SUMMARY OF LABORATORY TESTS

Project No. 08.18.920

Client: United States Army Corps of Engineers

Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080

Boring No.	Sample No.	Depth (ft)	Torvane Shear Test (tsf)	Soil Description	USCS	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plastic Limit	Plast. Index	Finer than #200 Sieve (%)	Uc/UU. Compr. (tsf)	Failure Strain (%)	Conf. Pres. (psi)	Failure Type
	13	27-28.5		Gray SAND with SILT; shells	SP-SM						11.8				
	14	30-32		Gray FAT CLAY	CH	48.4	72.3	92	25	67	98.7	0.83	4.6	20.0	60 degree
	15	32-34		Gray FAT CLAY	CH	44.6	74.8								
	16	34-36		Gray FAT CLAY	CH	41.8	79.2								
	17	36-38		Gray SILTY SAND; shells and clay	SM	21.5	92.9	NV	NP	NP	23.7	0.34	4.6		Vertical shear
	18	38-40		Gray poorly graded SAND with SILT	SP-SM						11.8				
07-215															
	1	0-2		Gray FAT CLAY	CH	38.1	78.2								
	2	2-4		Gray FAT CLAY	CH	61.8	60.3	83	23	60	96.4	0.32	2.9		Slickensided
	3	4-6		Gray FAT CLAY	CH	45.6	72.4					0.32	15.2	4.0	60 degree
	4	6-8		Gray FAT CLAY	CH	50.3	67.5								
	5	8-10	0.23	Gray FAT CLAY	CH	59.3	63.1	87	25	62	92.3				
	6	10-11.5		Gray poorly graded SAND with SILT; shells	SP-SM						8.0				
	7	15-16.5		Gray SILTY SAND; shells	SM						17.1				
	8	18.5-20		Gray SILTY SAND	SM						14.0				
07-216															
	1	0-2		Gray FAT CLAY	CH	37.5	76.8								
	2	2-4		Gray FAT CLAY	CH	76.5	59.3	81	24	57	91.4	0.34	5.1		Vertical shear
	3	4-6	0.25	Gray FAT CLAY	CH	39.2	61.0					0.17	4.8		Multiple shear
	4	6-8		Gray FAT CLAY	CH	70.0	55.6	72	21	51	92.0	0.27	4.6	5.5	60 degree
	5	8-10	0.13	Gray FAT CLAY	CH	68.1	56.4	86	24	62	95.7				
	6	10-12		Gray FAT CLAY	CH	59.9	61.0								
	7	12-13.5		Gray SILTY SAND	SM						24.5				
	8	16-18		Gray SANDY LEAN CLAY	CL	28.6	95.6								
	9	18-20		Gray SANDY SILTY CLAY	CL-ML	20.6	97.3								
07-217															
	1	0-1		Gray and brown FAT CLAY	CH										
	2	1-2		Gray and brown FAT CLAY	CH	52.6		87	24	63	95.0				
	3	2-3		Gray and brown FAT CLAY	CH										
	4	3-4		Gray FAT CLAY	CH	64.2		103	28	75	98.0				
	5	4-5		Gray FAT CLAY	CH										
	6	5-6		Gray FAT CLAY	CH	85.4		112	28	84	97.7				
07-218															
	1	0-2		Tan and gray SAND with SILT; shells	SP-SM						5.8				
	2	2-3.5		Gray and tan poorly graded SAND with SILT; shells	SP-SM						8.5				
	3	7-8.5		Gray poorly graded SAND	SP						4.2				
	4	12-13.5		Gray poorly graded SAND with SILT	SP-SM						7.8				

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Particle Size Analysis - ASTM D 422

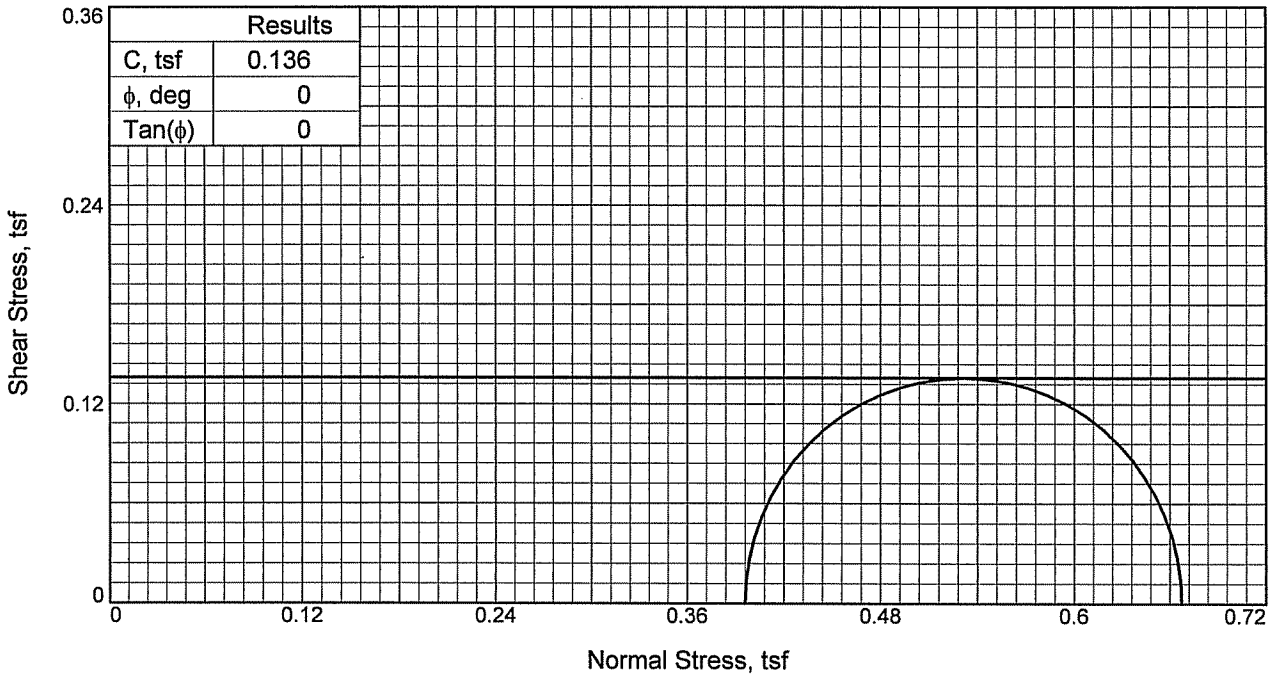
	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.3	75.2	24.5	
□	0.0	0.0	0.3	1.9	5.5	83.8	8.5	
△	0.0	0.0	0.0	0.2	0.5	91.5	7.8	
◇	0.0	0.0	2.6	3.5	6.3	81.1	6.5	
▽	0.0	0.0	0.0	0.0	0.1	90.3	9.6	

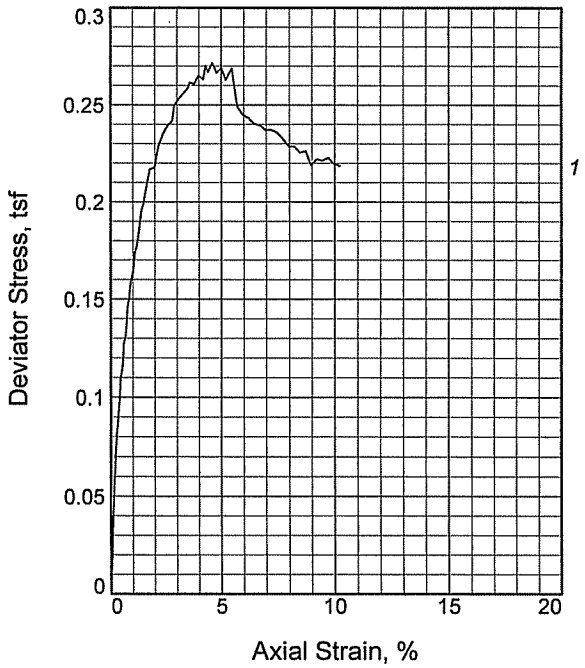
SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	07-216	7	12-13.5	Gray SILTY SAND	SM
□	07-218	2	2-3.5	Gray and tan poorly graded SAND with SILT; shells	SP-SM
△	07-218	4	12-13.5	Gray poorly graded SAND with SILT	SP-SM
◇	07-218	6	18.5-20	Gray poorly graded SAND with SILT; shells	SP-SM
▽	07-219	3	7-8.5	Gray poorly graded SAND with SILT	SP-SM

Tolunay-Wong Engineers, Inc.
Houston, Texas

Client: United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080
Project No.: 08.18.920 **Figure**





Sample No.		1
Initial	Water Content, %	70.0
	Dry Density, pcf	55.5
	Saturation, %	92.9
	Void Ratio	2.0343
	Diameter, in.	2.83
	Height, in.	6.00
At Test	Water Content, %	73.2
	Dry Density, pcf	55.5
	Saturation, %	97.2
	Void Ratio	2.0343
	Diameter, in.	2.83
	Height, in.	6.00
Strain rate, %/min.		1.00
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.40
Fail. Stress, tsf		0.27
Ult. Stress, tsf		
σ_1 Failure, tsf		0.67
σ_3 Failure, tsf		0.40

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Gray FAT CLAY

LL= 72 **PL=** 21 **PI=** 51

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 2850
Torvane; tsf: 0.275
Failure type: 60 degree

Client: United States Army Corps of Engineers

Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080

Source of Sample: 07-216 **Depth:** 6-8

Sample Number: 4

Proj. No.: 08.18.920 **Date Sampled:** 7/31/08

TRIAXIAL SHEAR TEST REPORT

Tolunay-Wong Engineers, Inc.

TRIAXIAL COMPRESSION TEST

Unconsolidated Undrained

8/8/2008
11:30 AM

Date: 7/31/08
Client: United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA Contract No. DACW64-03-D-0008, Task Order No. 0080
Project No.: 08.18.920
Location: 07-216
Depth: 6-8 **Sample Number:** 4
Description: Gray FAT CLAY
Remarks: Test method: ASTM D 2850
Torvane; tsf: 0.275
Failure type: 60 degree
Type of Sample: Undisturbed
Assumed Specific Gravity=2.70 **LL=**72 **PL=**21 **PI=**51
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	150.980	104.870
Moisture content: Dry soil+tare, gms.	101.820	73.950
Moisture content: Tare, gms.	31.620	31.710
Moisture, %	70.0	73.2
Moist specimen weight, gms.	932.4	
Diameter, in.	2.83	
Area, in.^{2}	6.27	
Height, in.	6.00	
Wet Density, pcf	94.5	
Dry density, pcf	55.5	
Void ratio	2.0343	
Saturation, %	92.9	

Test Readings for Specimen No. 1

Membrane modulus = .130 kN/cm^2
Membrane thickness = .031 cm
Cell pressure = 5.50 psi (0.396 tsf)
Back pressure = 0.00 psi (0.000 tsf)
Strain rate, %/min. = 1.00
Fail. Stress = 0.271 tsf **at reading no.** 47

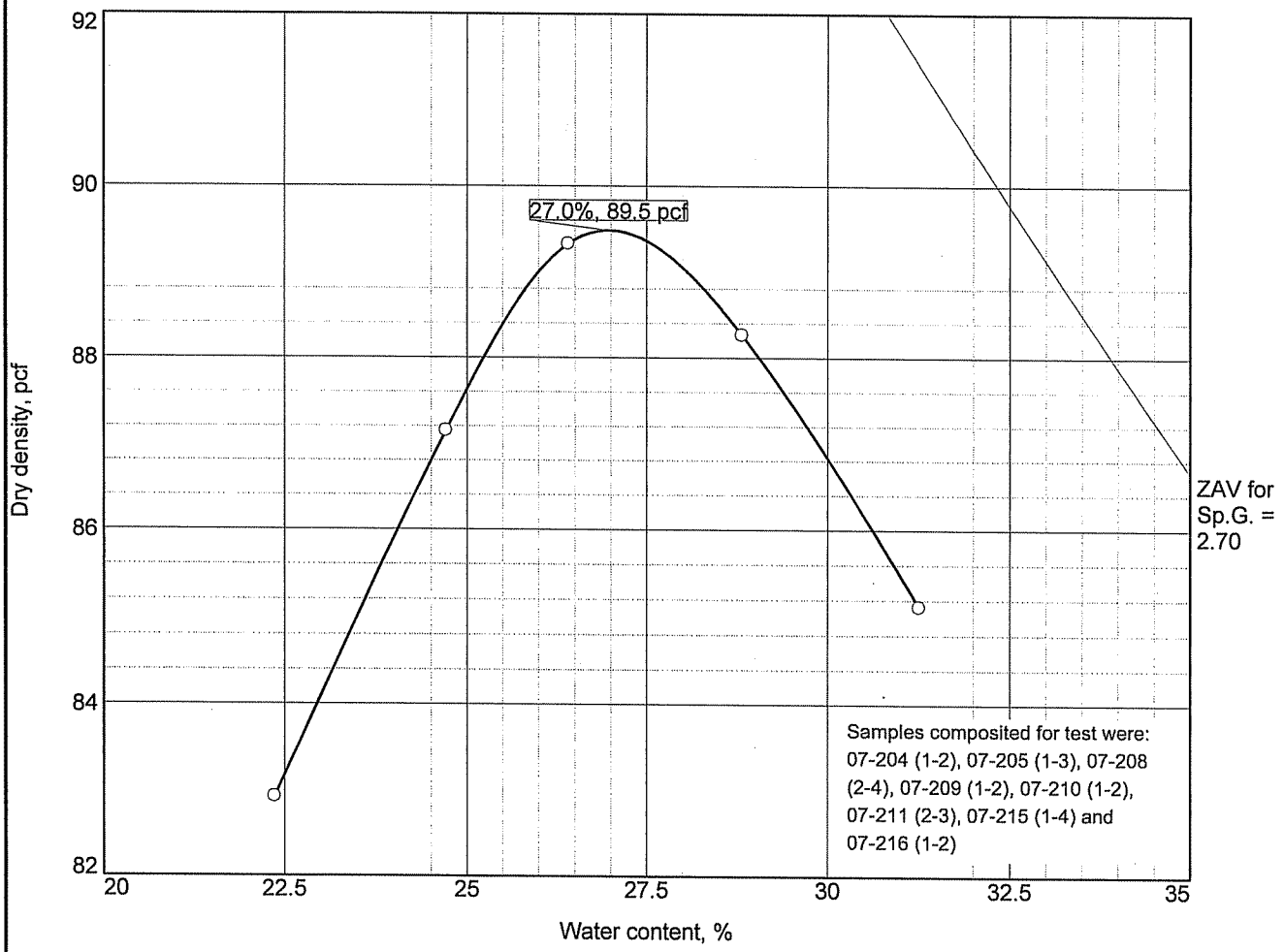
Test Readings for Specimen No. 1

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	0.0299	0.000	0.0	0.0	0.000	0.396	0.396	1.00	0.396	0.000
1	0.0387	5.097	5.1	0.1	0.058	0.396	0.454	1.15	0.425	0.029
2	0.0405	5.390	5.4	0.2	0.062	0.396	0.458	1.16	0.427	0.031
3	0.0417	5.741	5.7	0.2	0.066	0.396	0.462	1.17	0.429	0.033
4	0.0430	6.466	6.5	0.2	0.074	0.396	0.470	1.19	0.433	0.037
5	0.0450	6.720	6.7	0.3	0.077	0.396	0.473	1.19	0.434	0.038
6	0.0463	7.313	7.3	0.3	0.084	0.396	0.480	1.21	0.438	0.042
7	0.0496	7.923	7.9	0.3	0.091	0.396	0.487	1.23	0.441	0.045
8	0.0509	8.229	8.2	0.4	0.094	0.396	0.490	1.24	0.443	0.047
9	0.0541	8.783	8.8	0.4	0.100	0.396	0.496	1.25	0.446	0.050
10	0.0554	9.410	9.4	0.4	0.108	0.396	0.504	1.27	0.450	0.054
11	0.0587	9.840	9.8	0.5	0.112	0.396	0.508	1.28	0.452	0.056
12	0.0620	10.207	10.2	0.5	0.117	0.396	0.513	1.29	0.454	0.058
13	0.0633	10.603	10.6	0.6	0.121	0.396	0.517	1.31	0.457	0.061
14	0.0646	11.145	11.1	0.6	0.127	0.396	0.523	1.32	0.460	0.064
15	0.0692	11.462	11.5	0.7	0.131	0.396	0.527	1.33	0.461	0.065
16	0.0712	11.725	11.7	0.7	0.134	0.396	0.530	1.34	0.463	0.067
17	0.0738	12.428	12.4	0.7	0.142	0.396	0.538	1.36	0.467	0.071
18	0.0758	12.879	12.9	0.8	0.147	0.396	0.543	1.37	0.469	0.073
19	0.0804	13.261	13.3	0.8	0.151	0.396	0.547	1.38	0.472	0.076
20	0.0817	13.638	13.6	0.9	0.155	0.396	0.551	1.39	0.474	0.078
21	0.0850	14.014	14.0	0.9	0.159	0.396	0.555	1.40	0.476	0.080
22	0.0897	14.372	14.4	1.0	0.163	0.396	0.559	1.41	0.478	0.082
23	0.0922	14.859	14.9	1.0	0.169	0.396	0.565	1.43	0.480	0.084
24	0.0942	15.257	15.3	1.1	0.173	0.396	0.569	1.44	0.483	0.087
25	0.1001	15.609	15.6	1.2	0.177	0.396	0.573	1.45	0.485	0.089
26	0.1059	16.306	16.3	1.3	0.185	0.396	0.581	1.47	0.488	0.092
27	0.1125	17.218	17.2	1.4	0.195	0.396	0.591	1.49	0.494	0.098
28	0.1182	17.570	17.6	1.5	0.199	0.396	0.595	1.50	0.495	0.099
29	0.1240	18.143	18.1	1.6	0.205	0.396	0.601	1.52	0.499	0.103
30	0.1363	19.205	19.2	1.8	0.217	0.396	0.613	1.55	0.504	0.108
31	0.1487	19.328	19.3	2.0	0.218	0.396	0.614	1.55	0.505	0.109
32	0.1544	19.961	20.0	2.1	0.225	0.396	0.621	1.57	0.508	0.112
33	0.1602	20.394	20.4	2.2	0.229	0.396	0.625	1.58	0.511	0.115
34	0.1725	20.982	21.0	2.4	0.235	0.396	0.631	1.59	0.514	0.118
35	0.1847	21.386	21.4	2.6	0.239	0.396	0.635	1.60	0.516	0.120
36	0.1970	21.654	21.7	2.8	0.242	0.396	0.638	1.61	0.517	0.121
37	0.2028	22.368	22.4	2.9	0.250	0.396	0.646	1.63	0.521	0.125
38	0.2152	22.760	22.8	3.1	0.253	0.396	0.649	1.64	0.523	0.127
39	0.2267	23.022	23.0	3.3	0.256	0.396	0.652	1.65	0.524	0.128
40	0.2390	23.316	23.3	3.5	0.258	0.396	0.654	1.65	0.525	0.129
41	0.2454	23.619	23.6	3.6	0.262	0.396	0.658	1.66	0.527	0.131
42	0.2570	23.596	23.6	3.8	0.261	0.396	0.657	1.66	0.526	0.130
43	0.2692	24.036	24.0	4.0	0.265	0.396	0.661	1.67	0.529	0.133
44	0.2814	23.912	23.9	4.2	0.263	0.396	0.659	1.66	0.528	0.132
45	0.2878	24.558	24.6	4.3	0.270	0.396	0.666	1.68	0.531	0.135
46	0.2935	24.304	24.3	4.4	0.267	0.396	0.663	1.67	0.529	0.133

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	0.3058	24.759	24.8	4.6	0.271	0.396	0.667	1.69	0.532	0.136
48	0.3174	24.378	24.4	4.8	0.267	0.396	0.663	1.67	0.529	0.133
49	0.3297	24.642	24.6	5.0	0.269	0.396	0.665	1.68	0.530	0.134
50	0.3419	24.145	24.1	5.2	0.263	0.396	0.659	1.66	0.527	0.131
51	0.3573	24.751	24.8	5.5	0.269	0.396	0.665	1.68	0.530	0.134
52	0.3720	24.246	24.2	5.7	0.249	0.396	0.645	1.63	0.521	0.125
53	0.3874	23.962	24.0	6.0	0.245	0.396	0.641	1.62	0.518	0.122
54	0.4022	23.942	23.9	6.2	0.243	0.396	0.639	1.61	0.518	0.122
55	0.4176	23.786	23.8	6.5	0.240	0.396	0.636	1.61	0.516	0.120
56	0.4323	23.816	23.8	6.7	0.239	0.396	0.635	1.60	0.516	0.120
57	0.4477	23.712	23.7	7.0	0.237	0.396	0.633	1.60	0.515	0.119
58	0.4625	23.837	23.8	7.2	0.237	0.396	0.633	1.60	0.515	0.119
59	0.4772	23.834	23.8	7.5	0.236	0.396	0.632	1.60	0.514	0.118
60	0.4927	23.662	23.7	7.7	0.233	0.396	0.629	1.59	0.512	0.116
61	0.5074	23.413	23.4	8.0	0.229	0.396	0.625	1.58	0.510	0.114
62	0.5229	23.495	23.5	8.2	0.228	0.396	0.624	1.58	0.510	0.114
63	0.5376	23.320	23.3	8.5	0.225	0.396	0.621	1.57	0.509	0.113
64	0.5530	23.518	23.5	8.7	0.226	0.396	0.622	1.57	0.509	0.113
65	0.5678	22.953	23.0	9.0	0.219	0.396	0.615	1.55	0.505	0.109
66	0.5832	23.378	23.4	9.2	0.222	0.396	0.618	1.56	0.507	0.111
67	0.5979	23.418	23.4	9.5	0.221	0.396	0.617	1.56	0.507	0.111
68	0.6127	23.683	23.7	9.7	0.223	0.396	0.619	1.56	0.507	0.111
69	0.6283	23.497	23.5	10.0	0.220	0.396	0.616	1.55	0.506	0.110
70	0.6430	23.509	23.5	10.2	0.218	0.396	0.614	1.55	0.505	0.109

COMPACTION TEST REPORT



Test specification: ASTM D 698-07 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CH			2.70			0.0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 89.5 pcf Optimum moisture = 27.0 %	Dark Gray FAT CLAY

Project No. 08.18.920 **Client:** United States Army Corps of Engineers
Project: Galveston Channel and San Jacinto PA
Contract No. DACW64-03-D-0008, Task Order No. 0080 **Date:**
○ **Source of Sample:** Mix 01 **Sample Number:** 1

Remarks:
Test method: ASTM D 698
Preparation Method: Dry
Specific Gravity: Assumed

Tolunay-Wong Engineers, Inc.

Houston, Texas

Tested By: SA **Checked By:** JL

Hole No. 07-216

BORING LOG

DISTRICT	
INSTALLATION	
SHEET 1 OF 1 SHEETS	
1. PROJECT	Galveston Channel and San Jacinto PA
2. LOCATION (Coordinates or Station)	N=13693133 E=3319059
3. DRILLING AGENCY	Dempsey (Geotest Engineering, Inc.)
4. LABORATORY TESTING AGENCY	Tolunay-Wong Engineers, Inc.
5. DEPTH OF WATER	▽ TOD: ▼ 24-HR:
6. DEPTH OF HOLE	20 ft
7. ELEVATION OF HOLE	
8. DATUM FOR ELEVATION	
9. ELEVATION OF GROUNDWATER	▽ TOD: ▼ 24-HR:
10. DRILLING DATE and TIME	STARTED: 4/21/08 COMPLETED: 4/21/08
11. CLASSIFICATION REFERENCE	
12. ENGINEER	

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (%)	SPT (N)	PENETROMETER (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (% <200)
			FAT CLAY(CH), firm, gray & brown -w/ roots @ 0' - 2'		1			1.0	76.8	37.5				
			-soft @ 2' - 4' -w/ sand seams @ 3' - 6'		2			0.50	59.3	76.5	81	24	57	91.4
5			-very soft below 4'		3			0.0	61.0	39.2				
			-gray below 6'		4			0.25	55.6	70.0	72	21	51	92
					5			0.0	56.4	68.1	86	24	62	95.7
10			-w/ sand @ 10'		6			0.0	61.0	59.9				
			SILTY SAND (SM), very loose, gray		7		3							24.5
15														
			SANDY LEAN CLAY (CL), very soft, gray		8			0.0	95.6	28.6				
			SANDY SILTY CLAY (CL-ML), very soft, gray		9			0.0	97.3	20.6				
20														
25														
30														

SWG 1836 BOR 08.18.920.GPJ TOLUNAY-WONG ENGINEERS.GDT 11/10/08

ENG FORM: SWG 1836 BOR