BORING LOG NO. 10-B10

CLIENT:	USACE, Galveston District Galveston, Texas	PROJECT:	Galveston Channel Deepening, TO-0010
BORING LOCATION:	N: 13688063.08 E: 3316589.59	SITE:	San Jacinto Placement Area Galveston, Texas

Approx. Surface Elevation: 12.3 feet

Graphic Log	DESCRIPTION	Elevation	Depth
	FILL: CLAYEY SAND gray, w/ roots, moist, stiff	10.3	2.0
	FILL: FAT CLAY brownish gray, soft to medium soft	6.8	5.5
	FILL: CLAYEY SAND dark bluish gray, w/ shell, fine , some cohesion, medium dense	1.3	11.0
	FILL: FAT CLAY dark bluish gray, very soft	-5.7	18.0
	POORLY GRADED SAND w/ SILT bluish gray, fine , w/ shell, loose to medium dense	-17.7	30.0
	Boring terminated at 30 feet.		

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
1	SC	ST	4		1.5		26								
3	CH	ST	15		0.5		47	72							
5		ST	22		0.0	0.25			93	28	65	96			
7	SC	SS	16	10			26								
9		SS	13	24			31					16			
11	CH	SS	22	1			50								
13		SS	19				53								
15		ST	21		0.0	0.05			59	20	39	94			
17		SS	24	1			71								
19	SP-SM	SS	9	30			28					7			
21		SS	11	17			26								
23		SS	10	10			27								
25		SS	13	5			30								
27		SS	11	15			30								
29		SS	13	28			29								

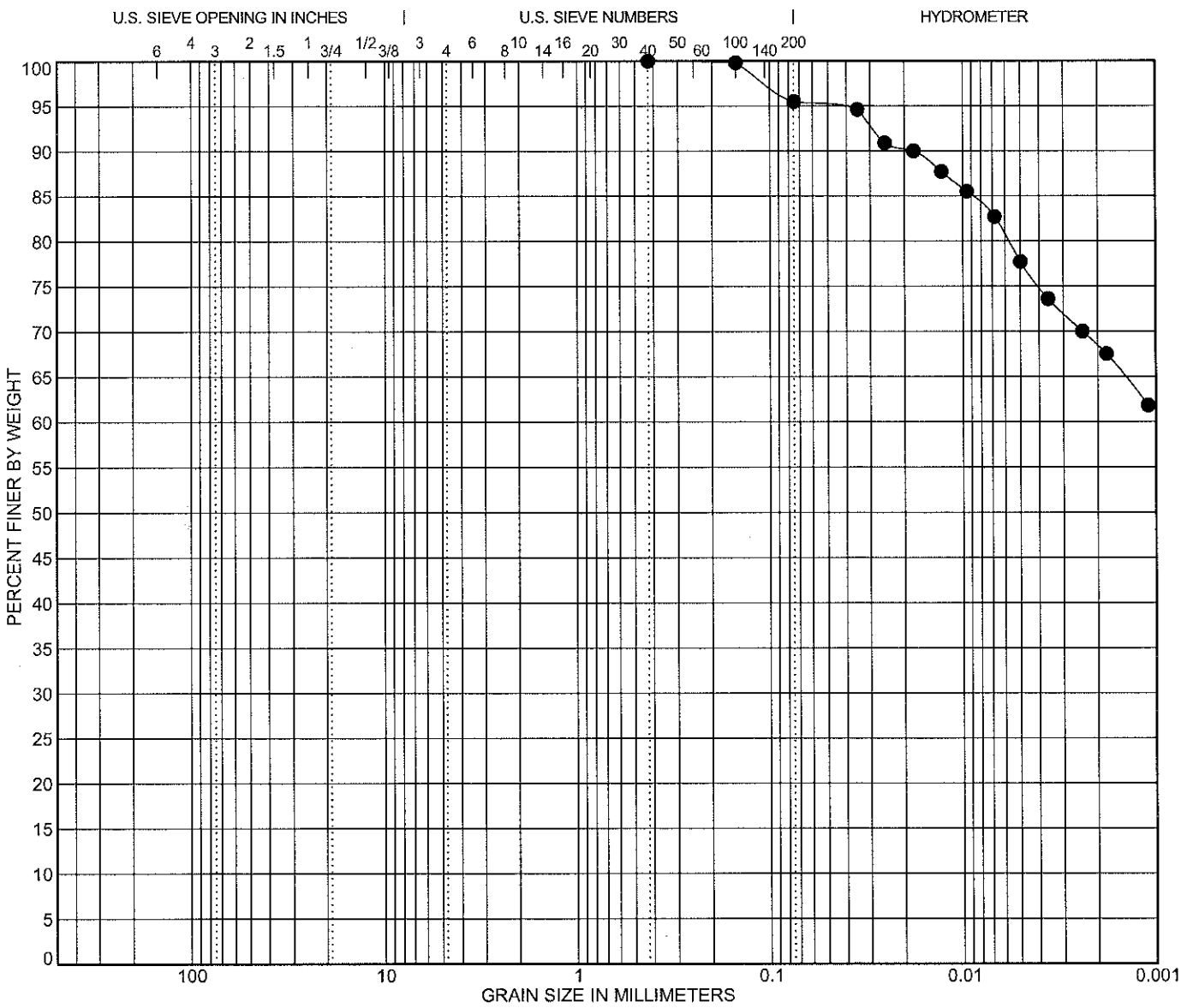
STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: **Dry auger to 6 feet; wet rotary thereafter.**

WATER LEVEL OBSERVATIONS			
4.5 ft	WS	3 ft	at 5 min
2 ft	at 10 min	2 ft	at 15 min

Terracon

DATE DRILLED	Page 1 of 1
4/12/2010	10-B10
PROJECT NUMBER 92105154	EXHIBIT A-10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **10-B10**	**4.0**	**FAT CLAY(CH)**	**93**	**28**	**65**		

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **10-B10**	**4.0**				**100**	**99.8**	**95.5**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **10-B10**	**4.0**	**0.425**				**0.0**	**4.5**	**27.1**	**68.4**

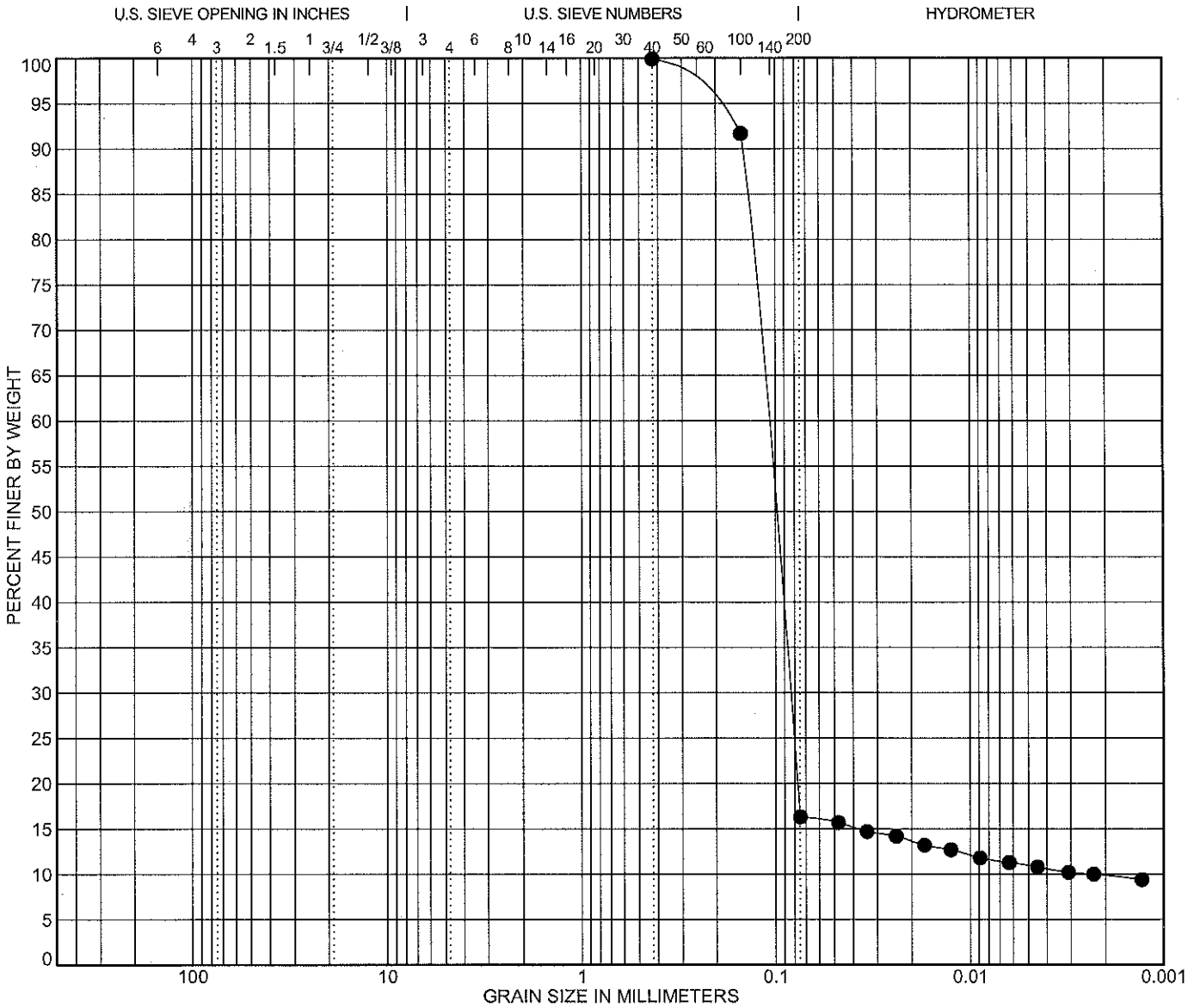
GRAIN SIZE DISTRIBUTION

Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

Terracon

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

SPECIMEN ID
10-B10, 4.0



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **10-B10**	**8.5**					**28.07**	**48.74**

Percent Passing the Indicated Sieve

Specimen Identification		3/8"	#4	#10	#40	#100	#200
● **10-B10**	**8.5**				**99.9**	**91.7**	**16.3**

Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **10-B10**	**8.5**	**0.425**	**0.102**	**0.085**	**0.002**	**0.0**	**83.6**	**6.5**	**9.9**

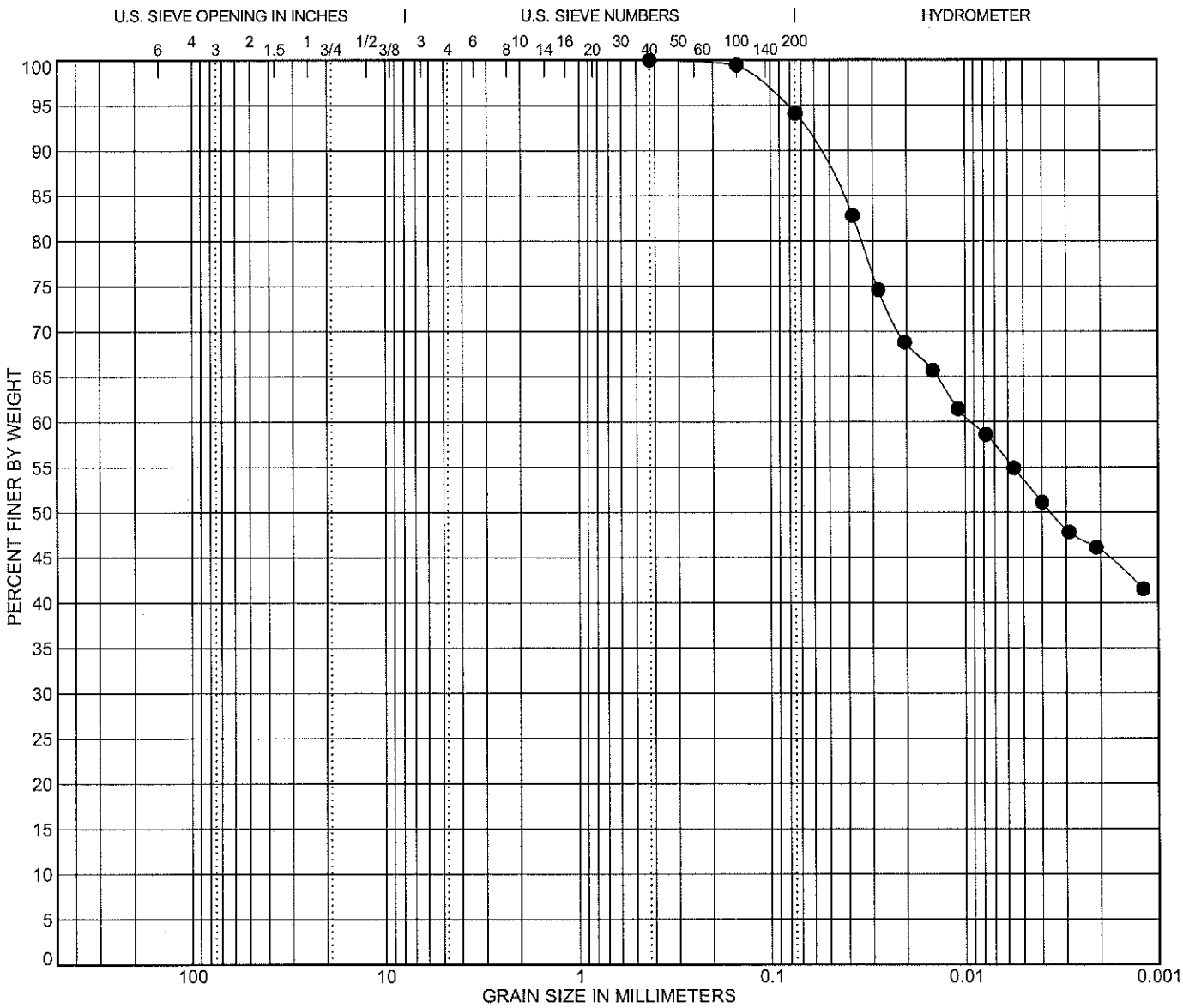
GRAIN SIZE DISTRIBUTION

Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

Terracon

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

SPECIMEN ID
10-B10, 8.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**10-B10**	**14.0**	**FAT CLAY(CH)**	**59**	**20**	**39**		

Percent Passing the Indicated Sieve

	Specimen Identification		3/8"	#4	#10	#40	#100	#200
●	**10-B10**	**14.0**				**100**	**99.4**	**94.1**

	Specimen Identification		D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10-B10**	**14.0**	**0.425**	**0.004**			**0.0**	**5.8**	**48.4**	**45.7**

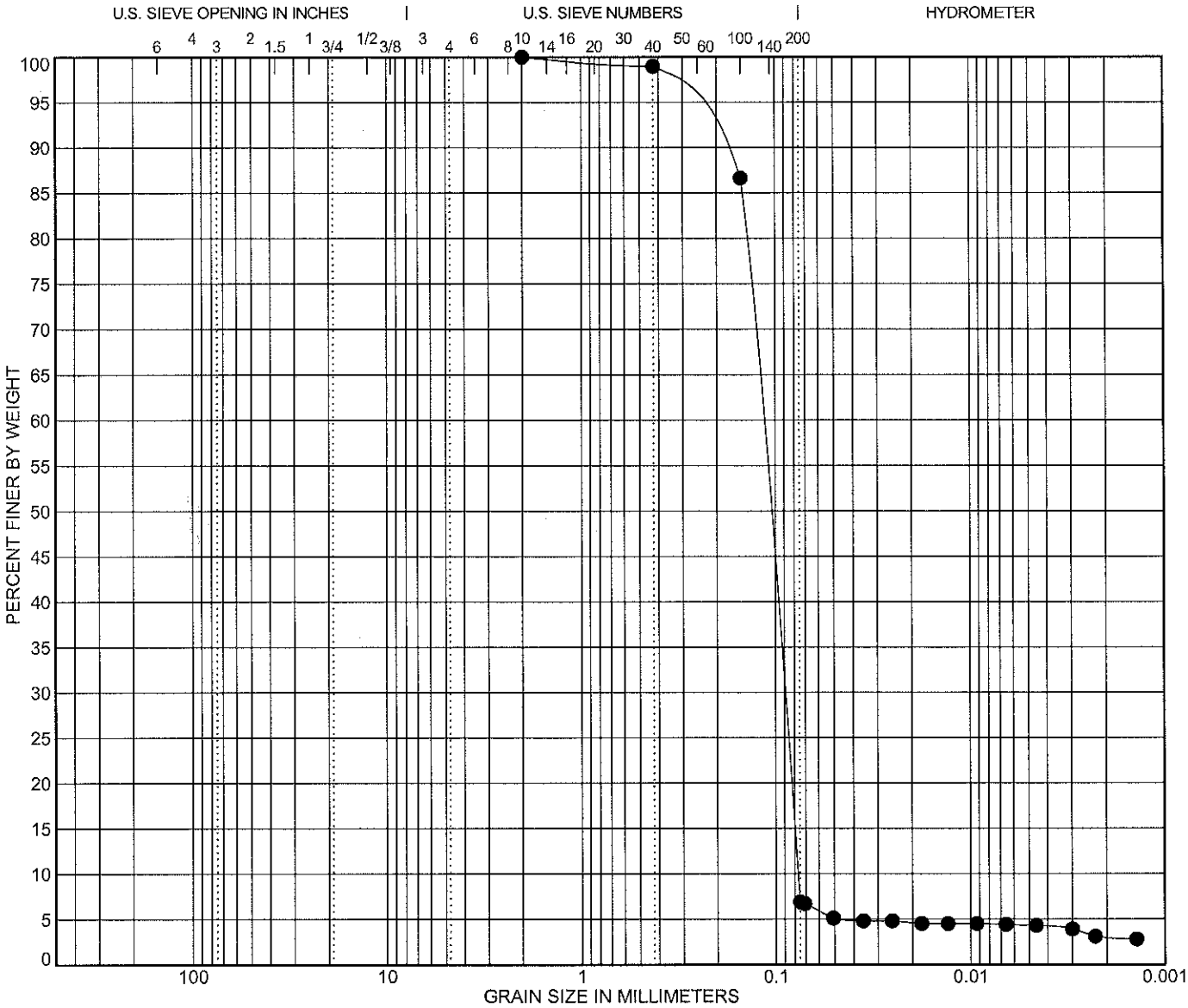
GRAIN SIZE DISTRIBUTION

Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

Terracon

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

SPECIMEN ID
10-B10, 14.0



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	**10-B10**	**18.5**					**0.92**	**1.54**

Percent Passing the Indicated Sieve

Specimen Identification			3/8"	#4	#10	#40	#100	#200
●	**10-B10**	**18.5**			**100**	**99**	**86.6**	**6.9**

Specimen Identification			D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10-B10**	**18.5**	**2**	**0.109**	**0.092**	**0.077**	**0.0**	**93.1**	**3.9**	**3.0**

GRAIN SIZE DISTRIBUTION

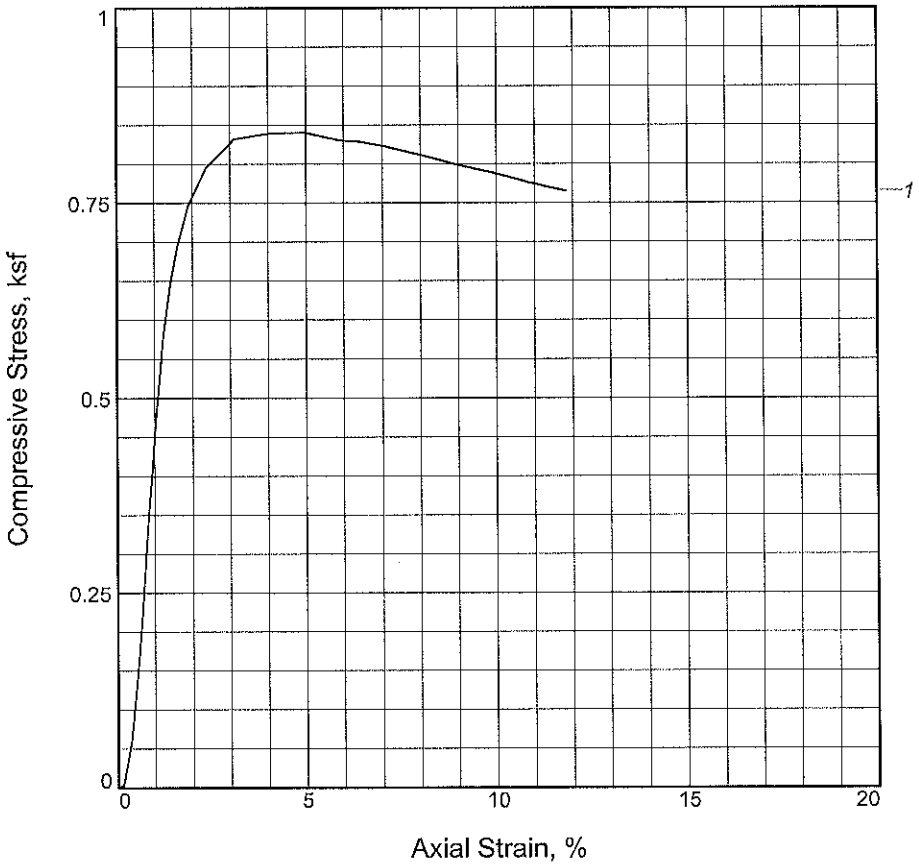
Galveston Channel Deepening,
TO-0010
Galveston, Texas
Project Number 92105154

Terracon

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

SPECIMEN ID
10-B10, 18.5

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.841			
Undrained shear strength, ksf	0.420			
Failure strain, %	5.0			
Strain rate, in./min.	0.055			
Water content, %	62.6			
Wet density, pcf	109.0			
Dry density, pcf	67.0			
Saturation, %	110.3			
Void ratio	1.5604			
Specimen diameter, in.	2.757			
Specimen height, in.	5.815			
Height/diameter ratio	2.11			

Description: Gray Fat Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Undisturbed

Project No.: 92105154

Date Sampled:

Remarks:
ASTM D2166

Client: USACE

Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010

Location: 10-B10

Sample Number: 3 **Depth:** 4-6 ft.

UNCONFINED COMPRESSION TEST
Terracon, Inc.
Houston, TX

UNCONFINED COMPRESSION TEST

7/21/2010

Date:
Client: USACE
Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010
Project No.: 92105154
Location: 10-B10
Depth: 4-6 ft. **Sample Number:** 3
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.	187.320
Moisture content: Dry soil+tare, gms.	134.440
Moisture content: Tare, gms.	49.940
Moisture, %	62.6
Moist specimen weight, gms.	993.34
Diameter, in.	2.757
Area, in.^{2}	5.970
Height, in.	5.815
Wet density, pcf	109.0
Dry density, pcf	67.0
Void ratio	1.5604
Saturation, %	110.3

Test Readings for Specimen No. 1

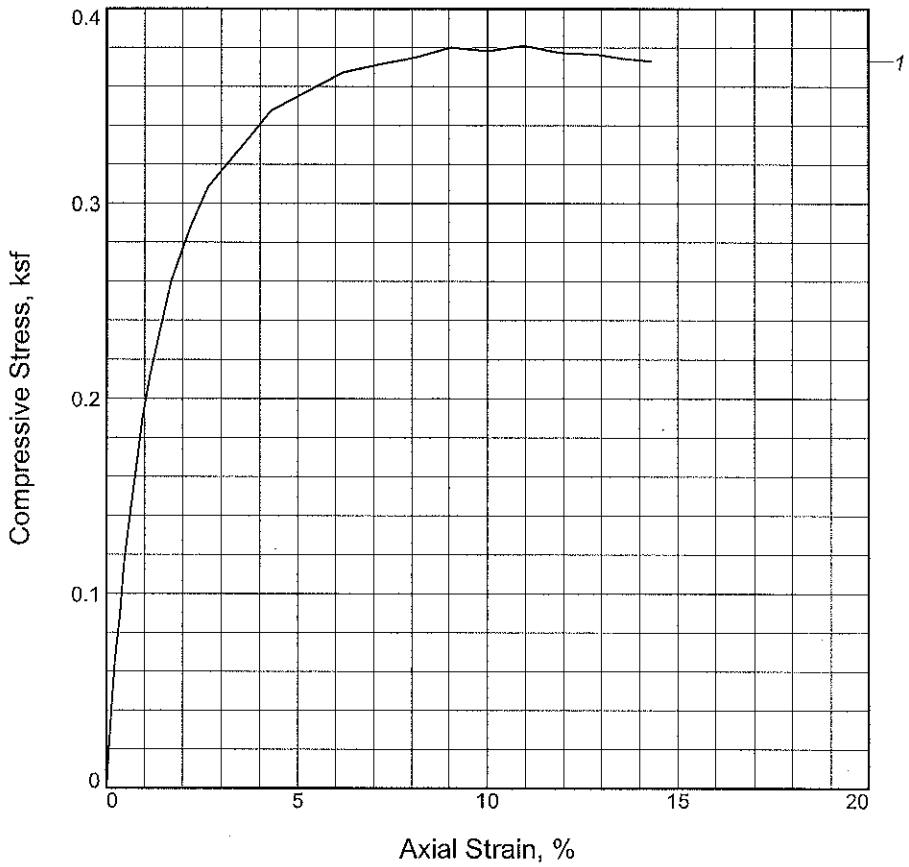
Strain rate, in./min. = 0.055
Unconfined compressive strength = 0.841 ksf **at reading no.** 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0080	0.150	0.1	0.1	0.004
2	0.0082	0.219	0.2	0.1	0.005
3	0.0205	2.473	2.5	0.4	0.059
4	0.0272	4.587	4.6	0.5	0.110
5	0.0328	6.765	6.8	0.6	0.162
6	0.0371	8.632	8.6	0.6	0.207
7	0.0409	10.626	10.6	0.7	0.255
8	0.0451	12.698	12.7	0.8	0.304
9	0.0494	14.891	14.9	0.8	0.356
10	0.0550	17.257	17.3	0.9	0.412
11	0.0602	19.758	19.8	1.0	0.472
12	0.0659	21.900	21.9	1.1	0.522
13	0.0711	24.104	24.1	1.2	0.574
14	0.0825	27.150	27.1	1.4	0.646
15	0.0933	29.239	29.2	1.6	0.694

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.1099	31.551	31.6	1.9	0.747
17	0.1374	33.753	33.8	2.4	0.795
18	0.1814	35.633	35.6	3.1	0.833
19	0.2368	36.295	36.3	4.1	0.840
20	0.2888	36.685	36.7	5.0	0.841
21	0.3442	36.596	36.6	5.9	0.831
22	0.3716	36.721	36.7	6.4	0.829
23	0.4127	36.709	36.7	7.1	0.823
24	0.4680	36.581	36.6	8.0	0.811
25	0.5228	36.396	36.4	9.0	0.799
26	0.5777	36.297	36.3	9.9	0.789
27	0.6330	36.101	36.1	10.9	0.776
28	0.6880	35.995	36.0	11.8	0.766

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, ksf	0.381			
Undrained shear strength, ksf	0.191			
Failure strain, %	11.0			
Strain rate, in./min.	0.055			
Water content, %	51.8			
Wet density, pcf	107.5			
Dry density, pcf	70.8			
Saturation, %	100.0			
Void ratio	1.4237			
Specimen diameter, in.	2.763			
Specimen height, in.	5.766			
Height/diameter ratio	2.09			

Description: Gray Fat Clay

LL =	**PL =**	**PI =**	**Assumed GS=** 2.75	**Type:** Undisturbed

Project No.: 92105154

Date Sampled:

Remarks:
ASTM D2166

Client: USACE

Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010

Location: 10-B10

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

UNCONFINED COMPRESSION TEST
Terracon, Inc.
Houston, TX

UNCONFINED COMPRESSION TEST

7/22/2010

Date:
Client: USACE
Project: Galveston Channel Deepening San Jacinto Placement Area
Contract #W912HY-09-D-0021, Task Order #0010
Project No.: 92105154
Location: 10-B10
Depth: 14-16 ft. **Sample Number:** 8
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.	169.990
Moisture content: Dry soil+tare, gms.	132.270
Moisture content: Tare, gms.	59.400
Moisture, %	51.8
Moist specimen weight, gms.	975.55
Diameter, in.	2.763
Area, in.^{2}	5.996
Height, in.	5.766
Wet density, pcf	107.5
Dry density, pcf	70.8
Void ratio	1.4237
Saturation, %	100.0

Test Readings for Specimen No. 1

Strain rate, in./min. = 0.055
Unconfined compressive strength = 0.381 ksf **at reading no.** 23

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
0	0.0000	0.000	0.0	0.0	0.000
1	0.0020	0.412	0.4	0.0	0.010
2	0.0025	0.533	0.5	0.0	0.013
3	0.0082	1.819	1.8	0.1	0.044
4	0.0133	2.761	2.8	0.2	0.066
5	0.0204	3.691	3.7	0.4	0.088
6	0.0271	4.869	4.9	0.5	0.116
7	0.0356	5.838	5.8	0.6	0.139
8	0.0450	6.919	6.9	0.8	0.165
9	0.0535	7.931	7.9	0.9	0.189
10	0.0658	8.929	8.9	1.1	0.212
11	0.0824	10.008	10.0	1.4	0.237
12	0.0989	11.043	11.0	1.7	0.261
13	0.1263	12.227	12.2	2.2	0.287
14	0.1537	13.199	13.2	2.7	0.309
15	0.1977	14.108	14.1	3.4	0.327

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf
16	0.2473	15.120	15.1	4.3	0.348
17	0.3022	15.717	15.7	5.2	0.358
18	0.3575	16.309	16.3	6.2	0.367
19	0.4123	16.660	16.7	7.2	0.372
20	0.4671	16.995	17.0	8.1	0.375
21	0.5224	17.406	17.4	9.1	0.380
22	0.5773	17.512	17.5	10.0	0.378
23	0.6321	17.824	17.8	11.0	0.381
24	0.6874	17.841	17.8	11.9	0.377
25	0.7423	17.997	18.0	12.9	0.377
26	0.7835	18.044	18.0	13.6	0.374
27	0.8246	18.133	18.1	14.3	0.373

SUMMARY TABLE OF LABORATORY TEST DATA

Project name: TO-0010 Galveston Channel Deepening | Client: USACE, Galveston District | Terracon Project # : 92105154

Boring	Depth	Field tests			Atterberg Limits			Grain size Analysis										USCS Symbol	Wc	γd	Strenght tests																						
								% by weight passing sieve					Soil Particle Content								Direct Shear Test					Unconfined Compression				UU Triaxial Test				CU Triaxial Test							
		PP	TV	SPTn	LL	PL	PI	4	10	40	100	200	gravel	sand	silt	clay	sieve 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	
10-B9	44.5-46			52														SM**	23																						
	46.5-48			15														SM**	29																						
	48.5-50			8														SM**	31																						
	50.5-52			8														CL**	39																						
	52-54	0.00	0.50		38	16	22	100	99	99	97	68	0	32	29	39		CL																0.30	13	0.24	27	34	86	CL**
	54.5-56			5														SC**	31																						
	56-58	0.00	0.10															CH**	40																						
	58-60	0.00	0.15		52	19	33	100	100	100	99	89	0	11	53	36		CH	34	87																					
	60-62																	CH**	39																						
	62-64	0.00	0.25															CH**	46																						
	64-66	0.50	0.25															CH**	54																						
	66-68	0.00	0.20		41	16	25	100	100	100	81	43	0	57	15	28		SC								0.93	44	80	CH**												
	68-70	0.00	0.10															SC**	26																						
	70-72	0.50																SC**	28																						
	72-74	1.50																CL**	23																						
	74-76	0.00	0.10															CL**	28																						
	76-78	1.00						100	100	99	95	85	0	15	57	28		CL*	32																						
	78.5-80			14														CL**	30																						
10-B9	0-2	0.00						95	93	89	81	33	5	62	8	25		SC*	42																						
	2-4	0.00	0.10		107	32	75	100	100	100	100	99	0	1	30	69		CH	62	58																					
	4-6	0.00	0.05															CH**																							
	6-8	0.00	0.05															CH**								0.18	84	56	CH**												
	8.5-10			0				100	100	99	87	15	0	85	7	8		SM*	32																						
	10.5-12			5														SM**	30																						
	12.5-14			0														SM**	32																						
	14.5-16			5														SM**	26																						
	16.5-18			0														SM**	31																						
	18.5-20			39														SP-SM**	27																						
	20.5-22			44				100	100	98	65	8	0	92	4	4		SP-SM*	25																						
	22.5-24			21														SM**	32																						
	24.5-26			30														SM**	27																						
	26.5-28			38														SM**	27																						
	28.5-30			30				100	100	99	95	32	0	68	24	8		SM*	29																						
10-B10	0-2	1.50																SC**	26																						
	2-4	0.50																CH**	47	72																					
	4-6	0.00	0.25		93	28	65	100	100	100	100	95	0	5	27	68		CH								0.42	63	67	CH**												
	6.5-8			10														SC**	26																						
	8.5-10			24				100	100	100	92	16	0	84	6	10		SC*	31																						
	10.5-12			1														CH**	50																						
	12.5-14																	CH**	53																						
	14-16	0.00	0.05		59	20	39	100	100	100	99	94	0	6	48	46		CH								0.19	52	71	CH**												
	16.5-18			1														CH**	71																						
	18.5-20			30				100	100	99	87	7	0	93	4	3		SP-SM*	28																						
	20.5-22			17														SP-SM**	26																						
	22.5-24			10														SP-SM**	27																						
	24.5-26			5														SP-SM**	30																						
	26.5-28			15														SP-SM**	30																						
	28.5-30			28														SP-SM**	29																						
	0-2	0.75			81	30	51	100	100	100	100	92	0	8	27	65		CH	46							0.78	46	79	CH**												