BORING LOG NO. 09-B97

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13827302 E: 3260605	SITE:	Cedar Bayou PA6 Baytown, Texas

Approx. Surface Elevation: 13.5 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
	FAT CLAY dark gray and light brown, soft to very stiff, very high plasticity, moist - with roots 0 to 4 feet - with ferrous stains and calcareous nodules below 2 feet	1	CH	ST	10		0.5		46	74	88	33	55	95			
		2															
		3		ST	6		0.5		39								
		4															
		5		ST	7		0.5		43								
		6															
		7		ST	14		1.5		30								
		8															
		9		ST	12		2.5		24								
		10															
		11		ST	12		2.25		29	96	81	25	56	99			
		12															
		13		ST	17		0.5		23								
	-0.5 14.0	14															
	SANDY LEAN CLAY light brown and light gray, medium stiff, slight plasticity, moist	15	CL	ST	8	8			27								
		16															
		17		ST	8	7			24		29	20	9	69			
		18															
		19		ST	0												
	-6.5 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: **Dry augered to 14 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
▽ 12 ft	WD	▼ 10.5 ft	at 5 min
▼ 8.5 ft	at 10 min	▼ 8 ft	at 15 min

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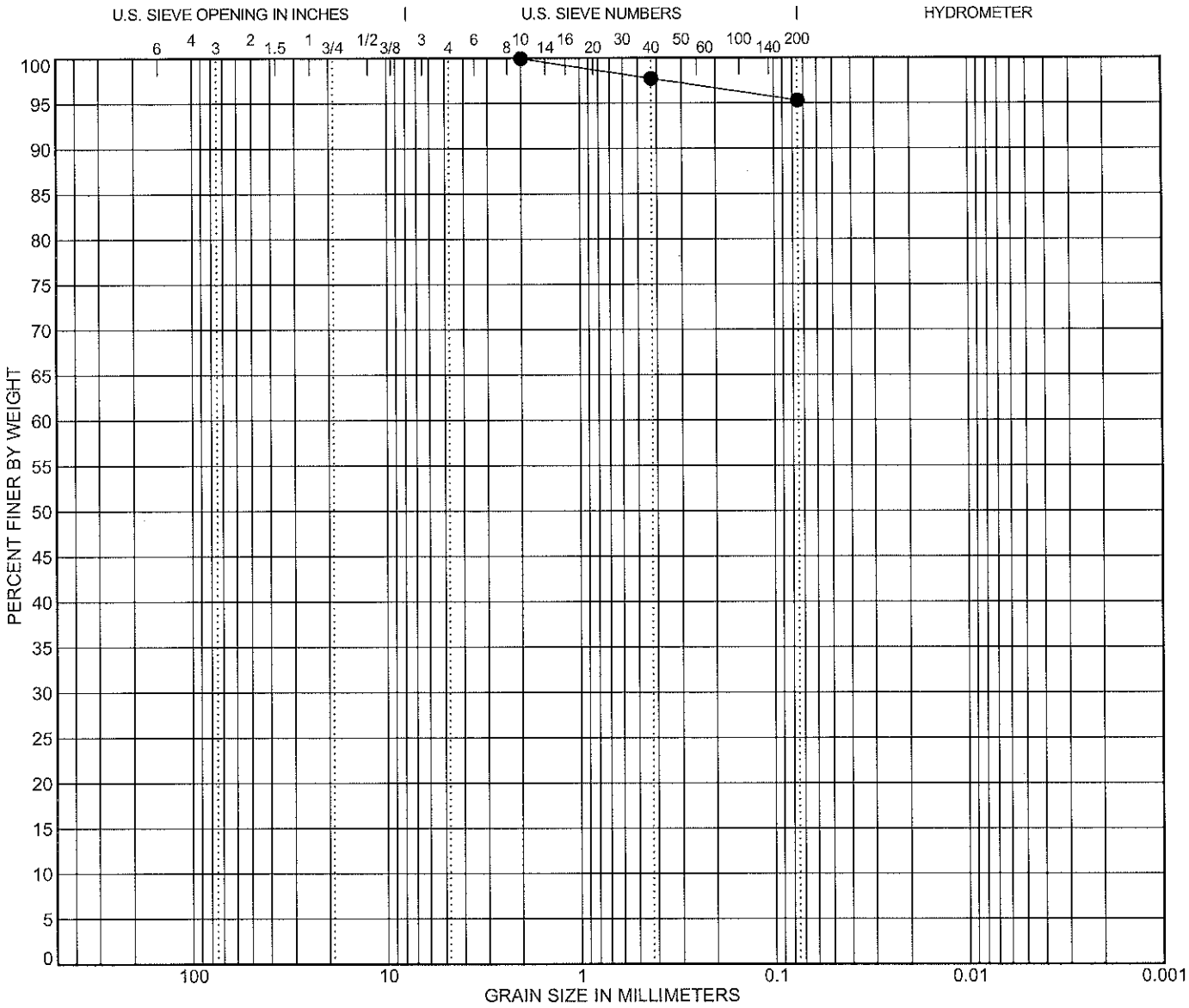
DATE DRILLED	Page 1 of 1
3/23/2010	09-B97
PROJECT NUMBER 92105186-A	EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B97	0.0	**FAT CLAY(CH)**	**88**	**33**	**55**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● 09-B97	0.0			**99.9**	**97.7**		**95.3**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 09-B97	0.0	**2**				**0.0**	**4.6**	**95.3**	

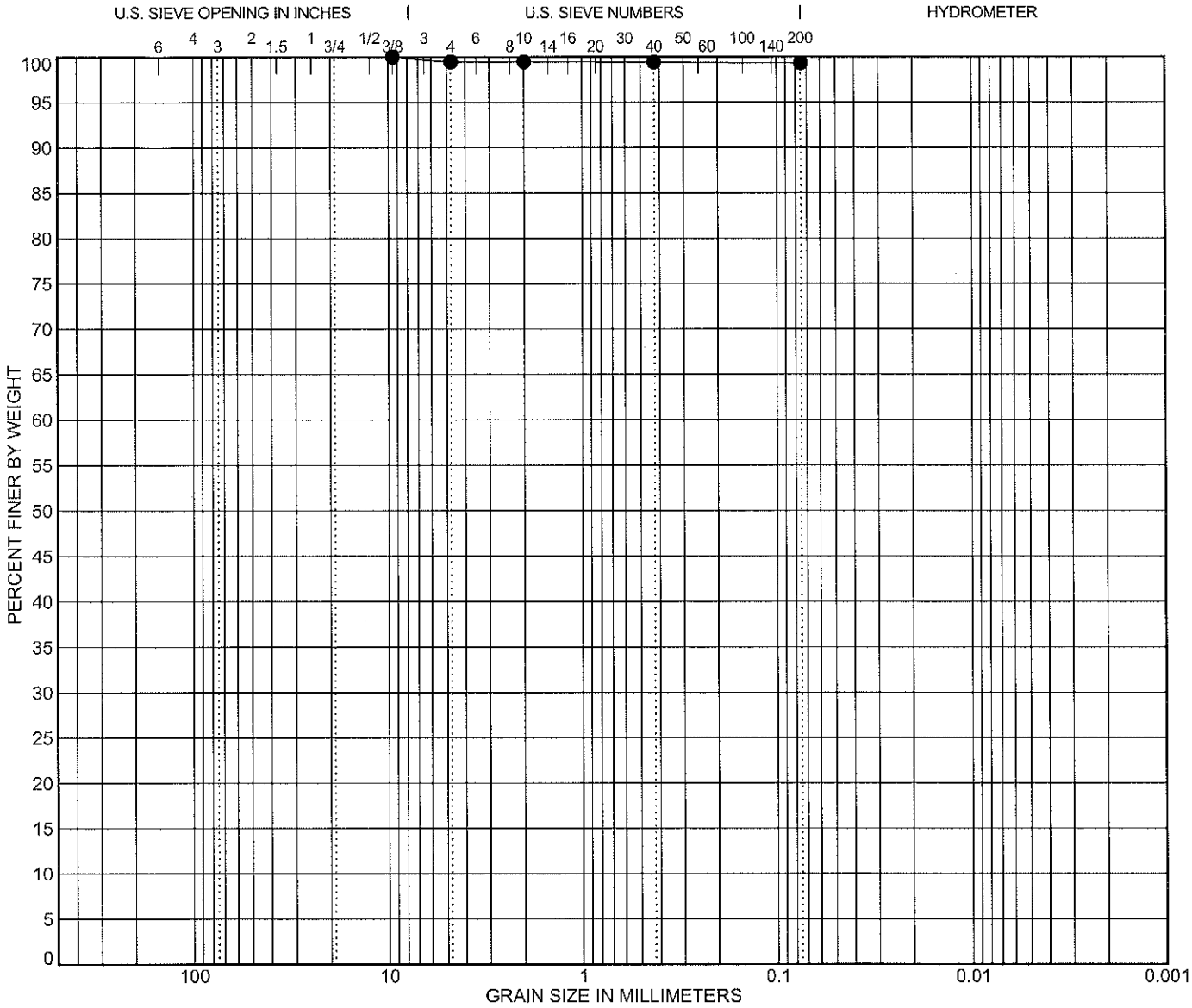
GRAIN SIZE DISTRIBUTION

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 Ô



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B97**	**10.0**	**FAT CLAY(CH)**	**81**	**25**	**56**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B97**	**10.0**	**100**	**99.5**	**99.5**	**99.4**		**99.3**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B97**	**10.0**	**9.5**				**0.5**	**0.1**	**99.3**	

GRAIN SIZE DISTRIBUTION

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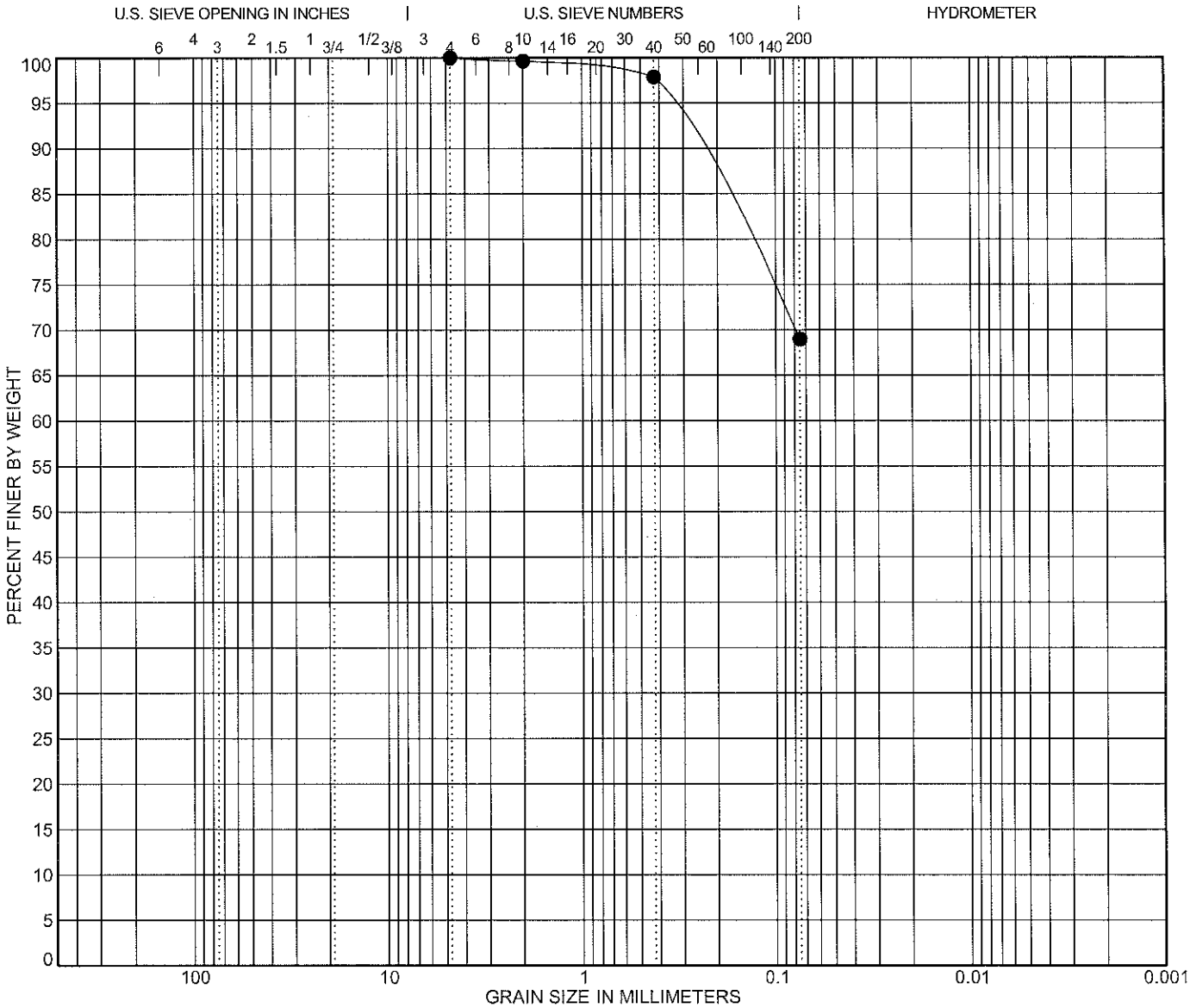

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B97**	**16.5**	**SANDY LEAN CLAY(CL)**	**29**	**20**	**9**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B97**	**16.5**		**100**	**99.6**	**97.9**		**69**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B97**	**16.5**	**4.75**				**0.0**	**31.0**	**69.0**	

GRAIN SIZE DISTRIBUTION

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

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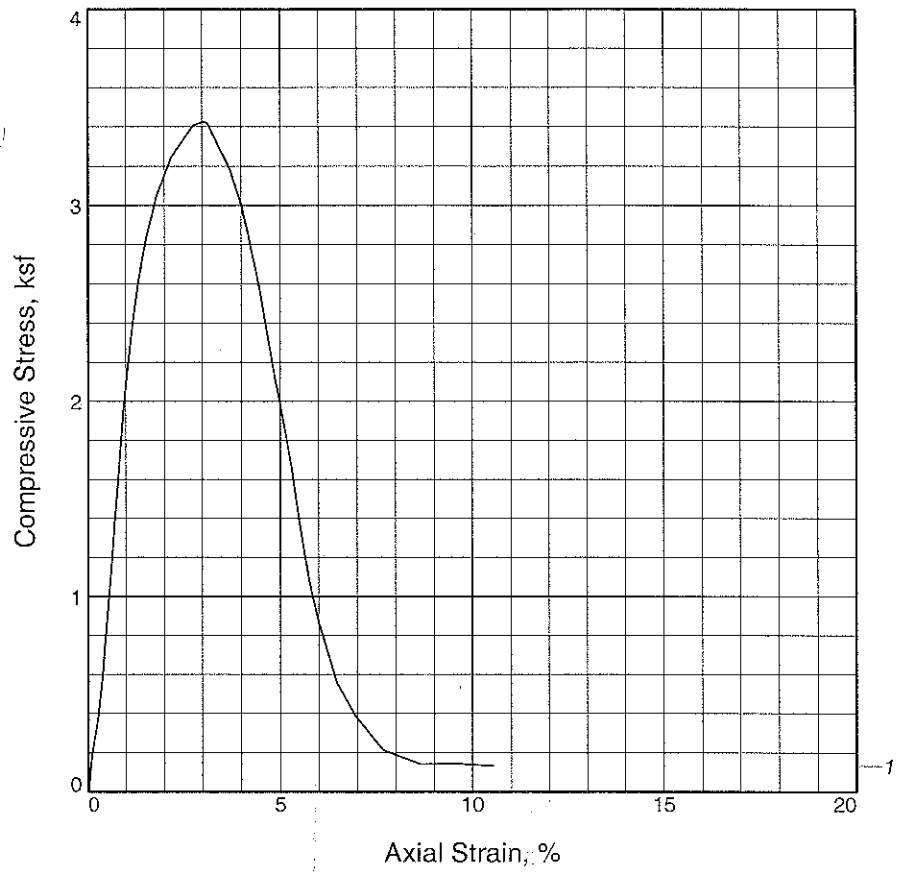
EXHIBIT Ö

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	3.427			
Undrained shear strength, ksf	1.713			
Failure strain, %	3.0			
Strain rate, in./min.	0.055			
Water content, %	29.5			
Wet density, pcf	123.9			
Dry density, pcf	95.7			
Saturation, %	102.2			
Void ratio	0.7934			
Specimen diameter, in.	2.729			
Specimen height, in.	5.771			
Height/diameter ratio	2.11			

Description: Brown and light gray Fat Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**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-B97

Sample Number: 6 **Depth:** 10-12 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-B97
Depth: 10-12 ft. **Sample Number:** 6
Description: Brown and light gray Fat Clay
Remarks: ASTM D2166
Type of Sample: undisturbed
Assumed Specific Gravity=2.75 **LL=** **PL=** **PI=**

Parameters for Specimen No. 1

Specimen Parameter	Initial
Moisture content: Moist soil+tare, gms.	166.890
Moisture content: Dry soil+tare, gms.	140.370
Moisture content: Tare, gms.	50.410
Moisture, %	29.5
Moist specimen weight, gms.	1098.27
Diameter, in.	2.729
Area, in.^{2}	5.849
Height, in.	5.771
Wet density, pcf	123.9
Dry density, pcf	95.7
Void ratio	0.7934
Saturation, %	102.2

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 3.427 ksf **at reading no.** 18

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0110	0.000	0.0	0.0	0.000
1	0.0120	0.300	0.3	0.0	0.007
2	0.0165	7.017	7.0	0.1	0.173
3	0.0259	14.847	14.8	0.3	0.365
4	0.0330	23.564	23.6	0.4	0.578
5	0.0382	32.519	32.5	0.5	0.797
6	0.0425	39.728	39.7	0.5	0.973
7	0.0481	48.871	48.9	0.6	1.195
8	0.0519	56.578	56.6	0.7	1.383
9	0.0604	71.216	71.2	0.9	1.738
10	0.0656	80.597	80.6	0.9	1.965
11	0.0713	88.680	88.7	1.0	2.160
12	0.0770	96.084	96.1	1.1	2.338
13	0.0878	107.835	107.8	1.3	2.619
14	0.0987	116.648	116.6	1.5	2.828
15	0.1153	126.287	126.3	1.8	3.053

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1375	134.857	134.9	2.2	3.247
17	0.1706	142.263	142.3	2.8	3.405
18	0.1866	143.570	143.6	3.0	3.427
19	0.1923	143.288	143.3	3.1	3.417
20	0.2254	134.366	134.4	3.7	3.185
21	0.2419	126.914	126.9	4.0	2.999
22	0.2585	116.393	116.4	4.3	2.743
23	0.2693	108.759	108.8	4.5	2.558
24	0.2887	92.744	92.7	4.8	2.173
25	0.3024	82.723	82.7	5.1	1.934
26	0.3161	71.602	71.6	5.3	1.670
27	0.3299	57.806	57.8	5.5	1.344
28	0.3436	45.943	45.9	5.8	1.066
29	0.3573	37.457	37.5	6.0	0.867
30	0.3847	24.128	24.1	6.5	0.556
31	0.4126	16.875	16.9	7.0	0.387
32	0.4537	9.378	9.4	7.7	0.213
33	0.5085	6.330	6.3	8.6	0.142
34	0.5638	6.422	6.4	9.6	0.143
35	0.6187	6.015	6.0	10.5	0.132

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-B94	0-2	0.00	0.30																			CH**	60																						
	2-4	0.25	0.05		62	21	41			100		100				100					83	CH	45							0.2	45	78	CH**											
	4-6	0.25	0.30		113	33	80					100				100			99		99	OH	60																						
	6-8	0.25	0.30																			CH**	48																						
	8-10																					CL**	39																						
	10-12	0.25	0.05		48	18	30					100				99					85	CL	39	83																					
	12-14	0.25	0.10																			OH**	78																						
	14-16	1.00																				CL**	26																						
	16-18	0.50																				CL**	33																						
	18-20	0.25	0.30																			CH**	42																						
09-B95	0-2	0.25	0.20		96	28	68					100				100					95	CH	51							0.3	51	68	CH**											
	4-6	0.25	0.15																			CH**	48																						
	6-8	0.25	0.30																			CH**	31																						
	8-10	0.25	0.20		51	18	33					100	100	100	100	100	100	99	98	94	94	CH	54											0.5	54	71	CH**							
	10-12	0.25	0.05																			CH**	47																						
	12-14	0.50																				CH**	35																						
	14-16	1.50																				CH**	30																						
	16-18	1.00			67	19	48					100				100					97	CH	33							1.0	33	91	CH**											
	18-20	0.50																				CH**	35																						
09-B96	0-2	0.25	0.25																			CH**	37																						
	2-4	0.75			83	23	60					100				100					90	CH	41							0.8	41	84	CH**											
	4-6	0.50																				CL-ML**	55																						
	6-8				26	20	6					100	100	100	100	100	99	98	86	51	50	CL-ML	26																						
	10-12	0.50																				CL**	32																						
	12-14	0.75			55	18	37					100				99					88	CH	25	97																					
	14-16	1.75																				CH**	23																						
	16-18	0.75							100	95		93				91					72	CL*	26																						
	18-20	0.75																				CL**	29																						
09-B97	0-2	0.50			88	33	55			100		100				98					95	CH	46	74																					
	2-4	0.50																				CH**	39																						
	4-6	0.50																				CH**	43																						
	6-8	1.50																				CH**	30																						
	8-10	2.50																				CH**	24																						
	10-12	2.25			81	25	56		100	100		100				99					99	CH	29							1.7	29	96	CH**											
	12-14	0.50																				CH**	23																						
	14-16			8																		CL**	27																						
	16-18			7	29	20	9			100		100				98					69	CL	24																						

NOTES:

USCS Symbol - Classification based on laboratory test results.

USCS Symbol* - Classification based partially on laboratory test results together with visual description.

USCS Symbol** - Classification based only on visual descriptions.