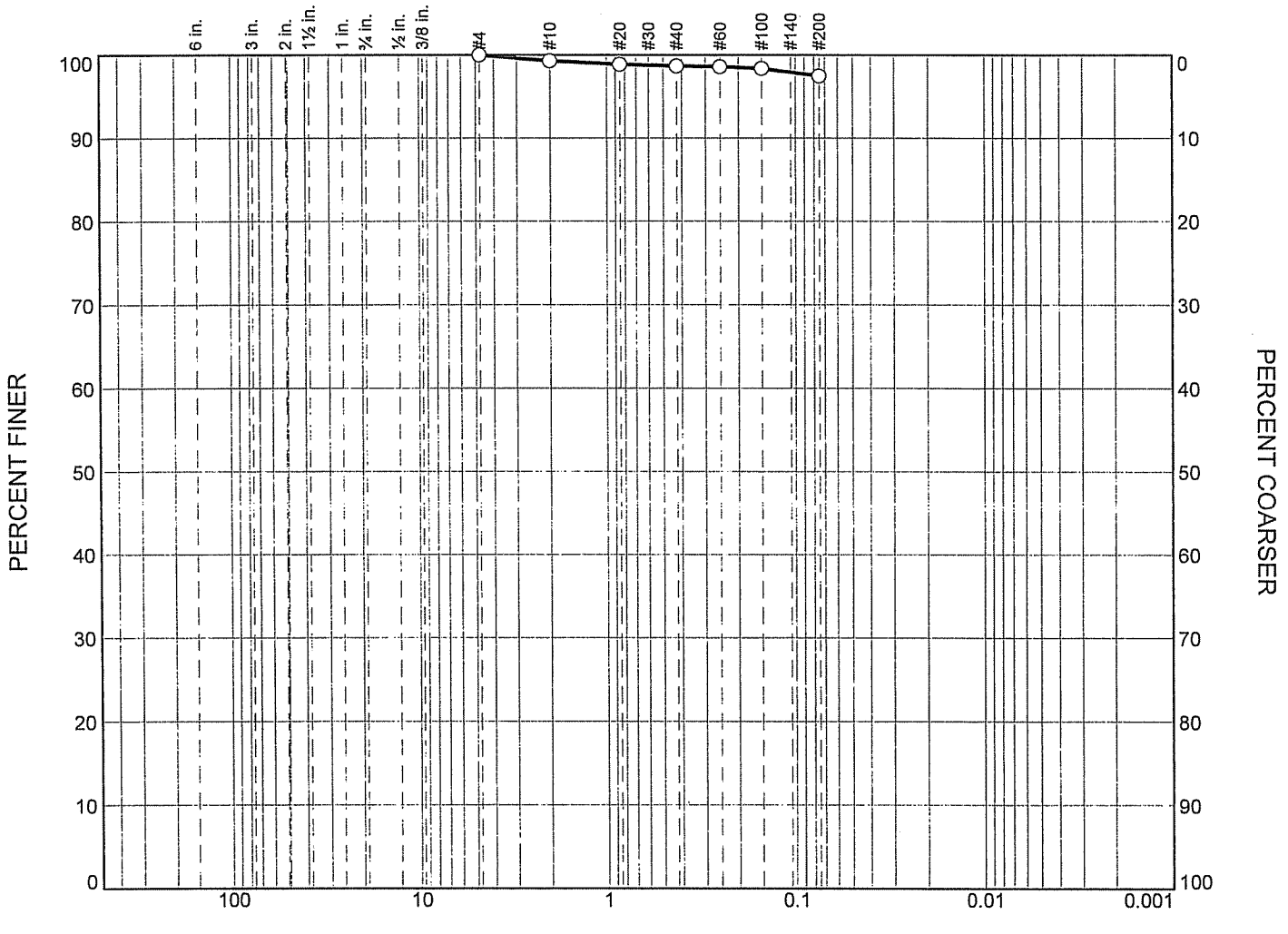
Tolunay-Wong Engineers, Inc.

Project Number:	08.18.921	Client:	United Army Corps of Engineers	Date:	9/18/08
Project Name:	Chocolate Bayou Placement Area DACW64-03-D-0008; Task Order 0079				

Boring No.	Sample No.	Sample Depth (ft)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plasticity Index	Finer than #200 sieve (%)	Uc/UU Compr. Strength (tsf)	Failure Strain (%)	Confining Pressure (psi)	Failure Type
08-79			**El. 8.75, E=3186743 N=13647040**											
	2	2-4	Gray FAT CLAY; calcareous nodules	CH	20.9	103.9								
	3	4-6	Tan and gray FAT CLAY; calcareous nodules	CH	21.0	105.8								
	4	6-8	Reddish-brown and gray SANDY LEAN CLAY	CL	22.7									
	5	8-10	Reddish-brown and tan LEAN CLAY; calcareous nodules	CL	22.6	101.5	25	15	10	86.1	2.44	11.7	9	Bulge
	6	10-12	Reddish-brown SANDY LEAN CLAY	CL	24.3									
	7	12-14	Reddish-brown SANDY LEAN CLAY	CL	26.5					56.7				
	8	14-16	Reddish-brown SANDY SILT	ML	26.6					58.0				
	9	16-18	Reddish-brown SILTY SAND	SM	29.3									
	10	18-20	Reddish-brown SILTY SAND	SM	30.4					48.6				
08-80			**El. 11.50, E=3185851 N=13647657**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	11.5	105.4								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	16.9	109.6								
	4	6-8	Reddish-brown and gray FAT CLAY	CH	33.3	87.9								
	5	8-10	Reddish-brown SANDY LEAN CLAY	CL	23.6					59.4				
	6	10-12	Reddish-brown and gray LEAN CLAY	CL	24.6					92.9				
	7	12-14	Reddish-brown and gray FAT CLAY	CH	23.5	100.5	55	20	35	98.9	2.50	14.6		60 degree
	8	14-16	Reddish-brown and gray FAT CLAY	CH	23.1	103.2								
	9	16-18	Reddish-brown and gray FAT CLAY	CH	24.3	101.5								
	10	18-20	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	25.3	101.5								
08-81			**El. 9.00, E=3185030 N=13648226**											
	2	2-4	Gray and tan SANDY LEAN CLAY	CL	9.9	113.5								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	19.0	106.5								
	4	6-8	Tan and gray SANDY LEAN CLAY	CL	18.3	107.3								
	5	8-10	Reddish-brown and gray SILTY SAND	SM	25.2	101.9								
	6	10-12	Tan and gray SILT	ML	25.9					95.8				
	7	12-14	Reddish-brown and gray FAT CLAY with SAND	CH	32.9	90.5	57	20	37	80.0	1.30	7.5	12	45 degree
	8	14-16	Tan and gray SILTY SAND	SM	24.4									
	9	16-18	Reddish-brown and gray FAT CLAY	CH	35.0					97.5				
	10	18-20	Reddish-brown and gray SANDY LEAN CLAY	CL	22.3									
08-82			**El. 12.00, E=3184209 N=13648793**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	19.8	106.7								
	3	4-6	Tan and gray SANDY LEAN CLAY; ferrous nodules	CL	16.8	111.3	33	16	17	64.1	2.10	15	6	Vertical shear
	4	6-8	Reddish-brown and gray SILTY SAND	SM	24.9					21.4				
	5	8-10	Reddish-brown and gray SILTY SAND	SM	25.3					23.7				
	7	12-14	Reddish-brown and gray SILTY SAND	SM	26.4					16.8				
	10	18-20	Reddish-brown and gray SILTY SAND	SM	24.0					17.8				
08-83			**El. 11.75, E=3183367 N=13648831**											
	2	2-4	Gray and tan SANDY LEAN CLAY	CL	15.2	109.0								
	3	4-6	Tan and gray SANDY LEAN CLAY	CL	19.6	109.0								
	4	6-8	Tan and reddish-brown SANDY SILTY CLAY	CL-ML	19.7	106.9	22	15	7	69.6	1.90	11	8	Bulge
	5	8-10	Tan and gray SILTY SAND	SM	27.2					25.3				
	7	12-14	Tan and gray SILTY SAND	SM	30.3					24.1				
	10	18-20	Tan and gray SILTY SAND	SM	30.3		NV	NP	NP	19.5				
08-84			**El. 9.75, E=3182831 N=13648199**											
	2	2-4	Tan and gray SANDY LEAN CLAY	CL	20.9	102.3								
	3	4-6	Reddish-brown and gray FAT CLAY	CH	27.3	96.0								
	4	6-8	Reddish-brown and gray FAT CLAY	CH	24.9	100.7								
	5	8-10	Reddish-brown and gray FAT CLAY	CH	25.5	98.8	75	23	52	99.1	1.41	11.5	9	60 degree
	6	10-12	Reddish-brown and gray FAT CLAY	CH	27.4	97.4								
	7	12-14	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	27.1	95.9								

Particle Size Analysis - ASTM D 422



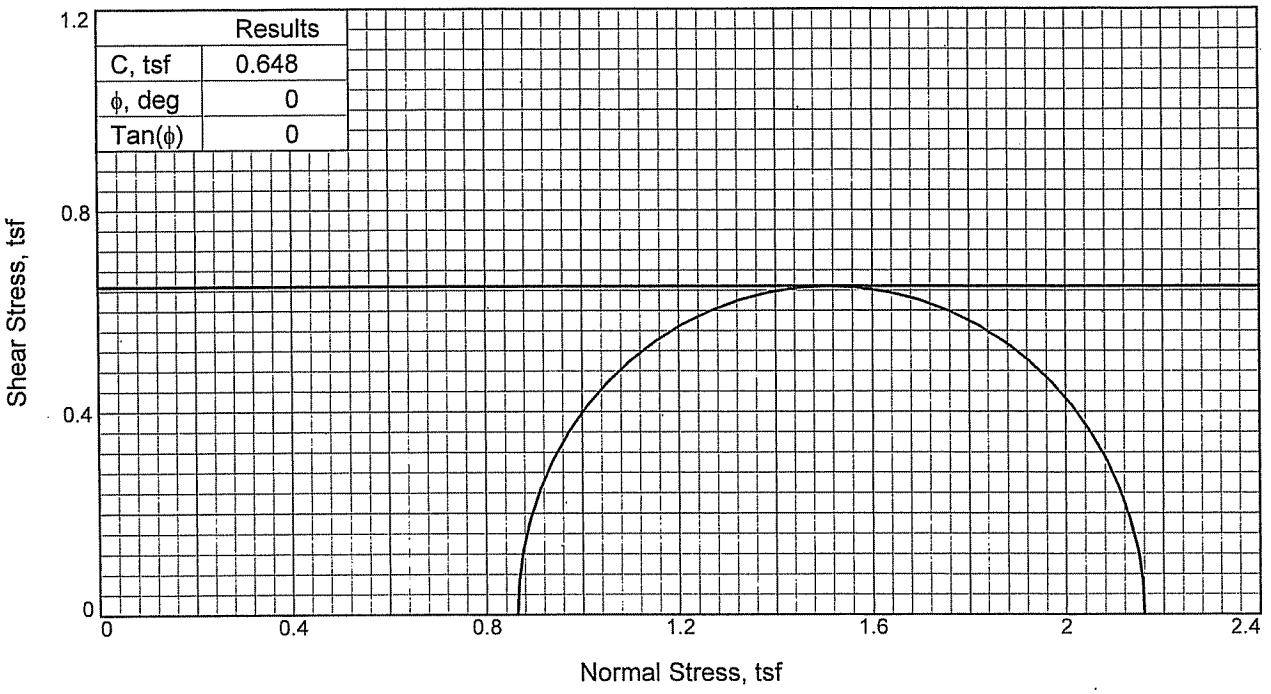
	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.7	0.6	1.2	97.5	

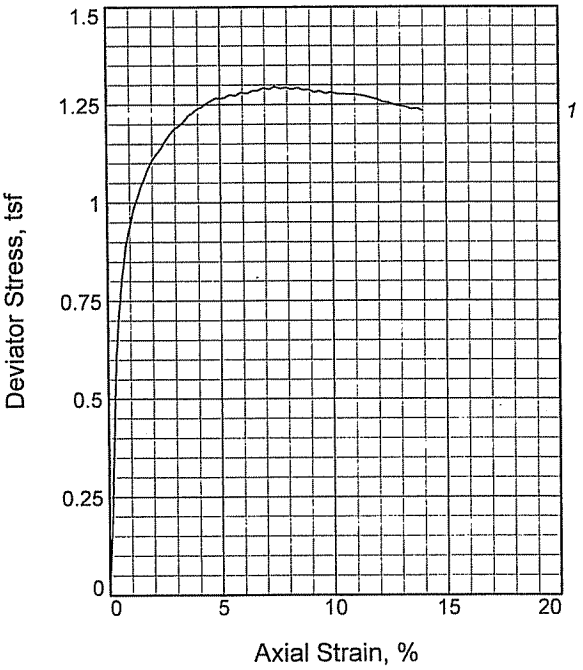
SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	08-81	9	16-18	Reddish-brown and gray FAT CLAY	CH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client: United States Army Corps of Engineers
Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079
Project No.: 08.18.921





Sample No.		1
Initial	Water Content, %	32.9
	Dry Density, pcf	90.5
	Saturation, %	98.9
	Void Ratio	0.9319
	Diameter, in.	2.84
	Height, in.	5.99
At Test	Water Content, %	30.3
	Dry Density, pcf	90.5
	Saturation, %	91.0
	Void Ratio	0.9319
	Diameter, in.	2.84
	Height, in.	5.99
Strain rate, %/min.		1.00
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.86
Fail. Stress, tsf		1.30
Ult. Stress, tsf		
σ_1 Failure, tsf		2.16
σ_3 Failure, tsf		0.86

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish-brown and gray FAT CLAY with SAND

LL= 57 **PL=** 20 **PI=** 37

Assumed Specific Gravity= 2.80

Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 1.50
Failure type: 45 degree

Client: United States Army Corps of Engineers

Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079

Source of Sample: 08-81 **Depth:** 12-14

Sample Number: 7

Proj. No.: 08.18.921 **Date Sampled:** 8/14/08

TRIAXIAL SHEAR TEST REPORT

Tolunay-Wong Engineers, Inc.

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

8/19/2008
12:44 PM

Date: 8/14/08
Client: United States Army Corps of Engineers
Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079
Project No.: 08.18.921
Location: 08-81
Depth: 12-14 **Sample Number:** 7
Description: Reddish-brown and gray FAT CLAY with SAND
Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 1.50
Failure type: 45 degree
Type of Sample: Undisturbed
Assumed Specific Gravity=2.80 **LL=**57 **PL=**20 **PI=**37
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	154.280	100.310
Moisture content: Dry soil+tare, gms.	123.890	84.380
Moisture content: Tare, gms.	31.570	31.800
Moisture, %	32.9	30.3
Moist specimen weight, gms.	1198.7	
Diameter, in.	2.84	
Area, in.^{2}	6.33	
Height, in.	5.99	
Wet Density, pcf	120.3	
Dry density, pcf	90.5	
Void ratio	0.9319	
Saturation, %	98.9	

Test Readings for Specimen No. 1

Membrane modulus = .130 kN/cm^2
Membrane thickness = .031 cm
Cell pressure = 12.00 psi (0.864 tsf)
Back pressure = 0.00 psi (0.000 tsf)
Strain rate, %/min. = 1.00
Fail. Stress = 1.296 tsf **at reading no.** 59

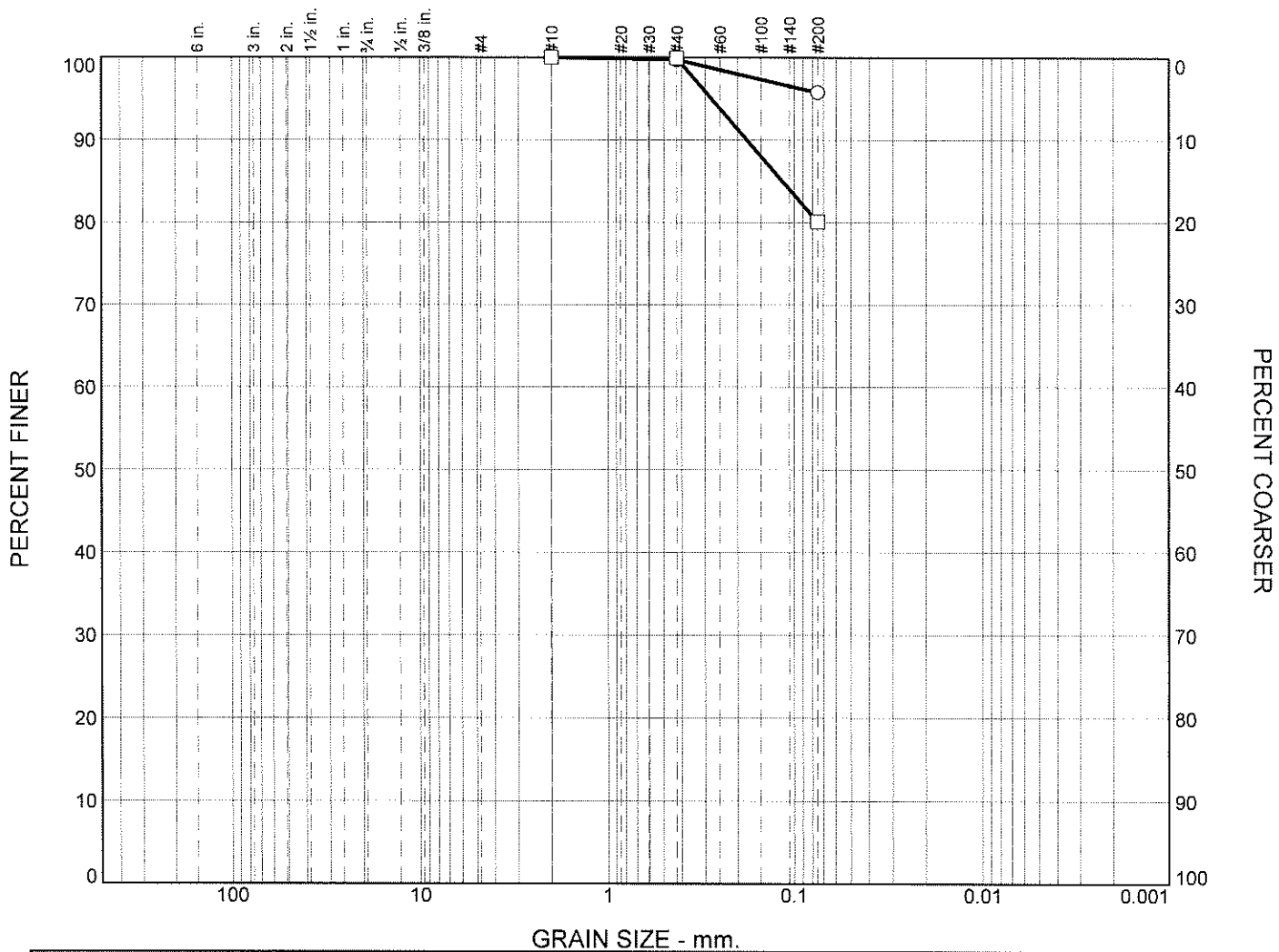
Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
0	0.0240	0.000	0.0	0.0	0.000	0.864	0.864	1.00	0.864	0.000
1	0.0329	18.485	18.5	0.1	0.210	0.864	1.074	1.24	0.969	0.105
2	0.0346	23.998	24.0	0.2	0.272	0.864	1.136	1.32	1.000	0.136
3	0.0358	27.462	27.5	0.2	0.312	0.864	1.176	1.36	1.020	0.156
4	0.0371	31.489	31.5	0.2	0.357	0.864	1.221	1.41	1.043	0.179
5	0.0392	35.468	35.5	0.3	0.402	0.864	1.266	1.47	1.065	0.201
6	0.0405	39.948	39.9	0.3	0.453	0.864	1.317	1.52	1.090	0.226
7	0.0418	43.783	43.8	0.3	0.496	0.864	1.360	1.57	1.112	0.248
8	0.0438	48.253	48.3	0.3	0.547	0.864	1.411	1.63	1.137	0.273
9	0.0451	51.162	51.2	0.4	0.579	0.864	1.443	1.67	1.154	0.290
10	0.0463	53.863	53.9	0.4	0.610	0.864	1.474	1.71	1.169	0.305
11	0.0484	56.179	56.2	0.4	0.636	0.864	1.500	1.74	1.182	0.318
12	0.0497	58.448	58.4	0.4	0.661	0.864	1.525	1.77	1.195	0.331
13	0.0510	60.523	60.5	0.4	0.685	0.864	1.549	1.79	1.206	0.342
14	0.0530	62.765	62.8	0.5	0.710	0.864	1.574	1.82	1.219	0.355
15	0.0542	64.573	64.6	0.5	0.730	0.864	1.594	1.85	1.229	0.365
16	0.0576	66.730	66.7	0.6	0.754	0.864	1.618	1.87	1.241	0.377
17	0.0588	68.131	68.1	0.6	0.770	0.864	1.634	1.89	1.249	0.385
18	0.0601	69.763	69.8	0.6	0.788	0.864	1.652	1.91	1.258	0.394
19	0.0622	71.196	71.2	0.6	0.804	0.864	1.668	1.93	1.266	0.402
20	0.0634	72.516	72.5	0.7	0.819	0.864	1.683	1.95	1.273	0.409
21	0.0668	74.400	74.4	0.7	0.840	0.864	1.704	1.97	1.284	0.420
22	0.0700	76.422	76.4	0.8	0.862	0.864	1.726	2.00	1.295	0.431
23	0.0725	78.655	78.7	0.8	0.887	0.864	1.751	2.03	1.307	0.443
24	0.0771	80.480	80.5	0.9	0.907	0.864	1.771	2.05	1.317	0.453
25	0.0804	82.178	82.2	0.9	0.925	0.864	1.789	2.07	1.327	0.463
26	0.0850	83.563	83.6	1.0	0.940	0.864	1.804	2.09	1.334	0.470
27	0.0896	85.516	85.5	1.1	0.961	0.864	1.825	2.11	1.345	0.481
28	0.0929	87.090	87.1	1.1	0.978	0.864	1.842	2.13	1.353	0.489
29	0.1000	89.184	89.2	1.3	1.001	0.864	1.865	2.16	1.364	0.500
30	0.1065	90.696	90.7	1.4	1.017	0.864	1.881	2.18	1.372	0.508
31	0.1123	92.558	92.6	1.5	1.037	0.864	1.901	2.20	1.382	0.518
32	0.1246	95.310	95.3	1.7	1.065	0.864	1.929	2.23	1.397	0.533
33	0.1304	96.778	96.8	1.8	1.080	0.864	1.944	2.25	1.404	0.540
34	0.1426	99.169	99.2	2.0	1.105	0.864	1.969	2.28	1.416	0.552
35	0.1549	100.997	101.0	2.2	1.123	0.864	1.987	2.30	1.425	0.561
36	0.1670	102.511	102.5	2.4	1.137	0.864	2.001	2.32	1.433	0.569
37	0.1786	104.432	104.4	2.6	1.156	0.864	2.020	2.34	1.442	0.578
38	0.1908	106.235	106.2	2.8	1.174	0.864	2.038	2.36	1.451	0.587
39	0.2030	107.722	107.7	3.0	1.188	0.864	2.052	2.37	1.458	0.594
40	0.2153	108.667	108.7	3.2	1.196	0.864	2.060	2.38	1.462	0.598
41	0.2275	109.837	109.8	3.4	1.206	0.864	2.070	2.40	1.467	0.603
42	0.2396	111.438	111.4	3.6	1.221	0.864	2.085	2.41	1.475	0.611
43	0.2518	112.518	112.5	3.8	1.230	0.864	2.094	2.42	1.479	0.615
44	0.2634	113.475	113.5	4.0	1.238	0.864	2.102	2.43	1.483	0.619
45	0.2756	114.286	114.3	4.2	1.244	0.864	2.108	2.44	1.486	0.622
46	0.2878	115.250	115.3	4.4	1.252	0.864	2.116	2.45	1.490	0.626

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress tsf	Minor Princ. Stress tsf	Major Princ. Stress tsf	1:3 Ratio	P tsf	Q tsf
47	0.2999	116.142	116.1	4.6	1.259	0.864	2.123	2.46	1.494	0.630
48	0.3122	117.027	117.0	4.8	1.266	0.864	2.130	2.47	1.497	0.633
49	0.3244	117.238	117.2	5.0	1.266	0.864	2.130	2.46	1.497	0.633
50	0.3365	117.655	117.7	5.2	1.268	0.864	2.132	2.47	1.498	0.634
51	0.3513	118.668	118.7	5.5	1.275	0.864	2.139	2.48	1.502	0.638
52	0.3660	118.671	118.7	5.7	1.272	0.864	2.136	2.47	1.500	0.636
53	0.3816	119.888	119.9	6.0	1.281	0.864	2.145	2.48	1.505	0.641
54	0.3963	119.861	119.9	6.2	1.278	0.864	2.142	2.48	1.503	0.639
55	0.4117	120.920	120.9	6.5	1.285	0.864	2.149	2.49	1.507	0.643
56	0.4265	121.203	121.2	6.7	1.285	0.864	2.149	2.49	1.507	0.643
57	0.4418	122.244	122.2	7.0	1.293	0.864	2.157	2.50	1.510	0.646
58	0.4566	122.174	122.2	7.2	1.288	0.864	2.152	2.49	1.508	0.644
59	0.4714	123.240	123.2	7.5	1.296	0.864	2.160	2.50	1.512	0.648
60	0.4869	123.010	123.0	7.7	1.290	0.864	2.154	2.49	1.509	0.645
61	0.5016	123.640	123.6	8.0	1.293	0.864	2.157	2.50	1.511	0.647
62	0.5164	123.499	123.5	8.2	1.288	0.864	2.152	2.49	1.508	0.644
63	0.5319	124.234	124.2	8.5	1.292	0.864	2.156	2.50	1.510	0.646
64	0.5466	124.061	124.1	8.7	1.287	0.864	2.151	2.49	1.508	0.644
65	0.5620	124.563	124.6	9.0	1.289	0.864	2.153	2.49	1.508	0.644
66	0.5767	124.200	124.2	9.2	1.281	0.864	2.145	2.48	1.505	0.641
67	0.5921	124.861	124.9	9.5	1.285	0.864	2.149	2.49	1.506	0.642
68	0.6068	124.551	124.6	9.7	1.278	0.864	2.142	2.48	1.503	0.639
69	0.6222	125.254	125.3	10.0	1.282	0.864	2.146	2.48	1.505	0.641
70	0.6369	125.166	125.2	10.2	1.277	0.864	2.141	2.48	1.503	0.639
71	0.6523	125.520	125.5	10.5	1.277	0.864	2.141	2.48	1.503	0.639
72	0.6671	125.788	125.8	10.7	1.276	0.864	2.140	2.48	1.502	0.638
73	0.6824	126.136	126.1	11.0	1.276	0.864	2.140	2.48	1.502	0.638
74	0.6972	126.266	126.3	11.2	1.274	0.864	2.138	2.47	1.501	0.637
75	0.7126	126.366	126.4	11.5	1.271	0.864	2.135	2.47	1.500	0.636
76	0.7273	126.291	126.3	11.7	1.267	0.864	2.131	2.47	1.497	0.633
77	0.7427	126.236	126.2	12.0	1.263	0.864	2.127	2.46	1.495	0.631
78	0.7574	125.964	126.0	12.2	1.257	0.864	2.121	2.45	1.492	0.628
79	0.7728	126.144	126.1	12.5	1.255	0.864	2.119	2.45	1.491	0.627
80	0.7876	125.951	126.0	12.7	1.249	0.864	2.113	2.45	1.489	0.625
81	0.8030	125.972	126.0	13.0	1.246	0.864	2.110	2.44	1.487	0.623
82	0.8177	126.162	126.2	13.2	1.244	0.864	2.108	2.44	1.486	0.622
83	0.8331	125.915	125.9	13.5	1.238	0.864	2.102	2.43	1.483	0.619
84	0.8479	126.504	126.5	13.7	1.240	0.864	2.104	2.44	1.484	0.620
85	0.8626	126.202	126.2	14.0	1.234	0.864	2.098	2.43	1.481	0.617

Particle Size Analysis - ASTM D 422



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.2	4.0	95.8	
□	0.0	0.0	0.0	0.0	0.1	19.9	80.0	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	08-81	6	10-12	Tan and gray SILT	ML
□	08-81	7	12-14	Reddish-brown and gray FAT CLAY with SAND	CH

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client: United States Army Corps of Engineers
Project: Chocolate Bayou Placement Area
Contract DACW64-03-D-0008; Task Order 0079
Project No.: 08.18.921