BORING LOG NO. 09-B82

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13827150 E: 3260243	SITE:	Cedar Bayou PA6 Baytown, Texas

Approx. Surface Elevation: 14.8 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 brown and gray, stiff, high plasticity, moist 11.3 — 3.5	1	CH	ST	5		1.5		23								
		3		ST	13		1.5		26	99	51	17	34	89			
	FAT CLAY dark gray, black and reddish brown, stiff to very stiff, very high plasticity, moist - with roots 3.5 to 6 feet - with slickensides 6 to 8 feet 0.8 — 14.0	4	CH														
		5		ST	22		4.0		29								
		7		ST	13		1.5		40								
		9		ST	11		1.5		40	79	92	29	63				
		11		ST	8		1.5		34								
		13		ST	12		1.75		27								
	LEAN CLAY light reddish brown and light gray, soft to stiff, medium plasticity, wet, with silt and sand seams - with calcareous nodules 14 to 16 feet -5.2 — 20.0	15	CL	ST	10		2.0		21	107	38	18	20	98			
		17		ST	12		0.5		22								
		19		ST	14		0.75		23	101	32	20	12	93			
	FAT CLAY reddish and yellowish brown, greenish gray and dark greenish gray, very stiff to hard, very high plasticity, moist - with silt seams 20 to 26 feet - soft 24 to 26 feet - with sand pockets 26 to 38 feet	21	CH	ST	17		1.75		27								
		23		ST	6		0.75		26		83	26	57	88			
		25		ST	8		0.5		27								
		27		ST	19		1.25		28								
		29		ST	16		2.5		32								
		31		ST	17		2.25		31								
		33		ST	4		2.0		39								
		34															

Continued Next Page

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

REMARKS: Dry augered to 18 feet; wet rotary thereafter.

WATER LEVEL OBSERVATIONS			
▽ 18 ft	WD	▼ 14 ft	at 5 min
▼ 12.5 ft	at 10 min	▼ 10 ft	at 15 min

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DATE DRILLED	Page 1 of 2
3/26/2010	09-B82
PROJECT NUMBER	EXHIBIT A-
92105186-A	

BORING LOG NO. 09-B82

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume I
BORING LOCATION:	N: 13827150 E: 3260243	SITE:	Cedar Bayou PA6 Baytown, Texas

Approx. Surface Elevation: 14.8 feet

Graphic Log	DESCRIPTION	DEPTH, FEET	USCS SYMBOL	SAMPLES: TYPE	RECOVERY, IN	SPT, BLOWS/FT	CALIBRATED HAND PENETROM., TSF	TORVANE, TSF	TESTS: MOISTURE CONTENT, %	DRY DENSITY, PCF	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	MINUS #200 SIEVE, %	COMPRESSIVE STRENGTH, TSF	FAILURE STRAIN, %	CONFINING PRESSURE, PSI
	FAT CLAY reddish and yellowish brown, greenish gray and dark greenish gray, very stiff to hard, very high plasticity, moist - with slickensides 36 to 40 feet	35		ST	14		2.5		35	89	104	30	74	100			
		36															
		37		ST	10		2.0		37								
		38															
		39		ST	20		1.5		38								
		40															
		41		ST	21		2.5		38								
		42															
		43		ST	4		2.0		39								
		44															
		45		ST	21		2.0		42	79	104	33	71				
		46															
		47		ST	4		1.75		39								
		48															
		49		ST	20		1.5		20								
		50															
		51		SS	18	12			25								
		52															
	-39.2 54.0	53		ST	12		2.25		30	95	71	24	47	96			
	LEAN CLAY w/ SAND gray and dark gray, soft to medium stiff, medium to high plasticity, moist, with interbedded sand layers and seams	54															
		55	CL	ST	13		0.5		24								
		56															
		57		ST	20		0.5		28								
		58															
		59		ST	9		0.75		25	101	40	18	22	76			
		60															
		61		ST	13		1.0		24								
	-47.2 62.0	62															
	SILTY, CLAYEY SAND dark gray, medium dense, slight to medium plasticity, fine grain, some cohesion, with clay and silt seams	63	SC-SM	SS	15	12			26								
	-50.2 65.0	64															
		65		SS	8	14			16								
	Boring terminated at 65 feet.																

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

REMARKS: **Dry augered to 18 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
▽ 18 ft	WD	▼ 14 ft	at 5 min
▼ 12.5 ft	at 10 min	▼ 10 ft	at 15 min

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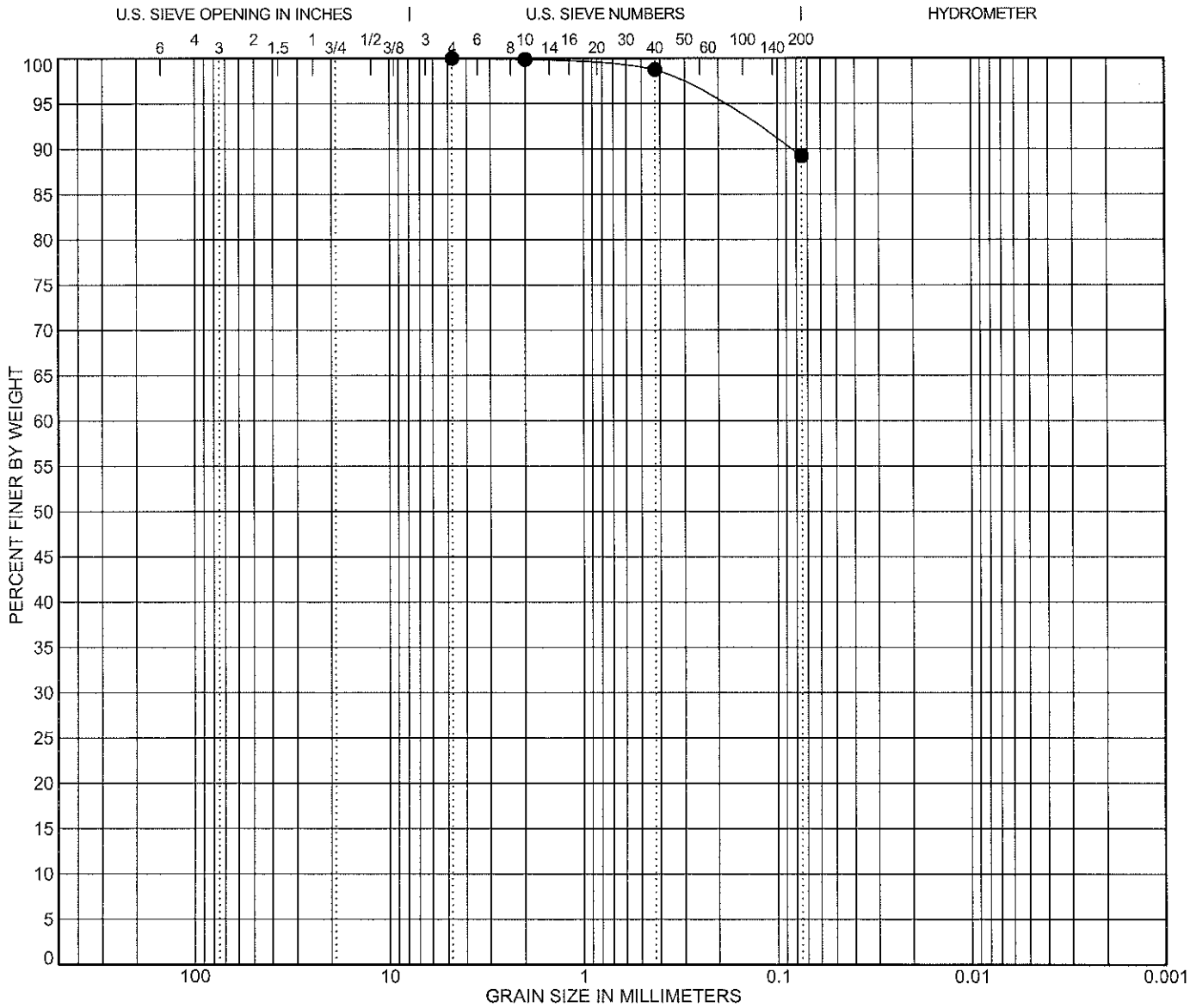
DATE DRILLED	Page 2 of 2
3/26/2010	09-B82
PROJECT NUMBER 92105186-A	EXHIBIT A-



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B82**	**2.0**	**FAT CLAY(CH)**	**51**	**17**	**34**		

	Percent Passing the Indicated Sieve						
	Specimen Identification	3/8"	#4	#10	#40	#100	#200
●	**09-B82 2.0**		**100**	**99.9**	**98.7**		**89.2**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B82**	**2.0**	**4.75**				**0.0**	**10.8**	**89.2**	

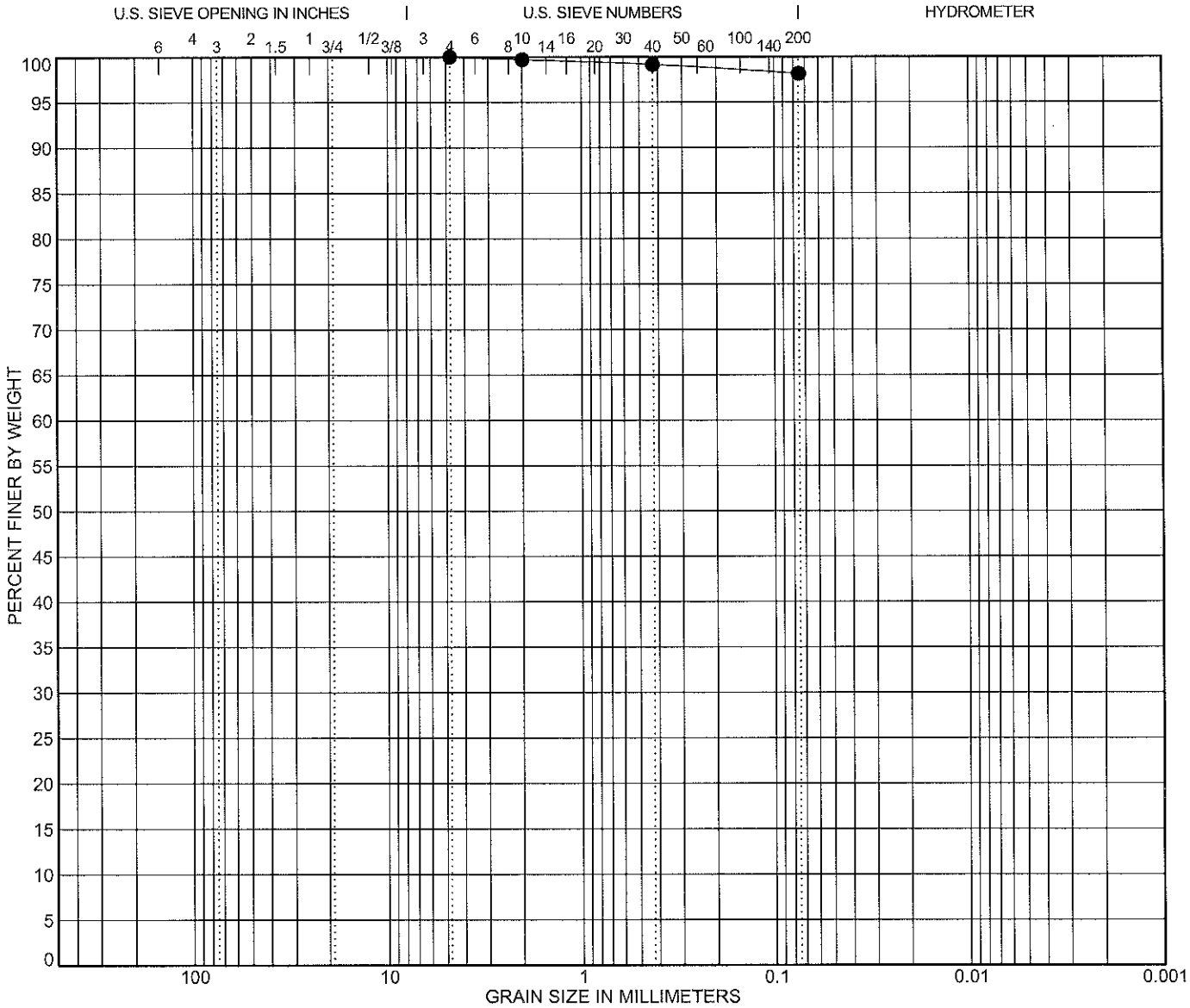
GRAIN SIZE DISTRIBUTION

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-B82**	**14.0**	**LEAN CLAY(CL)**	**38**	**18**	**20**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B82**	**14.0**		**100**	**99.7**	**99.2**		**98.1**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B82**	**14.0**	**4.75**				**0.0**	**1.9**	**98.1**	

GRAIN SIZE DISTRIBUTION

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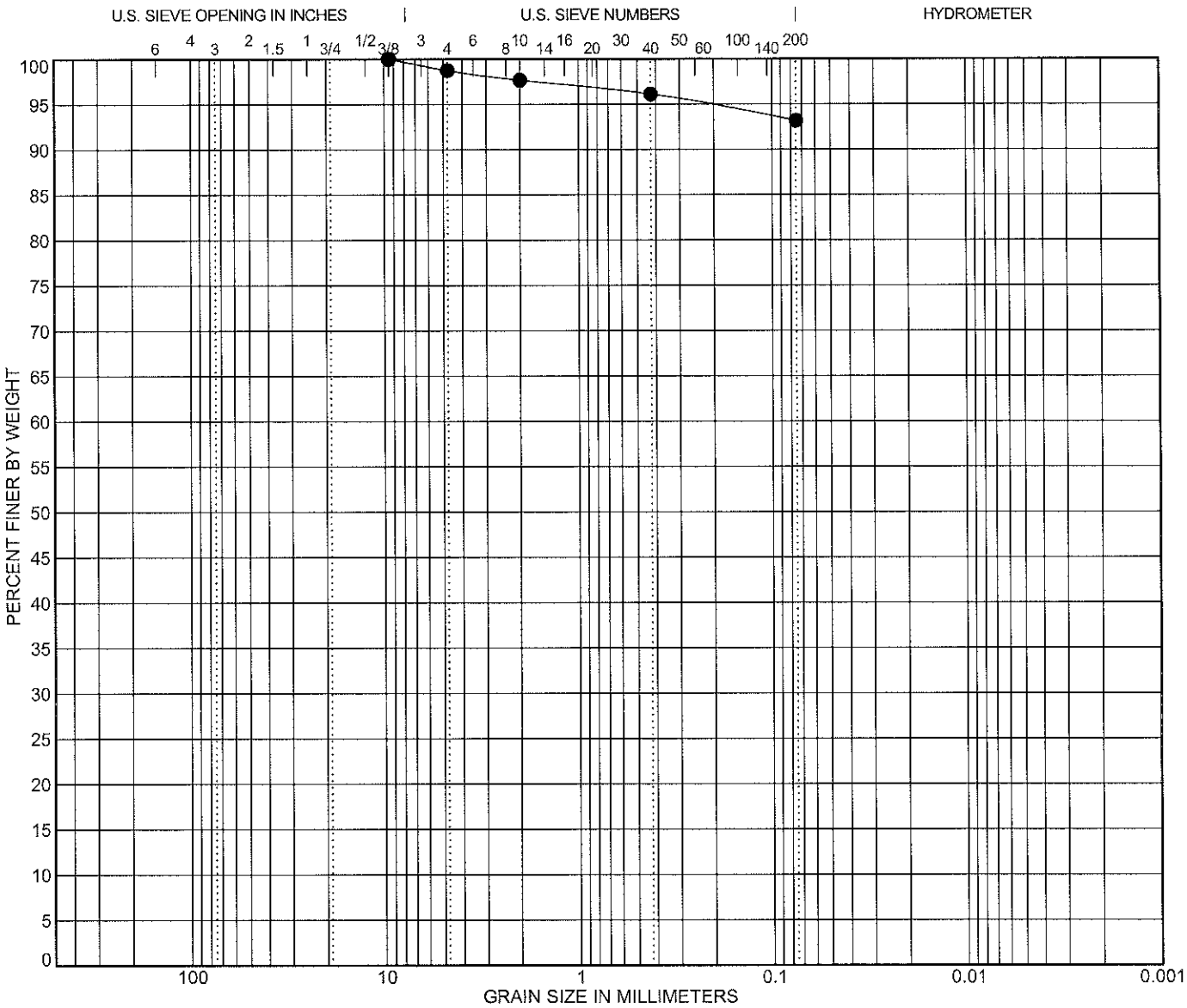

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **09-B82**	**18.0**	**LEAN CLAY(CL)**	**32**	**20**	**12**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **09-B82**	**18.0**	**100**	**98.7**	**97.7**	**96.1**		**93.2**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **09-B82**	**18.0**	**9.5**				**1.3**	**5.6**	**93.2**	

GRAIN SIZE DISTRIBUTION

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Baytown, Texas
Project Number 92105186-A

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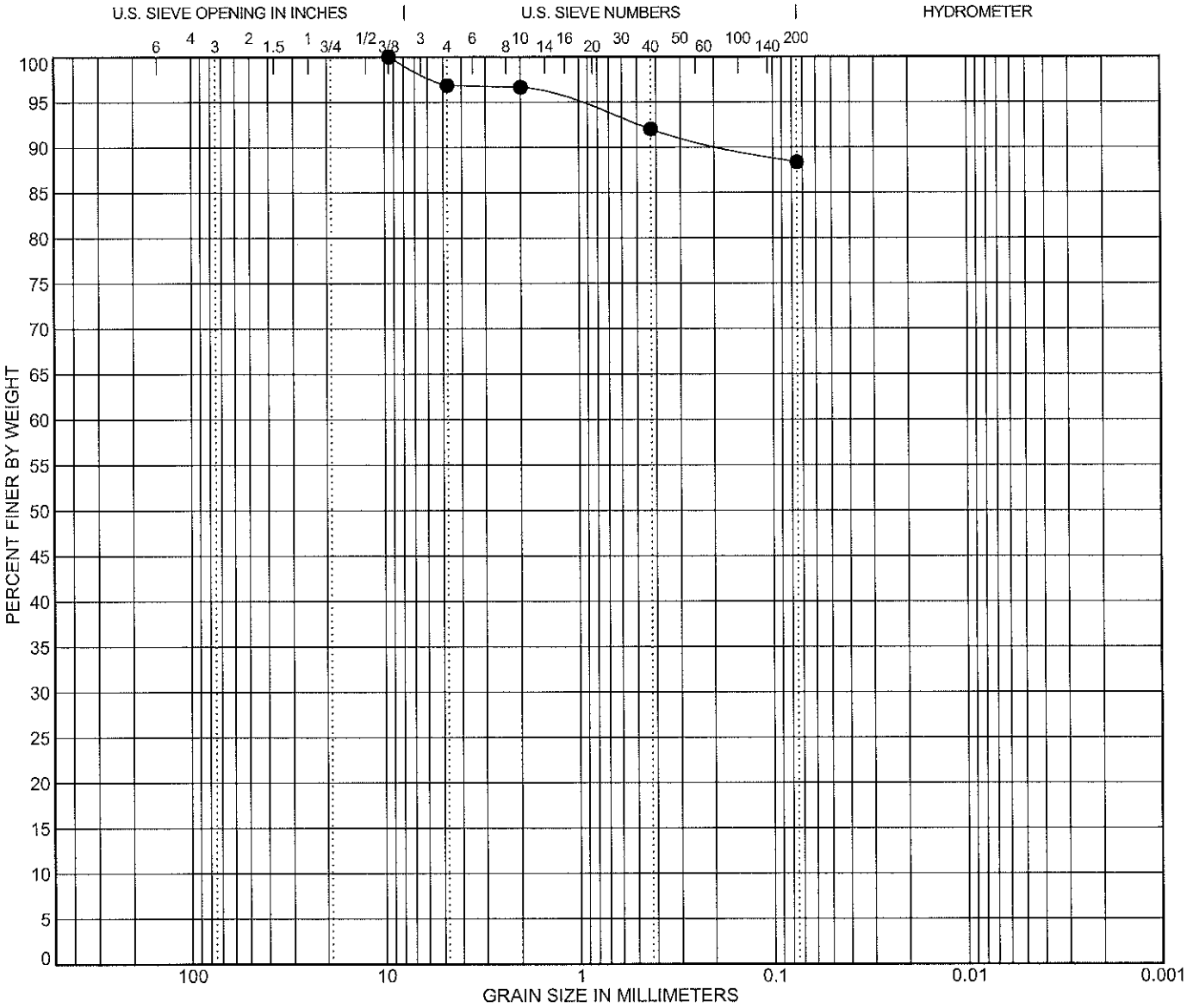

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B82	22.0	**FAT CLAY(CH)**	**83**	**26**	**57**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● 09-B82	22.0	**100**	**96.9**	**96.7**	**92**		**88.4**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 09-B82	22.0	**9.5**				**3.1**	**8.5**	**88.4**	

GRAIN SIZE DISTRIBUTION

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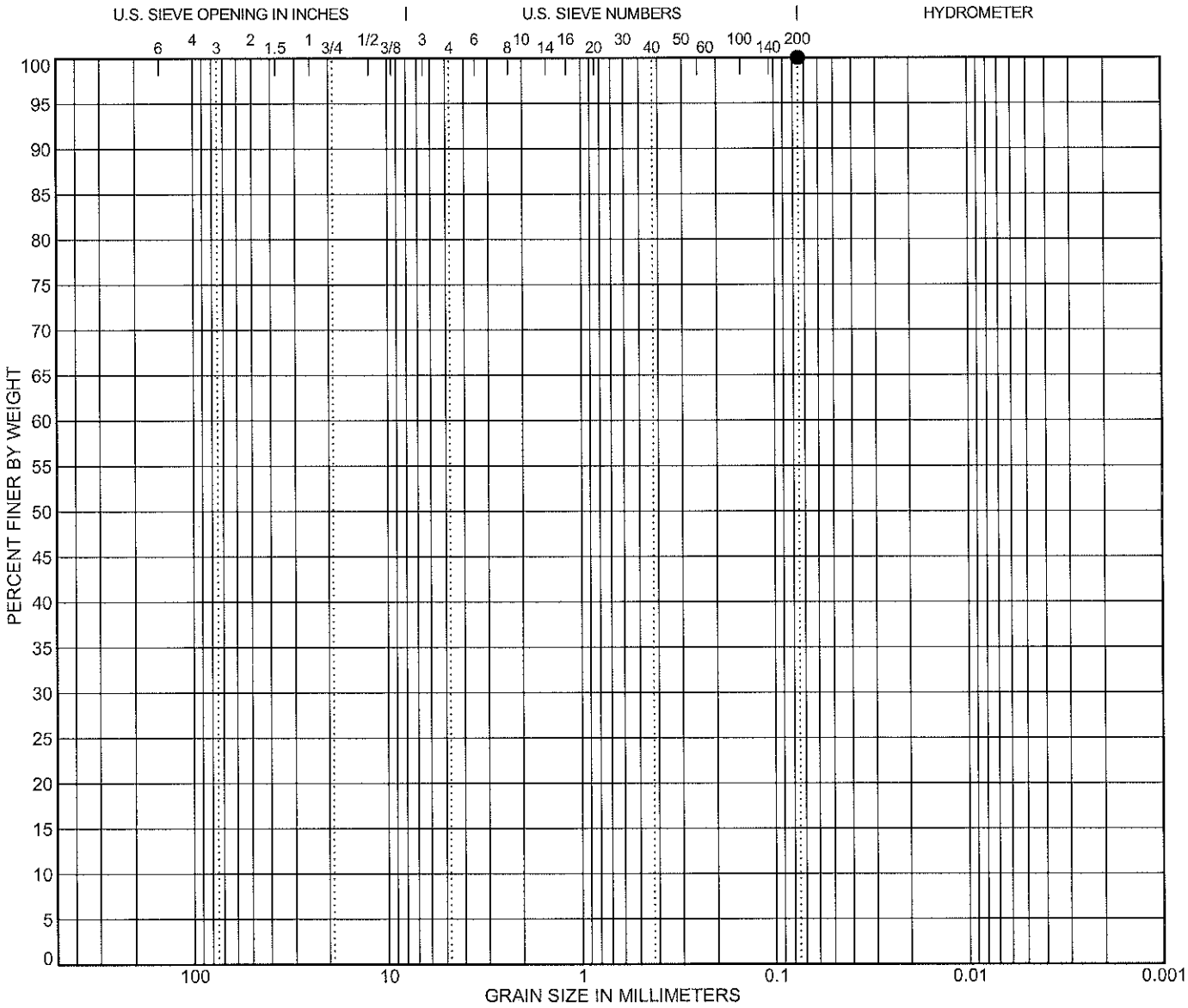

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **09-B82**	**34.0**	**FAT CLAY(CH)**	**104**	**30**	**74**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **09-B82**	**34.0**						**100**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **09-B82**	**34.0**	**0.075**				**0.0**	**0.0**	**100.0**	

GRAIN SIZE DISTRIBUTION

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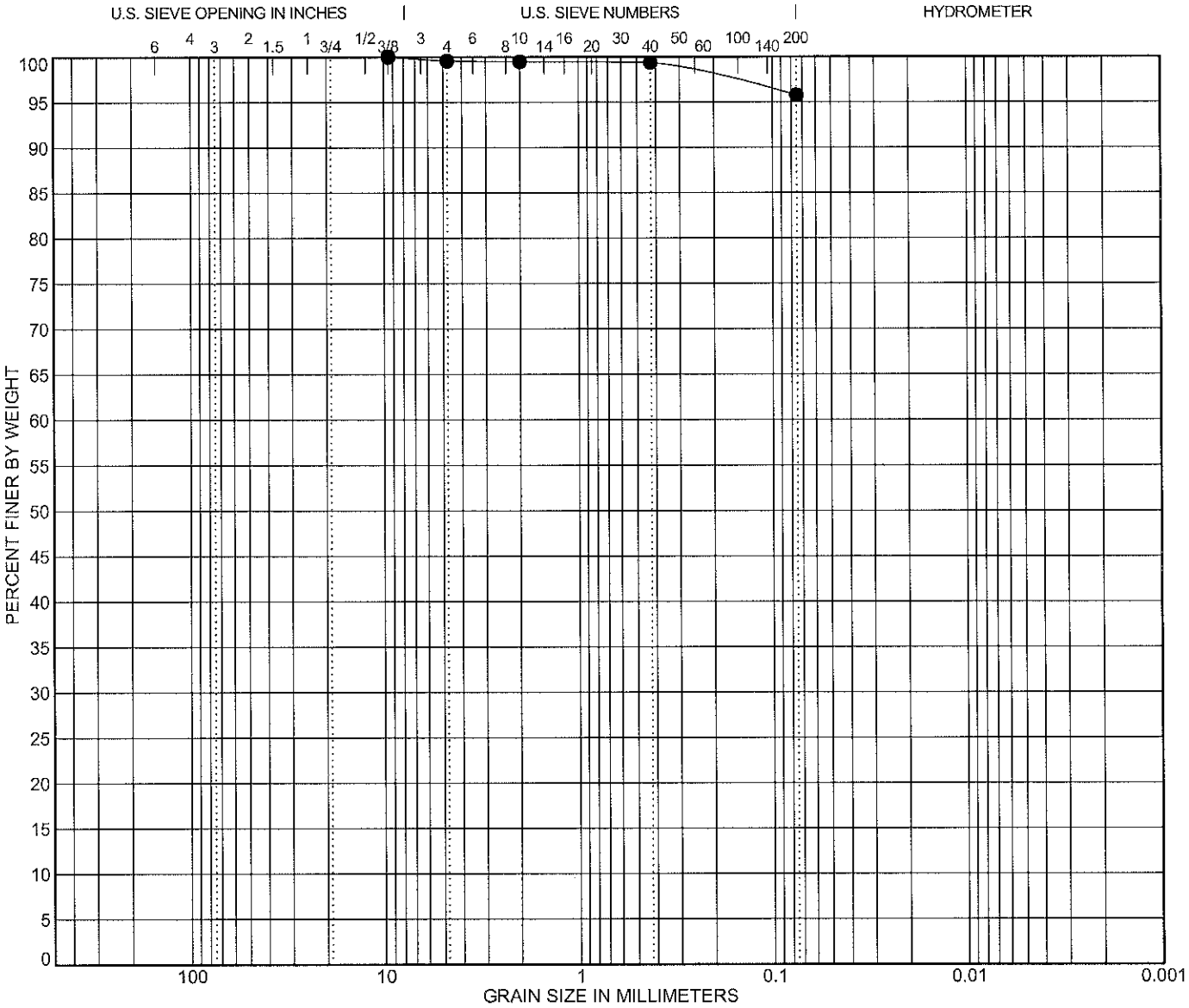

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● 09-B82	52.0	**FAT CLAY(CH)**	**71**	**24**	**47**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● 09-B82	52.0	**100**	**99.6**	**99.5**	**99.4**		**95.8**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 09-B82	52.0	**9.5**				**0.4**	**3.8**	**95.8**	

GRAIN SIZE DISTRIBUTION

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Project Number 92105186-A

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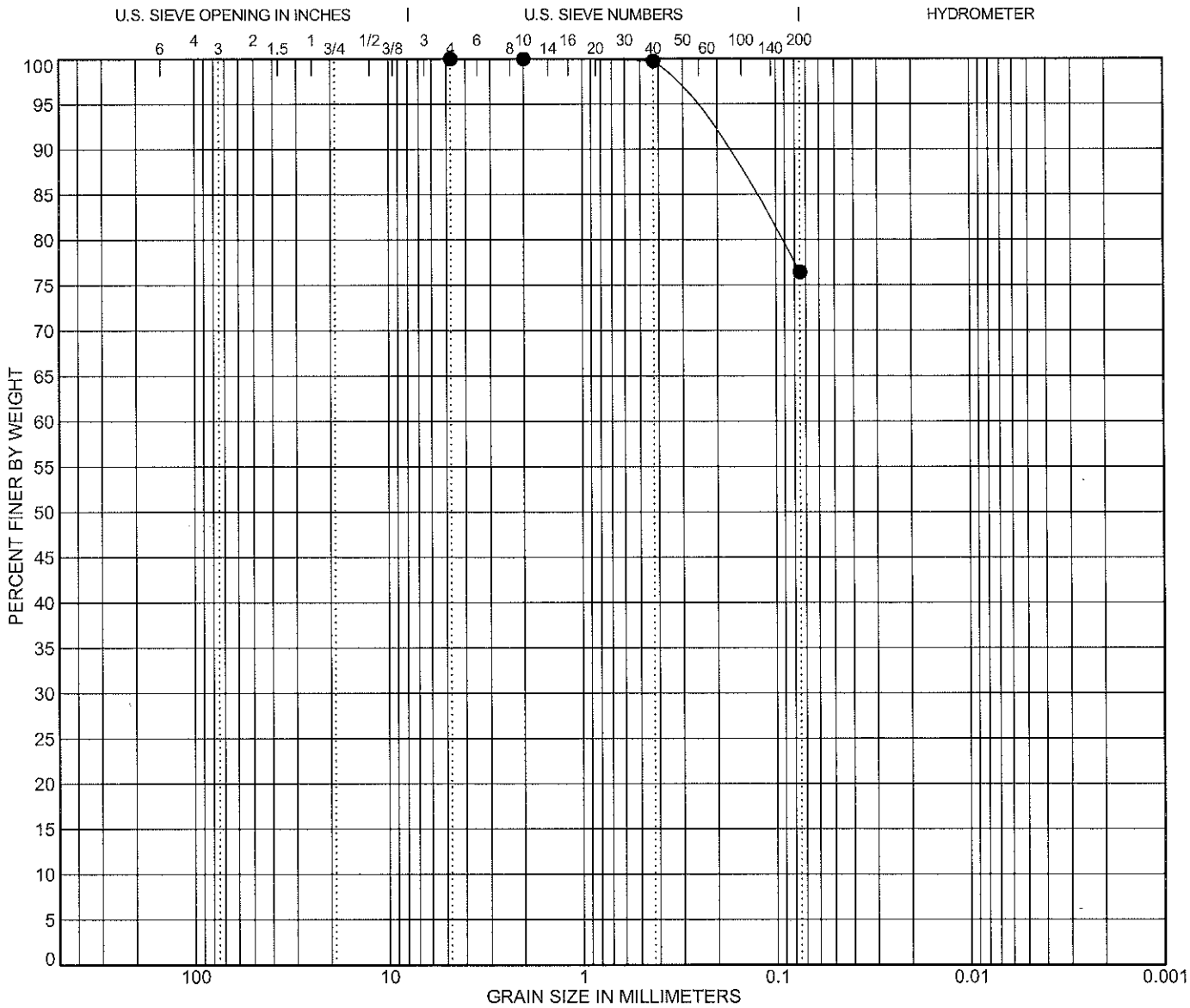

COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**09-B82**	**58.0**	**LEAN CLAY with SAND(CL)**	**40**	**18**	**22**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**09-B82**	**58.0**		**100**	**100**	**99.8**		**76.4**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**09-B82**	**58.0**	**4.75**				**0.0**	**23.6**	**76.4**	

GRAIN SIZE DISTRIBUTION

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

Terracon

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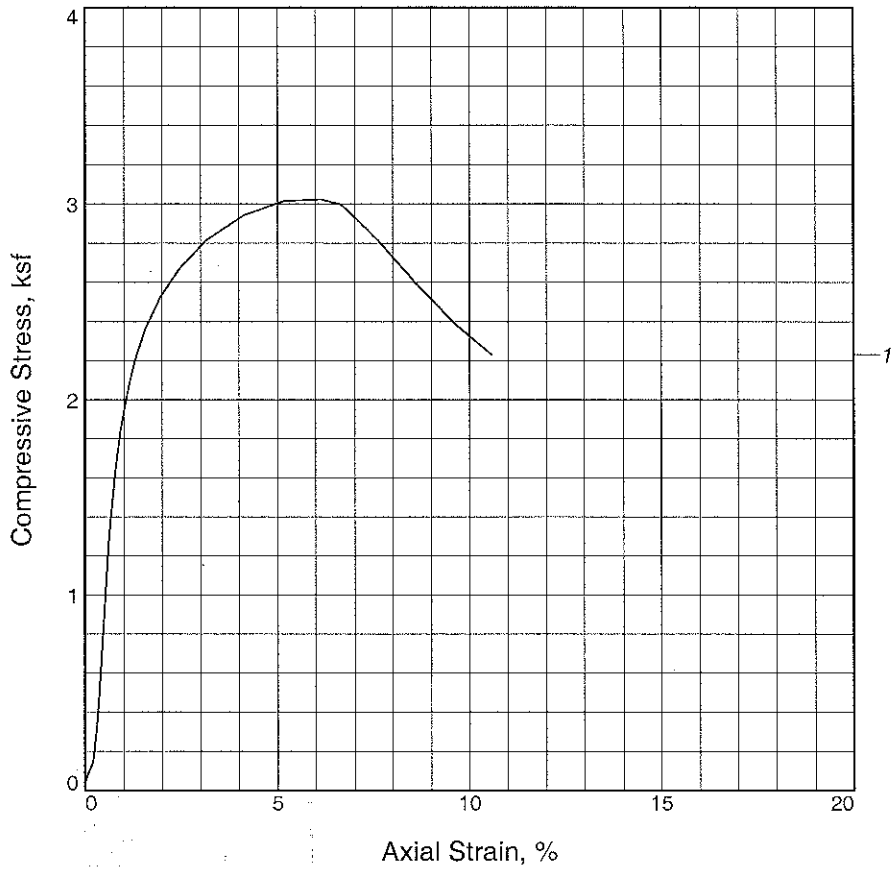
EXHIBIT ?

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	3.022			
Undrained shear strength, ksf	1.511			
Failure strain, %	6.1			
Strain rate, in./min.	0.055			
Water content, %	26.2			
Wet density, pcf	124.6			
Dry density, pcf	98.8			
Saturation, %	97.6			
Void ratio	0.7381			
Specimen diameter, in.	2.677			
Specimen height, in.	5.603			
Height/diameter ratio	2.09			

Description: Gray and tan Clay w/aggregates

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-B82

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-B82
Depth: 2-4 ft. **Sample Number:** 2
Description: Gray and tan Clay w/aggregates
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.	177.820
Moisture content: Dry soil+tare, gms.	153.220
Moisture content: Tare, gms.	59.330
Moisture, %	26.2
Moist specimen weight, gms.	1031.86
Diameter, in.	2.677
Area, in.^{2}	5.628
Height, in.	5.603
Wet density, pcf	124.6
Dry density, pcf	98.8
Void ratio	0.7381
Saturation, %	97.6

Test Readings for Specimen No. 1

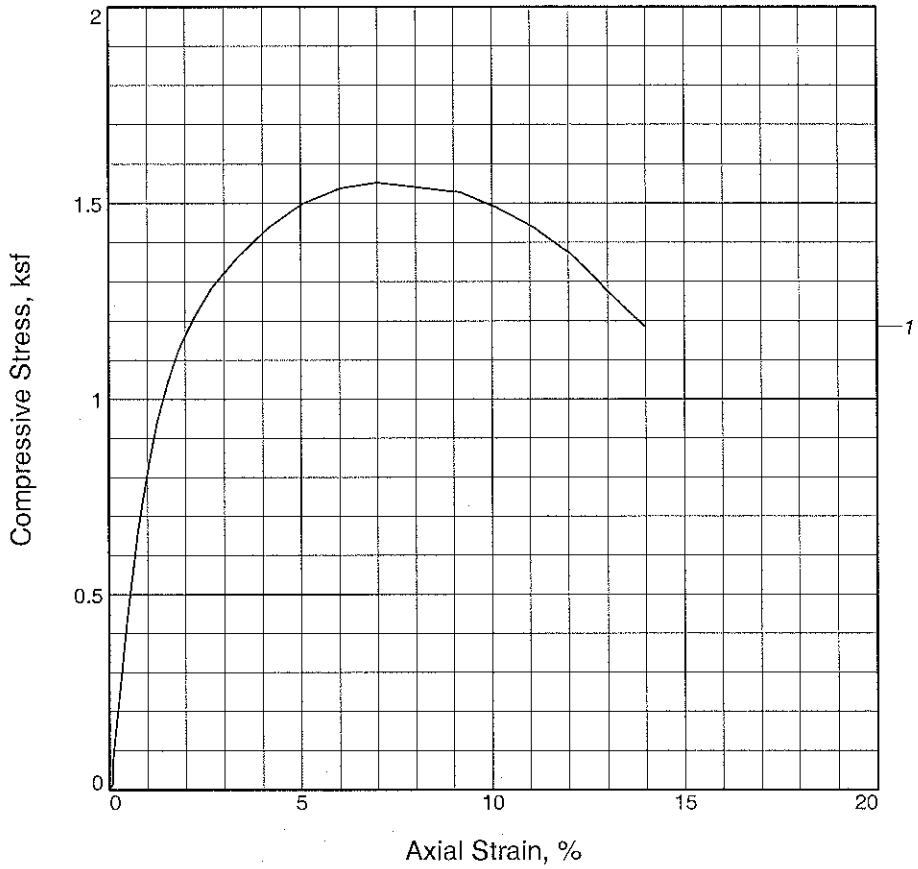
Strain rate, in./min. = 0.055
Unconfined compressive strength = 3.022 ksf **at reading no.** 20

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	1.950	1.9	0.0	0.050
2	0.0111	5.750	5.7	0.2	0.147
3	0.0163	12.275	12.3	0.3	0.313
4	0.0206	20.318	20.3	0.4	0.518
5	0.0248	29.558	29.6	0.4	0.753
6	0.0276	36.123	36.1	0.5	0.920
7	0.0305	42.479	42.5	0.5	1.081
8	0.0343	50.782	50.8	0.6	1.291
9	0.0385	57.703	57.7	0.7	1.466
10	0.0442	65.358	65.4	0.8	1.659
11	0.0508	72.862	72.9	0.9	1.847
12	0.0607	80.233	80.2	1.1	2.030
13	0.0716	86.871	86.9	1.3	2.194
14	0.0882	94.063	94.1	1.6	2.369
15	0.1099	100.664	100.7	2.0	2.525

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1378	107.118	107.1	2.5	2.673
17	0.1761	113.600	113.6	3.1	2.815
18	0.2314	120.000	120.0	4.1	2.943
19	0.2891	124.237	124.2	5.2	3.015
20	0.3444	125.852	125.9	6.1	3.022
21	0.3719	125.526	125.5	6.6	2.998
22	0.4267	119.043	119.0	7.6	2.814
23	0.4820	110.974	111.0	8.6	2.595
24	0.5368	103.490	103.5	9.6	2.394
25	0.5922	97.597	97.6	10.6	2.233

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	1.552			
Undrained shear strength, ksf	0.776			
Failure strain, %	7.0			
Strain rate, in./min.	0.055			
Water content, %	23.1			
Wet density, pcf	123.9			
Dry density, pcf	100.7			
Saturation, %	90.0			
Void ratio	0.7048			
Specimen diameter, in.	2.732			
Specimen height, in.	5.707			
Height/diameter ratio	2.09			

Description: Tan Clay w/sand and calc. nodules

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-B82

Sample Number: 10 **Depth:** 18-20 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-B82
Depth: 18-20 ft. **Sample Number:** 10
Description: Tan Clay w/sand and calc. nodules
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.	191.070
Moisture content: Dry soil+tare, gms.	164.760
Moisture content: Tare, gms.	50.750
Moisture, %	23.1
Moist specimen weight, gms.	1088.45
Diameter, in.	2.732
Area, in.^{2}	5.862
Height, in.	5.707
Wet density, pcf	123.9
Dry density, pcf	100.7
Void ratio	0.7048
Saturation, %	90.0

Test Readings for Specimen No. 1

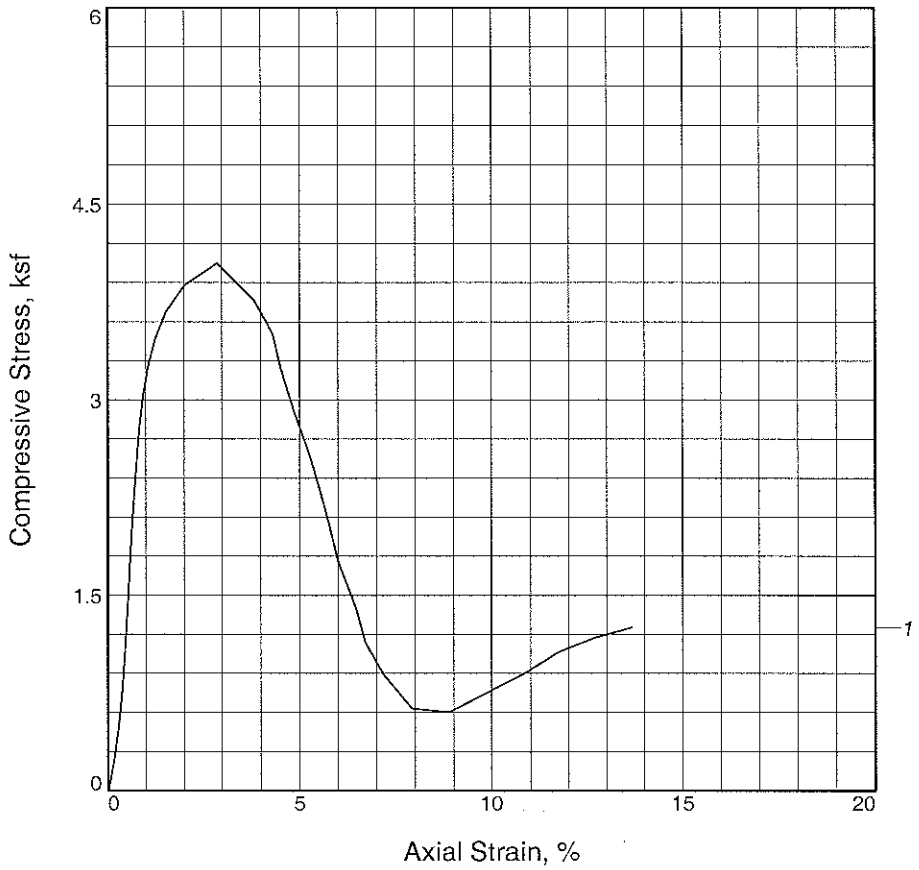
Strain rate, in./min. = 0.055
Unconfined compressive strength = 1.552 ksf **at reading no.** 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0050	0.612	0.6	0.1	0.015
2	0.0054	2.994	3.0	0.1	0.073
3	0.0121	7.384	7.4	0.2	0.181
4	0.0177	11.268	11.3	0.3	0.276
5	0.0229	15.213	15.2	0.4	0.372
6	0.0286	18.855	18.9	0.5	0.461
7	0.0357	22.918	22.9	0.6	0.559
8	0.0423	26.874	26.9	0.7	0.655
9	0.0508	30.824	30.8	0.9	0.750
10	0.0603	34.763	34.8	1.1	0.845
11	0.0711	38.726	38.7	1.2	0.939
12	0.0877	43.157	43.2	1.5	1.044
13	0.1043	46.679	46.7	1.8	1.126
14	0.1265	50.210	50.2	2.2	1.206
15	0.1539	53.736	53.7	2.7	1.284

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1922	57.485	57.5	3.4	1.365
17	0.2366	61.009	61.0	4.1	1.437
18	0.2886	64.277	64.3	5.1	1.499
19	0.3435	66.620	66.6	6.0	1.538
20	0.3988	67.948	67.9	7.0	1.552
21	0.4536	68.177	68.2	7.9	1.542
22	0.5089	68.385	68.4	8.9	1.530
23	0.5227	68.484	68.5	9.2	1.528
24	0.5775	67.450	67.4	10.1	1.489
25	0.6328	65.891	65.9	11.1	1.439
26	0.6876	63.481	63.5	12.0	1.372
27	0.7430	59.627	59.6	13.0	1.274
28	0.7978	56.079	56.1	14.0	1.185

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	4.048			
Undrained shear strength, ksf	2.024			
Failure strain, %	2.9			
Strain rate, in./min.	0.055			
Water content, %	34.7			
Wet density, pcf	119.8			
Dry density, pcf	88.9			
Saturation, %	102.7			
Void ratio	0.9301			
Specimen diameter, in.	2.752			
Specimen height, in.	5.734			
Height/diameter ratio	2.08			

Description: Brown and 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-B82

Sample Number: 18 **Depth:** 34-36 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-B82
Depth: 34-36 ft. **Sample Number:** 18
Description: Brown and 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.	147.700
Moisture content: Dry soil+tare, gms.	122.570
Moisture content: Tare, gms.	50.220
Moisture, %	34.7
Moist specimen weight, gms.	1072.93
Diameter, in.	2.752
Area, in.^{2}	5.948
Height, in.	5.734
Wet density, pcf	119.8
Dry density, pcf	88.9
Void ratio	0.9301
Saturation, %	102.7

Test Readings for Specimen No. 1

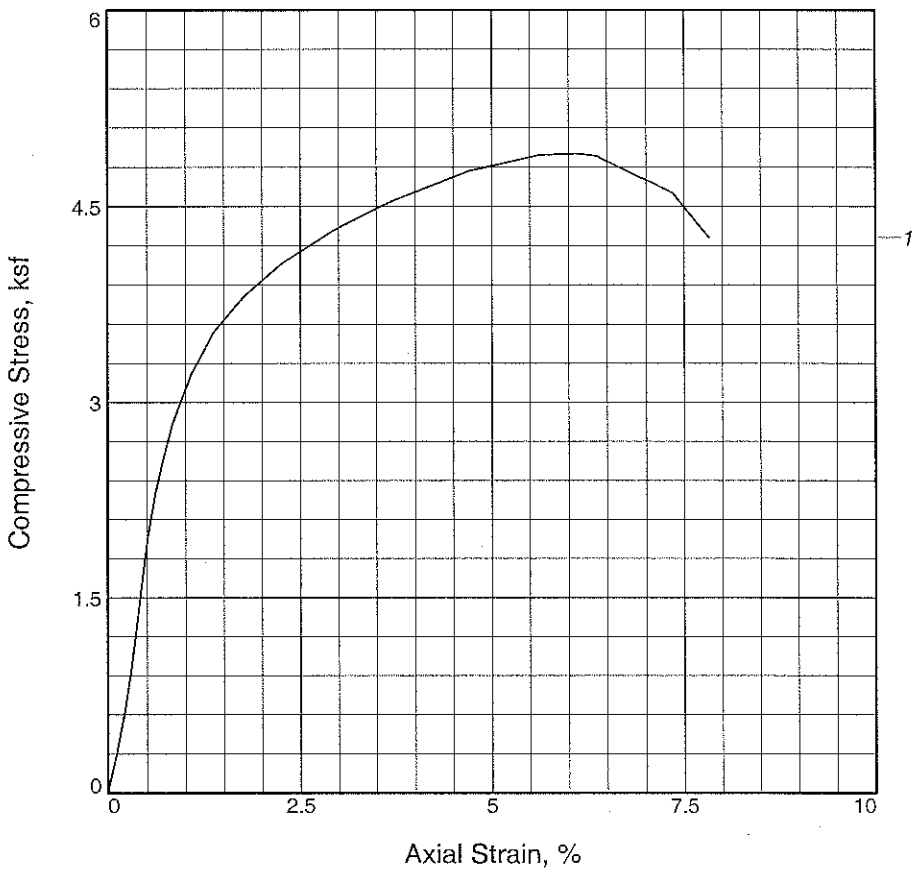
Strain rate, in./min. = 0.055
Unconfined compressive strength = 4.048 ksf **at reading no.** 18

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	0.055	0.1	0.0	0.001
2	0.0093	9.260	9.3	0.2	0.224
3	0.0164	19.797	19.8	0.3	0.478
4	0.0216	31.664	31.7	0.4	0.764
5	0.0259	44.813	44.8	0.5	1.080
6	0.0287	54.758	54.8	0.5	1.319
7	0.0315	65.127	65.1	0.5	1.568
8	0.0339	75.664	75.7	0.6	1.821
9	0.0367	86.005	86.0	0.6	2.069
10	0.0396	94.839	94.8	0.7	2.280
11	0.0438	106.695	106.7	0.8	2.563
12	0.0481	116.318	116.3	0.8	2.792
13	0.0533	126.206	126.2	0.9	3.027
14	0.0604	135.049	135.0	1.1	3.235
15	0.0712	144.651	144.7	1.2	3.458

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.0878	154.082	154.1	1.5	3.673
17	0.1152	163.499	163.5	2.0	3.879
18	0.1648	172.179	172.2	2.9	4.048
19	0.1700	171.410	171.4	3.0	4.027
20	0.2197	161.773	161.8	3.8	3.766
21	0.2471	151.014	151.0	4.3	3.498
22	0.2584	140.328	140.3	4.5	3.244
23	0.2750	128.365	128.4	4.8	2.959
24	0.3024	111.979	112.0	5.3	2.568
25	0.3161	101.813	101.8	5.5	2.329
26	0.3298	90.208	90.2	5.8	2.058
27	0.3435	77.729	77.7	6.0	1.769
28	0.3709	61.190	61.2	6.5	1.386
29	0.3846	50.179	50.2	6.7	1.133
30	0.4121	39.418	39.4	7.2	0.886
31	0.4536	28.251	28.3	7.9	0.630
32	0.5085	27.257	27.3	8.9	0.601
33	0.5633	33.957	34.0	9.8	0.741
34	0.6186	41.169	41.2	10.8	0.889
35	0.6734	49.872	49.9	11.7	1.066
36	0.7288	55.548	55.5	12.7	1.174
37	0.7836	59.796	59.8	13.7	1.250

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	4.901			
Undrained shear strength, ksf	2.451			
Failure strain, %	6.1			
Strain rate, in./min.	0.055			
Water content, %	29.6			
Wet density, pcf	123.3			
Dry density, pcf	95.1			
Saturation, %	101.2			
Void ratio	0.8044			
Specimen diameter, in.	2.735			
Specimen height, in.	5.614			
Height/diameter ratio	2.05			

Description: 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-B82

Sample Number: 27 **Depth:** 52-54 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-B82
Depth: 52-54 ft. **Sample Number:** 27
Description: 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.	160.570
Moisture content: Dry soil+tare, gms.	135.410
Moisture content: Tare, gms.	50.410
Moisture, %	29.6
Moist specimen weight, gms.	1067.54
Diameter, in.	2.735
Area, in.^{2}	5.875
Height, in.	5.614
Wet density, pcf	123.3
Dry density, pcf	95.1
Void ratio	0.8044
Saturation, %	101.2

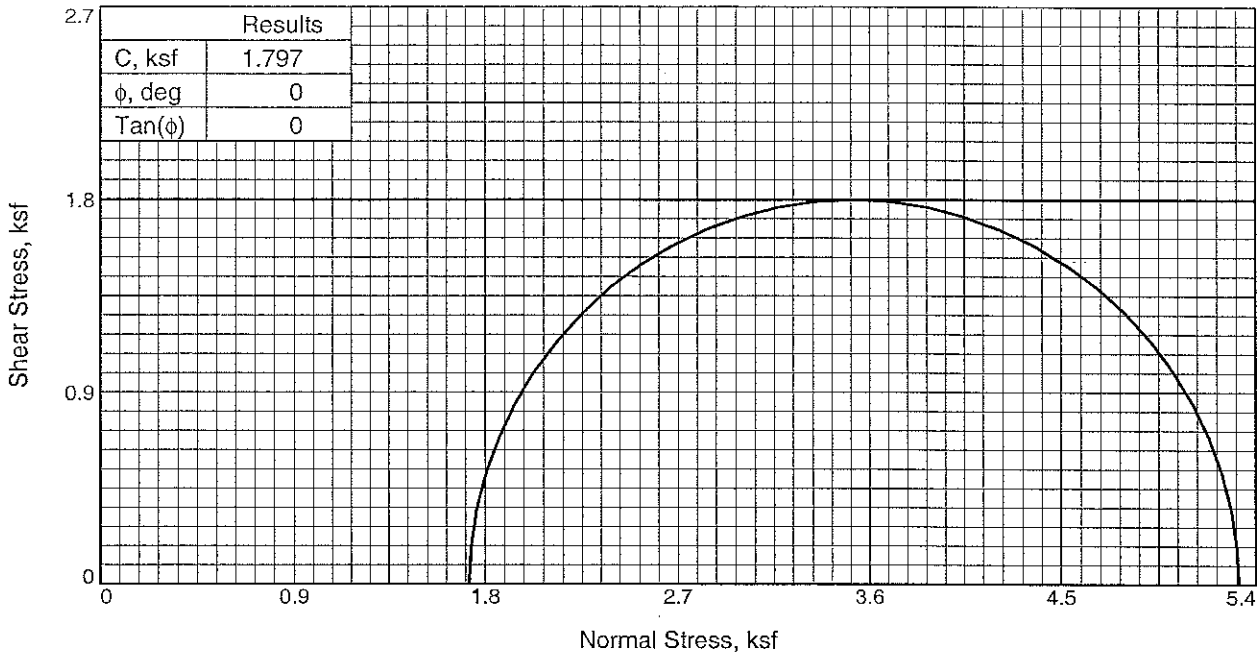
Test Readings for Specimen No. 1

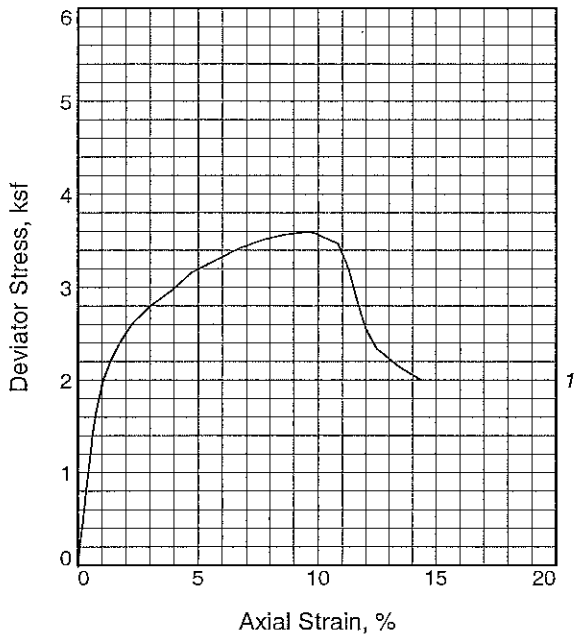
Strain rate, in./min. = 0.055
Unconfined compressive strength = 4.901 ksf **at reading no.** 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0005	0.600	0.6	0.0	0.015
2	0.0012	2.500	2.5	0.0	0.061
3	0.0064	12.382	12.4	0.1	0.303
4	0.0121	25.550	25.6	0.2	0.625
5	0.0163	37.866	37.9	0.3	0.925
6	0.0206	52.587	52.6	0.4	1.284
7	0.0248	67.774	67.8	0.4	1.654
8	0.0286	80.561	80.6	0.5	1.965
9	0.0343	94.515	94.5	0.6	2.302
10	0.0400	105.580	105.6	0.7	2.569
11	0.0466	116.589	116.6	0.8	2.834
12	0.0603	132.706	132.7	1.1	3.218
13	0.0769	146.202	146.2	1.4	3.534
14	0.0991	158.416	158.4	1.8	3.814
15	0.1265	169.594	169.6	2.3	4.063

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1648	181.512	181.5	2.9	4.318
17	0.2088	192.604	192.6	3.7	4.545
18	0.2641	204.182	204.2	4.7	4.769
19	0.3161	211.484	211.5	5.6	4.892
20	0.3435	212.999	213.0	6.1	4.901
21	0.3572	212.837	212.8	6.4	4.885
22	0.4125	202.529	202.5	7.3	4.599
23	0.4395	188.759	188.8	7.8	4.264





Sample No.		1
Initial	Water Content, %	21.3
	Dry Density, pcf	107.0
	Saturation, %	96.8
	Void Ratio	0.6048
	Diameter, in.	2.759
	Height, in.	5.765
At Test	Water Content, %	21.3
	Dry Density, pcf	107.0
	Saturation, %	96.8
	Void Ratio	0.6048
	Diameter, in.	2.759
	Height, in.	5.765
Strain rate, in./min.		0.055
Back Pressure, psi		0.000
Cell Pressure, psi		11.990
Fail. Stress, ksf		3.594
Ult. Stress, ksf		
σ_1 Failure, ksf		5.321
σ_3 Failure, ksf		1.727

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Tan and light gray Clay w/sand and calc. nodules

Assumed Specific Gravity= 2.75

Remarks: ASTM D2850

Client: USACE

Project: Pipeline Dredging, Cedar Bayou and Anahuac Channel, PA 16. Contract no. W912HY-09-D-0021, Task Order No. 0012

Location: 09-B82

Sample Number: 8 **Depth:** 14-16 ft.

Proj. No.: 92105186-B **Date Sampled:**

TRIAXIAL SHEAR TEST REPORT
Terracon, Inc.
Houston, TX

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

11/5/2010
2:35 PM

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-B82
Depth: 14-16 ft. **Sample Number:** 8
Description: Tan and light gray Clay w/sand and calc. nodules
Remarks: ASTM D2850
Type of Sample: Undisturbed
Assumed Specific Gravity=2.75 **LL=** **PL=** **PI=**
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	196.370	196.370
Moisture content: Dry soil+tare, gms.	170.800	170.800
Moisture content: Tare, gms.	50.650	50.650
Moisture, %	21.3	21.3
Moist specimen weight, gms.	1173.81	
Diameter, in.	2.759	
Area, in.^{2}	5.979	
Height, in.	5.765	
Wet density, pcf	129.7	
Dry density, pcf	107.0	
Void ratio	0.6048	
Saturation, %	96.8	

Test Readings for Specimen No. 1

Cell pressure = 11.990 psi (1.727 ksf)
Back pressure = 0.000 psi (0.000 ksf)
Strain rate, in./min. = 0.055
Fail. Stress = 3.594 ksf **at reading no.** 21

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Princ. Stress ksf	Major Princ. Stress ksf	1:3 Ratio	P ksf	Q ksf
0	0.0000	0.000	0.0	0.0	0.000	1.727	1.727	1.00	1.727	0.000
1	0.0000	-0.799	-0.8	0.0	-0.019	1.727	1.707	0.99	1.717	-0.010
2	0.0052	9.500	9.5	0.1	0.229	1.727	1.955	1.13	1.841	0.114
3	0.0124	19.854	19.9	0.2	0.477	1.727	2.204	1.28	1.965	0.239
4	0.0183	30.657	30.7	0.3	0.736	1.727	2.463	1.43	2.095	0.368
5	0.0242	39.578	39.6	0.4	0.949	1.727	2.676	1.55	2.201	0.475
6	0.0300	49.063	49.1	0.5	1.176	1.727	2.902	1.68	2.314	0.588
7	0.0352	58.109	58.1	0.6	1.391	1.727	3.118	1.81	2.422	0.696
8	0.0424	67.003	67.0	0.7	1.602	1.727	3.329	1.93	2.528	0.801
9	0.0509	75.505	75.5	0.9	1.803	1.727	3.529	2.04	2.628	0.901
10	0.0620	84.490	84.5	1.1	2.013	1.727	3.740	2.17	2.733	1.007
11	0.0789	93.083	93.1	1.4	2.211	1.727	3.938	2.28	2.832	1.106
12	0.1012	101.808	101.8	1.8	2.409	1.727	4.136	2.40	2.931	1.205
13	0.1286	110.415	110.4	2.2	2.600	1.727	4.327	2.51	3.027	1.300
14	0.1729	119.728	119.7	3.0	2.797	1.727	4.524	2.62	3.125	1.399
15	0.2231	127.544	127.5	3.9	2.953	1.727	4.680	2.71	3.203	1.477
16	0.2728	137.586	137.6	4.7	3.157	1.727	4.884	2.83	3.305	1.579
17	0.3337	145.365	145.4	5.8	3.299	1.727	5.025	2.91	3.376	1.649
18	0.3887	152.360	152.4	6.7	3.422	1.727	5.149	2.98	3.438	1.711
19	0.4437	157.767	157.8	7.7	3.508	1.727	5.234	3.03	3.480	1.754
20	0.4986	162.170	162.2	8.6	3.568	1.727	5.295	3.07	3.511	1.784
21	0.5536	165.079	165.1	9.6	3.594	1.727	5.321	3.08	3.524	1.797
22	0.5676	164.958	165.0	9.8	3.582	1.727	5.309	3.07	3.518	1.791
23	0.6226	161.551	161.6	10.8	3.471	1.727	5.197	3.01	3.462	1.735
24	0.6501	149.126	149.1	11.3	3.187	1.727	4.913	2.85	3.320	1.593
25	0.6636	139.002	139.0	11.5	2.963	1.727	4.689	2.72	3.208	1.481
26	0.6776	129.014	129.0	11.8	2.742	1.727	4.469	2.59	3.098	1.371
27	0.6916	120.579	120.6	12.0	2.556	1.727	4.282	2.48	3.005	1.278
28	0.7191	110.851	110.9	12.5	2.337	1.727	4.064	2.35	2.895	1.168
29	0.7741	102.822	102.8	13.4	2.144	1.727	3.871	2.24	2.799	1.072
30	0.8255	97.185	97.2	14.3	2.006	1.727	3.732	2.16	2.729	1.003

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-B82	0-2	1.50																				CH**	23																						
	2-4	1.50			51	17	34			100		100				99					89	CH	26							1.5	26	99	CH**											
	4-6	4.00																				CH**	29																						
	6-8	1.50																				CH**	40																						
	8-10	1.50			92	29	63															CH*	40	79																					
	10-12	1.50																				CH**	34																						
	12-14	1.75																				CH**	27																						
	14-16	2.00			38	18	20			100		100				99					98	CL	21											1.8	21	107	CL**							
	16-18	0.50																				CL**	22																						
	18-20	0.75			32	20	12		100	99		98				96					93	CL	23							0.8	23	101	CL**											
	20-22	1.75																				CH**	26																						
	22-24	0.75			83	26	57		100	97		97				92					88	CH	26																						
	24-26	0.50																				CH**	27																						
	26-28	1.25																				CH**	28																						
	28-30	2.50																				CH**	32																						
	30-32	2.25																				CH**	31																						
	32-34	2.00																				CH**	39																						
	34-36	2.50			104	30	74									100					100	CH	35							2.0	35	89	CH**											
	36-38	2.00																				CH**	37																						
	38-40	1.50																				CH**	38																						
	40-42	2.50																				CH**	38																						
	42-44	2.00																				CH**	39																						
	44-46	2.00			104	33	71															CH*	42	79																					
	46-48	1.75																				CH**	39																						
	48-50	1.50																				CH**	20																						
	50-52			12																		CH**	25																						
	52-54	2.25			71	24	47		100	100		100				99					96	CH	30							2.5	30	95	CH**											
	54-56	0.50																				CL**	24																						
	56-58	0.50																				CL**	28																						
	58-60	0.75			40	18	22			100		100				100					76	CL	25	101																					
	60-62	1.00																				CL**	24																						
	62-64			12																		SC-SM**	26																						
	64-66			14																		SC-SM**	16																						