurface details and laboratory testing results are included on the boring logs on Plates 2 through 25. Generalized subsurface profiles are included on Plates 28 through 30 for reference.

Variations. Our interpretations of soil and water depth conditions, as described in this report, are based on data obtained from our visual observations, sample borings, and laboratory tests. It is possible that undisclosed variations in soil or water depth conditions may occur outside the boring locations.

* * *





The following illustrations are attached and complete this report:

	<u>Plate</u>
Plan of Borings and Site Vicinity Map.....	1
Soil Boring Logs.....	2 through 25
Key to Terms and Symbols Used on Boring Logs.....	26a and 26b
Particle Size Analyses.....	27
Generalized Cross-Section A-A.....	28
Generalized Cross-Section B-B.....	29
Generalized Cross-Section C-C.....	30
Summary of Test Results.....	Appendix A
Triaxial Shear Test Results.....	Appendix B
Consolidation Test Results.....	Appendix C
Low Pressure Consolidation Test Results.....	Appendix D
Column Settling Test Results.....	Appendix E

Closing

We appreciate the opportunity to be of service to CPRA. Please call if you have any questions or comments concerning this data report, or when we may be of further assistance.

Sincerely,
FUGRO CONSULTANTS, INC.

Brenda Novoa, P.E.
Senior Professional

Jennifer E. Aguetant, P.E.
Engineering Supervisor

Reviewed By:

Eric R. Marx, P.E.
Branch Manager

Copies Submitted: Electronic copy only

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Cameron-Creole Watershed Grand Bayou Marsh Creation - CPRA.doc)





NOT TO SCALE

NOTE:
Marsh Creation areas are a visual representation only.

LEGEND:

⊕ SOIL BORING LOCATION

REFERENCE:
Images by Google Earth Pro.



SITE MAP



VICINITY MAP

		CAMERON-CREOLE WATERSHED GRAND BAYOU MARSH CREATION CAMERON PARISH, LOUISIANA	
PLAN OF BORINGS AND SITE/VICINITY MAP			
SIZE B	PROJECT NO. 04.55124002	REV. 0	
SCALE: AS SHOWN	DRAWN BY: DMS	CHKD BY: BN	DATE: 05/25/12
			Plate No.: 1

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 53' 05" W 93° 13' 36.98" SURFACE EL.: 0.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
				ORGANIC CLAY (OH) , very soft, black, with roots - dark gray and black below 2'			125 79	222	56	166									
5				FAT CLAY (CH) , very soft, dark gray - with roots and calcareous nodules from 4' to 6' - with roots and wood from 6' to 8' - with shell fragments from 8' to 14'	4.0		99	78											
10							80 77	85	22	63									
15				- gray below 14'			44												
20							62												
25							72												
30																			
35				LEAN CLAY (CL) , very soft to soft, gray	33.0		80	36 42	40 44	15 17	25 27								
40				SANDY LEAN CLAY (CL) , soft, gray	38.0		56	26											
					40.0			32											

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.4' at the time of drilling.

COMPLETION DATE: April 13, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-01

Project No.
04.55124002

PLATE 2

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 58.06" W 93° 13' 06.25" SURFACE EL.: 0.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH									
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT								
				STRATUM DESCRIPTION																
				ORGANIC CLAY (OH) , very soft, black, with roots	2.0			102												
				FAT CLAY (CH) , very soft, dark gray - with roots from 2' to 6'			99	100												
5				- with calcareous nodules from 6' to 8'				90												
								92												
				- gray below 8'				74												
10								79												
								51	50	19	31									
								68												
15								88												
				- with organics at 17'				94	99	28	71									
							86	85	21	64										
20							97													
25							42													
30							59													
35				LEAN CLAY (CL) , soft, gray	33.0			23												
				- with gravel traces from 38' to 39' - stiff at 38'			90	33												

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.4' at the time of drilling.

COMPLETION DATE: April 13, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-02

Project No.
 04.55124002

PLATE 3a

FCBR_LOG (FINAL).0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 58.06" W 93° 13' 06.25" SURFACE EL.: 0.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
				STRATUM DESCRIPTION														
				LEAN CLAY (CL) , soft, gray	43.0													
				FAT CLAY (CH) , soft, brown and greenish gray, with silt lenses														
45				- firm to stiff from 48' to 55'			36											
50							40											
55				- with shell fragments at 54'			33 40											1.6
60					60.0		33											

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.4' at the time of drilling.

COMPLETION DATE: April 13, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-02

Project No.
04.55124002

PLATE 3b

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 53' 18.52" W 93° 12' 24.36" SURFACE EL.: -1.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0 - 8.0				ORGANIC CLAY (OH) , very soft, dark brown - dark gray below 4'			315 115 241 109	288 118	82 28	206 90									
8.0 - 12.0				FAT CLAY (CH) , soft to firm, gray and yellowish brown, with shell fragments			28 26 26	51	15	36									
12.0 - 28.0				LEAN CLAY (CL) , firm, gray - with calcareous nodules at 14' - soft, yellowish brown and gray below 18' - with ferrous nodules at 18' - with shell fragments below 23'			22 23 23 26 25	38	20	18									
28.0 - 30.0				FAT CLAY (CH) , stiff, yellowish brown and gray, with sand lenses and ferrous nodules - brown from 33' to 38' - with shell fragments at 33'	79		47												1.6
30.0 - 40.0																			1.9

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 1.4' at the time of drilling.

COMPLETION DATE: April 11, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-04

Project No.
04.55124002

PLATE 5

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 53' 02.39" W 93° 12' 16.72" SURFACE EL.: -0.1'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
				STRATUM DESCRIPTION														
				ORGANIC CLAY (OH) , very soft, dark brown, with roots	2.0	96	148 91	141	41	100								
5				FAT CLAY (CH) , very soft, gray, with wood and organics			63											
				- with sand pockets at 6'			66 84	64 53	17 17	47 36								
10							77											
							44											
15				LEAN CLAY (CL) , firm, light gray	14.0		62											
				- with yellowish brown streaks and calcareous nodules below 16'			72											
				- stiff at 17'			30											
20							24	48	14	34								1.7
				- with silt pockets and sand traces at 23'			27											
25																		
							31											
30																		
				- with silt pockets and shell fragments at 33'														
35																		
40				- stiff at 38'		87												
				- brown below 39'			34											1.4

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.5' at the time of drilling.

COMPLETION DATE: April 10, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-05

Project No.
 04.55124002

PLATE 6a

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 53' 02.39" W 93° 12' 16.72" SURFACE EL.: -0.1'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
							UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
					STRATUM DESCRIPTION														
					LEAN CLAY (CL) , brown	42.0													
45																			
					FAT CLAY (CH) , firm, brown and gray, with shell fragments	48.0													
50					- with silt lenses and sand traces at 53'														
55					- brown, with sand lenses below 58'														
60						60.0	82	38											●
65																			
70																			
75																			
80																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.5' at the time of drilling.

COMPLETION DATE: April 10, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-05

Project No.
04.55124002

PLATE 6b

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 46.76" W 93° 13' 33.46" SURFACE EL.: 0.4'	STRATUM DEPTH, FT	CLASSIFICATION				SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT					
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0		
0			N=Push	FAT CLAY (CH) , very soft, dark gray - with roots from 0' to 1'	14.0	96	93										
5				- with calcareous nodules from 5' to 10'			81	99									
10				- with some gravel and a piece of wood at 10'			101										
12				- gray below 12'			89		82	22	60						
14							85										
15				LEAN CLAY (CL) , very stiff, gray and tan, with ferrous nodules - firm from 16' to 33'			54										
18				- with some calcareous nodules from 18' to 23'			57										
20							42										
23				- brown below 23'			23		42	14	28						
25							21										
30							20										
33				- stiff, with silt lenses below 33'			20										
35							91	30									
40							92	31									2.2

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0' at the time of drilling.

COMPLETION DATE: April 14, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-06

Project No.
04.55124002

PLATE 7

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 49.46" W 93° 13' 08.54" SURFACE EL.: -1.2'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
0				FAT CLAY (CH) , very soft, dark gray, with roots		91	17 69 98 75 75	99	20	79						
10				LEAN CLAY (CL) , soft to firm, dark gray - with shells at 13' - gray from 14' to 16' - gray and brown from 16' to 23' - stiff at 17' - brown, with silt lenses below 23'	10.0		43 27 22 21	43	15	28						
28				LEAN CLAY WITH SAND (CL) , brown	28.0	82	28									
33				FAT CLAY (CH) , stiff, brown, with silt lenses	33.0											
40					40.0	79	46									1.6

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 1.6' at the time of drilling.

COMPLETION DATE: April 14, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-07

Project No.
04.55124002

PLATE 8

FCBR_LOG (FINAL).0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 37.28" W 93° 12' 38.18" SURFACE EL.: -1.1'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
				STRATUM DESCRIPTION														
0				FAT CLAY (CH) , very soft, gray, with ferrous nodules - with organics at 2' - with shell fragments at 4' - with shell fragments at 8' - with organics below 8'			81 60	92	21	71								
5						94	50 52 40											
10							52 62 50	57	18	39								
12.0				LEAN CLAY (CL) , very soft, gray, with shell fragments, organics, and ferrous nodules	12.0		40 41	37	15	22								
15							29											
20				- with silt layers below 23'														
25																		
28.0				FAT CLAY (CH) , stiff, brown, with calcareous and ferrous nodules	28.0		89	29										
30								38	82	20	62							
35																		
40																		
																		1.5

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 1.5' at the time of drilling.

COMPLETION DATE: April 15, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-08

Project No.
04.55124002

PLATE 9a

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 00.36" W 93° 12' 38.18" SURFACE EL.: -0.2'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
0				FAT CLAY (CH) , very soft, gray and black, with roots			76									
5				- with shell fragments from 6' to 14'		99	77	90	25	65						
10				- with organics at 16'			64									
15				- with calcareous nodules at 18'			75									
20				- firm below 19'			70	70	22	48						
23.0				LEAN CLAY WITH SAND (CL) , gray and tan, with ferrous nodules	23.0											
25				- tan below 28'												
30						82		25								
33.0				FAT CLAY (CH) , stiff, tan and light gray, with ferrous nodules, sand seams, organics, and wood	33.0											
35						90		29								1.6
40.0					40.0											

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.6' at the time of drilling.

COMPLETION DATE: April 15, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-09

Project No.
 04.55124002

PLATE 10

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 42.63" W 93° 12' 32.66" SURFACE EL.: -0.3'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
0				FAT CLAY (CH) , very soft to soft, black, with roots - greenish gray, with silt pockets from 2' to 4' - gray, with shell fragments from 4' to 13'		94	58									
5							51									
							56	67	21	46						
							51									
							56									
							89	69	22	47						
							41									
							44									
				- brown and gray, with peat layers from 13' to 16'			58									
							74									
				- light gray below 16'			34									
				- firm below 17'												
19.0				LEAN CLAY (CL) , stiff to very stiff, light greenish gray	19.0											
				- brown below 23'												
				- with sand lenses at 23'		99	26									2.2
							28									
28.0				SANDY LEAN CLAY (CL) , very stiff, brown, with alternating clay and sand layers	28.0											
				- reddish brown below 33'		57	27									
							23									
							29									
							29									
40.0					40.0	44	26									
							27									

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.7' at the time of drilling.

COMPLETION DATE: April 17, 2012
 TOTAL DEPTH: 40'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 40'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-10

Project No.
04.55124002

PLATE 11

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 25.42" W 93° 12' 25.03" SURFACE EL.: 0.2'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
				FAT CLAY (CH) , very soft to soft, dark gray, with organics and roots			56	76	24	52						
5			N=Push			92										
			N=Push													
			N=Push				63	53	19	34						
10			N=Push													
			N=Push													
				- greenish gray from 14' to 18' - stiff below 14'			58	71	23	48						
15							66									1.7
							22									1.7
							19									
				SANDY LEAN CLAY (CL) , stiff, gray, with ferrous nodules	18.0		23									1.6
20																
25						99	25									1.2
							26									
30																
35				LEAN CLAY (CL) , tan	33.0		97	34								
40																

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.2' at the time of drilling.

COMPLETION DATE: April 17, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-11

Project No.
04.55124002

PLATE 12a

FGBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL	SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 25.42" W 93° 12' 25.03" SURFACE EL.: 0.2'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
							UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
					STRATUM DESCRIPTION														
45					LEAN CLAY (CL), tan														
48.0					FAT CLAY (CH), stiff, tan	88	100	33											1.5
50					- gray, with silty sand lenses below 53'			34											
55								52	83	26	57								
60.0						60.0													

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.2' at the time of drilling.

COMPLETION DATE: April 17, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-11

Project No.
04.55124002

PLATE 12b

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 31.27" W 93° 12' 07.11" SURFACE EL.: 0.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
				STRATUM DESCRIPTION														
0				FAT CLAY (CH) , very soft, gray, with roots and organics			93	106	32	74								
5						98	94											
10				LEAN CLAY (CL) , very soft to soft, gray	10.0		48	47	18	29								
15				FAT CLAY (CH) , firm, greenish gray	14.0		36	57	16	41								
20				SANDY LEAN CLAY (CL) , soft to firm, greenish gray	16.0	63	18											
25				FAT CLAY (CH) , stiff, gray, with reddish brown sand pockets	23.0	93	30											1.8
30						100	30											
35						89	34											1.4
40				- brown, with silt lenses from 38' to 43'		100	31											

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.4' at the time of drilling.

COMPLETION DATE: April 18, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed
 Grand Bayou Marsh Creation
 Cameron Parish, Louisiana

LOG OF BORING NO. B-12

Project No.
 04.55124002

PLATE 13a

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 31.27" W 93° 12' 07.11" SURFACE EL.: 0.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
45				FAT CLAY (CH) , stiff, gray, with reddish brown sand pockets - with a 2-inch shell fragments layer at 43'			42	82	30	52						
50					78		47 44									●
55							49									
60				- with shell fragments below 59'	60.0		43									

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 0.4' at the time of drilling.

COMPLETION DATE: April 18, 2012
 TOTAL DEPTH: 60'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 60'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-12

Project No.
04.55124002

PLATE 13b

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 19.2" W 93° 15' 10.8" SURFACE EL.: -6.1'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
0				FAT CLAY (CH) , very soft, gray, with shell fragments												
5																
10																
14.0				FAT CLAY WITH SAND (CH) , very soft, gray, with shell fragments	14.0	85	52 44	51	19	32						
15																
20.0					20.0											
25																
30																
35																
40																

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 6, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-13

Project No.
04.55124002

PLATE 14

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 09.2" W 93° 15' 22.1" SURFACE EL.: -6.5'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0				FAT CLAY (CH) , very soft, gray, with shell fragments															
5																			
10																			
15																			
18.0				LEAN CLAY (CL) , very soft, gray, with shell fragments	18.0														
20.0					20.0														
25																			
30																			
35																			
40																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 6, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-14

Project No.
04.55124002

PLATE 15

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 03.6" W 93° 15' 02.6" SURFACE EL.: -6.2'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
				FAT CLAY (CH) , very soft, gray															
5				LEAN CLAY (CL) , very soft, gray	4.0		94	65	45	18	27								
				FAT CLAY (CH) , very soft, gray, with shell fragments	6.0														
20					20.0			53 71	58	16	42								

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 7, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-15

Project No.
04.55124002

PLATE 16

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 37.6" W 93° 15' 02.8" SURFACE EL.: -6.3'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0				FAT CLAY (CH) , very soft, gray															
5				- with organics at 5'			107	85	23	62									
				- with shell fragments below 7'			69												
10																			
15							76	63	20	43									
							91	62											
20					20.0														
25																			
30																			
35																			
40																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 7, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-17

Project No.
04.55124002

PLATE 18

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 27.6" W 93° 15' 21.7" SURFACE EL.: -6.5'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
				FAT CLAY (CH) , very soft, gray - with shell fragments below 3'			67	51	17	34	◇								
5											◇								
10											◇								
15											◇								
20					20.0		98	51	50	15	35	◇							
25											◇								
30											◇								
35											◇								
40											◇								

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 8, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. B-18

Project No.
04.55124002

PLATE 19

Fugro Consultants, Inc.

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 52' 17.1" W 93° 14' 55.4" SURFACE EL.: -6.4'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0				FAT CLAY (CH) , very soft, gray, with shell fragments		91	94 67	74	20	54	◇								
5											◇								
10							64 55	58	19	39	◇								
15											◇								
20					20.0						◇								
25																			
30																			
35																			
40																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 6, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. C-01

Project No.
04.55124002

PLATE 20

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N29° 52' 01.0" W93° 15' 17.4" SURFACE EL.: -6.8'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0				FAT CLAY (CH) , very soft, gray		93	71	58	19	39	◇								
5				- with shell fragments below 3'							◇								
10											◇								
15											◇								
20					20.0						◇								
25																			
30																			
35																			
40																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7.5' at the time of drilling.

COMPLETION DATE: March 9, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. C-02

Project No.
04.55124002

PLATE 21

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 53.8" W 93° 14' 56.5" SURFACE EL.: -7.0'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH								
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT							
				STRATUM DESCRIPTION															
0				FAT CLAY (CH) , very soft, gray			84	61	21	40	◇								
5							82				◇								
10											◇								
15				- with shell fragments below 14'							◇								
18.0				FAT CLAY WITH SAND (CH) , very soft, gray, with shell fragments	18.0		53				◇								
20.0					20.0		81	87			◇								
25																			
30																			
35																			
40																			

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7.5' at the time of drilling.

COMPLETION DATE: March 7, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. C-03

Project No.
04.55124002

PLATE 22

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 42.6" W 93° 15' 22.5" SURFACE EL.: -6.6'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH							
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT						
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0			
0				FAT CLAY (CH) , very soft, gray, with shell fragments	20.0													
5																		
10																		
15																		
20								90	59	57	19	38						
25																		
30																		
35																		
40																		

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7.5' at the time of drilling.

COMPLETION DATE: March 8, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. C-04

Project No.
04.55124002

PLATE 23

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 40.4" W 93° 14' 53.4" SURFACE EL.: -6.4'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH					
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT				
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0	
0				FAT CLAY (CH) , very soft, gray												
5																
10				- with shell fragments at 9'												
15																
16.0				FAT CLAY WITH SAND (CH) , very soft, gray	16.0											
20						85	52	55	17	38						
20.0					20.0											
25																
30																
35																
40																

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 8, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

LOG OF BORING NO. C-05

Project No.
04.55124002

PLATE 24

FCBR_LOG (FINAL)_0 TO 1 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/24/12

DEPTH, FT	WATER LEVEL	SYMBOL SAMPLES	BLOWS PER FOOT	LOCATION: See Plate 1 COORDINATES: N 29° 51' 25.3" W 93° 15' 14.8" SURFACE EL.: -6.5'	STRATUM DEPTH, FT	CLASSIFICATION					SHEAR STRENGTH				
						UNIT DRY WT, PCF	PASSING NO. 200 SIEVE, %	WATER CONTENT, %	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX (PI)	KIPS PER SQ FT			
				STRATUM DESCRIPTION							0.2	0.4	0.6	0.8	1.0
				FAT CLAY (CH) , very soft, gray											
5				- with shell fragments at 4'		96	70	55	18	37					
10				- with shell fragments at 10'											
15															
20					20.0			60	55	18	37				
25															
30															
35															
40															

NOTES:

- Terms and symbols defined on Plates 26a and 26b.
- Water depth was 7' at the time of drilling.

COMPLETION DATE: March 9, 2012
 TOTAL DEPTH: 20'
 CAVED DEPTH: Not Applicable
 DRY AUGER: Not Applicable
 WET ROTARY: 0' to 20'
 BACKFILL: Cement-Bentonite Grout
 LOGGER: M. Allen



Cameron-Creole Watershed

Grand Bayou Marsh Creation

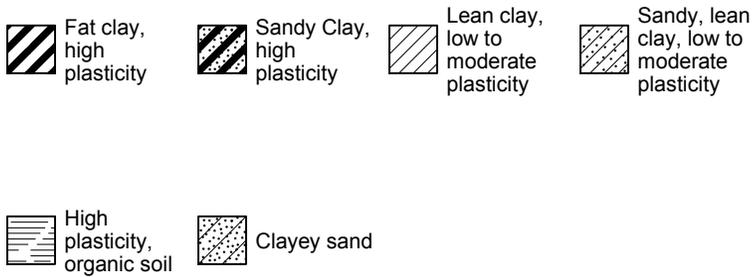
Cameron Parish, Louisiana

LOG OF BORING NO. C-06

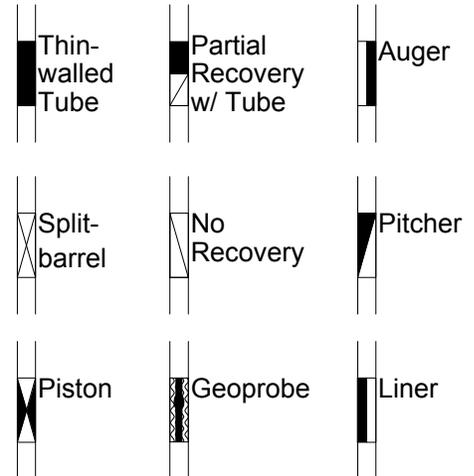
Project No.
04.55124002

PLATE 25

SOIL TYPES

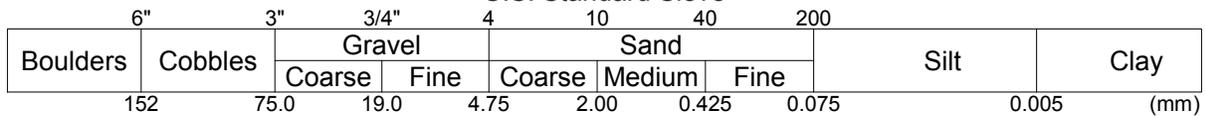


SAMPLER TYPES

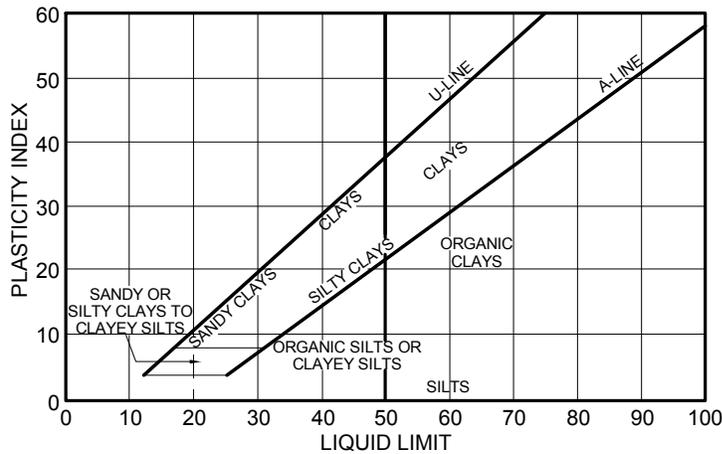


SOIL GRAIN SIZE

U.S. Standard Sieve



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 Consultants, Inc.

TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (1 of 2)

Project No.
04.55124002

PLATE 26a

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 = Field 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.

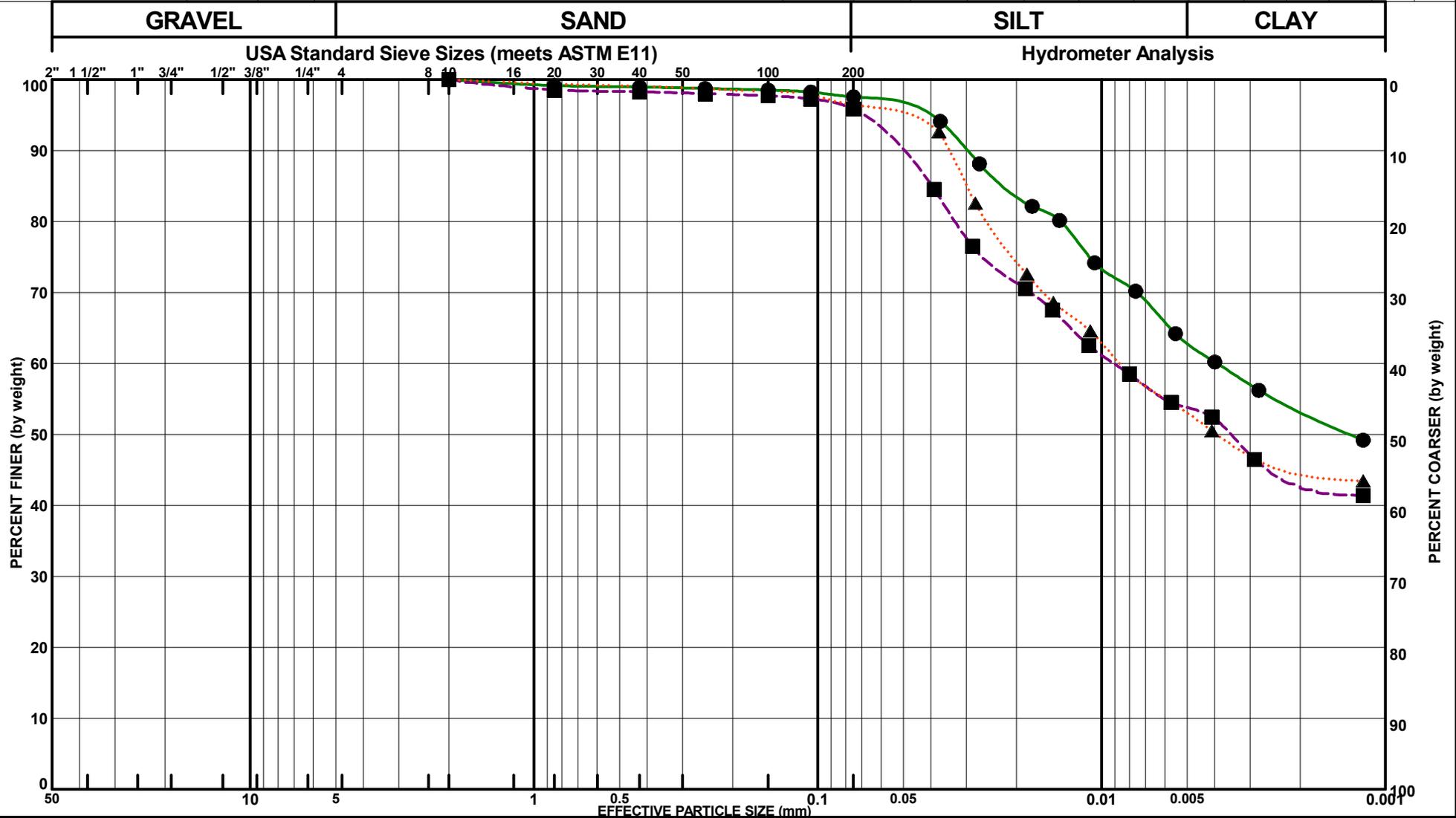


TERMS AND SYMBOLS USED ON BORING LOGS

SOIL CLASSIFICATION (2 of 2)

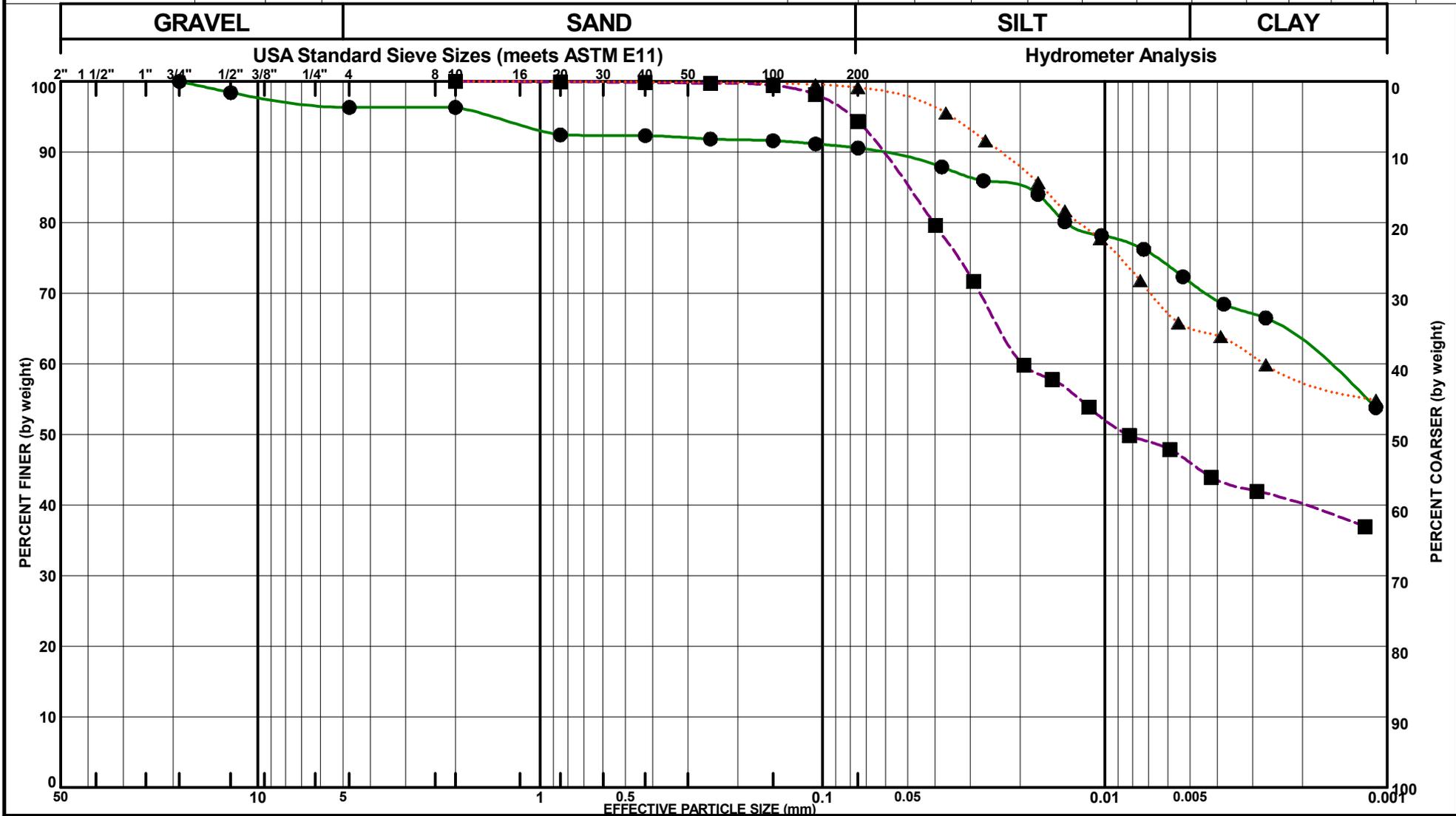
Project No. 04.55124002	PLATE 26b
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Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-04	4A	6-7	ORGANIC CLAY (OH), dark gray	0.0	2.4	34.6	63.0	2	0.004							
■ B-05	1B	0.5-1	ORGANIC CLAY (OH), dark brown, with roots	0.0	4.2	42.1	53.7	2	0.009							
▲ B-06	1	0-1.5	FAT CLAY (CH), dark gray, with roots	0.0	3.5	43.5	52.9	2	0.009							



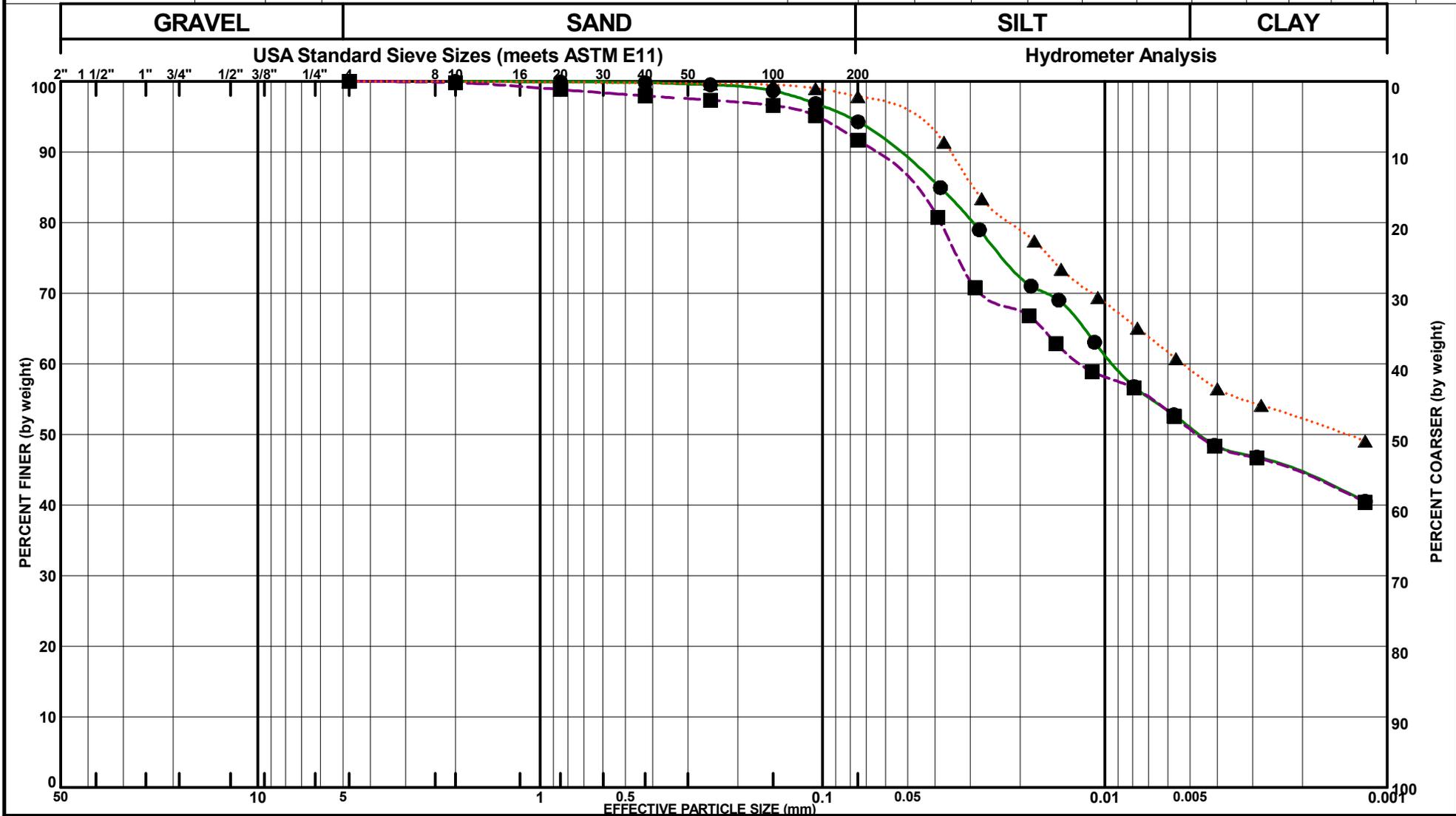
FCBR CSA LANDSCAPE 04-55124002.GPJ_FUGRO DATA TEMPLATE 042610.GDT 05/22/12

Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-07	2A	2-3	FAT CLAY (CH), dark gray, with roots	3.7	5.8	18.9	71.7	19	0.002							
■ B-08	3A	4-5	FAT CLAY (CH), gray, with shell fragments	0.0	5.7	48.4	46.0	2	0.02							
▲ B-09	4A	6-7	FAT CLAY (CH), gray and black, with roots	0.0	0.9	33.9	65.3	2	0.003							



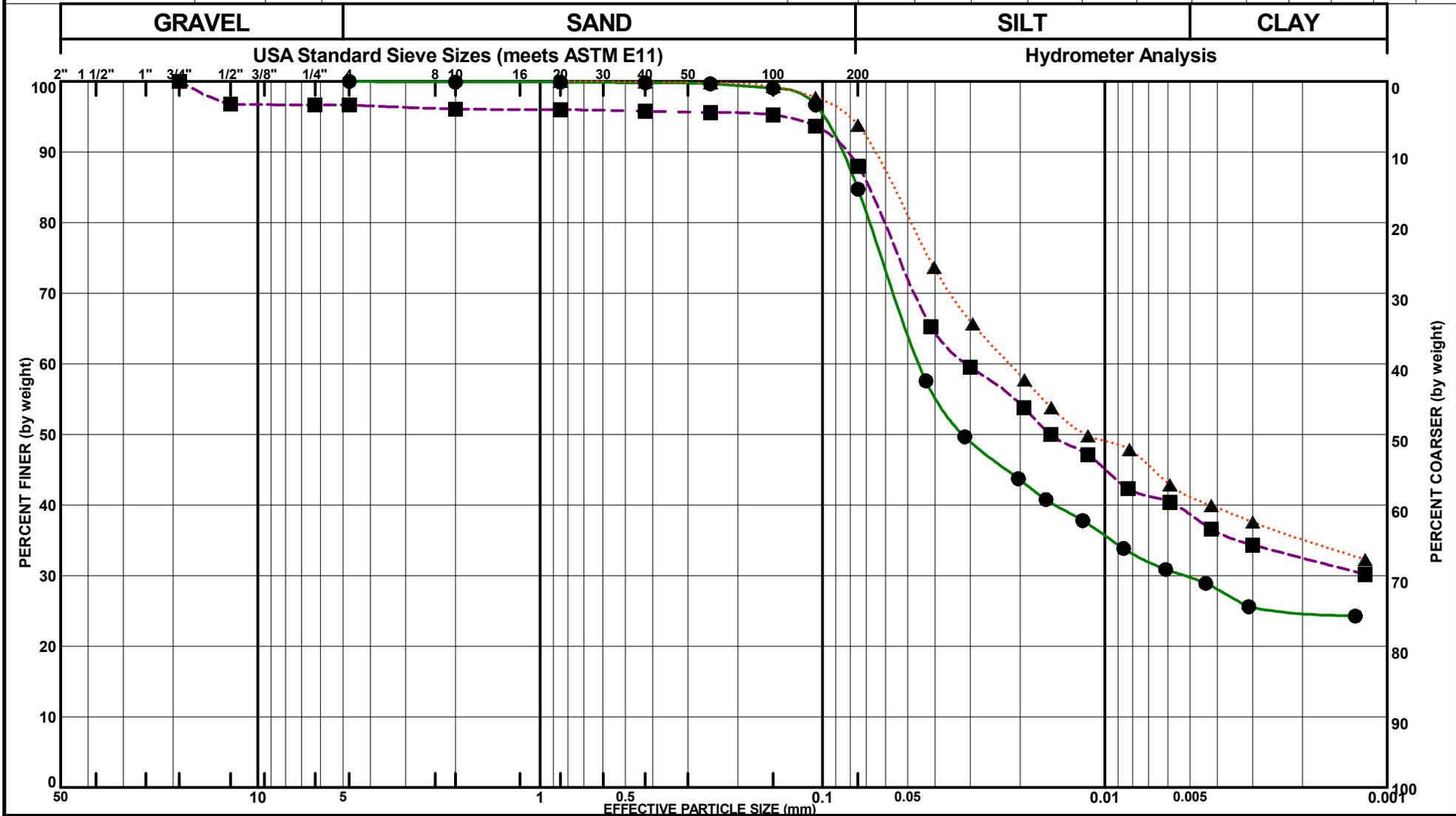
FCBR_GSA_LANDSCAPE_04.55124002.GPJ_FUGRO_DATA_TEMPLATE_042610.GDT_05/22/12

Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-10	1A	0-1	FAT CLAY (CH), black, with roots	0.0	5.7	43.2	51.1	2	0.009							
■ B-11	2	2-3.5	FAT CLAY (CH), dark gray, with organics and roots	0.0	8.3	40.7	50.9	4.75	0.012							
▲ B-12	3A	4-5	FAT CLAY (CH), gray, with roots and organics	0.0	2.1	38.6	59.3	4.75	0.005							



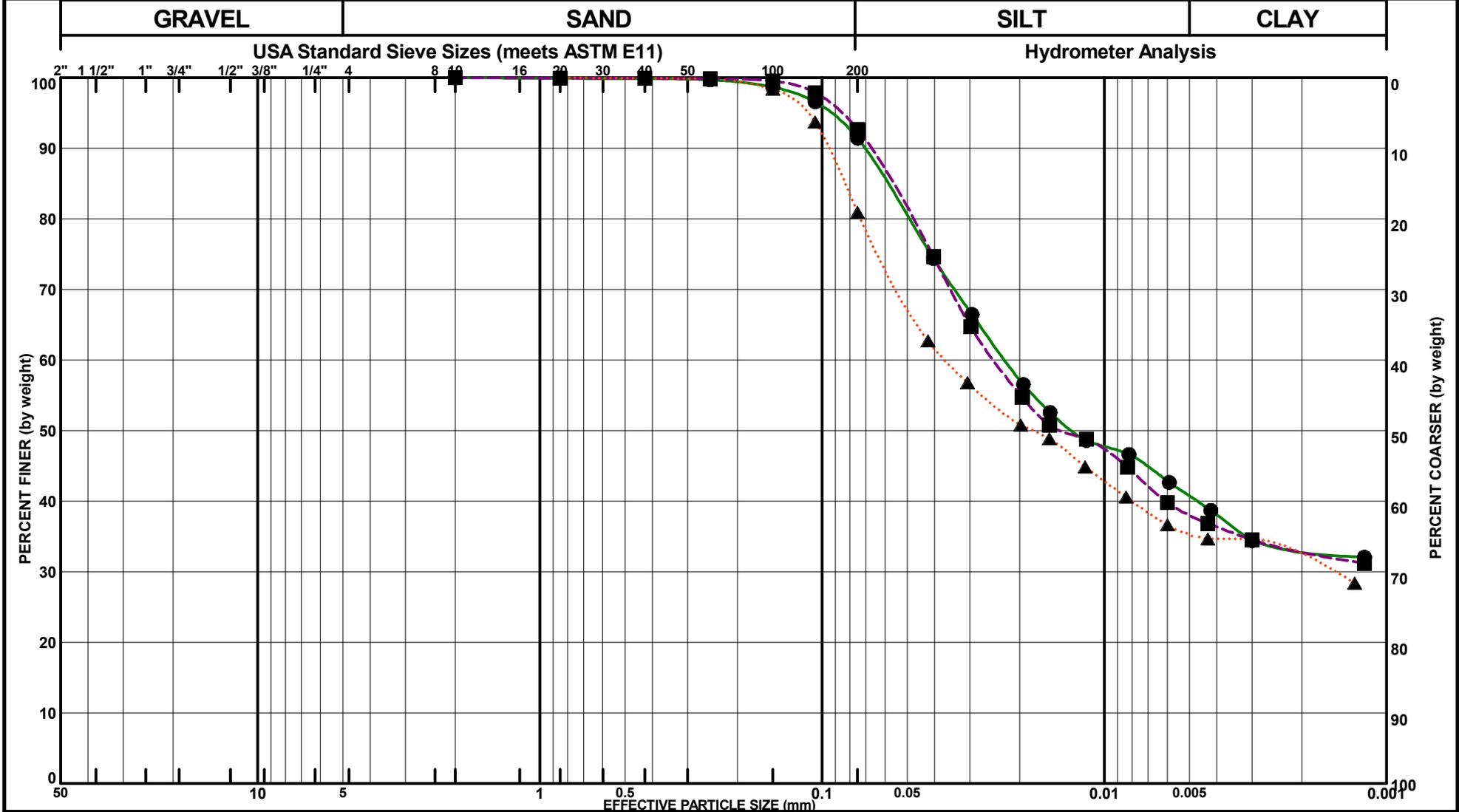
FCBR GSA LANDSCAPE 04.55124002.GPJ_FUGRO DATA TEMPLATE 042610.GDT 05/22/12

Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● B-13	16	15-16	FAT CLAY WITH SAND (CH), gray, with shell fragments	0.0	15.3	55.1	29.7	4.75	0.045	0.005						
■ B-14	8	7-8	FAT CLAY (CH), gray, with shell fragments	3.4	8.6	49.4	38.6	19	0.031							
▲ B-15	6	5-6	LEAN CLAY (CL), gray	0.0	6.2	52.4	41.4	0.85	0.022							

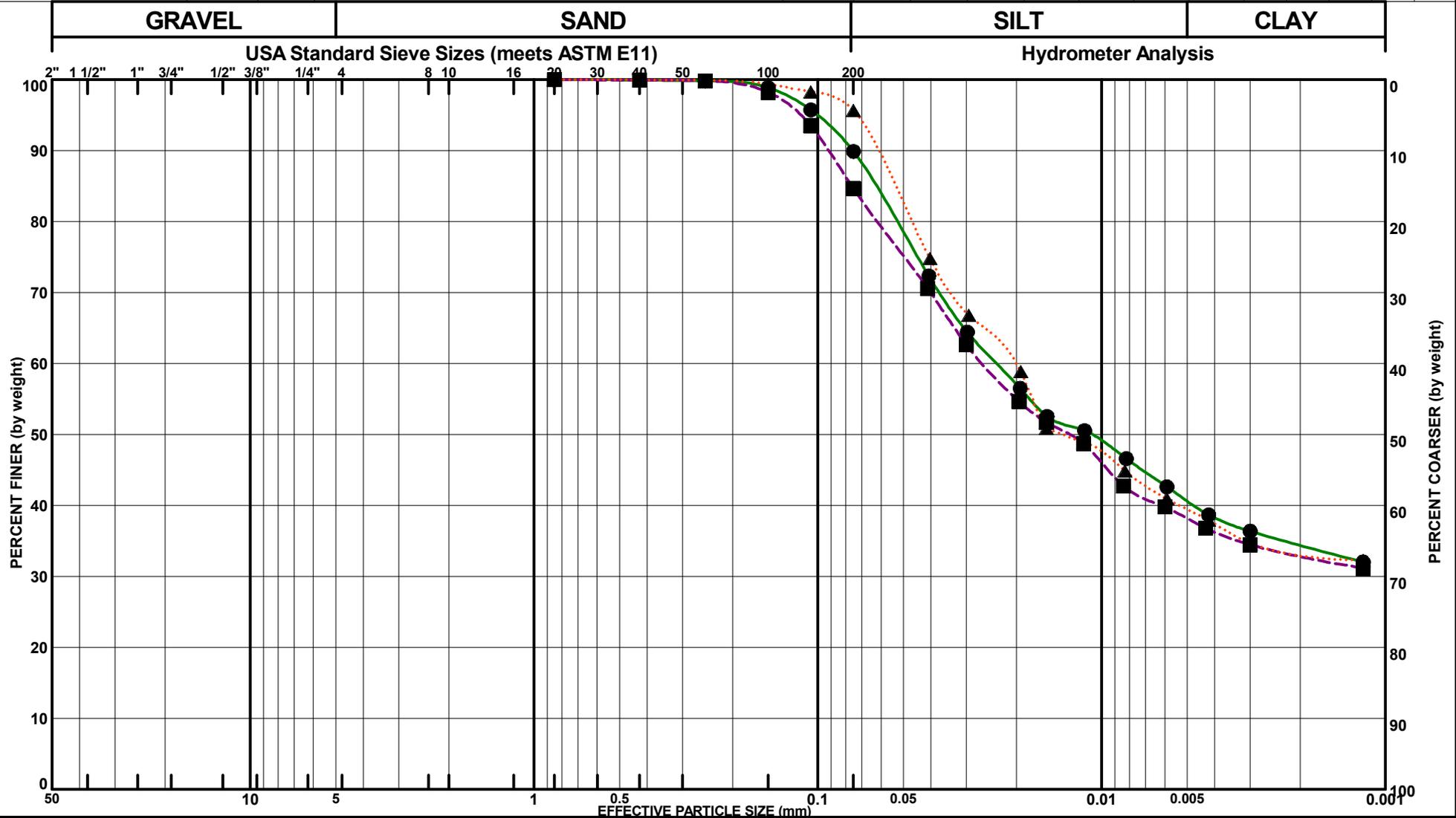


FCBR CSA LANDSCAPE_04.55124002.GPJ_FUGRO DATA TEMPLATE 042610.GDT_05/22/12

Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● C-01	2	1-2	FAT CLAY (CH), gray, with shell fragments	0.0	8.6	50.7	40.7	2	0.022							
■ C-02	2	1-2	FAT CLAY (CH), gray	0.0	7.3	54.5	38.2	2	0.024					58	19	39
▲ C-03	19	19-20	FAT CLAY WITH SAND (CH), gray, with shell fragments	0.0	19.1	45.3	35.6	0.85	0.036	0.002						



Boring Number	Sample Number	Depth (ft.)	Material Description	%Gravel	%Sand	%Silt	%Clay	D100	D60	D30	D10	Cc	Cu	LL	PL	PI
● C-04	12	11-12	FAT CLAY (CH), gray, with shell fragments	0.0	10.1	49.2	40.7	0.85	0.023					57	19	38
■ C-05	18	17-18	FAT CLAY WITH SAND (CH), gray	0.0	15.4	46.5	38.1	0.85	0.026					55	17	38
▲ C-06	4	3-4	FAT CLAY (CH), gray	0.0	4.3	56.2	39.4	0.85	0.021					55	18	37



FCBR CSA LANDSCAPE 04.55124002.GPJ_FUGRO DATA TEMPLATE 042610.GDT 05/22/12



Cameron-Creole Watershed

Cameron Parish, Louisiana

Tested By:
Eddie Lobell

Date Tested:
3/19/2012

Reviewed By:
Brenda Novoa

Date Reviewed:
3/22/2012

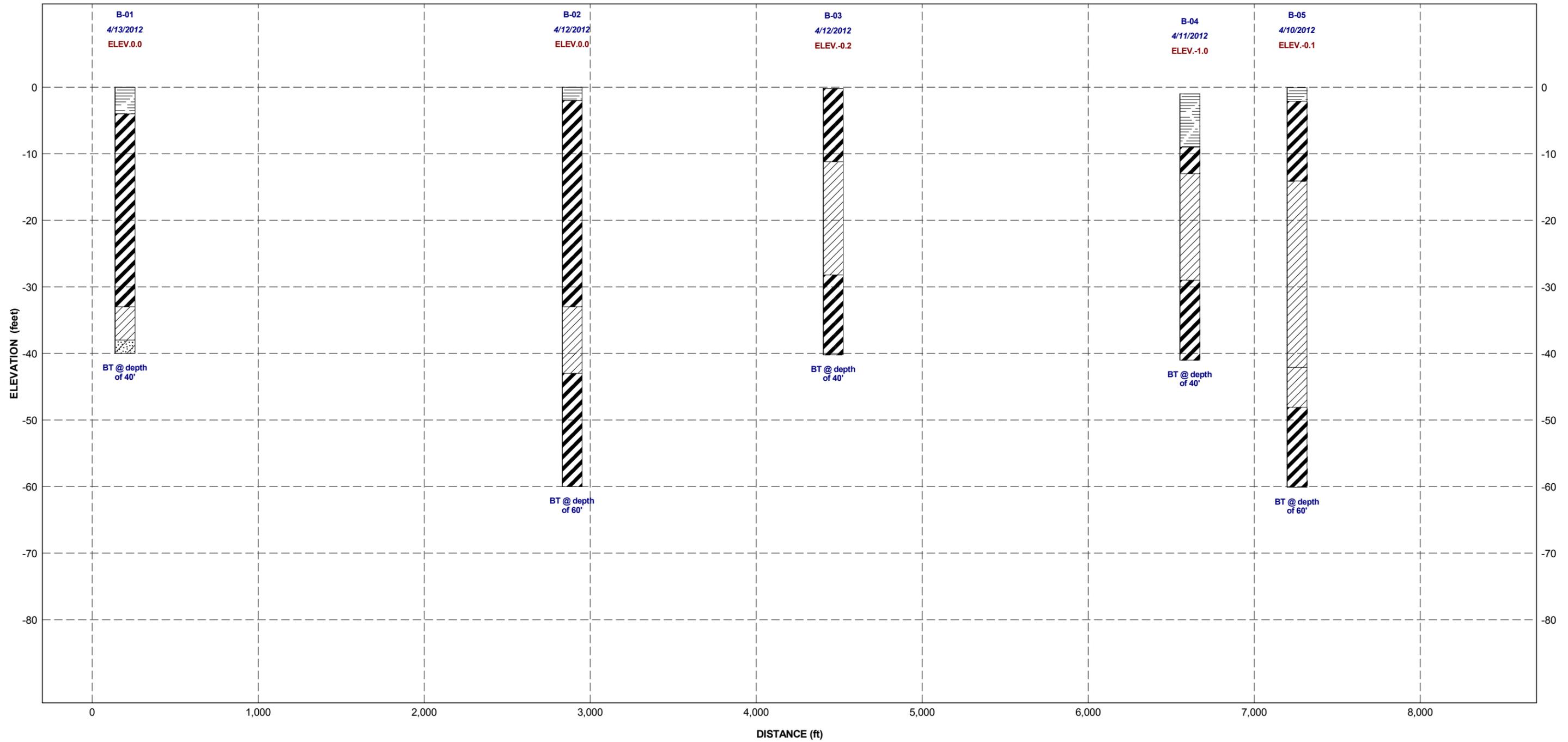
PARTICLE-SIZE ANALYSIS

ASTM D422/D6913/C136

Project No.
04.55124002

PLATE 27h

FCBR BOREHOLE DATA ONLY 11X17 04.55124002.GPJ FUGRO DATA TEMPLATE 042610.GDT 05/25/12

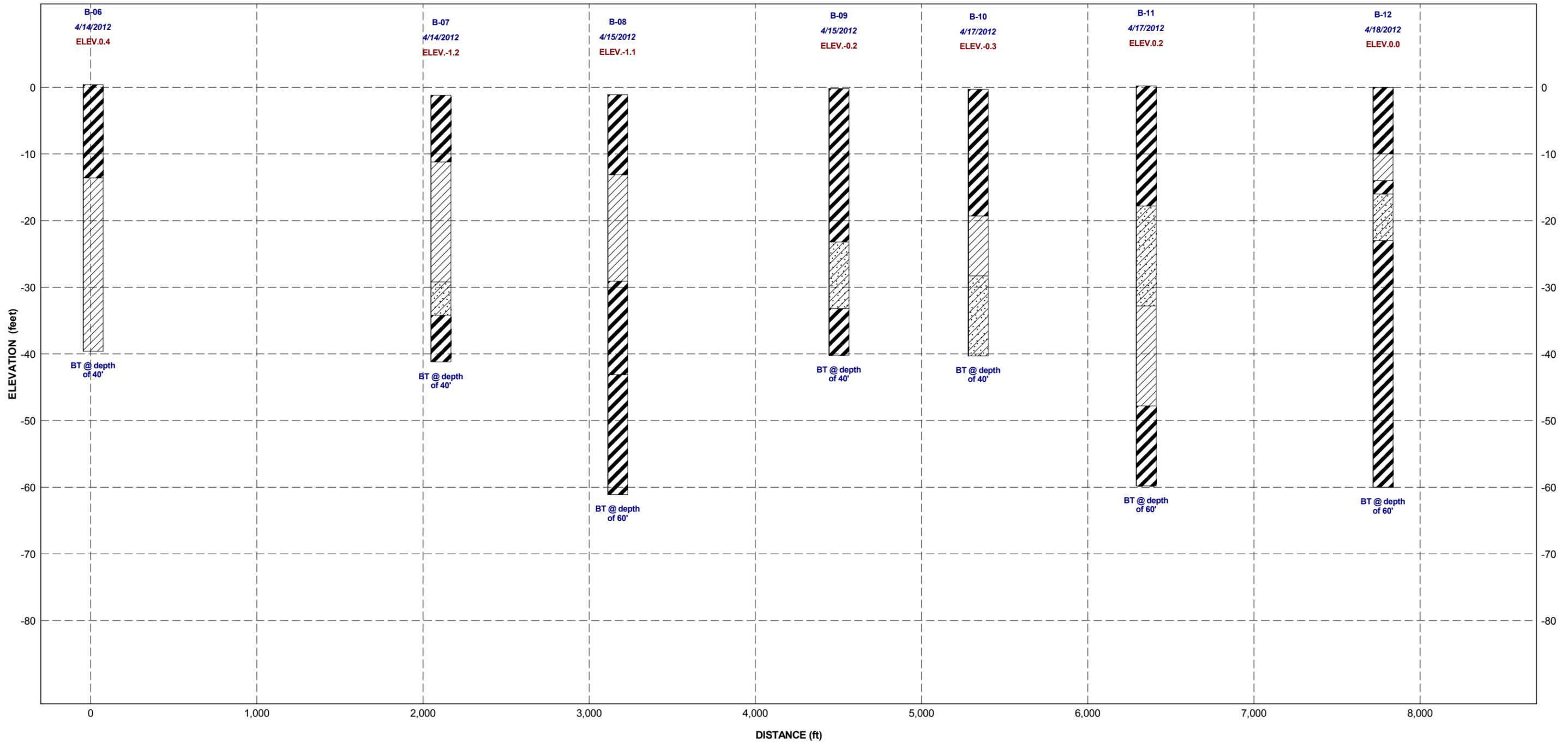


LITHOLOGY GRAPHICS

- Fat clay, high plasticity
 Sandy Clay, high plasticity
 Lean clay, low to moderate plasticity
 Sandy, lean clay, low to moderate plasticity
- High plasticity, organic soil
 Clayey sand

	CAMERON-CREOLE WATERSHED Grand Bayou Marsh Creation Cameron Parish, Louisiana
GENERALIZED SUBSURFACE PROFILE CROSS-SECTION A-A	
PROJECT NO. 04.55124002	
SCALE AS SHOWN	Drawn by: dms
Checked by: BN	Date: 5/25/2012
PLATE 28	

FCBR BOREHOLE DATA ONLY 11X17 04.55124002.GPJ FUGRO DATA TEMPLATE 042610.GDT 05/25/12

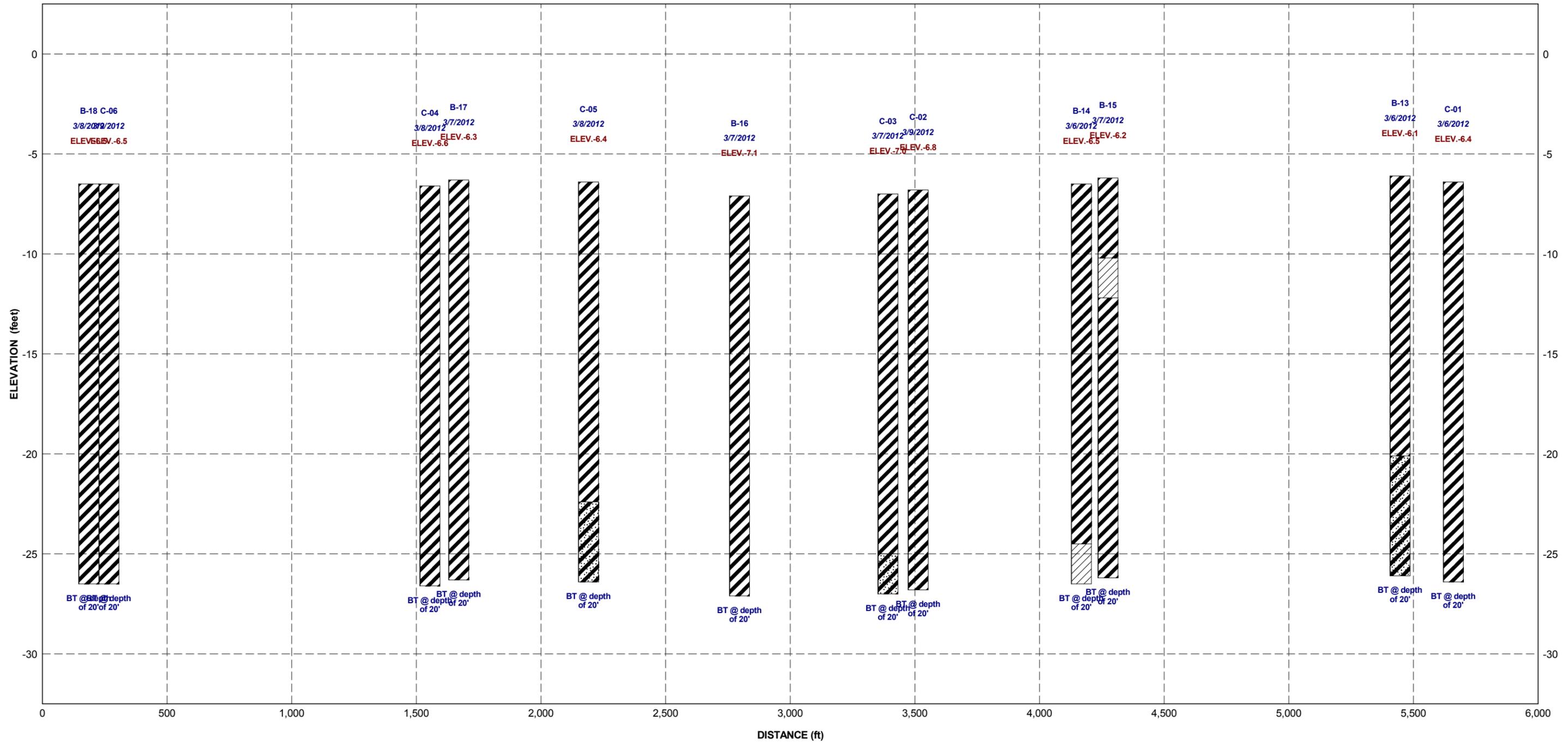


LITHOLOGY GRAPHICS

- Fat clay, high plasticity
- Sandy Clay, high plasticity
- Lean clay, low to moderate plasticity
- Sandy, lean clay, low to moderate plasticity
- High plasticity, organic soil
- Clayey sand

	CAMERON-CREOLE WATERSHED Grand Bayou Marsh Creation Cameron Parish, Louisiana			
GENERALIZED SUBSURFACE PROFILE CROSS-SECTION B-B				
PROJECT NO. 04.55124002				
SCALE AS SHOWN	Drawn by: dms	Checked by: BN	Date: 5/25/2012	PLATE 29

FCBR BOREHOLE DATA ONLY 11X17 04.55124002.GPJ FUGRO DATA TEMPLATE 042810.GDT 05/25/12



LITHOLOGY GRAPHICS

- Fat clay, high plasticity
- Sandy Clay, high plasticity
- Lean clay, low to moderate plasticity
- Sandy, lean clay, low to moderate plasticity
- High plasticity, organic soil
- Clayey sand

	CAMERON-CREOLE WATERSHED Grand Bayou Marsh Creation Cameron Parish, Louisiana
GENERALIZED SUBSURFACE PROFILE CROSS-SECTION C-C	
PROJECT NO. 04.55124002	
SCALE AS SHOWN	Drawn by: dms
Checked by: BN	Date: 5/25/2012
PLATE 30	

APPENDIX A
SUMMARY OF TEST RESULTS

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1B	1-2				102					0.09										
2A	2-3				100		99													
2B	3-4				90					0.12										
3B	5-6				92					0.12										
4B	7-8				74					0.10										
5B	9-10				79					0.09										
6	10-12	0.03	50	19	20					0.09	0.06									
7B	13-14				68					0.11										
8	14-16				88															
8B	15-16				88															
9A	16-17	0.94	99	28	94															
9B	17-18	1.02	85	21	86					0.15										
10B	19-20				97					0.08										
11B	24-25				42					0.12										
12B	29-30				59					0.14										
13B	34-35				23					0.25										
14B	39-40				33	90						UU	33	30	1.18		0.7	90	15.0	A,C
15B	44-45				36					0.41										
16B	49-50				40					0.53										
17A	53-55				33							UU	33	40	1.61		0.5		1.8	B
17B	54-55				40					0.73										
18B	59-60				33					0.34										

Notes:

NP = Non-Plastic Material
*Corrected as described on Terms and Symbols Used on Boring Logs.

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



Fugro Consultants, Inc

Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-02

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1A	0-1				89		99													
1B	1-2				86					0.07										
2A	2-3	0.06	103	28	32															
2B	3-4				121					0.10										
3B	5-6				113					0.07										
4A	6-7				117						0.03									
4B	7-8				120															
5A	8-9	1.23	107	32	124															
5B	9-10	1.14	109	28	120					0.05										
6B	11-12				28					0.16										
7B	13-14				25					0.68										
8A	14-15	0.24	42	17	23															
8B	15-16				22					0.66										
9B	17-18				23					0.64										
10A	18-19				30		95													
10B	19-20				30					0.47										
11A	23-24				35	88						UU	35	17.5	1.04		1.2	88	15.0	A,B
11B	24-25				32															
12B	29-30				51					0.25										
13B	34-35				47					0.27										
14B	39-40				46	77						UU	46	29.5	1.20		0.9	77	3.2	B

Notes:

NP = Non-Plastic Material
*Corrected as described on Terms and Symbols Used on Boring Logs.

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



Fugro Consultants, Inc

Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-03

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1A	0-1	0.85	92	21	81															
1B	1-2				60					0.18										
2B	3-4				50					0.13										
3A	4-5				52		94													
3B	5-6				40															
4B	7-8				52					0.08										
5A	8-9	1.14	57	18	62						0.07									
5B	9-10				50															
6B	11-12				38					0.15										
7A	12-13	1.10	37	15	40															
7B	13-14				41					0.12										
8B	15-16				29					0.51										
9B	17-18				25															
9B	19-20				16	109						UU	16	14.5	1.26		1.3	109	14.8	A,B
11B	29-30				29	89						UU	29	22	1.46		1.7	89	8.1	B
12A	33-34	0.29	82	20	38															
12B	34-35																			
14B	44-45				33	86						UU	33	33.5	1.54		1.2	86	15.0	A,C
17B	59-60				42	79						UU	42	45	1.61		0.9	79	4.0	C

Notes:

NP = Non-Plastic Material
 *Corrected as described on Terms and Symbols Used on Boring Logs.

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



Fugro Consultants, Inc

Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-08

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1A	0-1				58		94													
1B	1-2				51					0.09										
2A	2-3	0.76	67	21	56						0.08									
2B	3-4				51					0.09										
3B	5-6				56					0.03										
4A	6-7	1.44	69	22	89															
4B	7-8				41															
5B	9-10				74															
6B	11-12				44															
7B	13-14				58					0.32										
8A	14-15				74															
8B	15-16									0.13										
9B	17-18				34					0.51										
10B	19-20				20					2.22										
11A	23-24				26	99						UU	26	17.5	1.80		1.8	99	14.9	C
11B	24-25				28															
12A	28-29				27		57													
12B	29-30				23															
12A	33-34				29															
13B	34-35				29	92						UU	29	26	2.07		2.8	92	15.0	A
14A	38-39				26															
14B	39-40				27		44													

Notes:

NP = Non-Plastic Material
 *Corrected as described on Terms and Symbols Used on Boring Logs.

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



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Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-10

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1A	0-1	0.61	76	24	56					0.09										
1B	1-2									0.23										
2	2-4						92													
2B	3-4				97															
3B	5-6				66															
4	6-8	1.28	53	19	63															
4B	7-8				55															
5B	9-10				57															
6B	11-12				60															
7A	12-13	0.74	71	23	58															
7B	13-14				66					0.34										
8A	14-15				22															
8B	15-16									1.72										
9A	16-17				19															
9B	17-18									1.72										
10A	18-19				23															
10B	19-20									1.60										
11A	23-24				25	99						UU	25	17.5	1.22		2.5	99	15.0	B
11B	24-25				26		66													
13A	33-34				34		97													
16A	48-49				33		100													
16B	49-50				34	88						UU	34	37	1.50		1.0	88	5.3	A,B
18A	58-59	0.44	83	26	52															
18B	59-60																			

Notes:

NP = Non-Plastic Material
*Corrected as described on Terms and Symbols Used on Boring Logs.

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



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Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-11

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer* (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
1A	0-1	0.82	106	32	93															
1B	1-2									0.10										
2B	3-4				94					0.09										
3A	4-5				75		98													
3B	5-6									0.09										
4A	6-7				65															
4B	7-8									0.09										
5A	8-9				60															
5B	9-10									0.11										
6A	10-11	1.01	47	18	48						0.05									
6B	11-12									0.09										
7A	12-13				42															
7B	13-14									0.47										
8A	14-15	0.49	57	16	36															
8B	15-16									0.62										
9A	16-17				18		63													
9B	17-18									0.25										
10A	18-19				26															
10B	19-20									0.51										
11A	23-24				30															
11B	24-25				28	93						UU	28	18	1.76		2.1	93	15.0	A,C
12A	28-29				30		100													
13A	33-34				34															
13B	34-35				34	89						UU	34	26	1.43		0.7	89	2.5	A,B

Notes:

NP = Non-Plastic Material
*Corrected as described on Terms and Symbols Used on Boring Logs.

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



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Cameron-Creole Watershed

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Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-12

LELAP Lab ID #10001

Project No.
04.55124002

Sample No.	Depth (ft)	Identification Tests						Field Shear Strength Estimate		Miniature Vane Tests		Compression Tests								
		Liquidity Index	Liquid Limit (%)	Plastic Limit (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Passing No. 200 Sieve (%)	Penetrometer (ksf)	Torvane (ksf)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	Type Test	Moisture Content (%)	Confining Pressure (psi)	Shear Strength (ksf)	Remolded Shear Strength (ksf)	E50 Strain (%)	Dry Unit Weight (pcf)	Failure Strain (%)	Type of Failure
2	1-2	1.48	51	17	67				0.04											
4	3-4								0.04											
6	5-6								0.04											
8	7-8								0.04											
10	9-10								0.06											
12	11-12								0.06											
14	13-14								0.06											
16	15-16	1.05	50	15	51				0.06											
18	17-18								0.08											
20	19-20								0.08											

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



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Cameron-Creole Watershed

Grand Bayou Marsh Creation

Cameron Parish, Louisiana

SUMMARY OF TEST RESULTS - BORING B-18

LELAP Lab ID #10001

Project No.
04.55124002

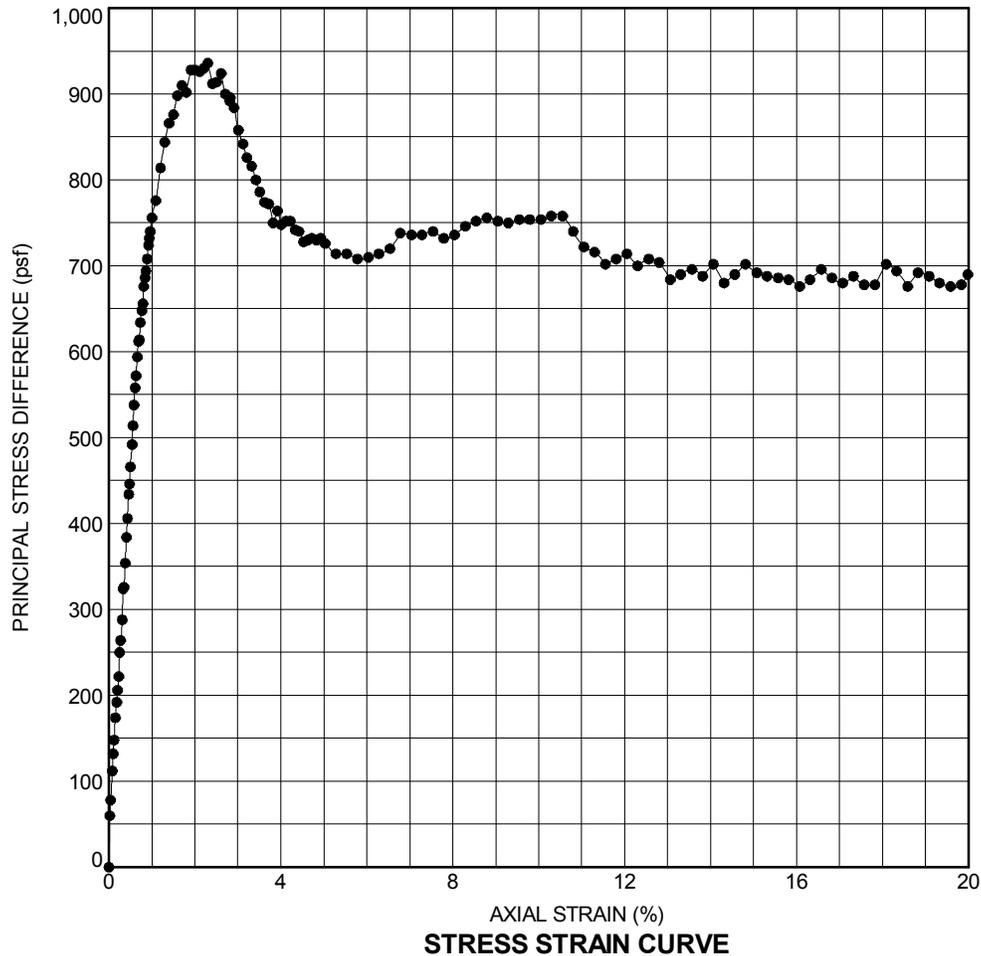
APPENDIX B
TRIAXIAL SHEAR TEST RESULTS



Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana			Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-01		Depth: 34-35 ft.	Classification: LEAN CLAY (CL), soft, gray	
Sample Number: 13B				
Project No.: 04.55124002		Test Date.: 4/30/2012	Organic Content (%) ASTM D2974: N/A	
Sample No.	1 ●	2 ■	3 ▲	Atterberg Limits ASTM D 4318: LL = 44 PL = 17 PI = 27
INITIAL	Water Content (%)	41.5		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
	Dry Density (pcf)	80.1		
	Saturation (%)	100.0		
	Void Ratio	1.13		
	Diameter (inches)	1.88		
	Height (inches)	3.87		
	% Passing #200 Sieve			
	Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		 Failure Sketch	
Cell Pressure (psi)	26.00			
Deviator Stress (psf)	936			
Shear Strength (psf)	468			
Failure Strain (%)	2.3			
σ_1 Failure (psf):	4680			
σ_3 Failure (psf):	3744			
Failure Type:	Bulging			

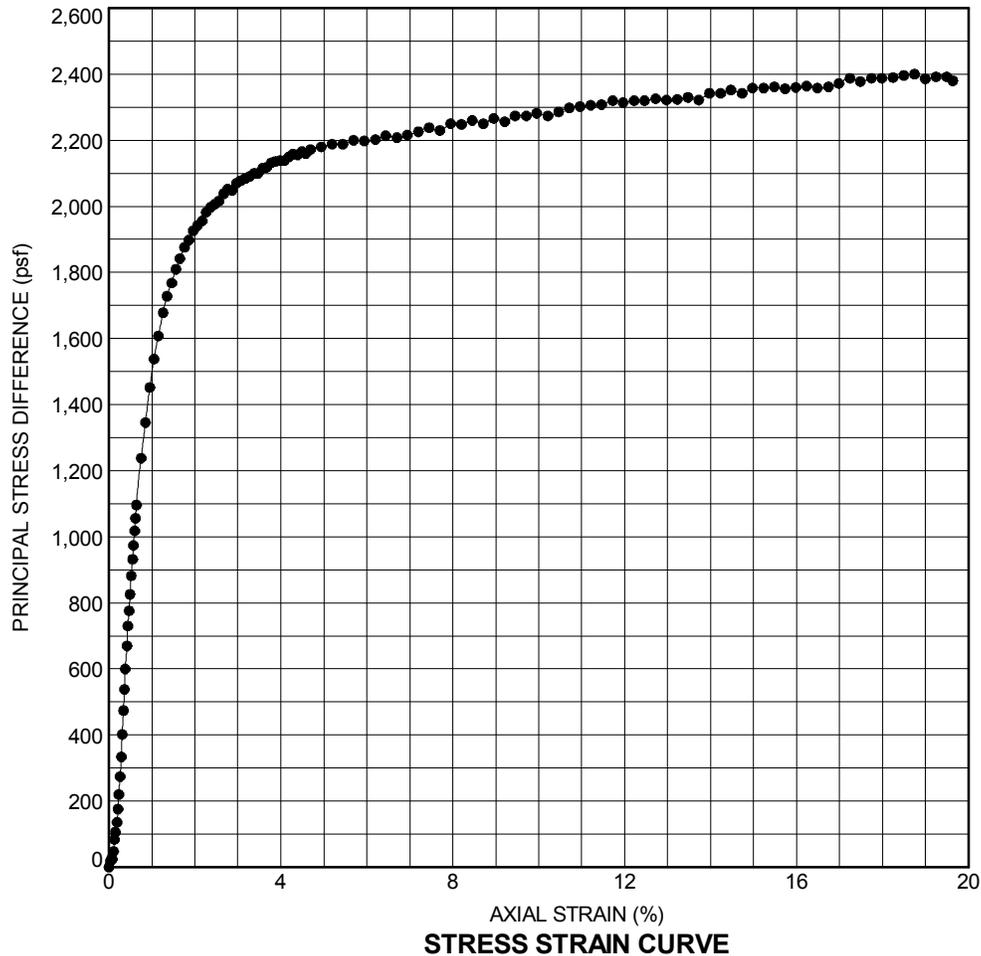




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-02		Depth: 39-40 ft.	
Sample Number: 14B		Classification: LEAN CLAY (CL), stiff, gray	
Project No.: 04.55124002		Test Date.: 4/20/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	32.6	
	Dry Density (pcf)	90.5	
	Saturation (%)	100.0	
	Void Ratio	0.89	
	Diameter (inches)	2.86	
	Height (inches)	5.81	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)		1.0	
Cell Pressure (psi)		30.00	
Deviator Stress (psf)		2358	
Shear Strength (psf)		1179	
Failure Strain (%)		15.0	
σ_1 Failure (psf):		6678	
σ_3 Failure (psf):		4320	
Failure Type:		Bulging	
		 Failure Sketch	
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

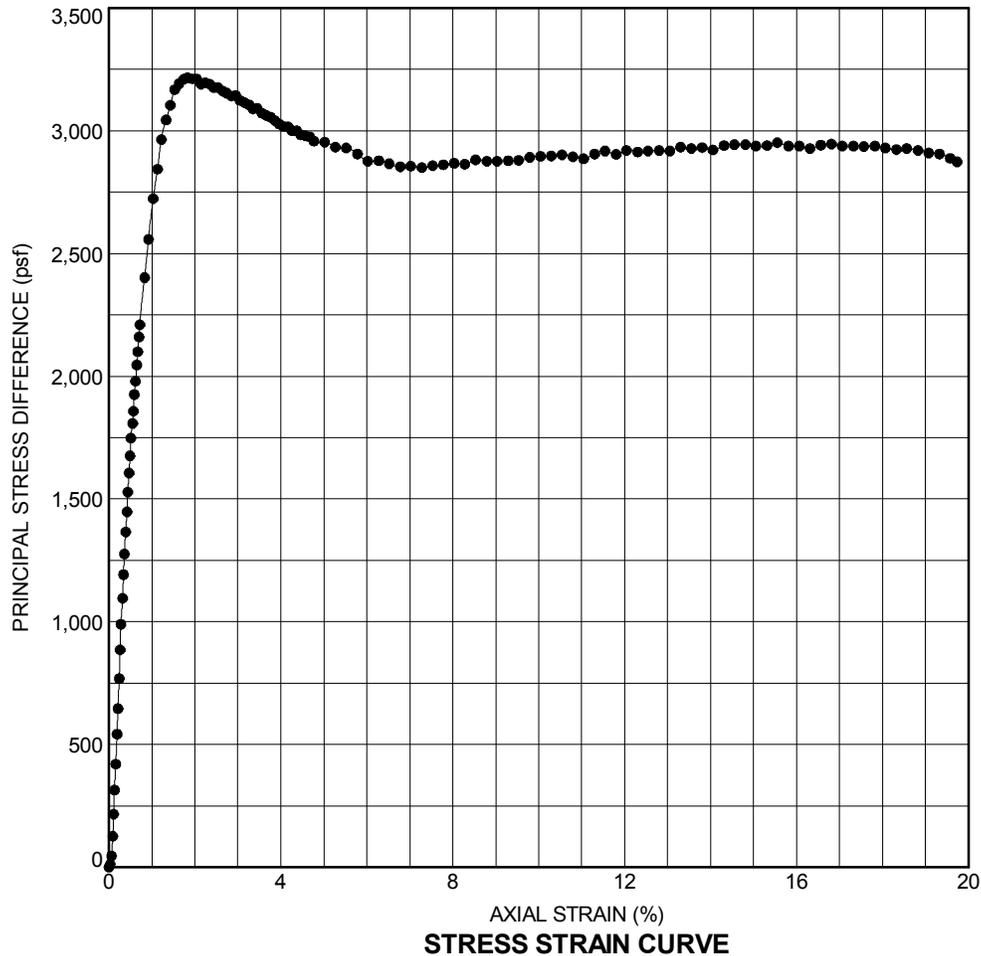




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-02		Depth: 53-55 ft.	
Sample Number: 17A		Classification: FAT CLAY (CH), stiff, brown and greenish gray, with silt lenses and shell fragments	
Project No.: 04.55124002		Test Date.: 4/20/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)		32.6
	Dry Density (pcf)		
	Saturation (%)		
	Void Ratio		
	Diameter (inches)		2.87
	Height (inches)		5.69
	% Passing #200 Sieve		
	Specific Gravity		2.74
	Strain Rate (%/min.)		1.0
	Cell Pressure (psi)		40.00
	Deviator Stress (psf)		3216
	Shear Strength (psf)		1608
	Failure Strain (%)		1.8
	σ_1 Failure (psf):		8976
	σ_3 Failure (psf):		5760
	Failure Type:		Shear Plane
			Failure Sketch
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

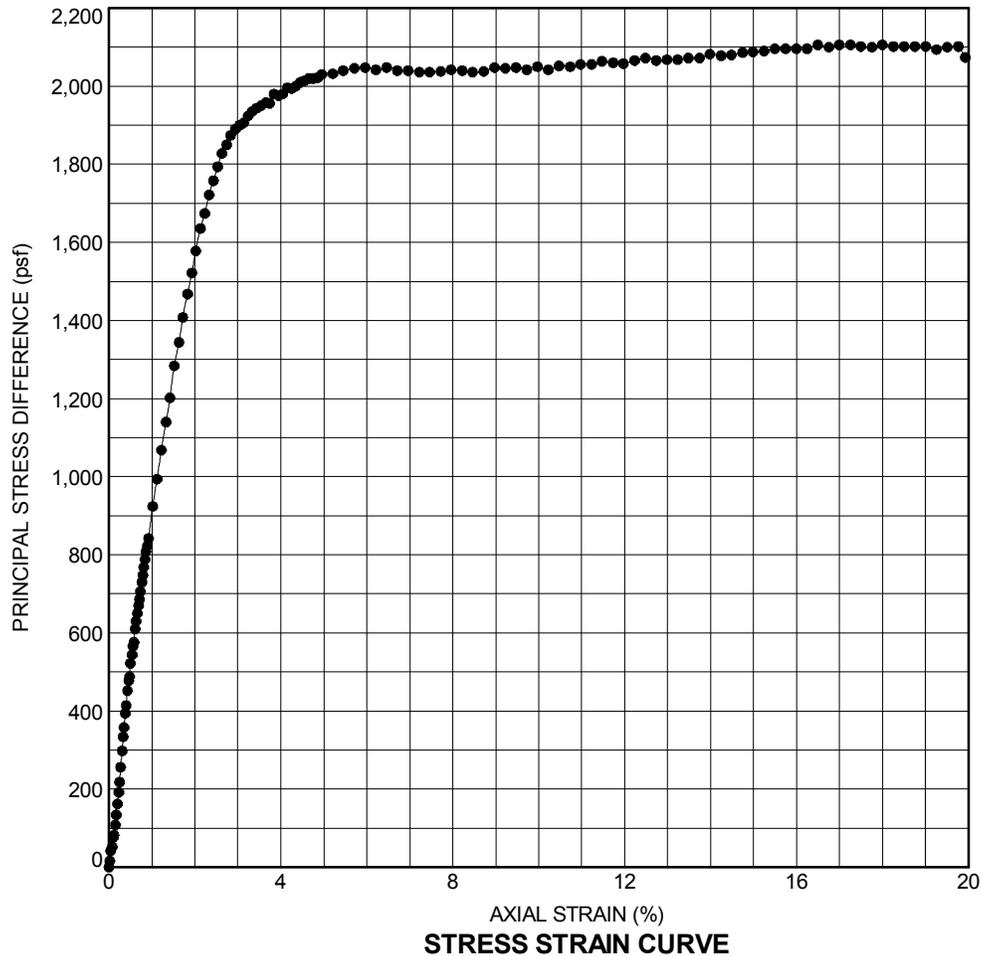




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TRIAXIAL SHEAR TEST

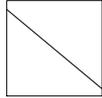
Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-03		Depth: 23-24 ft.	
Sample Number: 11A		Classification: LEAN CLAY (CL), stiff, brown, with silt pockets	
Project No.: 04.55124002		Test Date.: 4/20/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
Water Content (%)	34.8		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Dry Density (pcf)	88.5		
Saturation (%)	100.0		
Void Ratio	0.93		
Diameter (inches)	2.87		
Height (inches)	5.99		
% Passing #200 Sieve			
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		 Failure Sketch
Cell Pressure (psi)	17.50		
Deviator Stress (psf)	2088		
Shear Strength (psf)	1044		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	4608		
σ_3 Failure (psf):	2520		
Failure Type:	Bulging		

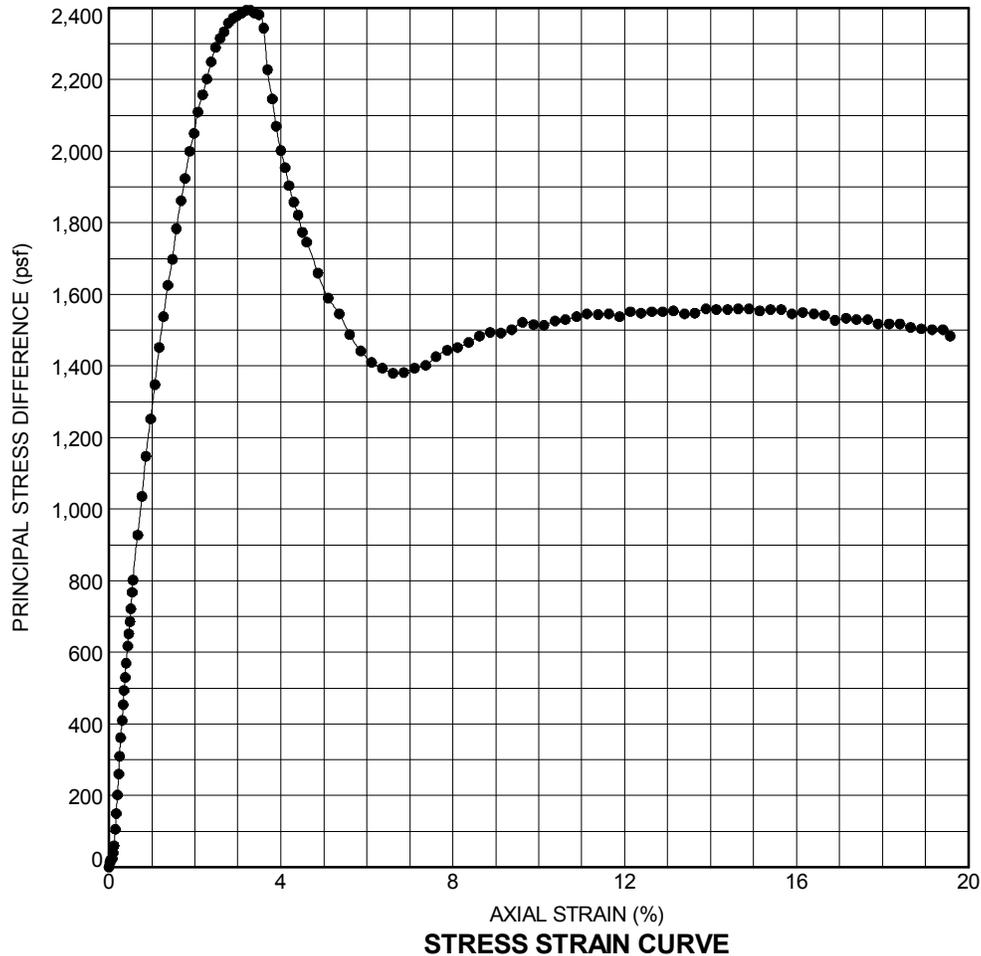




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-03		Depth: 39-40 ft.	
Sample Number: 14B		Classification: FAT CLAY (CH), stiff, gray	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	46.1	
	Dry Density (pcf)	77.0	
	Saturation (%)	100.0	
	Void Ratio	1.22	
	Diameter (inches)	2.85	
	Height (inches)	5.75	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)		1.0	
Cell Pressure (psi)		29.50	
Deviator Stress (psf)		2394	
Shear Strength (psf)		1197	
Failure Strain (%)		3.2	
σ_1 Failure (psf):		6642	
σ_3 Failure (psf):		4248	
Failure Type:		 Shear Plane Failure Sketch	
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

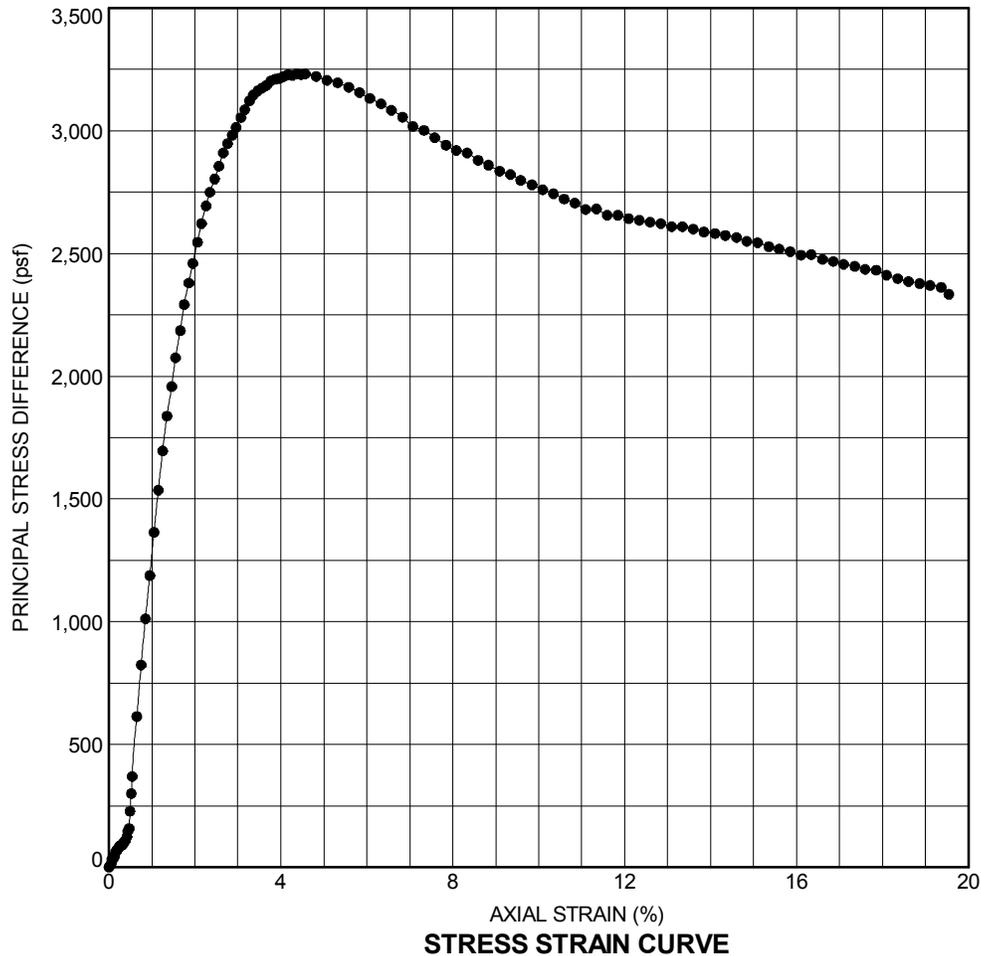
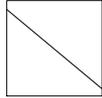




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-04		Depth: 29-30 ft.	
Sample Number: 12B		Classification: FAT CLAY (CH), stiff, yellowish brown and gray, with sand lenses and ferrous nodules	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	47.2	
	Dry Density (pcf)	79.3	
	Saturation (%)	100.0	
	Void Ratio	1.16	
	Diameter (inches)	2.86	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	22.00		
Deviator Stress (psf)	3232		
Shear Strength (psf)	1616		
Failure Strain (%)	4.4		
σ_1 Failure (psf):	6400		
σ_3 Failure (psf):	3168		
Failure Type:	Shear Plane		

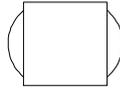




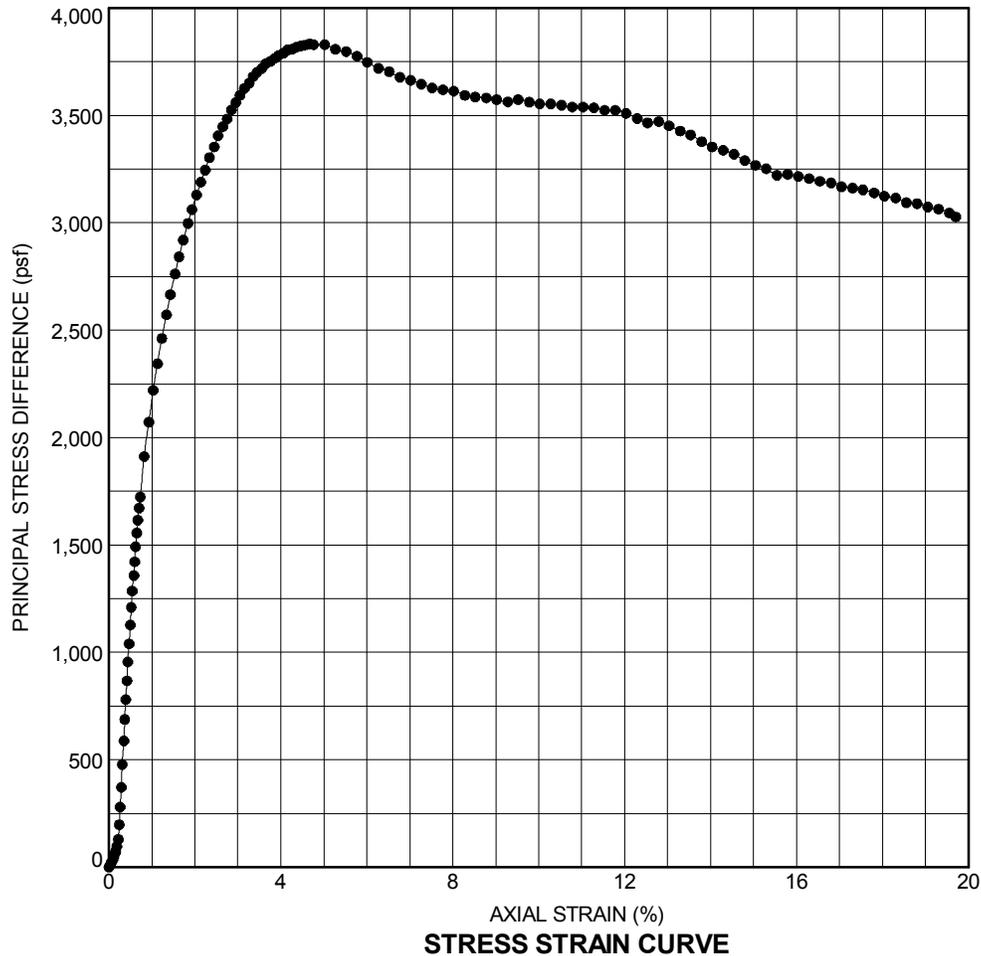
Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-04		Depth: 39-40 ft.	
Sample Number: 14B		Classification: FAT CLAY (CH), stiff, yellowish brown and gray, with sand lenses and ferrous nodules	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	34.6	
	Dry Density (pcf)	88.1	
	Saturation (%)	100.0	
	Void Ratio	0.94	
	Diameter (inches)	2.87	
	Height (inches)	5.99	
	% Passing #200 Sieve	2.74	
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	30.00		
Deviator Stress (psf)	3834		
Shear Strength (psf)	1917		
Failure Strain (%)	4.7		
σ_1 Failure (psf):	8154		
σ_3 Failure (psf):	4320		
Failure Type:	Bulging		



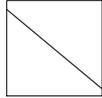
Failure Sketch

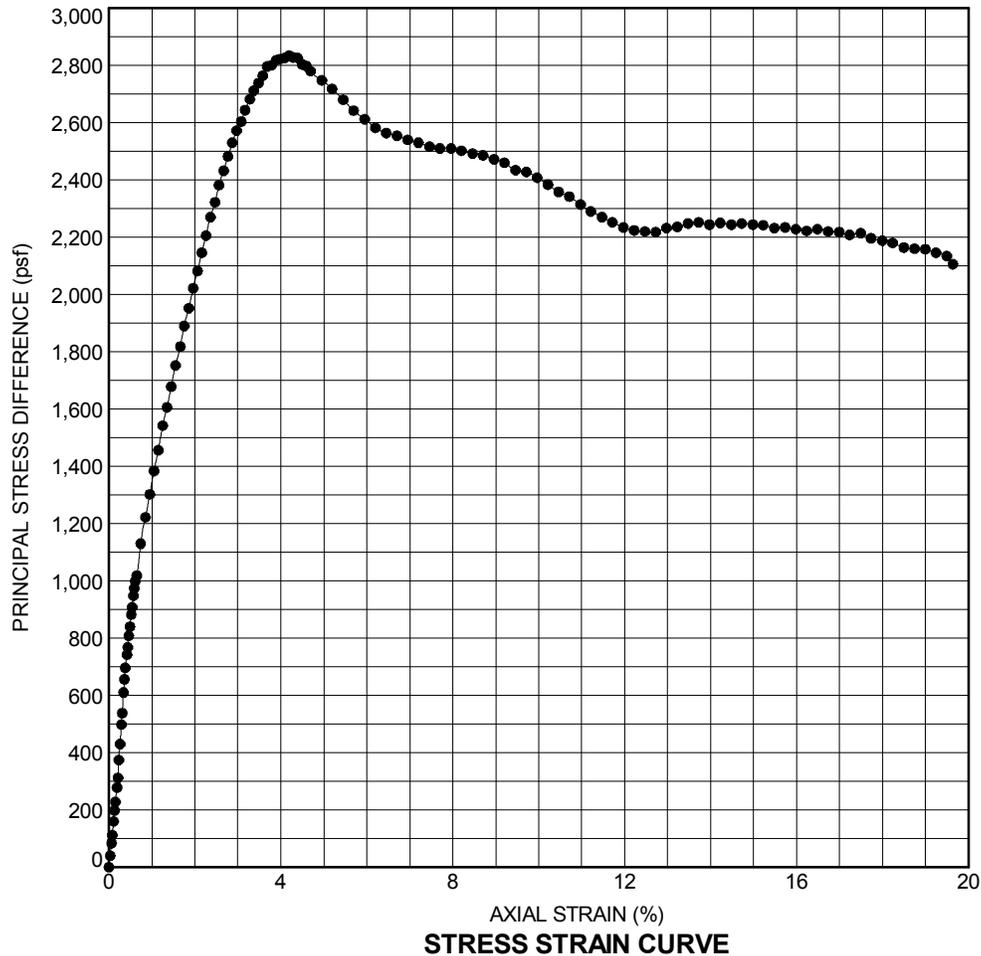




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-05		Depth: 38-39 ft.	
Sample Number: 14A		Classification: LEAN CLAY (CL), stiff, yellowish brown and gray	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	34.3	
	Dry Density (pcf)	86.8	
	Saturation (%)	96.8	
	Void Ratio	0.97	
	Diameter (inches)	2.86	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	29.00		
Deviator Stress (psf)	2834		
Shear Strength (psf)	1417		
Failure Strain (%)	4.2		
σ_1 Failure (psf):	7010		
σ_3 Failure (psf):	4176		
Failure Type:	Shear Plane		

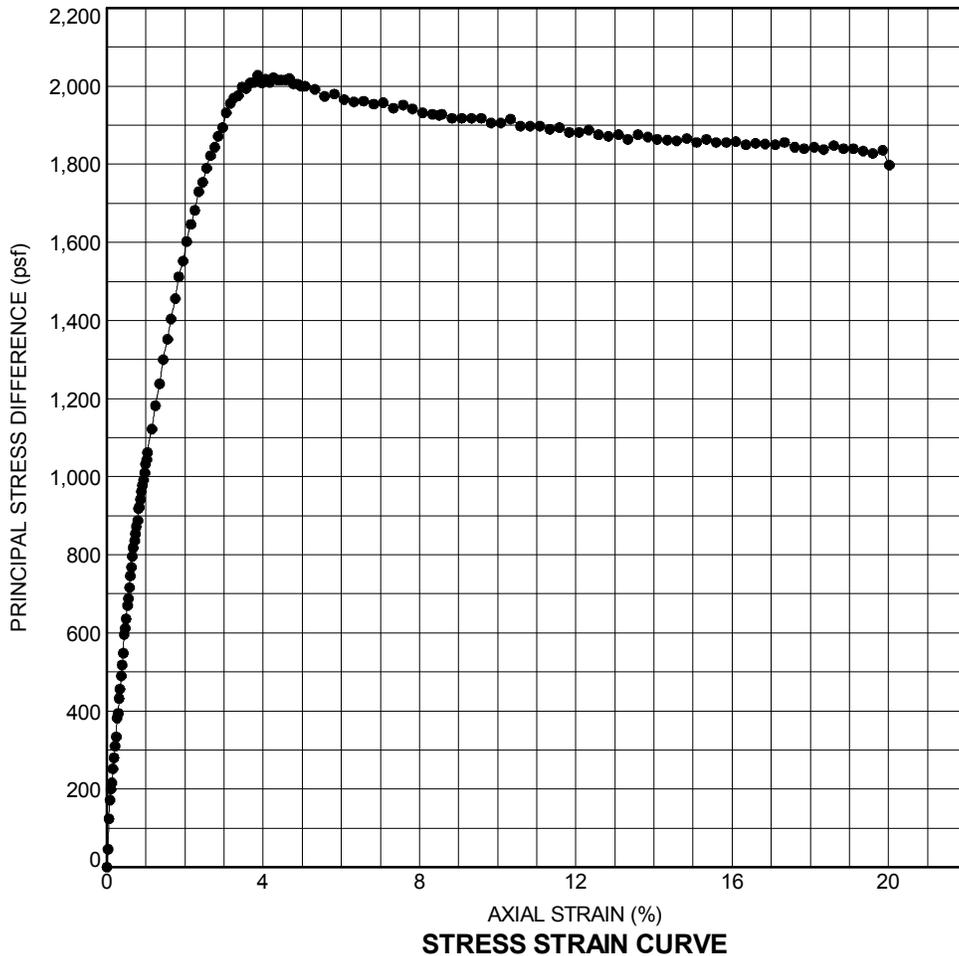




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-05		Depth: 59-60 ft.	
Sample Number: 18B		Classification: FAT CLAY (CH), stiff, brown, with shell fragments and sand lenses	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	37.7	
	Dry Density (pcf)	82.4	
	Saturation (%)	96.0	
	Void Ratio	1.08	
	Diameter (inches)	1.94	
	Height (inches)	3.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)		1.0	
Cell Pressure (psi)		45.00	
Deviator Stress (psf)		2028	
Shear Strength (psf)		1014	
Failure Strain (%)		3.9	
σ_1 Failure (psf):		8508	
σ_3 Failure (psf):		6480	
Failure Type:		Multi Shear	
		 Failure Sketch	
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

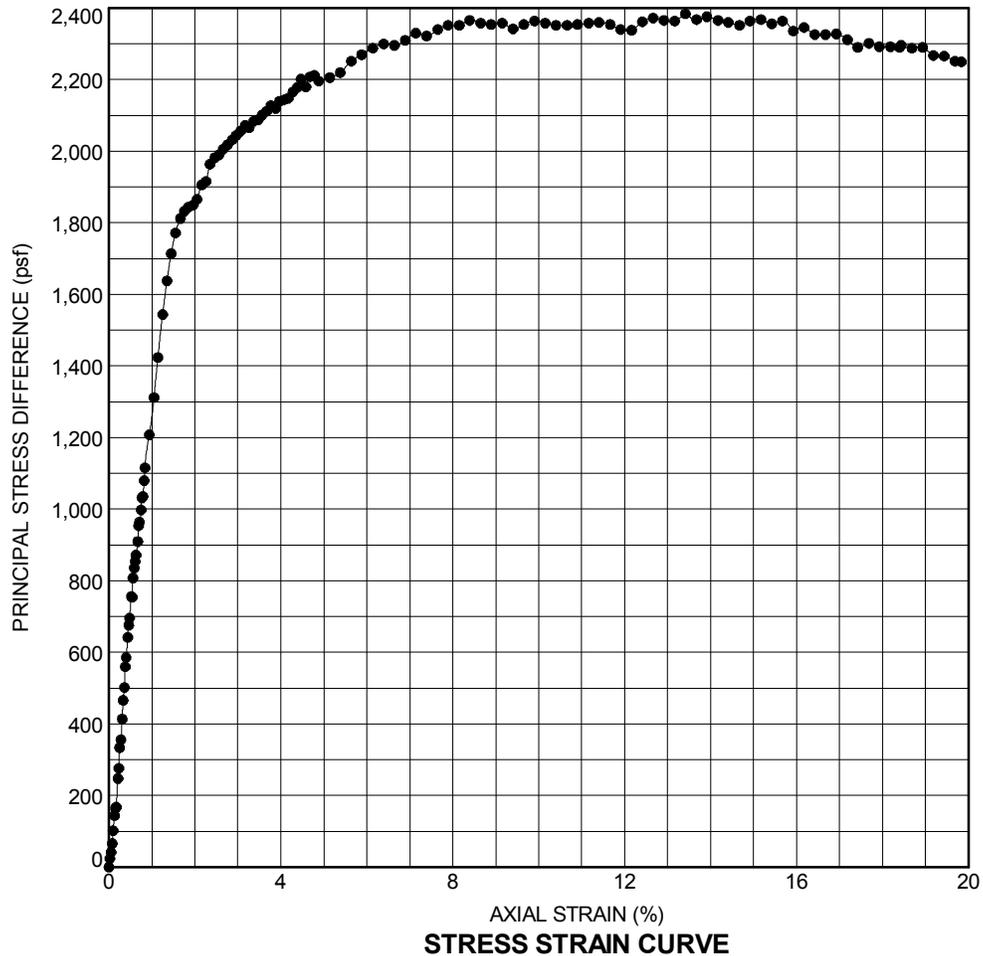




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-06		Depth: 34-35 ft.	
Sample Number: 13B		Classification: LEAN CLAY (CL), stiff, brown, with ferrous nodules and silt lenses	
Project No.: 04.55124002		Test Date.: 4/24/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
Water Content (%)	31.3		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Dry Density (pcf)	91.7		
Saturation (%)	99.1		
Void Ratio	0.87		
Diameter (inches)	1.89		
Height (inches)	4.14		
% Passing #200 Sieve			
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	26.00		
Deviator Stress (psf)	2384		
Shear Strength (psf)	1192		
Failure Strain (%)	13.4		
σ_1 Failure (psf):	6128		
σ_3 Failure (psf):	3744		
Failure Type:	Multi Shear	Failure Sketch	

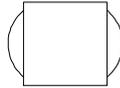




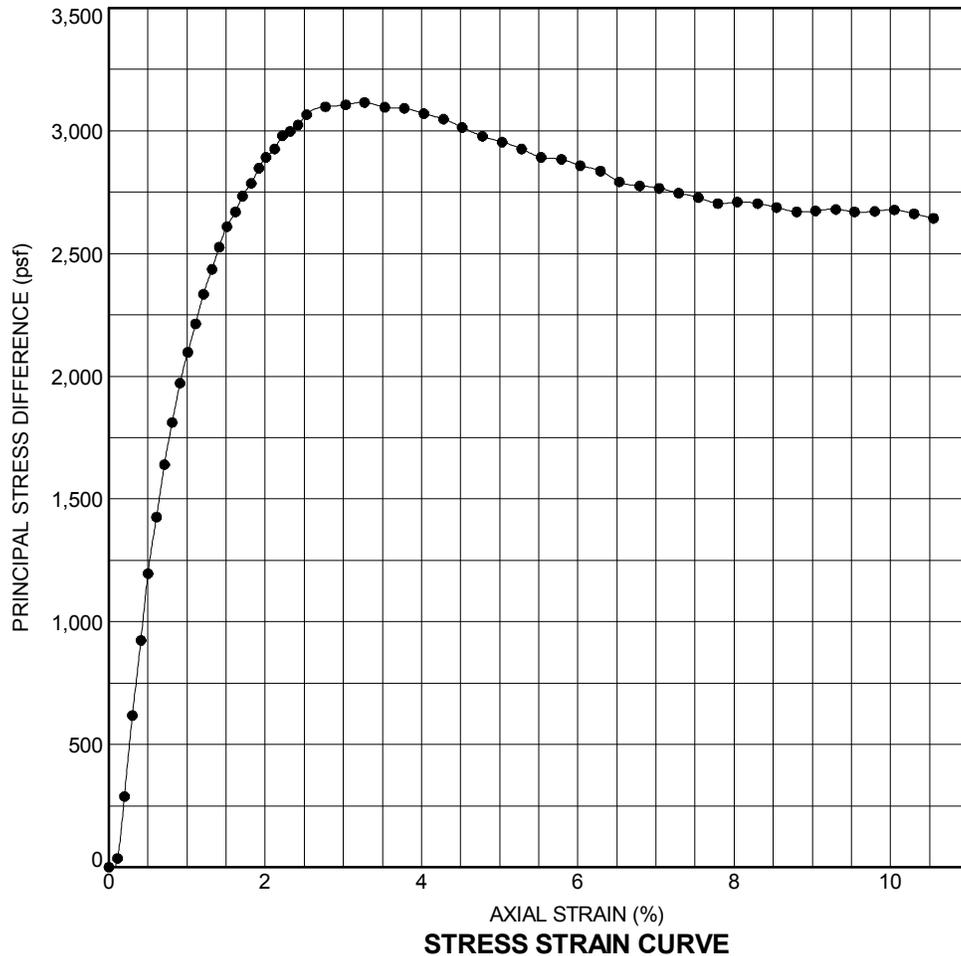
Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-07		Depth: 39-40 ft.	
Sample Number: 14B		Classification: FAT CLAY (CH), stiff, brown, with silt lenses	
Project No.: 04.55124002		Test Date.: 4/25/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	45.9	
	Dry Density (pcf)	78.7	
	Saturation (%)	100.0	
	Void Ratio	1.17	
	Diameter (inches)	1.88	
	Height (inches)	3.84	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	30.00		
Deviator Stress (psf)	3116		
Shear Strength (psf)	1558		
Failure Strain (%)	3.3		
σ_1 Failure (psf):	7436		
σ_3 Failure (psf):	4320		
Failure Type:	Bulging		



Failure Sketch

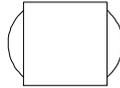




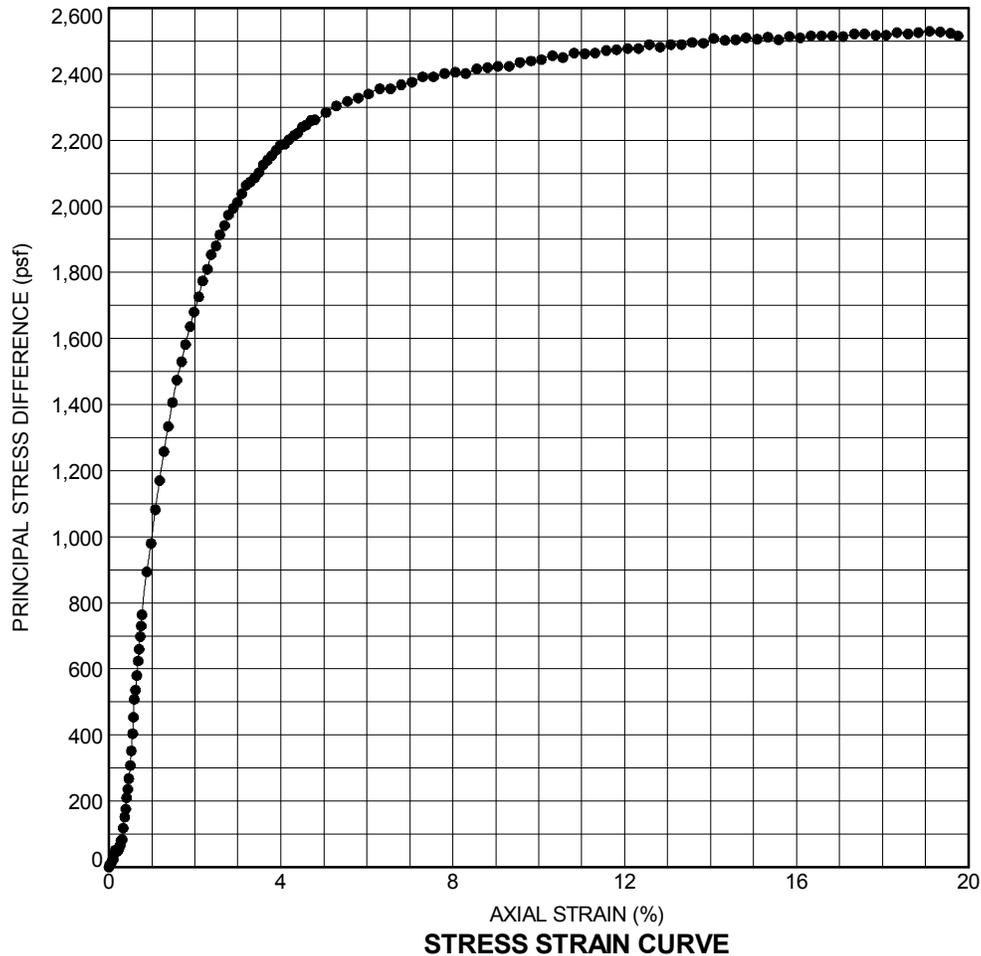
Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-08		Depth: 19-20 ft.	
Sample Number: 9B		Classification: LEAN CLAY (CL), stiff, gray, with shell fragments, organics, and ferrous nodules	
Project No.: 04.55124002		Test Date.: 4/25/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	15.9	
	Dry Density (pcf)	108.8	
	Saturation (%)	76.1	
	Void Ratio	0.57	
	Diameter (inches)	2.84	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	14.50		
Deviator Stress (psf)	2510		
Shear Strength (psf)	1255		
Failure Strain (%)	14.8		
σ_1 Failure (psf):	4598		
σ_3 Failure (psf):	2088		
Failure Type:	Bulging		



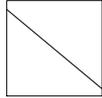
Failure Sketch

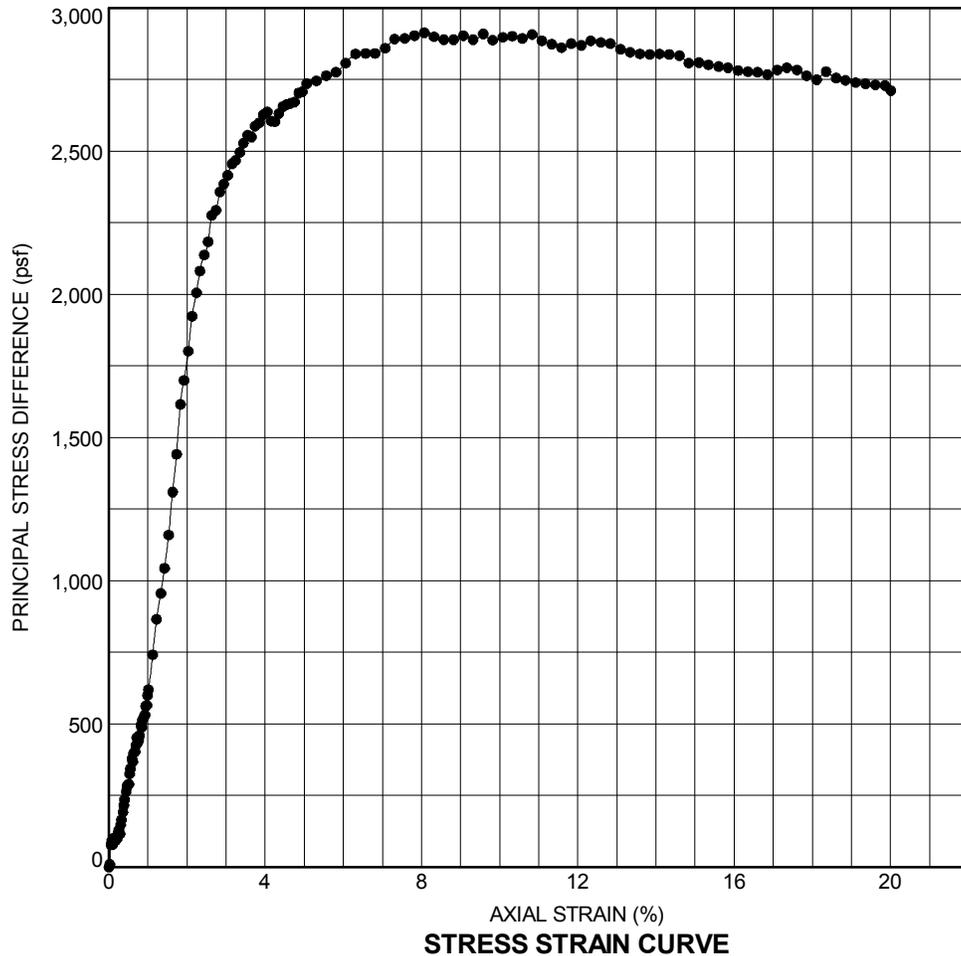




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-08	Depth: 29-30 ft.	Classification: FAT CLAY (CH), stiff, brown, with calcareous and ferrous nodules	
Sample Number: 11B			
Project No.: 04.55124002	Test Date.: 4/25/2012	Organic Content (%) ASTM D2974: N/A	
Sample No.	1 ● 2 ■ 3 ▲		
INITIAL	Water Content (%)	29.4	Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
	Dry Density (pcf)	89.4	
	Saturation (%)	88.2	
	Void Ratio	0.91	
	Diameter (inches)	1.89	
	Height (inches)	4.00	
	% Passing #200 Sieve		
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	22.00		
Deviator Stress (psf)	2914		
Shear Strength (psf)	1457		
Failure Strain (%)	8.1		
σ_1 Failure (psf):	6082		
σ_3 Failure (psf):	3168		
Failure Type:	Shear Plane	Failure Sketch	

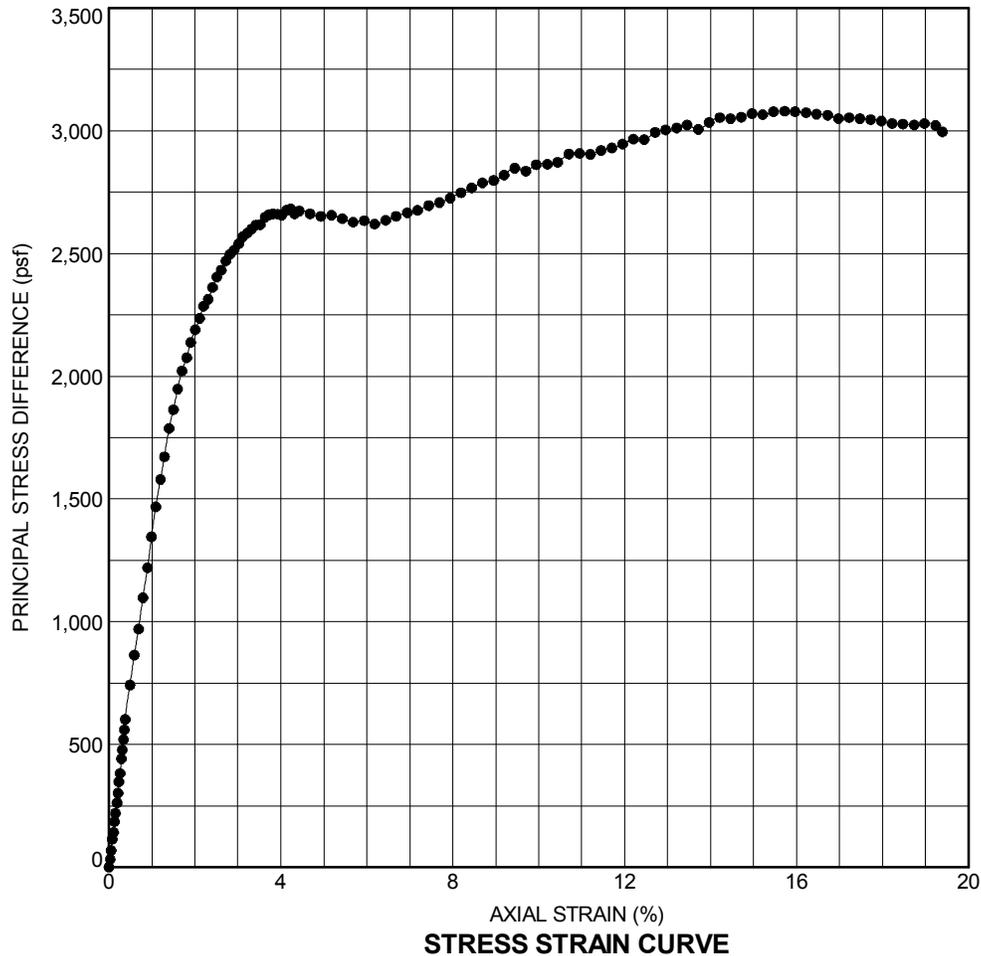
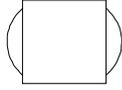




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-08		Depth: 44-45 ft.	
Sample Number: 14B		Classification: FAT CLAY (CH), stiff, tan, with calcareous and ferrous nodules	
Project No.: 04.55124002		Test Date.: 4/25/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.1	
	Dry Density (pcf)	86.0	
	Saturation (%)	91.9	
	Void Ratio	0.99	
	Diameter (inches)	1.88	
	Height (inches)	4.04	
	% Passing #200 Sieve	2.74	
Specific Gravity	2.74		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	33.50		
Deviator Stress (psf)	3070		
Shear Strength (psf)	1535		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	7894		
σ_3 Failure (psf):	4824		
Failure Type:	Bulging		
	Failure Sketch		

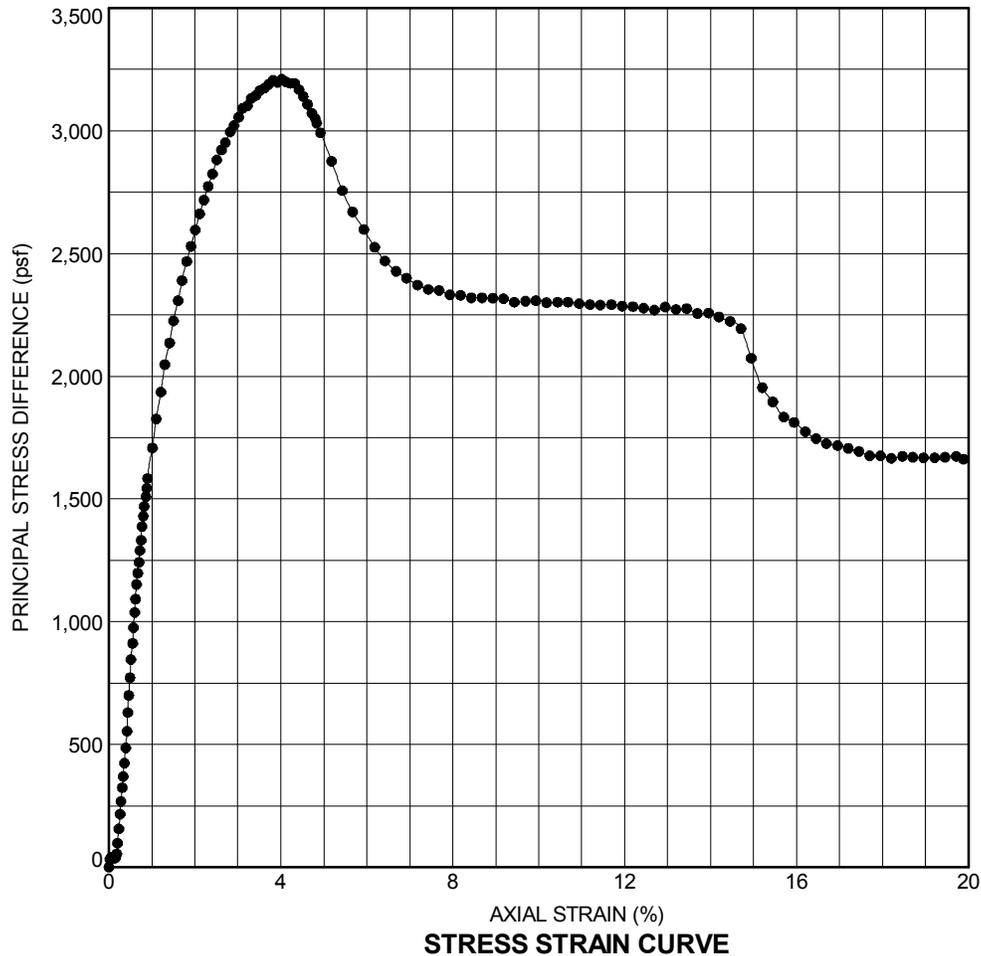




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

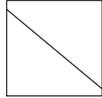
Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850
Source of Sample: B-08 Depth: 59-60 ft.		Classification: FAT CLAY (CH), stiff, gray, with calcareous and ferrous nodules, and silt seams
Sample Number: 17B		
Project No.: 04.55124002 Test Date.: 4/25/2012		Organic Content (%) ASTM D2974: N/A
Sample No.	1 ● 2 ■ 3 ▲	
INITIAL	Water Content (%)	42.1
	Dry Density (pcf)	79.0
	Saturation (%)	99.2
	Void Ratio	1.16
	Diameter (inches)	2.84
	Height (inches)	5.99
	% Passing #200 Sieve	
	Specific Gravity	2.74
Strain Rate (%/min.)		1.0
Cell Pressure (psi)		45.00
Deviator Stress (psf)		3210
Shear Strength (psf)		1605
Failure Strain (%)		4.0
σ_1 Failure (psf):		9690
σ_3 Failure (psf):		6480
Failure Type:		Multi Shear Failure Sketch
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.		

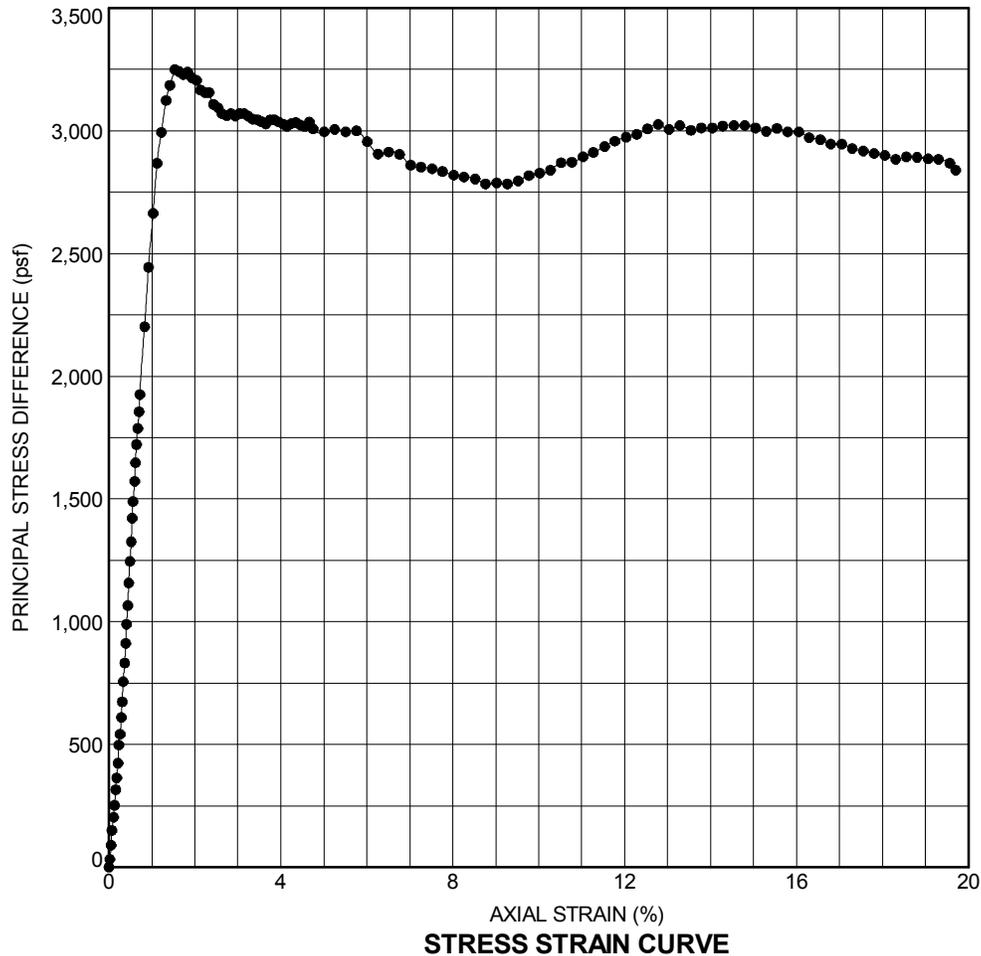




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-09		Depth: 34-35 ft.	
Sample Number: 13B		Classification: FAT CLAY (CH), stiff, tan and light gray, with ferrous nodules, sand seams, organics, and wood	
Project No.: 04.55124002		Test Date.: 4/25/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	29.5	
	Dry Density (pcf)	90.4	
	Saturation (%)	90.5	
	Void Ratio	0.89	
	Diameter (inches)	1.89	
	Height (inches)	4.00	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)		1.0	
Cell Pressure (psi)		26.00	
Deviator Stress (psf)		3250	
Shear Strength (psf)		1625	
Failure Strain (%)		1.5	
σ_1 Failure (psf):		6994	
σ_3 Failure (psf):		3744	
Failure Type:		 Shear Plane Failure Sketch	
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

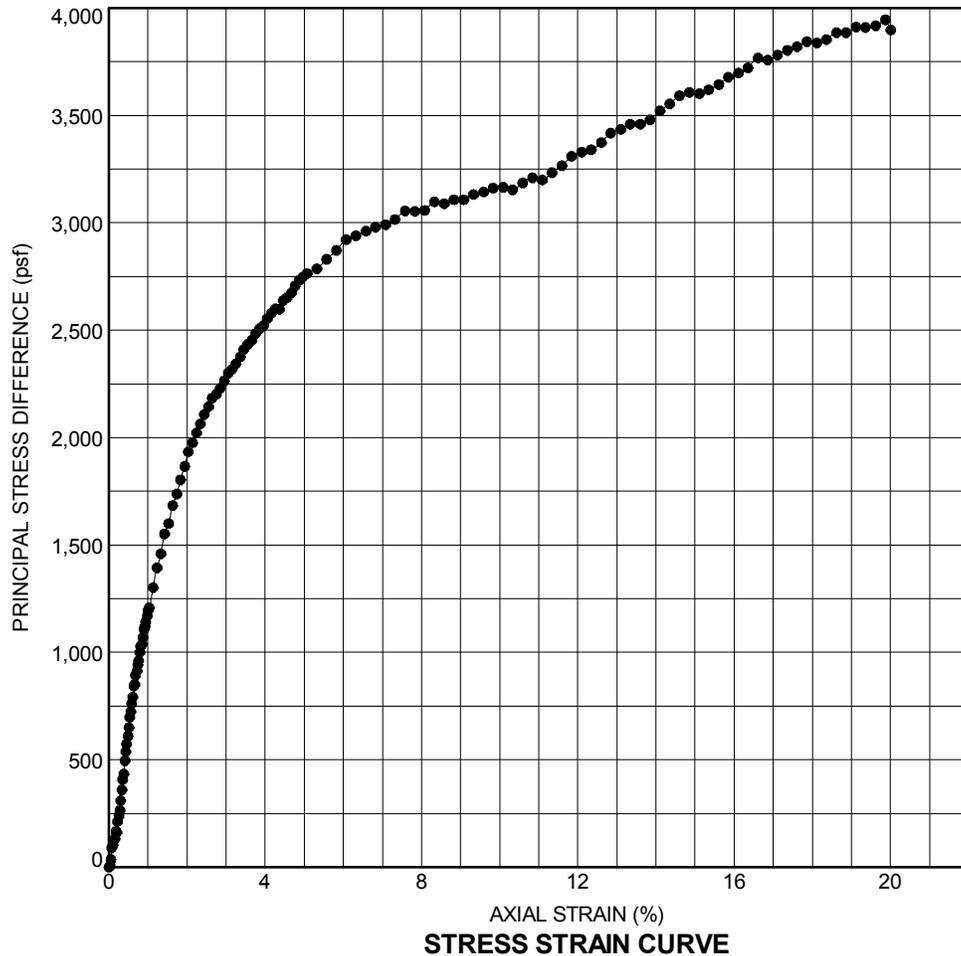




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TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-10 Depth: 23-24 ft.		Classification: LEAN CLAY, stiff, brown, with sand lenses	
Sample Number: 11A		Organic Content (%) ASTM D2974: N/A	
Project No.: 04.55124002 Test Date.: 4/26/2012			
Sample No.	1 ● 2 ■ 3 ▲		
INITIAL	Water Content (%)	26.4	
	Dry Density (pcf)	99.4	
	Saturation (%)	100.0	
	Void Ratio	0.72	
	Diameter (inches)	1.87	
	Height (inches)	3.88	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)		1.0	
Cell Pressure (psi)		17.50	
Deviator Stress (psf)		3608	
Shear Strength (psf)		1804	
Failure Strain (%)		14.9	
σ_1 Failure (psf):		6128	
σ_3 Failure (psf):		2520	
Failure Type:		Multi Shear Failure Sketch	
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

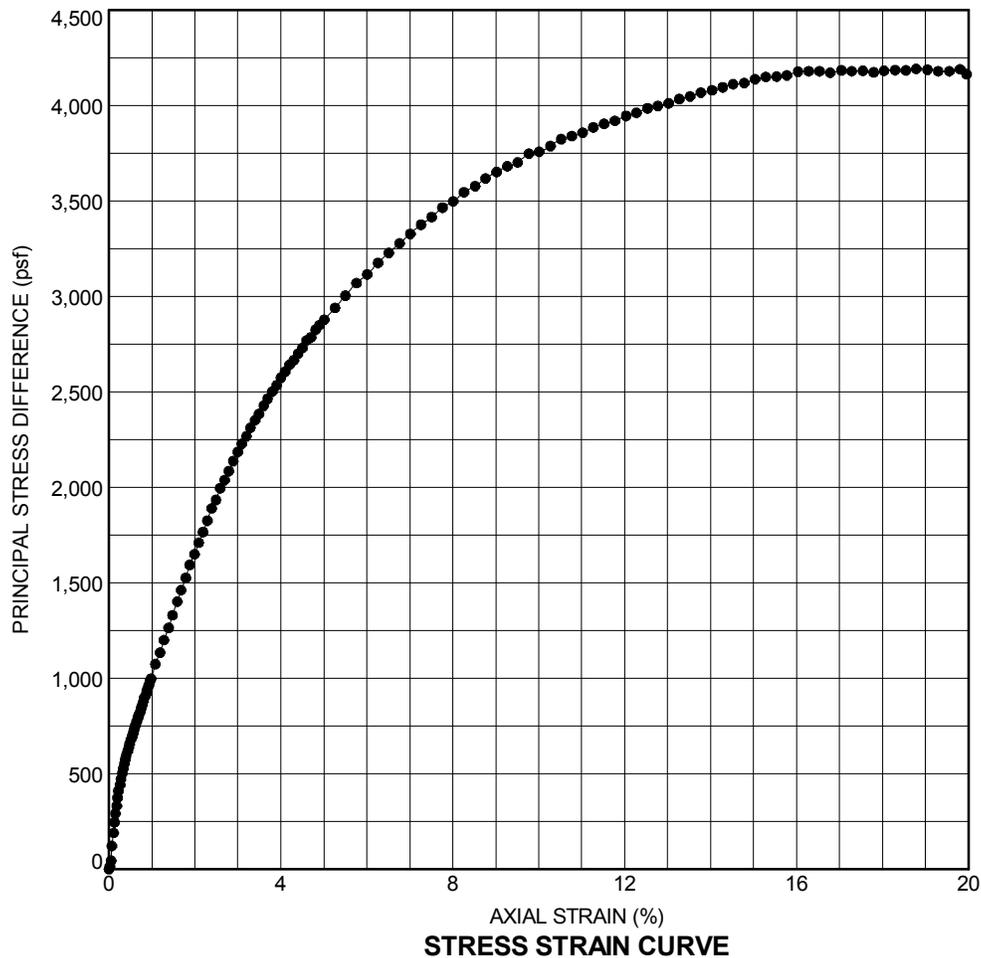




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

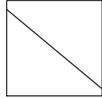
Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-10		Depth: 34-35 ft.	
Sample Number: 13B		Classification: SANDY CLAY, very stiff, reddish brown	
Project No.: 04.55124002		Test Date.: 4/26/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%) 28.6 Dry Density (pcf) 92.3 Saturation (%) 91.9 Void Ratio 0.85 Diameter (inches) 2.83 Height (inches) 5.99 % Passing #200 Sieve Specific Gravity 2.74		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Strain Rate (%/min.)	1.0		
Cell Pressure (psi)	26.00		
Deviator Stress (psf)	4136		
Shear Strength (psf)	2068		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	7880		
σ_3 Failure (psf):	3744		
Failure Type:	Bulging		





Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-11		Depth: 23-24 ft.	
Sample Number: 11A		Classification: SANDY CLAY (CL), stiff, gray	
Project No.: 04.55124002		Test Date.: 4/26/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	25.5	
	Dry Density (pcf)	99.4	
	Saturation (%)	96.9	
	Void Ratio	0.72	
	Diameter (inches)	2.84	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	17.50		
Deviator Stress (psf)	2430		
Shear Strength (psf)	1215		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	4950		
σ_3 Failure (psf):	2520		
Failure Type:	Shear Plane		

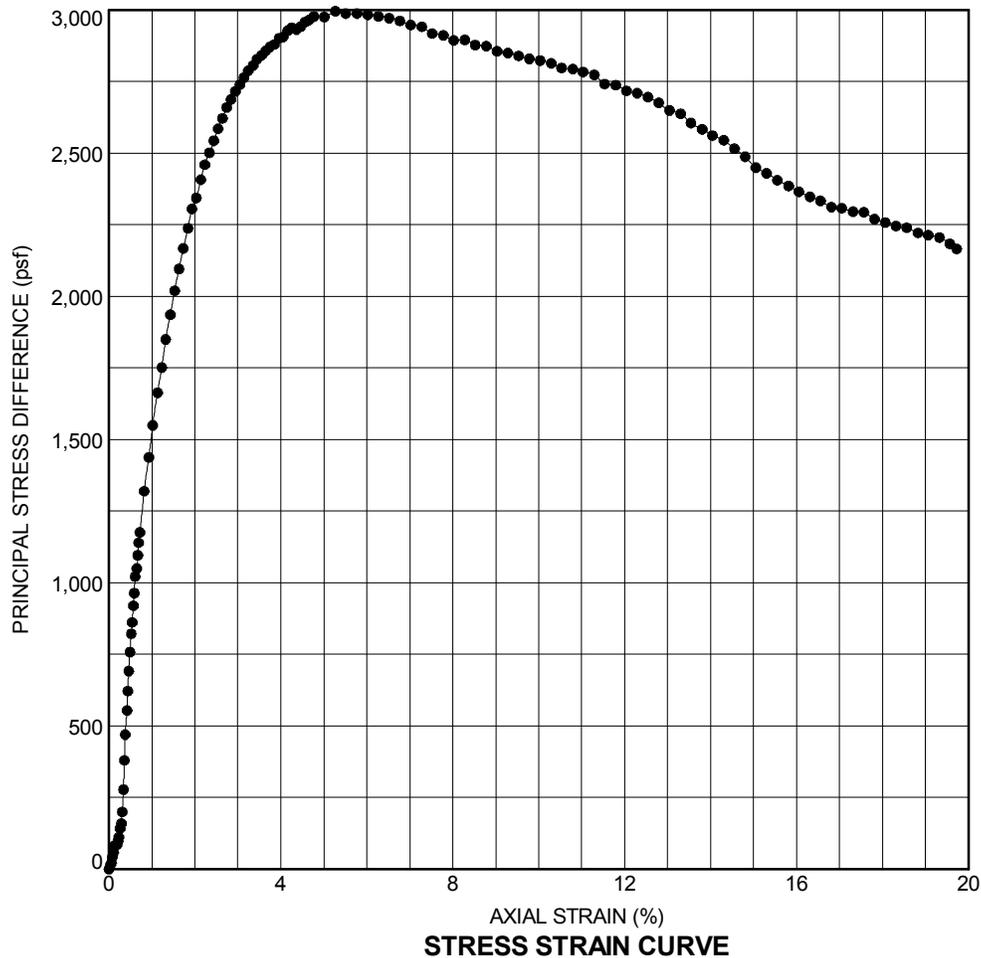




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

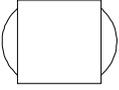
Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-11		Depth: 49-50 ft.	
Sample Number: 16B		Classification: FAT CLAY (CH), stiff, tan	
Project No.: 04.55124002		Test Date.: 4/27/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.8	
	Dry Density (pcf)	88.3	
	Saturation (%)	99.0	
	Void Ratio	0.94	
	Diameter (inches)	2.86	
	Height (inches)	5.99	
	% Passing #200 Sieve	2.74	
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		 <p>Failure Sketch</p>
Cell Pressure (psi)	37.00		
Deviator Stress (psf)	2996		
Shear Strength (psf)	1498		
Failure Strain (%)	5.3		
σ_1 Failure (psf):	8324		
σ_3 Failure (psf):	5328		
Failure Type:	Bulging		
Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.			

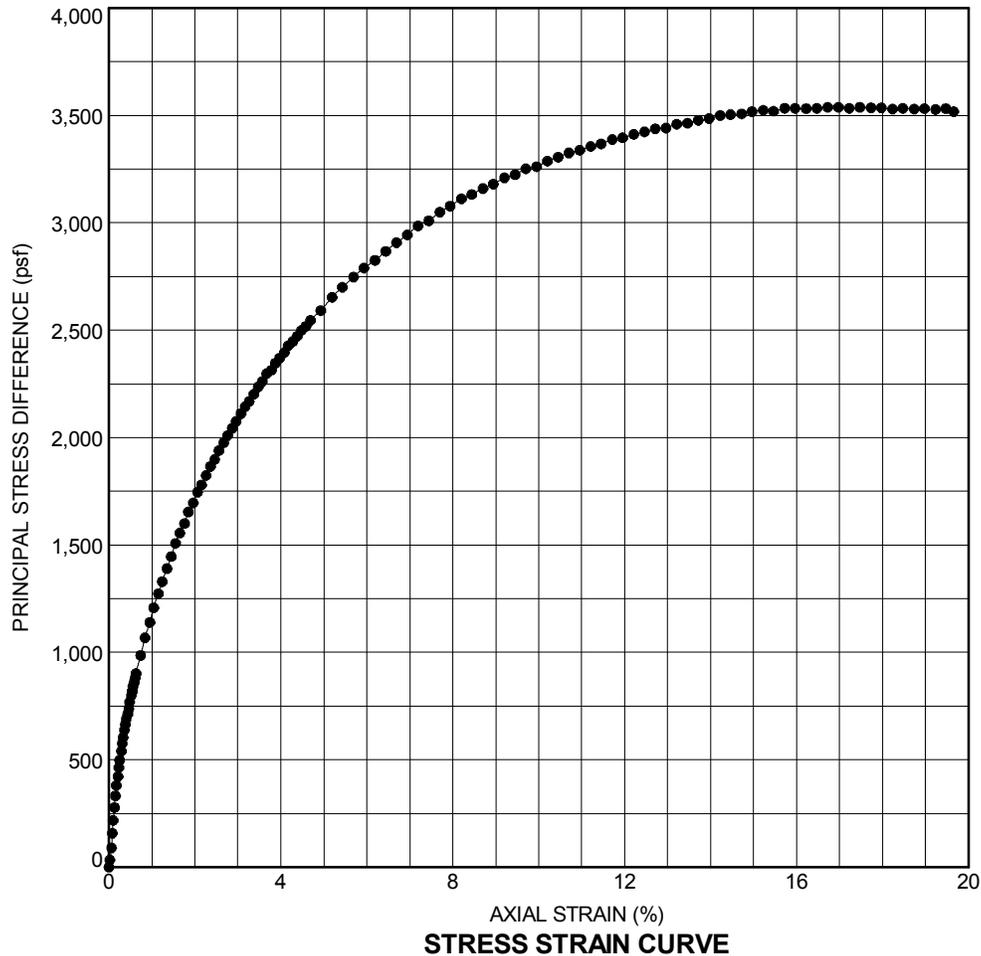




Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-12		Depth: 24-25 ft.	
Sample Number: 11B		Classification: FAT CLAY (CH), stiff, gray, with reddish brown sand pockets	
Project No.: 04.55124002		Test Date.: 4/30/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
Water Content (%)	27.8		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Dry Density (pcf)	92.6		
Saturation (%)	90.0		
Void Ratio	0.85		
Diameter (inches)	2.85		
Height (inches)	5.99		
% Passing #200 Sieve			
Specific Gravity	2.74		
Strain Rate (%/min.)	1.0		 Failure Sketch
Cell Pressure (psi)	18.00		
Deviator Stress (psf)	3519		
Shear Strength (psf)	1759		
Failure Strain (%)	15.0		
σ_1 Failure (psf):	6111		
σ_3 Failure (psf):	2592		
Failure Type:	Bulging		

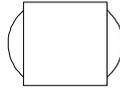




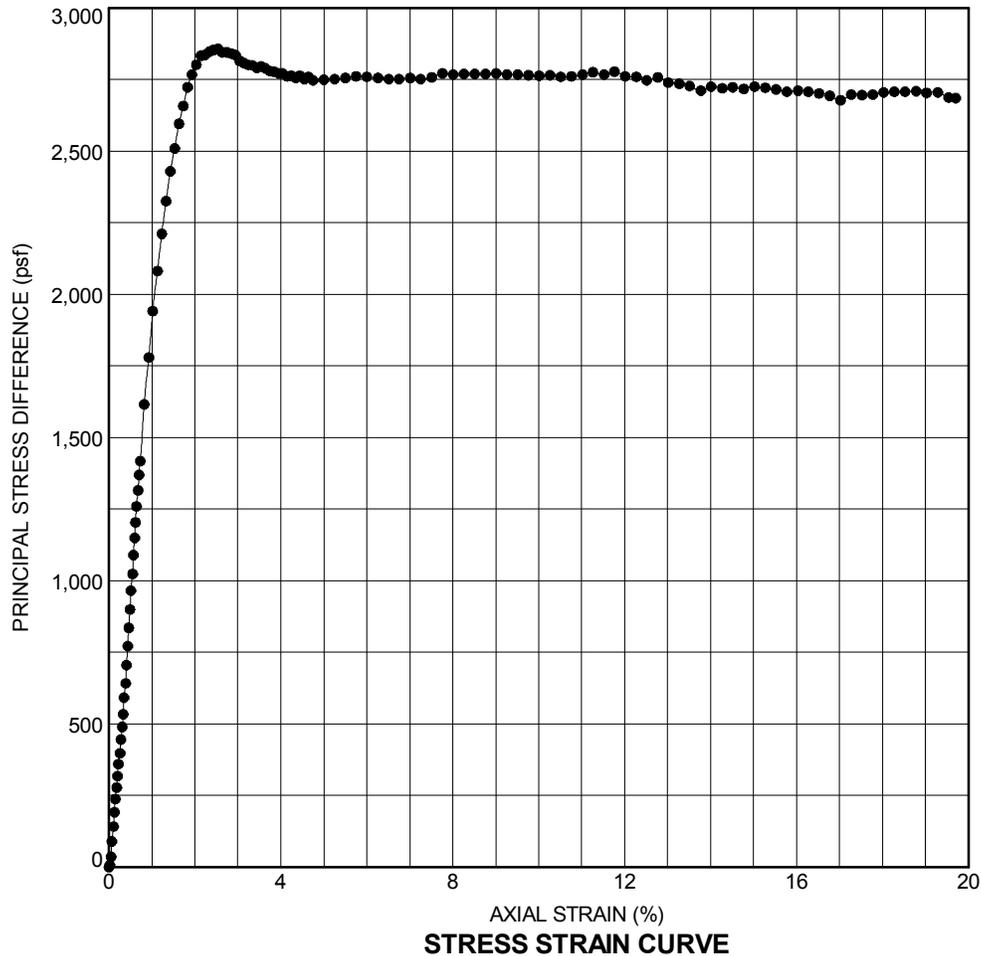
Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-12		Depth: 34-35 ft.	
Sample Number: 13B		Classification: FAT CLAY (CH), stiff, gray, with reddish brown sand pockets	
Project No.: 04.55124002		Test Date.: 4/30/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	33.9	
	Dry Density (pcf)	88.6	
	Saturation (%)	100.0	
	Void Ratio	0.93	
	Diameter (inches)	2.86	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	26.00		
Deviator Stress (psf)	2858		
Shear Strength (psf)	1429		
Failure Strain (%)	2.5		
σ_1 Failure (psf):	6602		
σ_3 Failure (psf):	3744		
Failure Type:	Bulging		



Failure Sketch

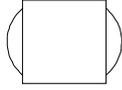




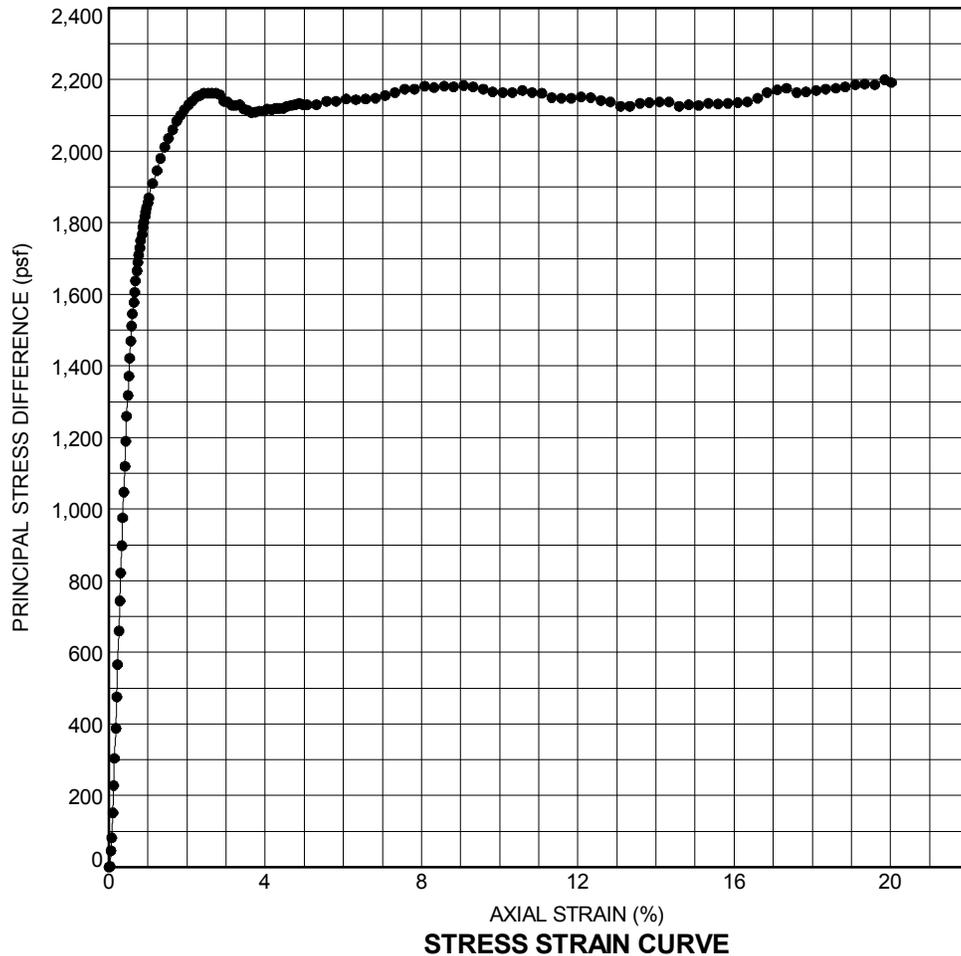
Fugro Consultants, Inc.

TRIAXIAL SHEAR TEST

Project Name: Cameron-Creole Watershed Cameron Parish, Louisiana		Type of Test: Unconsolidated Undrained ASTM D 2850	
Source of Sample: B-12		Depth: 49-50 ft.	
Sample Number: 16B		Classification: FAT CLAY (CH), stiff, gray, with reddish brown sand pockets	
Project No.: 04.55124002		Test Date.: 4/30/2012	
Organic Content (%) ASTM D2974:		N/A	
Sample No.	1 ●	2 ■	3 ▲
INITIAL	Water Content (%)	44.4	
	Dry Density (pcf)	77.9	
	Saturation (%)	100.0	
	Void Ratio	1.19	
	Diameter (inches)	2.85	
	Height (inches)	5.99	
	% Passing #200 Sieve		
	Specific Gravity	2.74	
Strain Rate (%/min.)	1.0		Remarks: Visual classification in general accordance with ASTM Standard D2487. Specific Gravity assumed.
Cell Pressure (psi)	37.00		
Deviator Stress (psf)	2184		
Shear Strength (psf)	1092		
Failure Strain (%)	9.1		
σ_1 Failure (psf):	7512		
σ_3 Failure (psf):	5328		
Failure Type:	Bulging		

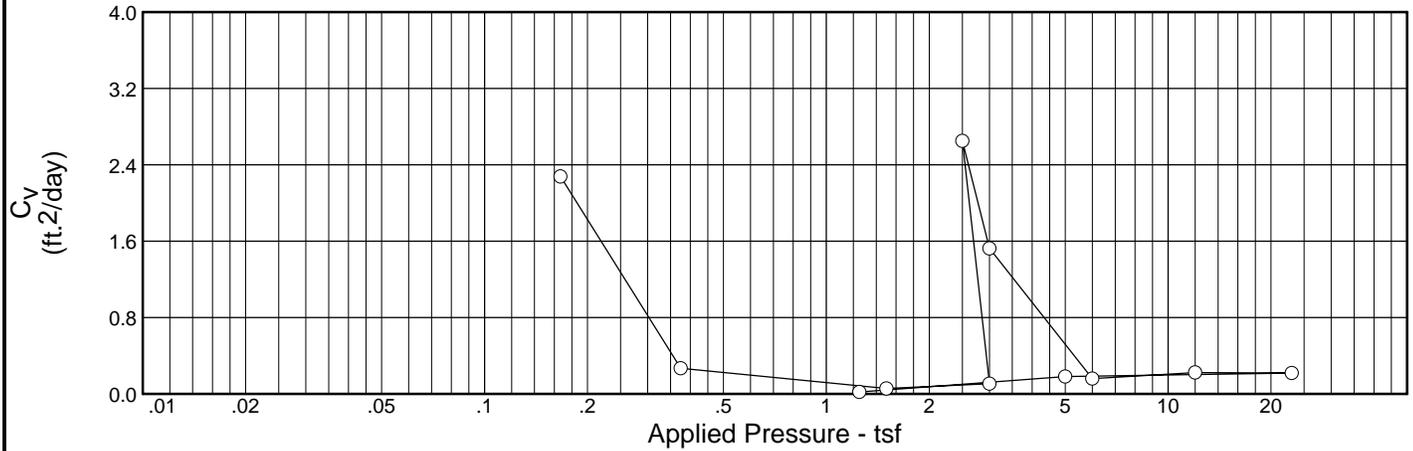
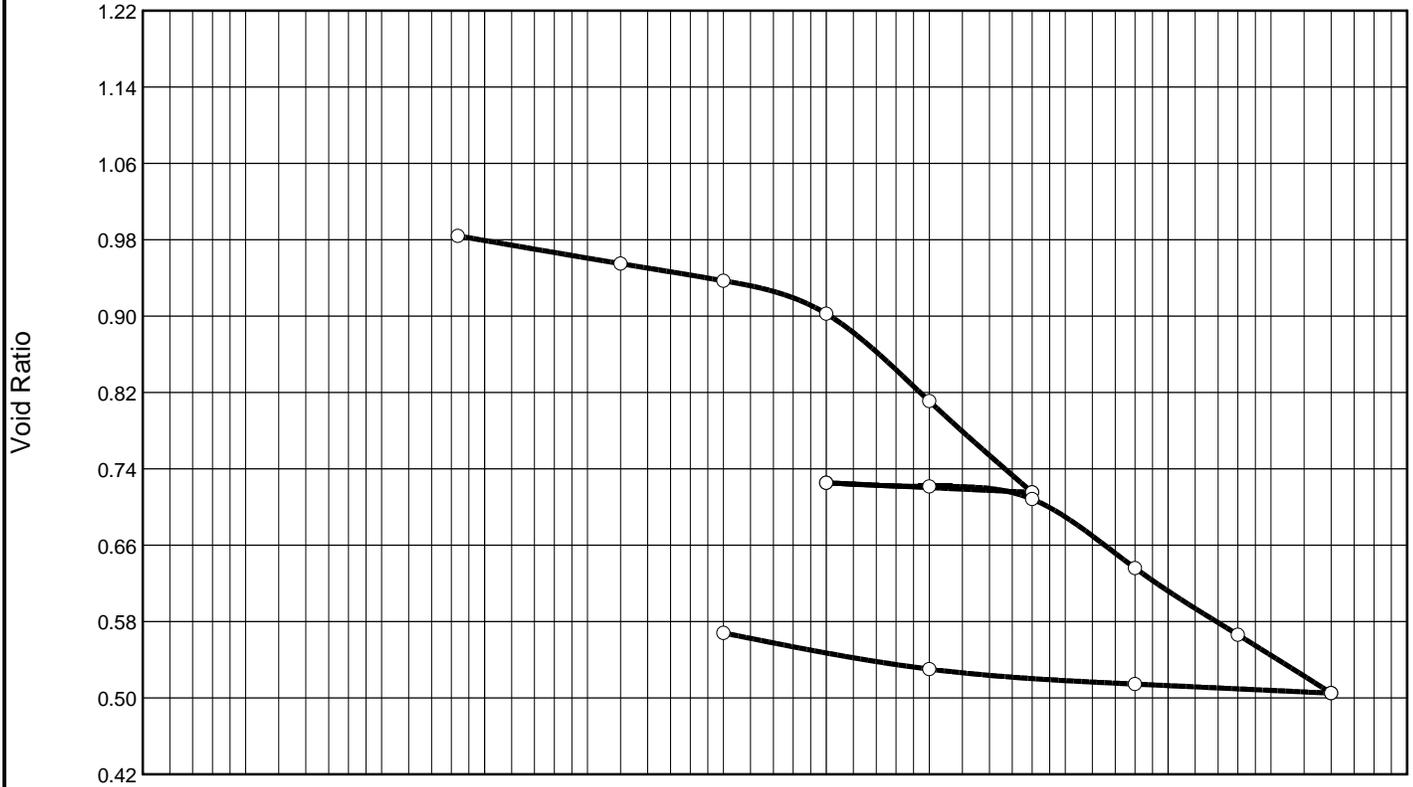


Failure Sketch



APPENDIX C
CONSOLIDATION TEST RESULTS

CONSOLIDATION TEST REPORT

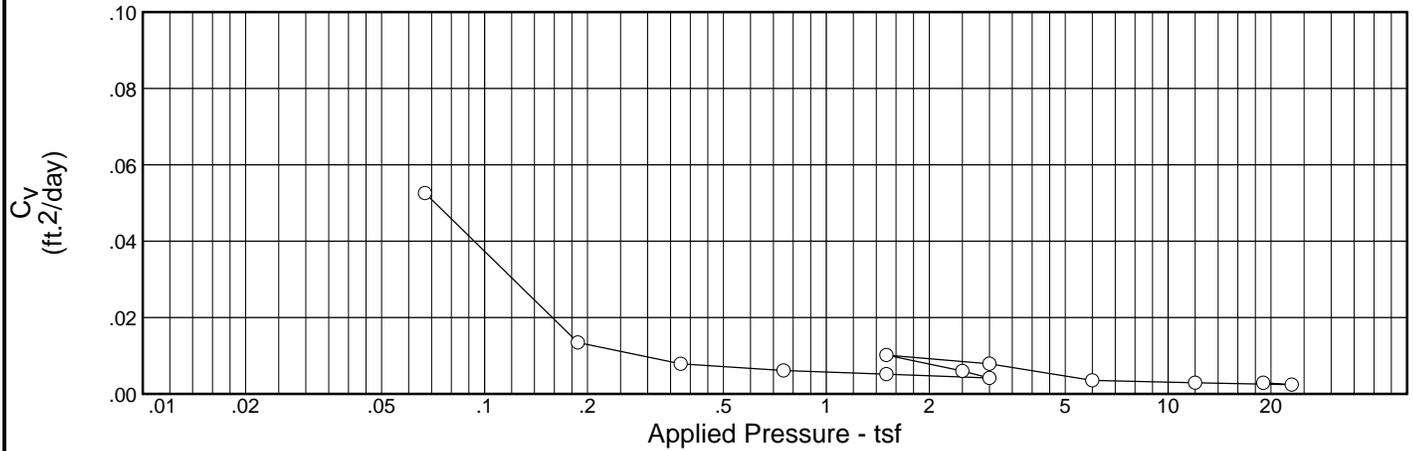
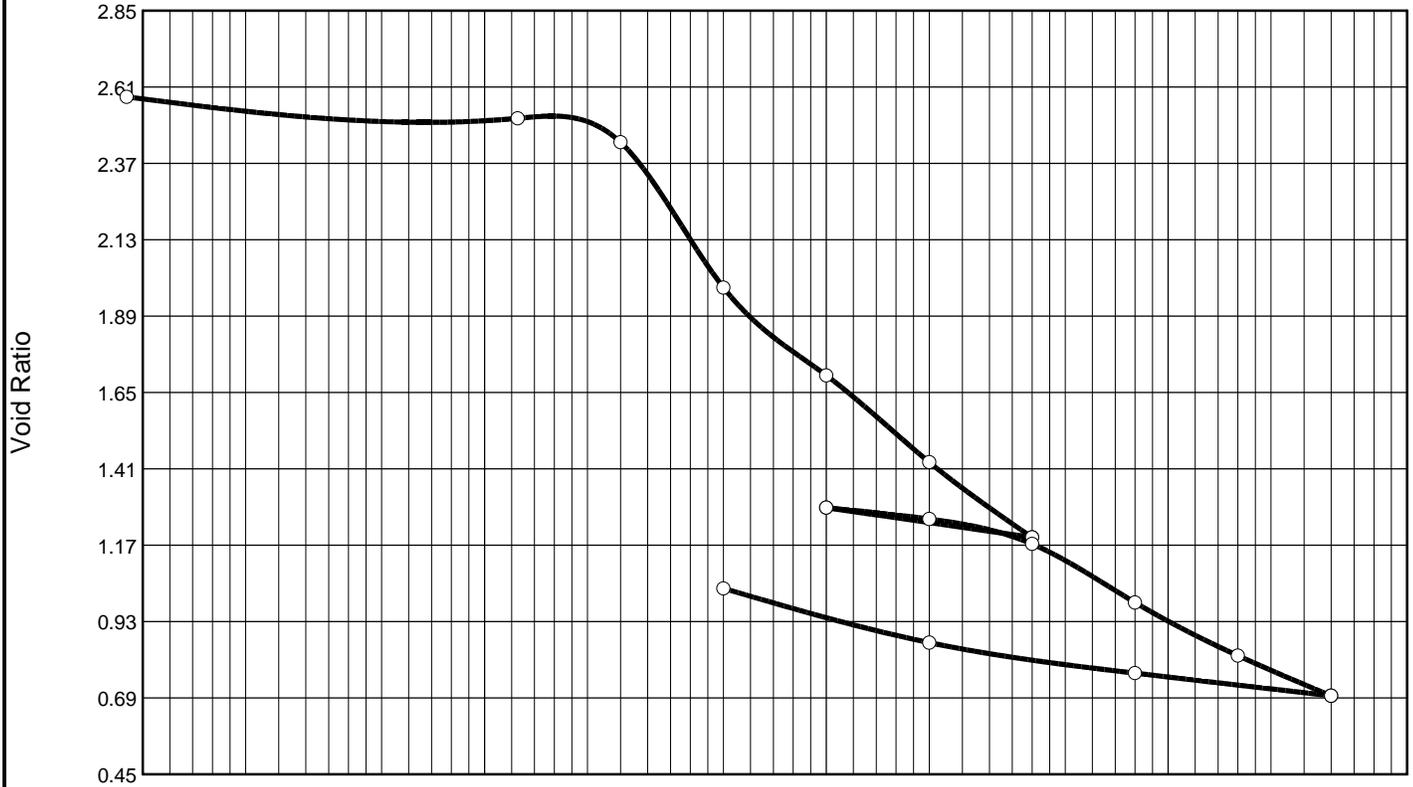


	Natural									
Saturation	Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Initial Void Ratio
94.3 %	34.8 %	84.1	44	27	2.678		0.96	0.31	0.03	0.988

MATERIAL DESCRIPTION	USCS	AASHTO
LEAN CLAY, gray	CL	

Project No. 04.55124002 Client: CPRA Project: Cameron-Creole Watershed Grand Bayou Marsh Creation Source: B-1 Sample No.: 13B Elev./Depth: 34	Remarks: Tested by: IK Calculated by: KA Checked by: BN
Fugro Consultants, Inc. Baton Rouge, LA	Figure

CONSOLIDATION TEST REPORT

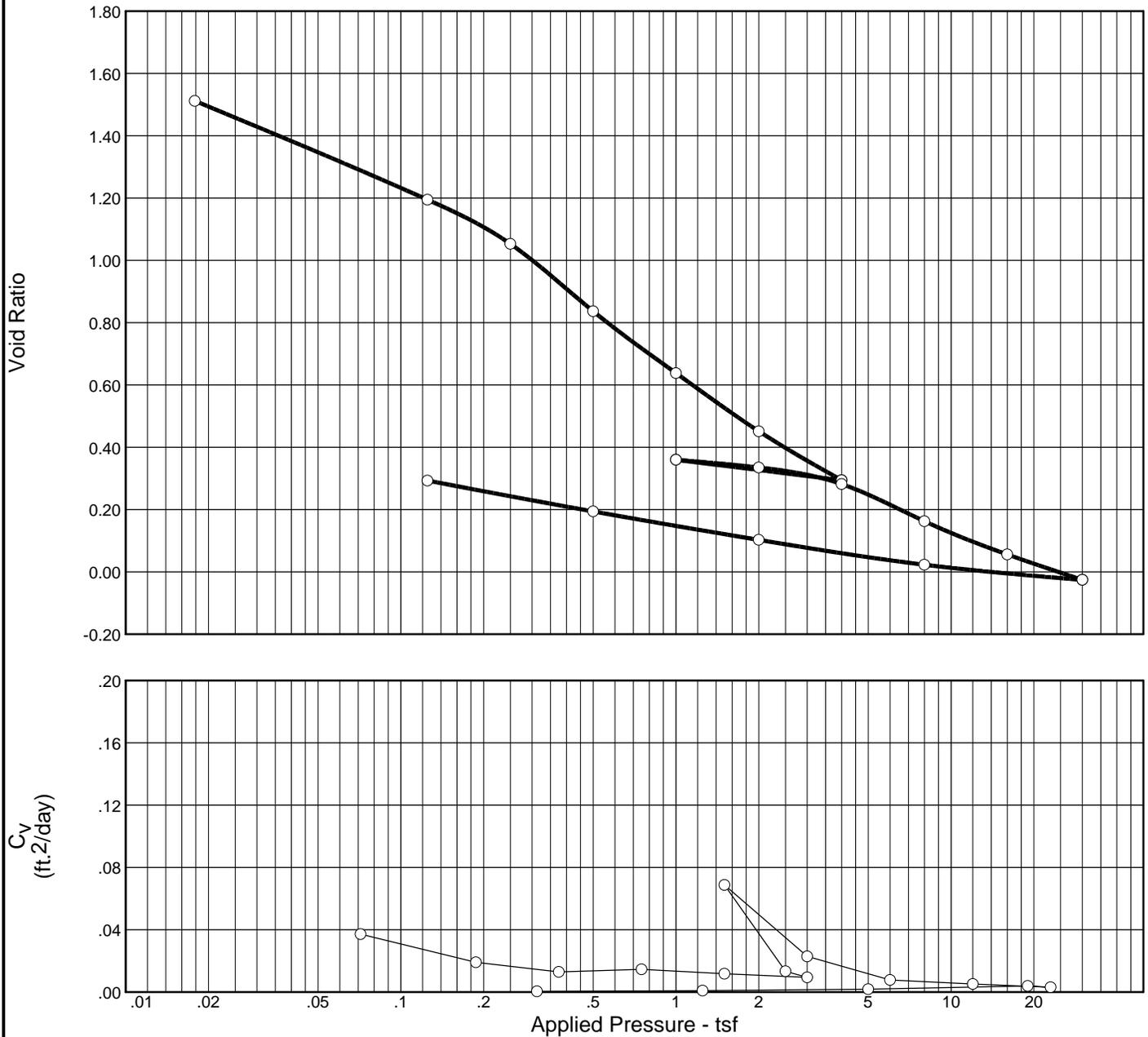


	Natural									
Saturation	Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Initial Void Ratio
97.6 %	94.7 %	46.3	85	64	2.657		0.22	1.03	0.19	2.579

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

Project No. 04.55124002 Client: CPRA Project: Cameron-Creole Watershed Grand Bayou Marsh Creation Source: B-2 Sample No.: 9B Elev./Depth: 17	Remarks: Tested by: IK Calculated by: KA Checked by: BN
Fugro Consultants, Inc. Baton Rouge, LA	Figure

CONSOLIDATION TEST REPORT



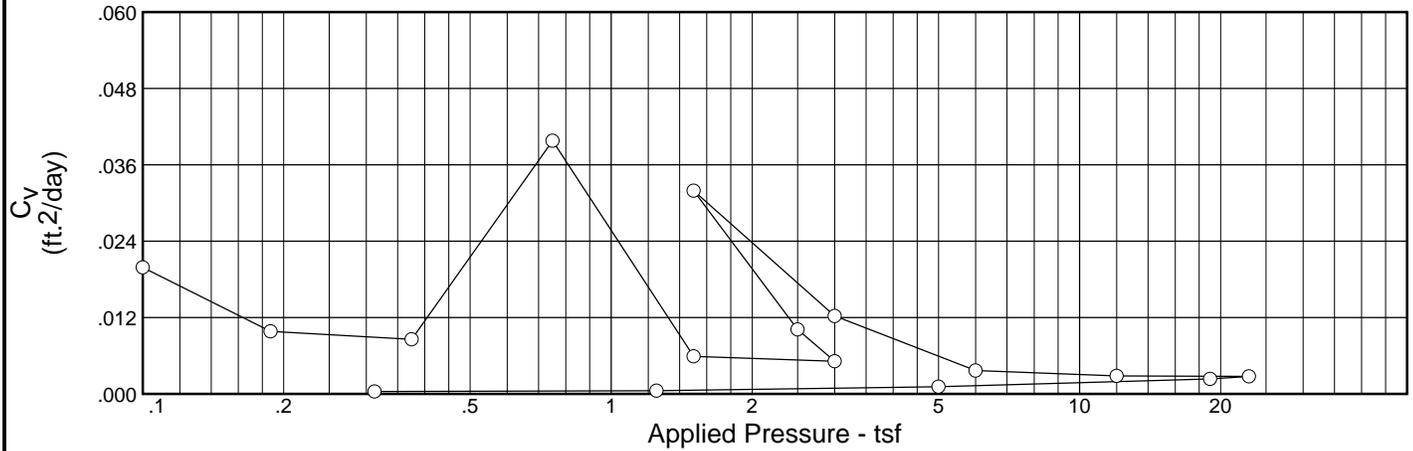
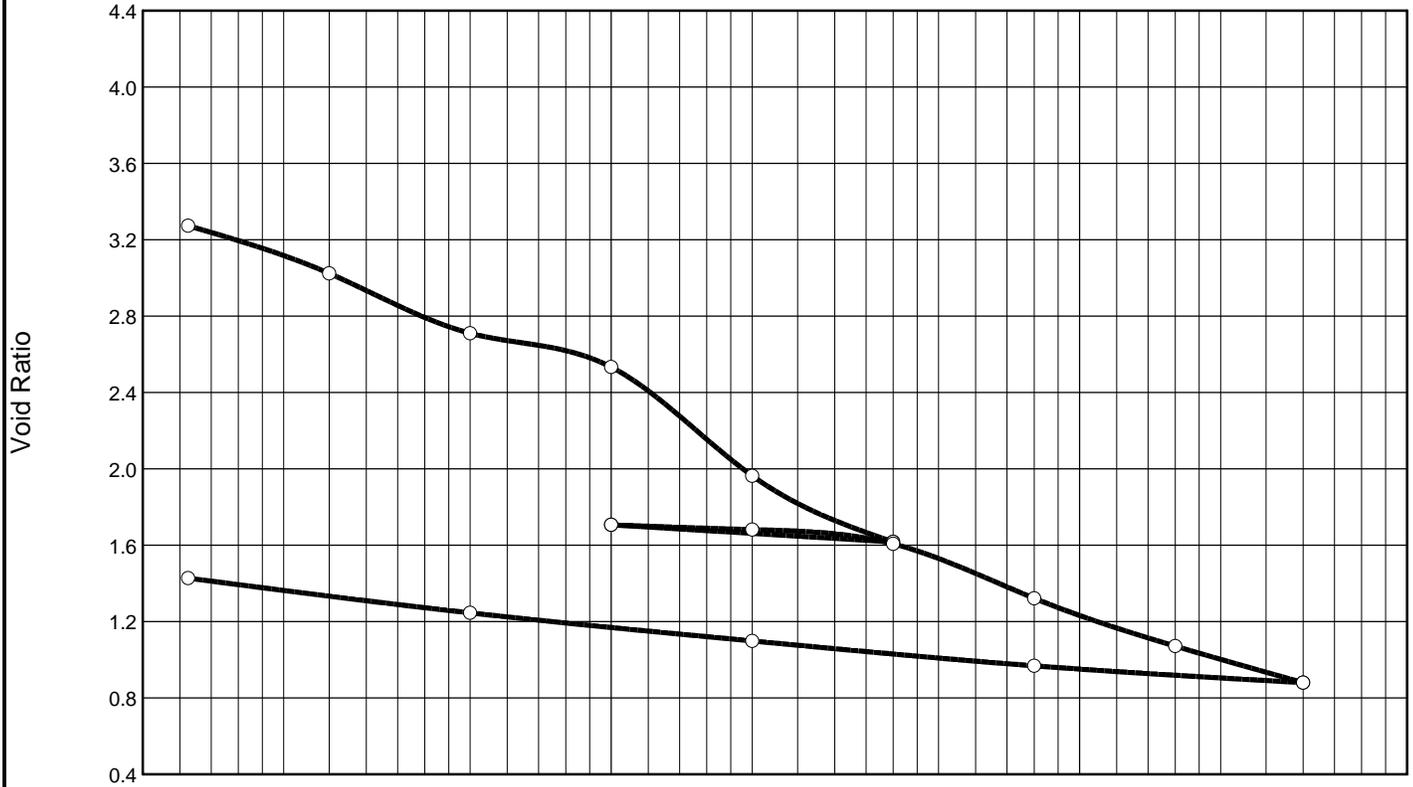
	Natural									
Saturation	Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Initial Void Ratio
40.3 %	22.7 %	66.7	109	81	2.686		0.21	0.52	0.13	1.514

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

Project No. 04.55124002 Client: CPRA Project: Cameron-Creole Watershed Grand Bayou Marsh Creation Source: B-3 Sample No.: 5B Elev./Depth: 9	Remarks: Tested by: IK Calculated by: KA Checked by: BN
Fugro Consultants, Inc. Baton Rouge, LA	

Figure

CONSOLIDATION TEST REPORT

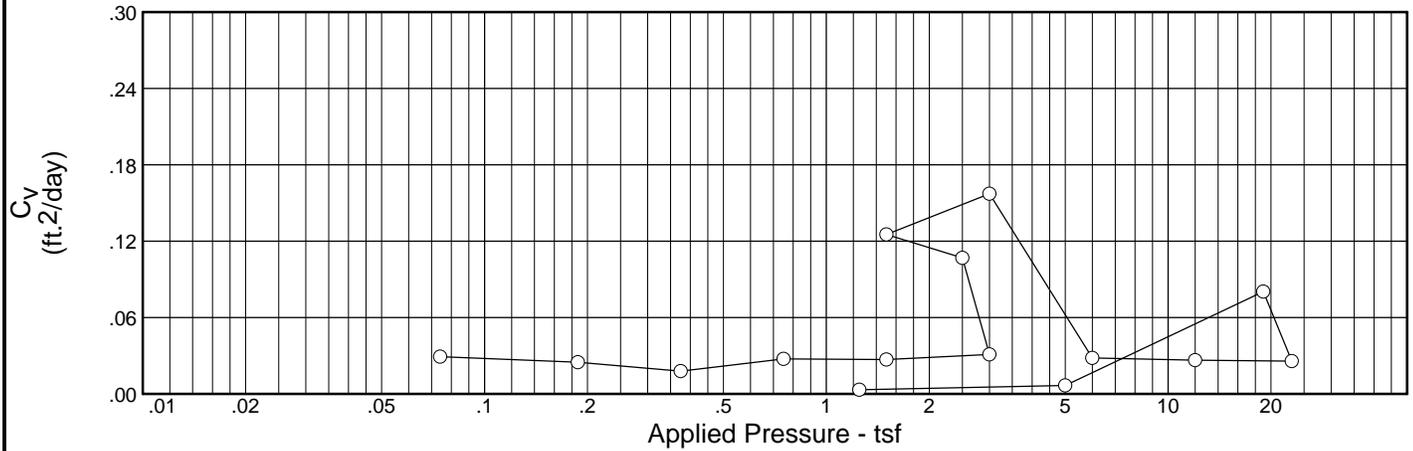


	Natural									
Saturation	Moisture	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _C (tsf)	C _c	C _r	Initial Void Ratio
102.2 %	149.0 %	33.6	118	90	2.504		0.97	1.87	0.17	3.649

MATERIAL DESCRIPTION	USCS	AASHTO
ORGANIC CLAY, dark brown	CH	

Project No. 04.55124002 Client: CPRA Project: Cameron-Creole Watershed Grand Bayou Marsh Creation Source: B-4 Sample No.: 2B Elev./Depth: 3	Remarks: Tested by: IK Calculated by: KA Checked by: BN
Fugro Consultants, Inc. Baton Rouge, LA	Figure

CONSOLIDATION TEST REPORT



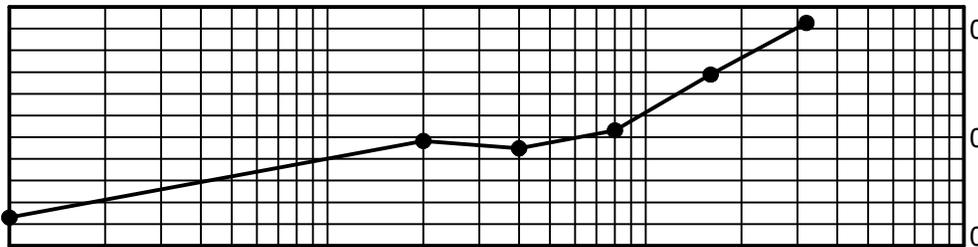
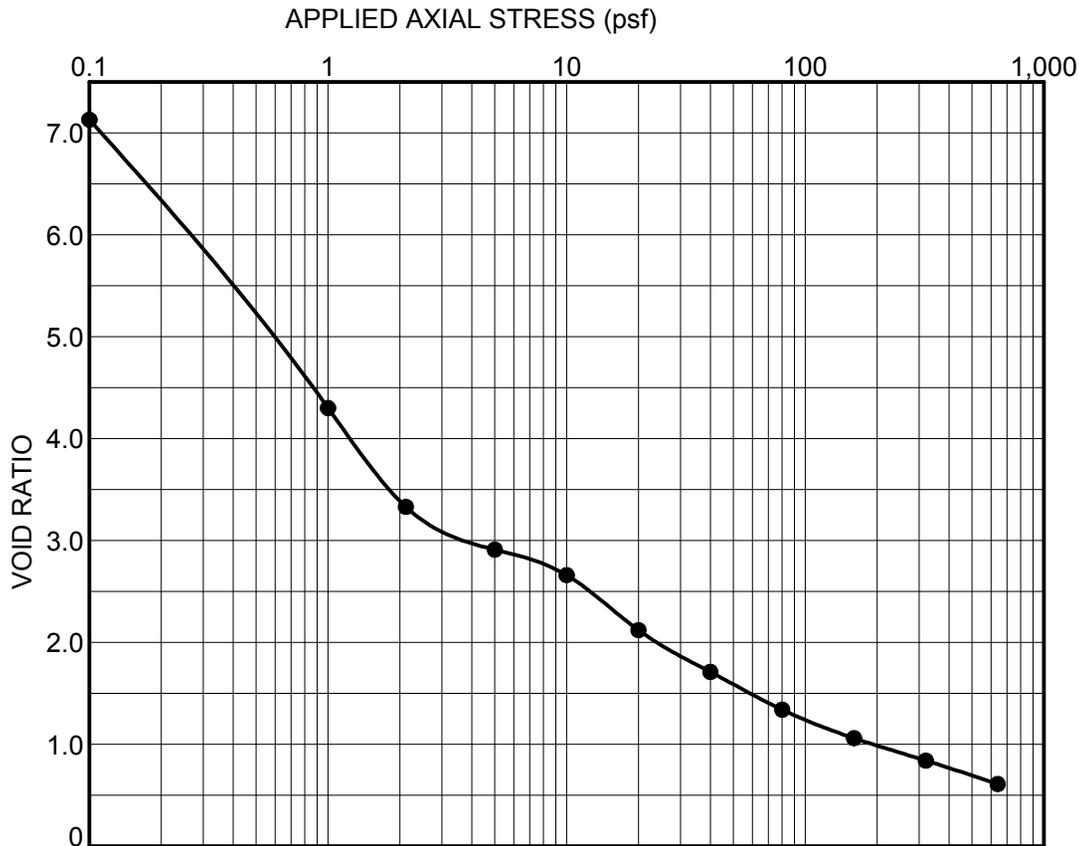
Natural	Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P _c (tsf)	C _c	C _r	Initial Void Ratio
Saturation									
102.1 %	66.1 %	61.0	64	47	2.658	0.14	0.43	0.06	1.721

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

Project No. 04.55124002 Client: CPRA Project: Cameron-Creole Watershed Grand Bayou Marsh Creation Source: B-5 Sample No.: 3A Elev./Depth: 4	Remarks: Tested by: IK Calculated by: KA Checked by: BN
Fugro Consultants, Inc. Baton Rouge, LA	Figure

APPENDIX D

LOW PRESSURE CONSOLIDATION TEST RESULTS



Depth (ft.): 0-10			
Material: Gray Fat Clay with shell fragments			
Source:			
Specific Gravity: 2.68 (Calculated)			
Saturation (%): 100			
Initial Void Ratio (Eo): 7.00			
Initial Moisture Content (%): 266.0			
Initial Dry Density (lbs./cu. ft.): 20.0			
Compression Index (Cc): 1.26			
Recompression Index (Cr):			
Atterberg Limits (LL, PL, PI)	61	17	44

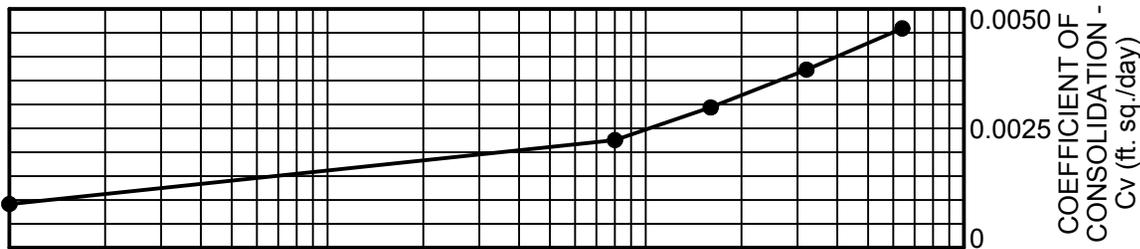
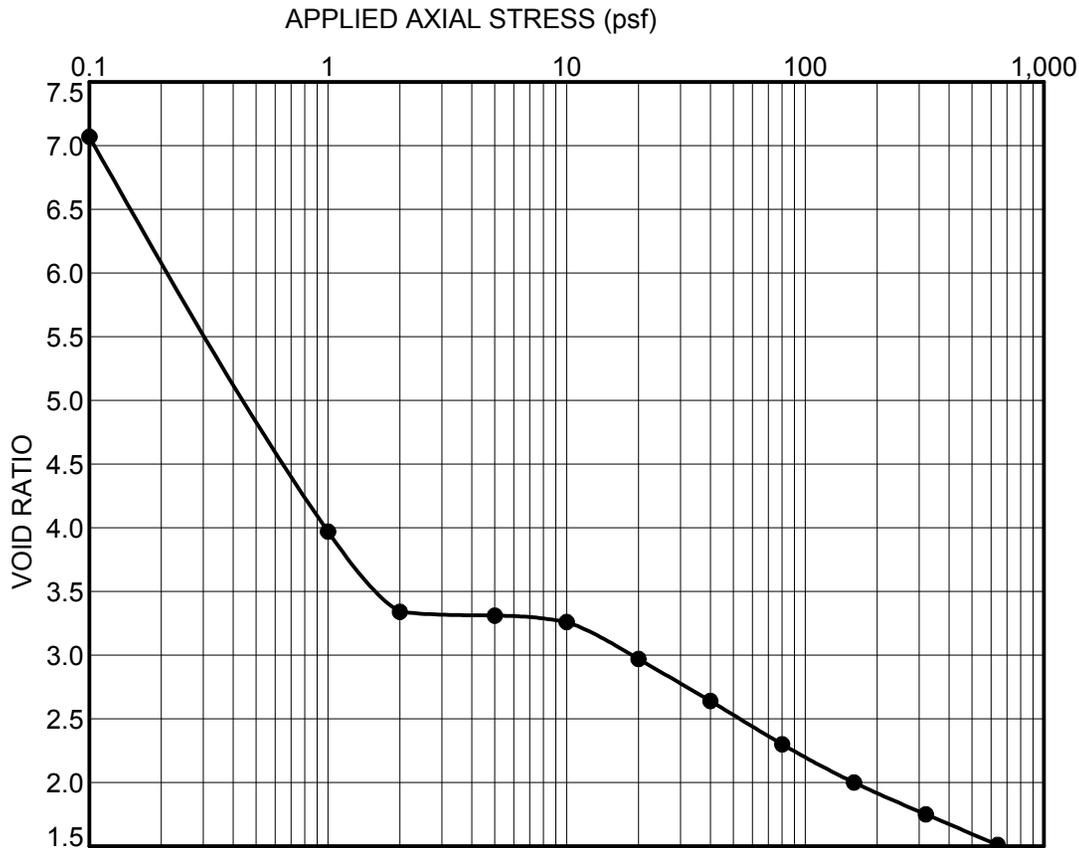


Cameron-Creole Watershed Cameron Parish, Louisiana

INCREMENTAL CONSOLIDATION TEST

Sample ID: **Composite 0-10**

Tested By: Karen Allen	Date Tested: 4/3/2012	Reviewed By: Michael Alfortish	Date Reviewed: 5/25/2012	Project No. 04.55124002
----------------------------------	---------------------------------	--	------------------------------------	-----------------------------------



Depth (ft.):	0-20		
Material:	Gray Fat Clay		
Source:			
Specific Gravity:	2.69 (Calculated)		
Saturation (%):	100		
Initial Void Ratio (Eo):	7.07		
Initial Moisture Content (%):	263.0		
Initial Dry Density (lbs./cu. ft.):	19.7		
Compression Index (Cc):	0.97		
Recompression Index (Cr):			
Atterberg Limits (LL, PL, PI)	59	17	42

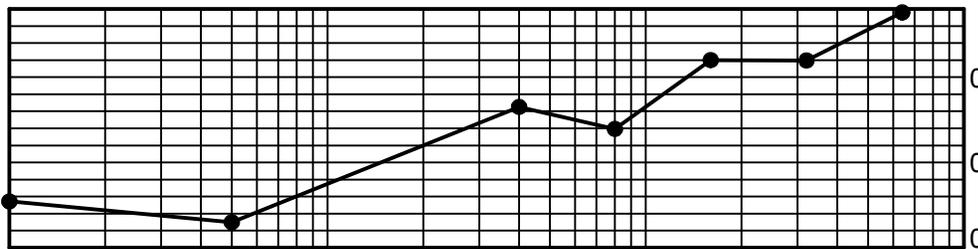
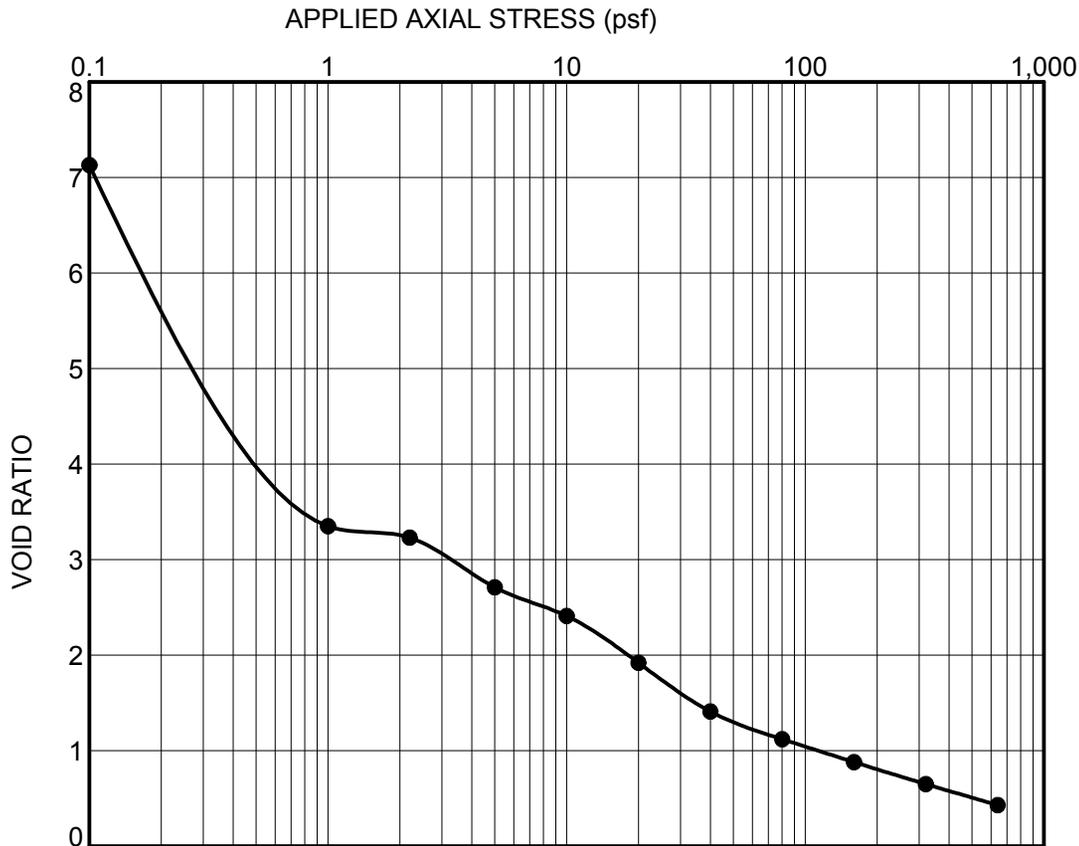


Cameron-Creole Watershed Cameron Parish, Louisiana

INCREMENTAL CONSOLIDATION TEST

Sample ID: Composite 0-20

Tested By: Karen Allen	Date Tested: 4/23/2012	Reviewed By: Michael Alfortish	Date Reviewed: 5/25/2012	Project No. 04.55124002
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Depth (ft.): 10-20			
Material: Gray Fat Clay with shell fragments			
Source:			
Specific Gravity: 2.69 (Calculated)			
Saturation (%): 100			
Initial Void Ratio (Eo): 7.13			
Initial Moisture Content (%): 265.0			
Initial Dry Density (lbs./cu. ft.): 20.5			
Compression Index (Cc): 1.21			
Recompression Index (Cr):			
Atterberg Limits (LL, PL, PI)	52	16	36



Cameron-Creole Watershed Cameron Parish, Louisiana

INCREMENTAL CONSOLIDATION TEST

Sample ID: Composite 10-20

Tested By: Karen Allen	Date Tested: 4/3/2012	Reviewed By: Michael Alfortish	Date Reviewed: 5/25/2012	Project No. 04.55124002
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APPENDIX E
COLUMN SETTLING TEST RESULTS

Final Report:

**Settling Properties of Dredged Sediments for the Cameron-Creole Watershed Grand
Bayou Marsh Creation (CS-54) Project
(Fugro Consultants, Inc. Project no. 5512-4002)**

Submitted to:

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April 20, 2012

1.0 Introduction, Scope, and Objectives

The objective of the study reported here was to evaluate zone settling and compression settling properties of sediments which may be hydraulically dredged as part of the Cameron-Creole Watershed Grand Bayou Marsh Creation (CS-54) Project (Fugro Consultants, Inc. Project no. 5512-4002).

2.0 Experimental Procedures and Results

Water (labeled as: 5512-4002) and homogenized sediment (labeled as: Comp 5512-4002 (all-borings) 0-20) from the proposed dredging location were provided by Fugro Consultants, Inc. for laboratory testing. The salinity of water provided from the proposed dredging site, measured in terms of total dissolved solids (TDS) following *Standard Methods*¹, was 5.2 g/L.

Slurry was prepared using the homogenized sediment and water from the proposed dredging location plus additional water adjusted to the same salinity as site water using synthetic sea salt (Instant Ocean). 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. 1110-2-5027². The fine-grained sediment slurry was 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. 1110-2-5027². 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. The total suspended solids (TSS) concentration at the start of the settling test was 145.1 g/L.

A clear sediment-water interface was observed shortly after the start of the settling test (<1 hour), 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 15 days as depicted in Figure 1 (see Appendix A for tabulated data).

Water samples were collected from the clarified layer above the sediment-water interface for measurement of TSS as described in the US Army Corps of Engineers Manual No. 1110-2-5027². Because the TSS concentrations in the samples collected for characterization of flocculent settling in the zone above the sediment-water interface were low, the mass of suspended solids retained on the filters was lower than the 5 mg recommended by the US Army Corps of Engineers Manual No. 1110-2-5027². Based on the data collected, the TSS concentration in all samples from the flocculent settling above the sediment-water interface are reported here as <50 mg/L (calculated as the minimum residue mass required for acceptable analysis, 5 mg, divided by the sample volume filtered, 0.10 L).

As shown in Figure 1, zone settling was observed during the first portion of the settling test, followed by compression settling thereafter.

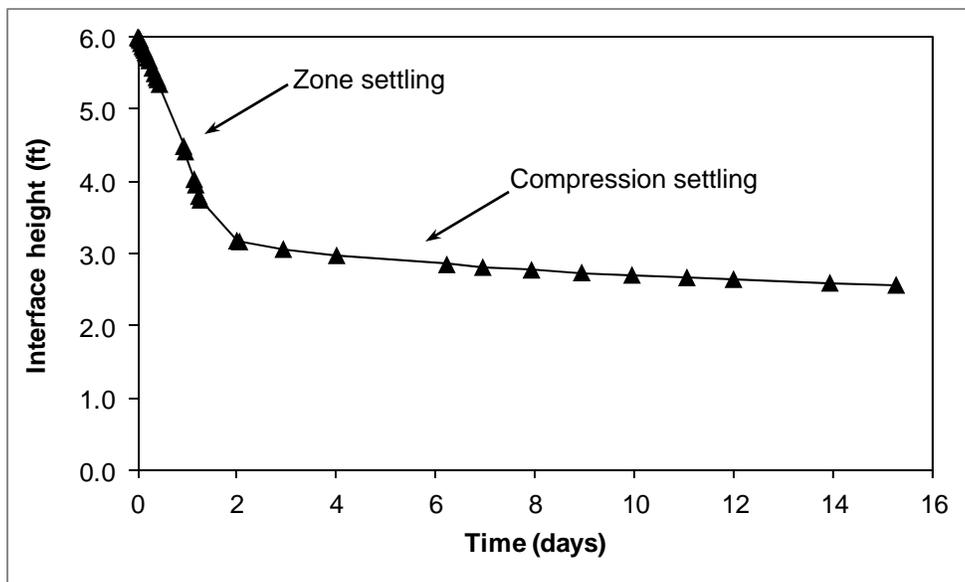


Figure 1: Interface height as a function of time during the pilot-scale settling test.

Data for the first 1.4 days of the settling test, during which zone settling was observed, is depicted separately in Figure 2. A linear regression was performed with the resulting equation and correlation coefficient depicted on the graph. The slope of the regression line, which corresponds to the zone settling velocity, was 1.78 ft/day (0.074 ft/hour).

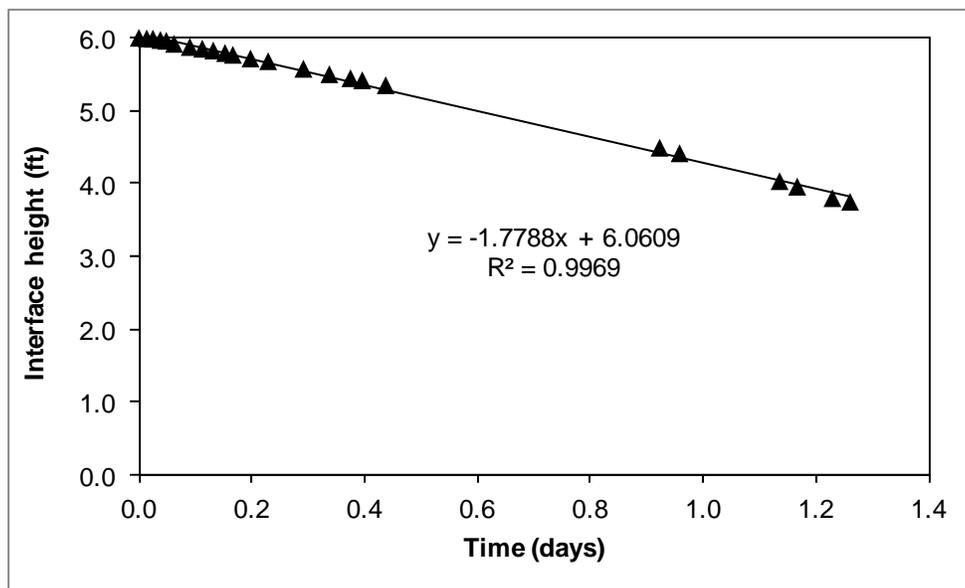


Figure 2: Interface height as a function of time during the zone settling portion of the pilot-scale settling test.



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. 2).

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

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 suspended solids concentration as a function of time during compression settling is depicted in Figure 3.

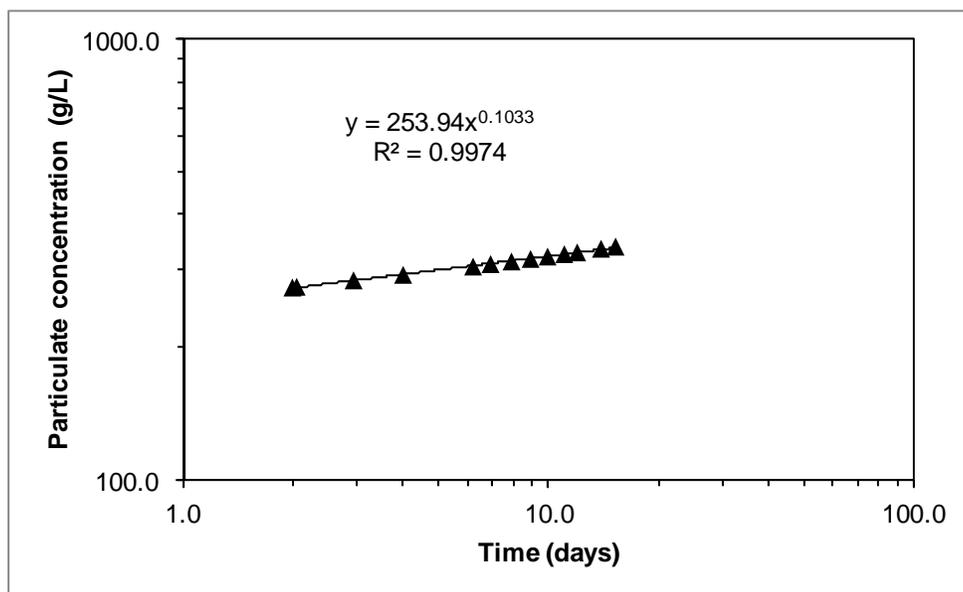


Figure 3: Concentration of settled solids as a function of time during the compression settling portion of the pilot-scale settling test.

3.0 References

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

Appendix A: Interface height as a function of time during the pilot-scale column settling test.

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

Elapsed duration (hr)	Interface Height (ft)
0.00	6.000
0.33	5.992
0.60	5.988
0.92	5.971
1.17	5.958
1.50	5.917
2.17	5.875
2.70	5.850
3.17	5.825
3.67	5.792
4.00	5.767
4.75	5.717
5.50	5.679
7.00	5.575
8.10	5.500
9.00	5.446
9.50	5.417
10.5	5.350
22.15	4.492
23.00	4.417
27.25	4.033
28.00	3.958
29.50	3.800
30.25	3.750
47.80	3.183
49.10	3.171
70.25	3.067
96.00	2.979
149.2	2.854
166.5	2.817
190.0	2.779
214.3	2.742
238.5	2.708
265.0	2.675
287.5	2.650
334.0	2.600
366.0	2.571

