BORING LOG NO. 09-B87

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13826901 E: 3261637	SITE:	Cedar Bayou PA6 Baytown, Texas

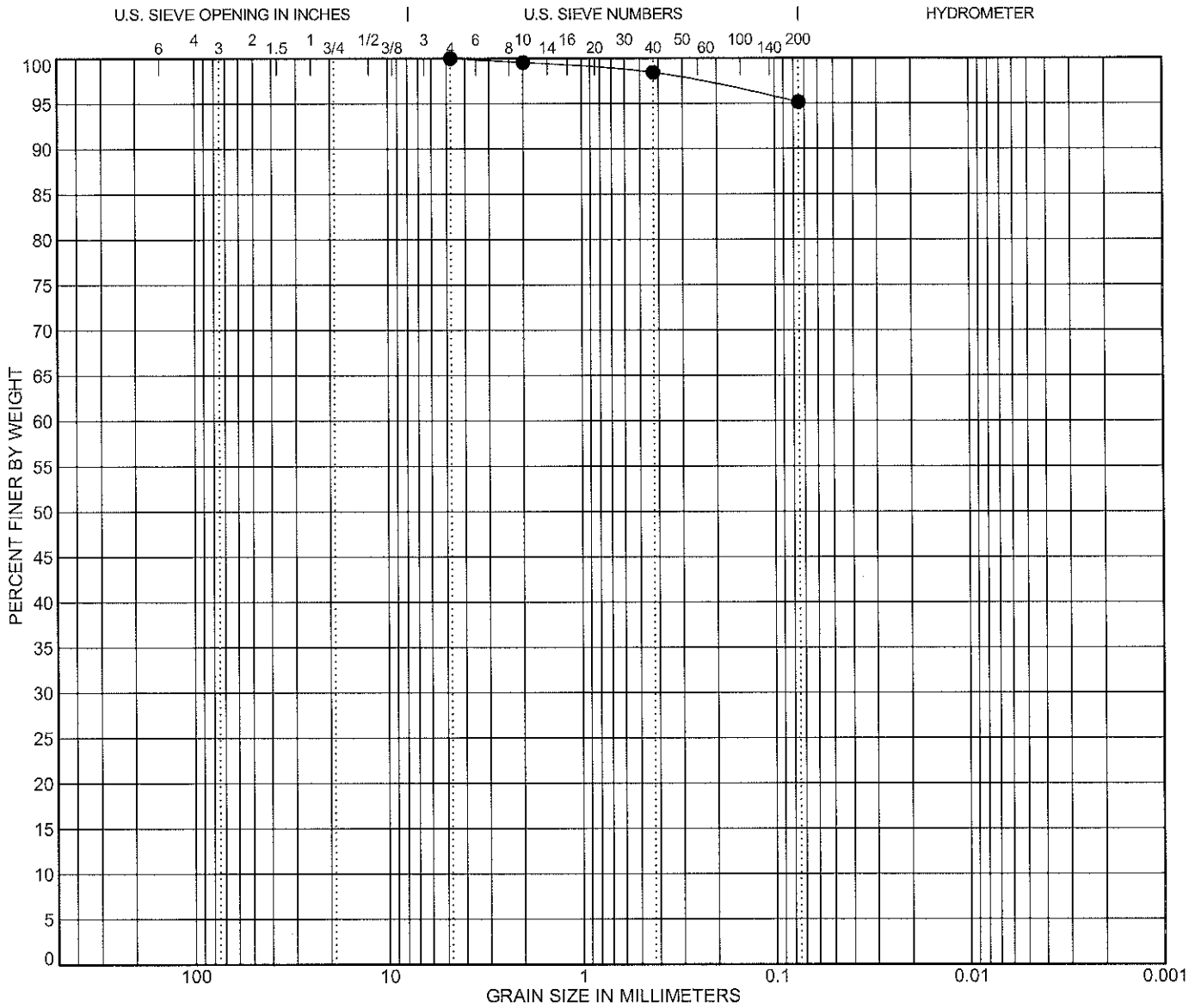
Approx. Surface Elevation: 11.5 feet

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	TYPE	RECOVERY, IN	SPT, BLOWS/FT	CALIBRATED HAND PENETROM., TSF	TORVANE, TSF	MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	FILL: FAT CLAY dark gray, gray and reddish brown, very soft to soft, high to very high plasticity, moist to wet	1	CH	ST	14		0.25	0.3	38		59	20	39	95			
		2															
		3		ST	10		0.25	0.15	81	58	96	27	69	97			
		4															
		5		ST	9		0.5	0.3	31								
		6															
		7		ST	11		0.5	0.25	32								
		8															
		9		ST	10		0.5	0.4	24								
	1.5 10.0	10															
	FAT CLAY dark gray, reddish brown, light brown and light gray, very soft to medium stiff, very high plasticity, wet	11	CH	ST	17		0.25	0.2	79	55	110	32	78	100			
		12															
		13		ST	5		1.0		30								
		14															
		15		ST	3		0.25	0.2	39								
		16															
		17		ST	5		1.0		34								
		18															
		19		ST	4		0.75		32								
	-8.5 20.0	20															
	Boring terminated at 20 feet.																

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: Wet rotary from ground surface due to the presence of surface water ponded.

WATER LEVEL OBSERVATIONS				
▽	▼	Terracon	DATE DRILLED 3/17/2010	Page 1 of 1
▼	▼		PROJECT NUMBER 92105186-A	09-B87
				EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **09-B87**	**0.0**	**FAT CLAY(CH)**	**59**	**20**	**39**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **09-B87**	**0.0**		**100**	**99.5**	**98.4**		**95.1**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **09-B87**	**0.0**	**4.75**				**0.0**	**4.9**	**95.1**	

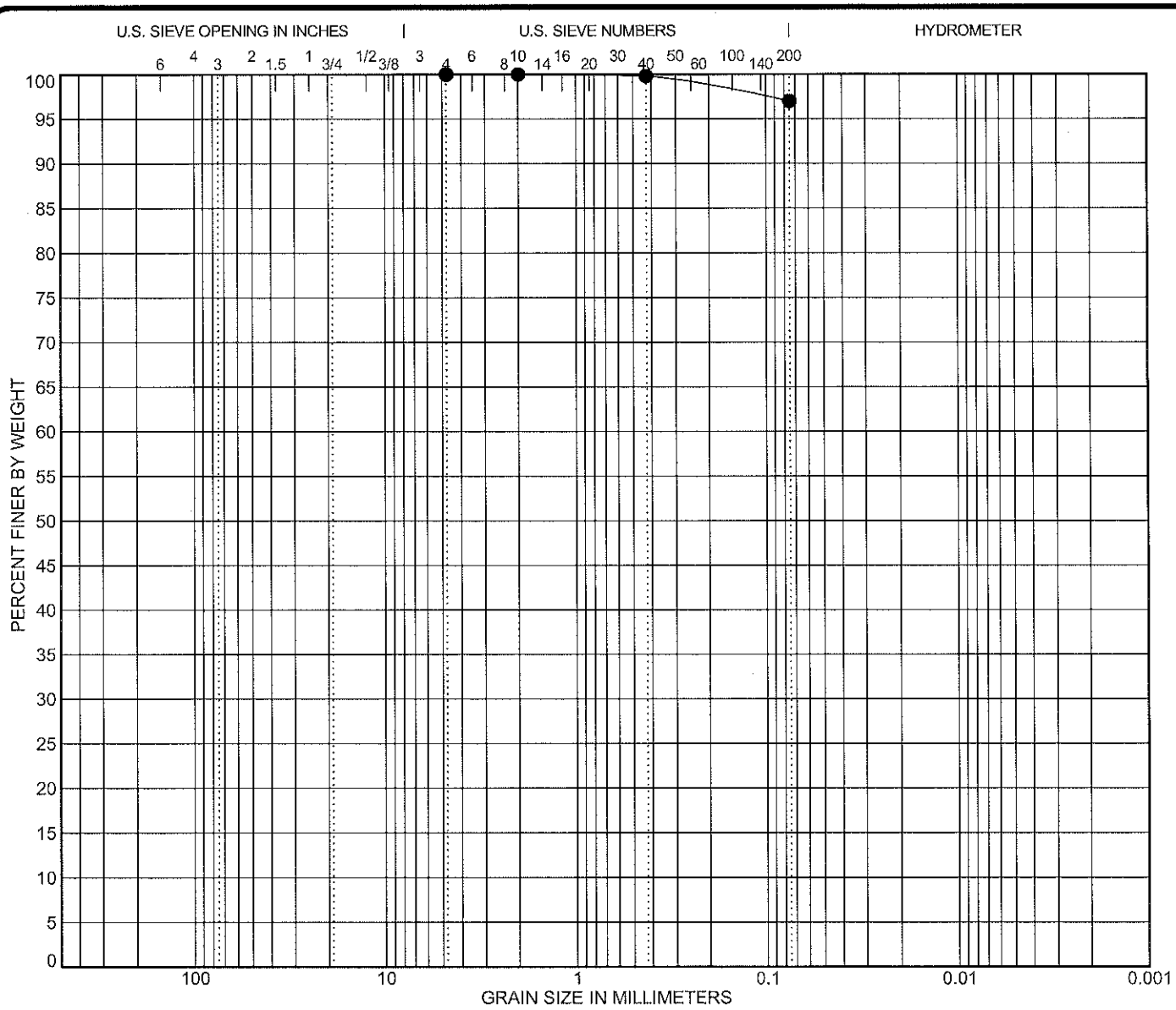
GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
Baytown, Texas
Project Number 92105186-A

Terracon

Terracon Consultants, Inc.
11555 Clay Road, Suite 100
Houston, Texas 77043
Telephone: 713-690-8989
Fax: 713-690-8787

EXHIBIT



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B87**	**2.0**	**FAT CLAY(CH)**	**96**	**27**	**69**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B87**	**2.0**		**100**	**100**	**99.8**		**97**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B87**	**2.0**	**4.75**				**0.0**	**3.0**	**97.0**	

GRAIN SIZE DISTRIBUTION

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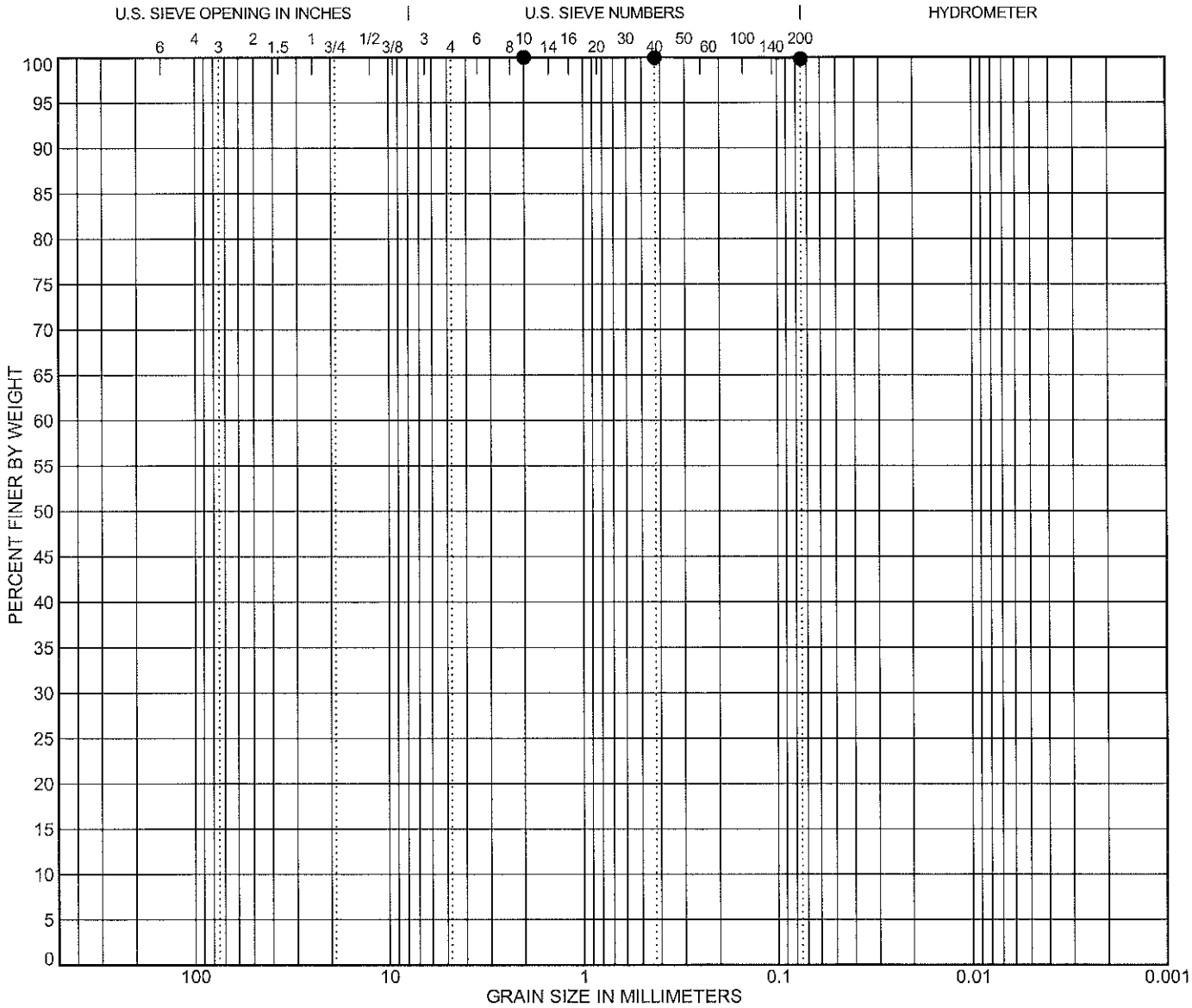

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B87**	**10.0**	**FAT CLAY(CH)**	**110**	**32**	**78**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B87**	**10.0**			**100**	**99.9**		**99.8**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B87**	**10.0**	**2**				**0.0**	**0.2**	**99.8**	

GRAIN SIZE DISTRIBUTION

TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
Baytown, Texas
Project Number 92105186-A

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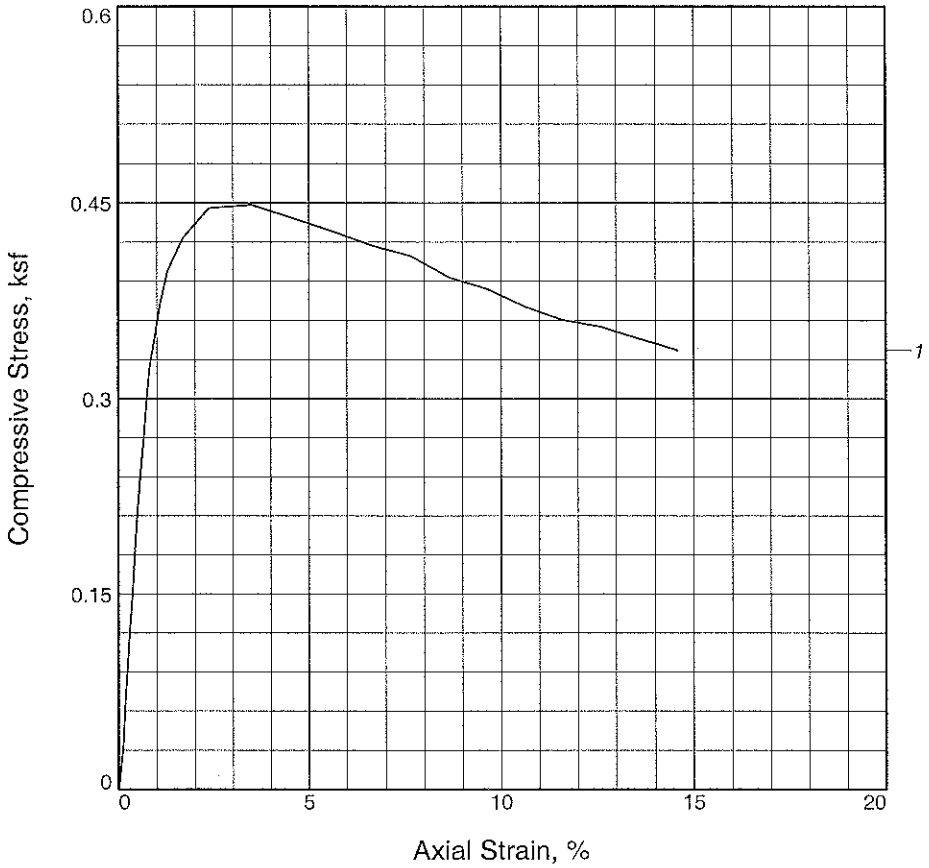
EXHIBIT ¶

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.449			
Undrained shear strength, ksf	0.224			
Failure strain, %	3.5			
Strain rate, in./min.	0.055			
Water content, %	81.0			
Wet density, pcf	104.6			
Dry density, pcf	57.8			
Saturation, %	112.1			
Void ratio	2.0237			
Specimen diameter, in.	2.714			
Specimen height, in.	5.569			
Height/diameter ratio	2.05			

Description: Dark gray Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.80	**Type:** Undisturbed

Project No.: 92105186-B
Date Sampled:

Remarks:
ASTM D2166

Client: USACE

Project: Pipeline Dredging, Cedar Bayou and Anahuac Channel, PA 16. Contract no. W912HY-09-D-0021, Task Order No. 0012
Location: 09-B87
Sample Number: 2 **Depth:** 2-4 ft.

UNCONFINED COMPRESSION TEST
Terracon, Inc.
Houston, TX

UNCONFINED COMPRESSION TEST

11/5/2010

Date:
Client: USACE
Project: Pipeline Dredging, Cedar Bayou and Anahuac Channel, PA 16.
Contract no. W912HY-09-D-0021, Task Order No. 0012
Project No.: 92105186-B
Location: 09-B87
Depth: 2-4 ft. **Sample Number:** 2
Description: Dark gray Clay
Remarks: ASTM D2166
Type of Sample: Undisturbed
Assumed Specific Gravity=2.80 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	137.590
Moisture content: Dry soil+tare, gms.	98.430
Moisture content: Tare, gms.	50.080
Moisture, %	81.0
Moist specimen weight, gms.	884.86
Diameter, in.	2.714
Area, in.^{2}	5.785
Height, in.	5.569
Wet density, pcf	104.6
Dry density, pcf	57.8
Void ratio	2.0237
Saturation, %	112.1

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 0.449 ksf **at reading no.** 19

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0010	0.061	0.1	0.0	0.002
2	0.0070	1.388	1.4	0.1	0.035
3	0.0099	2.668	2.7	0.2	0.066
4	0.0136	3.946	3.9	0.2	0.098
5	0.0165	4.908	4.9	0.3	0.122
6	0.0207	6.293	6.3	0.4	0.156
7	0.0236	7.421	7.4	0.4	0.184
8	0.0273	8.659	8.7	0.5	0.214
9	0.0316	9.896	9.9	0.6	0.245
10	0.0359	10.898	10.9	0.6	0.270
11	0.0401	12.045	12.0	0.7	0.298
12	0.0453	13.160	13.2	0.8	0.325
13	0.0524	14.103	14.1	0.9	0.348
14	0.0604	15.146	15.1	1.1	0.373
15	0.0713	16.188	16.2	1.3	0.398

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.0935	17.279	17.3	1.7	0.423
17	0.1318	18.349	18.3	2.4	0.446
18	0.1871	18.623	18.6	3.4	0.448
19	0.1923	18.673	18.7	3.5	0.449
20	0.2089	18.615	18.6	3.8	0.446
21	0.2642	18.418	18.4	4.7	0.437
22	0.3162	18.211	18.2	5.7	0.428
23	0.3715	17.951	18.0	6.7	0.417
24	0.4263	17.809	17.8	7.7	0.409
25	0.4816	17.290	17.3	8.6	0.393
26	0.5364	17.083	17.1	9.6	0.384
27	0.5913	16.657	16.7	10.6	0.371
28	0.6466	16.375	16.4	11.6	0.360
29	0.7014	16.330	16.3	12.6	0.355
30	0.7567	16.091	16.1	13.6	0.346
31	0.8116	15.858	15.9	14.6	0.337

Project name: TO-0012 Pipeline Dredging, Volume I, Cedar Bayou PA 6 | Client: USACE, Galveston District | Terracon Project # : 92105186-A

Boring	Depth	Field tests			Atterberg Limits			Grain Size Analysis														USCS Symbol (ASTM 2487)	Wc	γd	Strength tests																				
								Percent Pasing Sieve																	Direct Shear Test					Unconfined Compression				UU Triaxial Test				CU Triaxial Test						
		PP	TV	SPTn	LL	PL	PI	3/4"	3/8"	4	8	10	16	20	30	40	50	70	100	140	200				C	φ	Wc	γd	Symbol	C	Wc	γd	Symbol	C	Wc	γd	Symbol	C	φ	c'	φ'	Wc	γd	Symbol
	ft	tsf	tsf	bl/ft	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%		%	pcf	ksf	°	%	pcf		ksf	%	pcf		ksf	%	pcf		ksf	°	ksf	°	%	pcf	
09-B86	0-2	1.75																				CH**	22																						
	2-4	0.50			66	23	43		100	98		96				95					86	CH	23							1.3	23	98	CH**											
	4-6	1.25																				CH**	29																						
	6-8	1.00																				CH**	31																						
	8-10	0.50																				CH**	37																						
	10-12	0.25	0.20		59	20	39		100	97		95				93					86	CH	38											0.5	38	86	CH**							
	12-14	0.00	0.15																			CH**	70																						
	14-16	2.00			58	20	38		100	98		95				92					87	CH	17							3.5	17	112	CL**											
	16-18	1.50																				CL**	20																						
	18-20	1.75										100		100	100	100	100	100	100	99	88	CL*	25																						
	20-22	1.00																				CL**	24																						
	22-24	2.75																				CH**	28																						
	24-26	2.50			93	28	65									100					100	CH	30							2.5	30	92	CH**											
	26-28	2.50																				CH**	32																						
	28-30	2.50																				CH**	33																						
	30-32	3.00																				CH**	35																						
	32-34	1.75																				CH**	35																						
	34-36	2.50																				CH**	38																						
	36-38	2.50			88	28	60									100					100	CH	36	86																				
	38-40	2.00																				CH**	35																						
	40-42	2.25																				CH**	39																						
	42-44	1.50																				CH**	40																						
	44-46	2.25			101	32	69															CH*	41	81																				
	46-48	0.75																				CH**	28																						
	48-50	1.00																				CL**	20																						
	50-52	1.75																				CH**	24																						
	52-54	1.75																				CH**	27																						
	54-56	1.00			42	19	23					100				100					99	CL	29							1.6	29	96	CL**											
	56-58	1.50																				CH**	31																						
	58-60	1.25																				CH**	43																						
	60-62	1.50																				CH**	41																						
	62-64	1.00																				CH**	35																						
	64-66	1.00																				CH**	38																						
09-B87	0-2	0.25	0.30		59	20	39			100		100				98					95	CH	38																						
	2-4	0.25	0.15		96	27	69					100				100					97	CH	81							0.2	81	58	CH**											
	4-6	0.50	0.30																			CH**	31																						
	6-8	0.50	0.25																			CH**	32																						
	8-10	0.50	0.40																			CH**	24																						
	10-12	0.25	0.20		110	32	78					100				100					100	CH	79	55																					
	12-14	1.00																				CH**	30																						
	14-16	0.25	0.20																			CH**	39																						
	16-18	1.00																				CH**	34																						
	18-20	0.75																				CH**	32																						
09-B88	0-2	0.25	0.25																			CH**	48																						
	2-4	0.25	0.20		114	27	87					100				100					98	CH	78	53																					
	4-6	0.25	0.25																			CH**	72																						
	6-8	0.25	0.35																			CH**	49																						
	8-10	0.25	0.10																			CH**	43																						
	10-12	0.25	0.10		83	27	56									100					100	CH	86							0.2	86	52	CH**											
	12-14	1.25																				CH**	37																						
	14-16	2.00																				CH**	19																						
	16-18	2.00			54	17	37		100	100		99				97					96	CH	20	108																					
	18-20	1.50																				CH**	23																						