TOLUNAY-WONG ENGINEERS, INC.

Boring No.	Sample No.	Sample Depth (feet)	Elevation (feet)	Pocket Pen. (tsf)	Soil Description	USCS	Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Finer than No. 200 (%)	Unit Dry Weight (pcf)	Dev./Compr. Stress (tsf)	Failure Strain (%)	Confining Pressure (psi)	Failure Type
07-29	N 13844820.73, E 3155536.91		44.45													
	2	2-4	40.45	3.75	Reddish-brown and gray FAT CLAY	CH	24.8									
	3	4-6	38.45	3.50	Reddish-brown and gray FAT CLAY	CH	30.7									
	4	6-8	36.45	4.50	Reddish-brown and gray FAT CLAY	CH	23.6									
	5	8-10	34.45	2.50	Reddish-brown and gray FAT CLAY	CH	30.4									
	6	10-12	32.45	3.00	Gray and reddish-brown FAT CLAY	CH	29.9					88.1	1.52	2.0		Vertical shear
	7	12-14	30.45	2.75	Reddish-brown and gray FAT CLAY	CH	32.6	94	29	65		83.4	1.12	1.3	12	Vertical shear
	8	14-16	28.45	3.25	Gray and tan FAT CLAY; calcareous nodules	CH	21.5									
	9	16-18	26.45	3.50	Gray and tan FAT CLAY; calcareous nodules	CH	19.8									
	10	18-20	24.45	4.00	Reddish-brown and gray FAT CLAY	CH	29.6									
	11	20-22	22.45	4.25	Gray and tan FAT CLAY	CH	22.8									
	12	22-24	20.45	4.25	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	24.4									
	13	24-25	19.45	4.00	Gray and reddish-brown FAT CLAY	CH	23.6									
07-30	N 13844357.92, E 3155690.69		56.31													
	1	0-2	54.31	4.25	Reddish-brown and gray FAT CLAY	CH	21.2									
	2	2-4	52.31	4.50	Dark gray LEAN CLAY with SAND	CL	17.6									
	3	4-6	50.31	4.50	Gray and reddish-brown FAT CLAY; lean clay seams	CH	18.6									
	4	6-8	48.31	3.25	Reddish-brown and gray FAT CLAY	CH	33.1									
	5	8-10	46.31	4.50	Gray and tan FAT CLAY	CH	20.1									
	6	10-12	44.31	2.25	Tan and gray FAT CLAY	CH	23.3									
	7	12-14	42.31	3.50	Gray and reddish-brown FAT CLAY	CH	21.2									
	8	14-16	40.31	4.25	Gray and tan FAT CLAY Gray and tan FAT CLAY	CH	21.6									
	9	16-18	38.31	4.00	Reddish-brown and gray FAT CLAY	CH	29.9									
	10	18-20	36.31	4.25	Gray and tan FAT CLAY	CH	20.4									
	11	20-22	34.31	4.50	Reddish-brown and gray FAT CLAY	CH	18.6									
	12	22-24	32.31	3.50	Gray and tan FAT CLAY	CH	20.6									
	13	24-26	30.31	4.50	Gray and tan FAT CLAY; rotten roots	CH	20.5									
	14	26-28	28.31	2.00	Gray FAT CLAY	CH	27.6									
	15	28-30	26.31	1.75	Tan and gray FAT CLAY	CH	27.6									
	16	30-32	24.31	2.50	Tan and gray FAT CLAY; calcareous and ferrous nodules	CH	28.3	73	22	51		95.2	1.25	1.8		Slickensided
	17	32-34	22.31	2.00	Tan and gray FAT CLAY; calcareous nodules	CH	26.9									
	18	34-36	20.31	3.50	Reddish-brown and gray FAT CLAY	CH	26.2									
	19	36-38	18.31	3.50	Reddish-brown and gray FAT CLAY; silt pockets	CH	25.5									
	20	38-40	16.31	4.50	Reddish-brown and gray FAT CLAY; silt pockets	CH	24.9									
07-31	N 13843832.85, E 3155714.45		56.95													
	1	0-2	54.95	2.25	Gray and reddish-brown FAT CLAY	CH	21.8									
	2	2-4	52.95	3.50	Gray and tan SANDY LEAN CLAY	CL	18.1									
	3	4-6	50.95	2.50	Gray and tan SANDY LEAN CLAY; calcareous nodules	CL	19.4									
	4	6-8	48.95	4.50	Gray and tan FAT CLAY	CH	33.6									
	5	8-10	46.95	2.00	Reddish-brown and gray FAT CLAY	CH	35.0									
	6	10-12	44.95	4.25	Gray and reddish-brown FAT CLAY	CH	22.4									
	7	12-14	42.95	3.50	Gray and tan FAT CLAY	CH	19.9									
	8	14-16	40.95	3.00	Gray and reddish-brown FAT CLAY	CH	25.8									
	9	16-18	38.95	3.00	Gray and reddish-brown FAT CLAY	CH	26.0									
	10	18-20	36.95	3.25	Gray and tan FAT CLAY	CH	18.5									
	11	20-22	34.95	2.00	Reddish-brown and gray FAT CLAY	CH	40.1									
	12	22-24	32.95	2.50	Reddish-brown and gray FAT CLAY; calcareous nodules	CH	26.3	91	27	64		92.7	1.30	1.6		Vertical shear
	13	24-25	31.95	4.50	Gray and tan FAT CLAY	CH	19.9									
07-32	N 13843308.16, E 3155741.26		56.15													
	1	0-2	54.15	4.50	Reddish-brown and gray FAT CLAY	CH	20.6									
	2	2-4	52.15	4.50	Reddish-brown and gray FAT CLAY	CH	20.4									
	3	4-6	50.15	3.00	Gray and reddish-brown FAT CLAY; sandy lean clay seams	CH	30.3									
	4	6-8	48.15	3.25	Gray and reddish-brown FAT CLAY	CH	21.2									
	5	8-10	46.15	3.50	Reddish-brown and gray FAT CLAY; sand seams	CH	27.6									
	6	10-12	44.15	3.25	Reddish-brown and gray FAT CLAY	CH	29.6									
	7	12-14	42.15	2.75	Reddish-brown and gray FAT CLAY	CH	24.4	90	25	65		98.3	2.39	3.8		Slickensided

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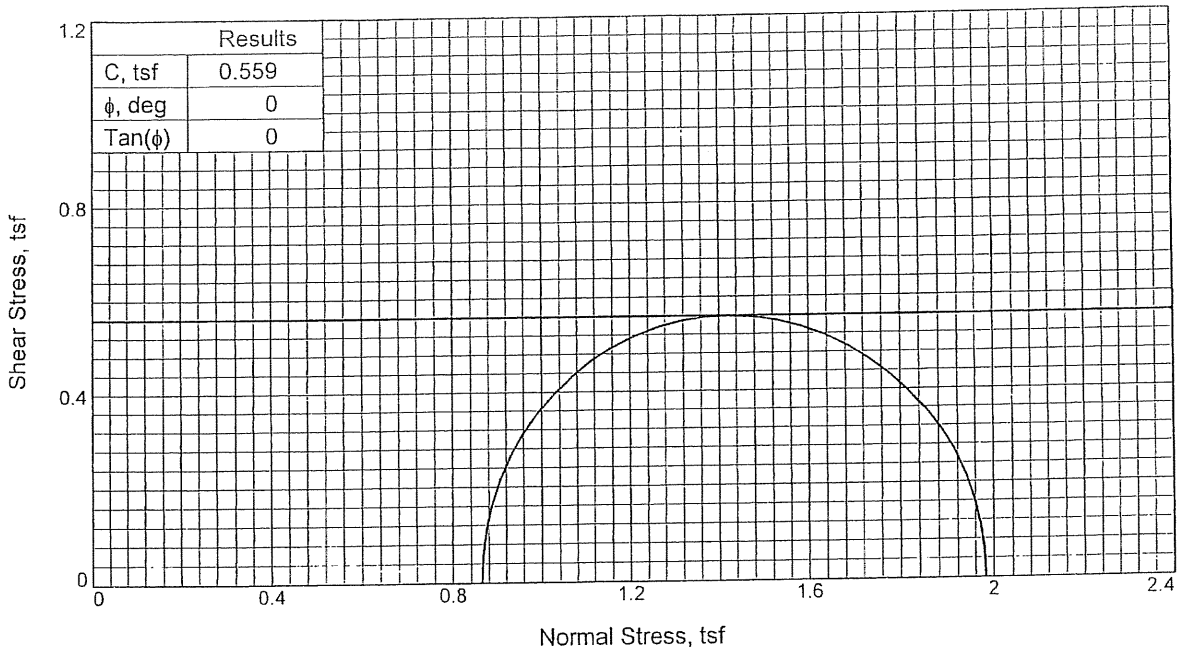

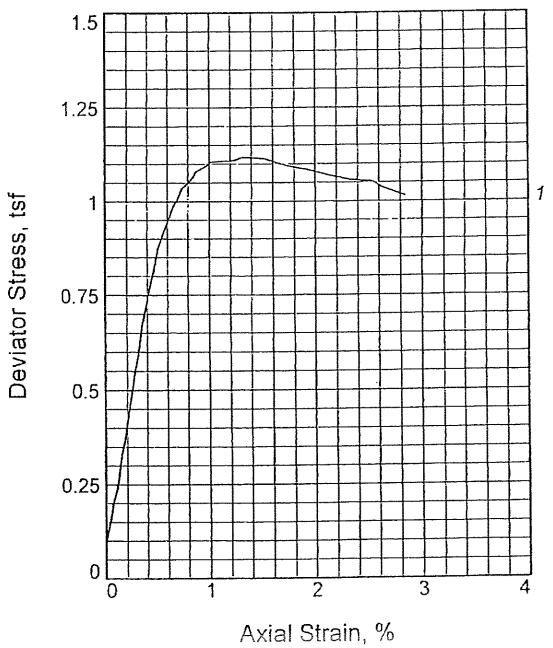

Sample No.		1
Initial	Water Content, %	32.6
	Dry Density, pcf	83.4
	Saturation, %	86.2
	Void Ratio	1.0208
	Diameter, in.	2.75
	Height, in.	6.00
At Test	Water Content, %	32.6
	Dry Density, pcf	83.4
	Saturation, %	86.2
	Void Ratio	1.0208
	Diameter, in.	2.75
	Height, in.	6.00
Strain rate, %/min.		1.00
Back Pressure, tsf		0.00
Cell Pressure, tsf		0.86
Fail. Stress, tsf		1.12
Strain, %		1.3
Ult. Stress, tsf		
Strain, %		
σ_1 Failure, tsf		1.98
σ_3 Failure, tsf		0.86

Type of Test:
Unconsolidated Undrained

Sample Type: Undisturbed

Description: Reddish-brown and gray FAT CLAY

LL= 94 PL= 29 PI= 65

Assumed Specific Gravity= 2.70

Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 2.75
Failure type: Vertical shear

Client: U. S. Army Corps of Engineers

Project: House Tract Placement Area
Contract No. DACW64-03-D-0008, Task Order 0067

Source of Sample: 07-29 **Depth:** 12-14

Sample Number: 7

Proj. No.: 07.18.922 **Date Sampled:** 11/6/07

TRIAXIAL SHEAR TEST REPORT

Tolunay-Wong Engineers, Inc.

TRIAXIAL COMPRESSION TEST
Unconsolidated Undrained

11/13/2007
2:10 PM

Date: 11/6/07
Client: U. S. Army Corps of Engineers
Project: House Tract Placement Area
Contract No. DACW64-03-D-0008, Task Order 0067
Project No.: 07.18.922
Location: 07-29
Depth: 12-14 **Sample Number:** 7
Description: Reddish-brown and gray FAT CLAY
Remarks:
Test method: ASTM D 2850
Pocket pen; tsf: 2.75
Failure type: Vertical shear
Type of Sample: Undisturbed
Assumed Specific Gravity=2.70 **LL**=94 **PL**=29 **PI**=65
Test Method: ASTM D 2850

Parameters for Specimen No. 1

Specimen Parameter	Initial	Final
Moisture content: Moist soil+tare, gms.	135.460	135.460
Moisture content: Dry soil+tare, gms.	110.000	110.000
Moisture content: Tare, gms.	31.880	31.880
Moisture, %	32.6	32.6
Moist specimen weight, gms.	1038.3	
Diameter, in.	2.75	
Area, in.^{2}	5.96	
Height, in.	6.00	
Wet Density, pcf	110.6	
Dry density, pcf	83.4	
Void ratio	1.0208	
Saturation, %	86.2	

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 = 1.119 tsf **at reading no.** 36

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	0.8575	0.000	0.0	0.0	0.000	0.864	0.864	1.00	0.864	0.000
1	0.8576	7.973	8.0	0.0	0.096	0.864	0.960	1.11	0.912	0.048
2	0.8592	11.311	11.3	0.0	0.137	0.864	1.001	1.16	0.932	0.068
3	0.8605	13.872	13.9	0.1	0.167	0.864	1.031	1.19	0.948	0.084
4	0.8618	16.764	16.8	0.1	0.202	0.864	1.066	1.23	0.965	0.101
5	0.8638	19.953	20.0	0.1	0.241	0.864	1.105	1.28	0.984	0.120
6	0.8651	23.437	23.4	0.1	0.283	0.864	1.147	1.33	1.005	0.141
7	0.8664	27.052	27.1	0.1	0.326	0.864	1.190	1.38	1.027	0.163
8	0.8684	30.728	30.7	0.2	0.370	0.864	1.234	1.43	1.049	0.185
9	0.8697	34.680	34.7	0.2	0.418	0.864	1.282	1.48	1.073	0.209
10	0.8716	38.770	38.8	0.2	0.467	0.864	1.331	1.54	1.098	0.234
11	0.8729	41.945	41.9	0.3	0.505	0.864	1.369	1.58	1.117	0.253
12	0.8742	45.261	45.3	0.3	0.545	0.864	1.409	1.63	1.137	0.273
13	0.8762	48.946	48.9	0.3	0.589	0.864	1.453	1.68	1.159	0.295
14	0.8775	52.583	52.6	0.3	0.633	0.864	1.497	1.73	1.180	0.316
15	0.8788	56.024	56.0	0.4	0.674	0.864	1.538	1.78	1.201	0.337
16	0.8808	59.853	59.9	0.4	0.720	0.864	1.584	1.83	1.224	0.360
17	0.8821	62.397	62.4	0.4	0.751	0.864	1.615	1.87	1.239	0.375
18	0.8834	64.732	64.7	0.4	0.778	0.864	1.642	1.90	1.253	0.389
19	0.8854	67.639	67.6	0.5	0.813	0.864	1.677	1.94	1.271	0.407
20	0.8867	69.988	70.0	0.5	0.841	0.864	1.705	1.97	1.285	0.421
21	0.8880	72.755	72.8	0.5	0.874	0.864	1.738	2.01	1.301	0.437
22	0.8901	75.055	75.1	0.5	0.902	0.864	1.766	2.04	1.315	0.451
23	0.8913	76.625	76.6	0.6	0.920	0.864	1.784	2.07	1.324	0.460
24	0.8946	79.578	79.6	0.6	0.955	0.864	1.819	2.11	1.342	0.478
25	0.8959	81.029	81.0	0.6	0.972	0.864	1.836	2.13	1.350	0.486
26	0.8972	82.274	82.3	0.7	0.987	0.864	1.851	2.14	1.358	0.494
27	0.8993	83.622	83.6	0.7	1.003	0.864	1.867	2.16	1.365	0.501
28	0.9005	84.806	84.8	0.7	1.017	0.864	1.881	2.18	1.372	0.508
29	0.9018	86.171	86.2	0.7	1.033	0.864	1.897	2.20	1.381	0.517
30	0.9051	87.406	87.4	0.8	1.047	0.864	1.911	2.21	1.388	0.524
31	0.9085	88.921	88.9	0.8	1.065	0.864	1.929	2.23	1.396	0.532
32	0.9097	90.100	90.1	0.9	1.079	0.864	1.943	2.25	1.403	0.539
33	0.9156	91.509	91.5	1.0	1.095	0.864	1.959	2.27	1.411	0.547
34	0.9189	92.585	92.6	1.0	1.107	0.864	1.971	2.28	1.417	0.553
35	0.9312	92.979	93.0	1.2	1.109	0.864	1.973	2.28	1.419	0.555
36	0.9370	93.870	93.9	1.3	1.119	0.864	1.983	2.29	1.423	0.559
37	0.9492	93.751	93.8	1.5	1.115	0.864	1.979	2.29	1.422	0.558
38	0.9615	92.254	92.3	1.7	1.095	0.864	1.959	2.27	1.411	0.547
39	0.9737	91.531	91.5	1.9	1.084	0.864	1.948	2.25	1.406	0.542
40	0.9853	90.526	90.5	2.1	1.070	0.864	1.934	2.24	1.399	0.535
41	0.9976	89.622	89.6	2.3	1.057	0.864	1.921	2.22	1.393	0.529
42	1.0100	89.495	89.5	2.5	1.053	0.864	1.917	2.22	1.391	0.527
43	1.0157	88.167	88.2	2.6	1.037	0.864	1.901	2.20	1.382	0.518
44	1.0280	86.539	86.5	2.8	1.016	0.864	1.880	2.18	1.372	0.508

Hole No. 07-29

BORING LOG	DISTRICT	INSTALLATION	SHEET 1 OF 1 SHEETS

1. PROJECT House Tract Placement Area	7. ELEVATION OF HOLE 44.45 ft
2. LOCATION (Coordinates or Station) N=13844820.73 E=3155536.91	8. DATUM FOR ELEVATION
3. DRILLING AGENCY T.R.I.	9. ELEVATION OF GROUNDWATER ▽ TOD: ▼ 24-HR:
4. LABORATORY TESTING AGENCY Tolunay-Wong Engineers, Inc.	10. DRILLING DATE and TIME STARTED: 2/22/07 COMPLETED: 2/22/07
5. DEPTH OF WATER ▽ TOD: ▼ 24-HR:	11. CLASSIFICATION REFERENCE
6. DEPTH OF HOLE 25 ft	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"FILL", firm, reddish brown & gray		1	50		1.00						
			-very stiff to hard below 2'		2	58		3.50		24.8				
5					3	54		3.25		30.7				
			-w/ ferrous nodules & sand pockets below 6'		4	42		4.50		23.6				
					5	67		2.50		30.4				
10					6	63		3.00	88.1	29.9				
					7	65		2.75	83.4	32.6	94	29	65	
			-gray & tan @ 14' - 22' -w/ calcareous nodules @ 14' - 18'		8	56		3.25		21.5				
15					9	71		3.25		19.8				
					10	58		4.50		29.6				
20					11	54		4.50		22.8				
			-w/ calcareous nodules @ 22' - 24'		12	63		4.50		24.4				
	19.5				13	100		4.25		23.6				
25			Boring terminated at 25 ft.											
30														

SWG 1836 BOR 03.14.859-057.GPJ TOLUNAY-WONG ENGINEERS.GDT 3/4/08

ENG FORM: SWG 1836 BOR

07-27
N.=13,844,844.19, E.=3,154,558.51

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
1.25	37-	CH,S,R
2.00	34-	CH,VS,R
2.00	32-	CH,VS,R&Gy
2.00	36-	CH,W/SiSms,VS,R&Gy
2.00	30-	CH,VS,Gy&R
2.25	34-	CH,VS,Gy&R
4.50	25-92, 74-21,	CH,W/RtsVS,Gy&Bl
2.50	37-85,	CH,VS,R&Gy
3.50	22-	CH,VS,Gy
3.00	25-	CH,W/CalcNod,VS,GyTn&R
2.75	23-	CH,W/CalcNod,VS,Gy&Tn
3.75	31-	CH,VS,Gy&R
2.75	23-	CH,VS,Gy&R
2.50	33-	CH,VS,R&Gy
2.50	31-	CH,VS,Gy&Tn
2.50	30-95,	CH,W/Fer&CalcNod,VS,Tn&Gy
2.25	28-96, 76-21,	CH,Slks,W/CalcNod,VS,Tn&Gy
4.50	26-	CH,H,R&Gy
4.00	23-	CH,VS,R&Gy
4.25	22-	CH,W/SdSms,VS,R&Gy

07-28
N.=13,844,870.34, E.=3,155,085.93

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
3.75	29-	CH,VS,Gy&R
3.00	30-	CH,VS,Gy&Tn
2.75	23-96,	CH,VS,Gy&R
1.75	21-107, 79-24,	CH,Slks,S,Tn,Gy&R
2.25	26-	CH,VS,Gy&R
2.50	22-	CH,VS,Gy&R
3.00	22-	CH,VS,Gy&R
3.25	22-	CH,VS,Gy&R
2.00	21-	CH,W/CalcNod,VS,Gy&R
3.50	25-	CH,VS,Gy&R
2.50	22-	CH,W/CalcNod,VS,Gy
3.00	26-	CH,W/CalcNod,VS,Gy&RBn
4.00	27-	CH,VS,Gy&R

07-29
N.=13,844,820.73, E.=3,155,536.91

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
1.00		CH,S,R
3.50	25-	CH,VS,R
3.25	31-	CH,VS,R&Gy
4.50	24-	CH,H,R&Gy
2.50	30-	CH,VS,R&Gy
3.00	30-88,	CH,W/CalcNod,VS,Gy&R
2.75	33-83, 94-29,	CH,W/CalcNod,VS,Gy&R
3.25	22-	CH,VS,Gy&R
3.25	20-	CH,VS,Gy&R
4.50	30-	CH,H,Gy
4.50	23-	CH,H,Gy
4.50	24-	CH,W/CalcNod,H,Gy
4.25	24-	CH,H,Gy&R

07-30
N.=13,844,357.92, E.=3,155,690.69

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
1.75	21-	CH,S,R&Gy
4.50	18-	CI,W/Sd,H,Gy
3.50	19-	CH,W/CISms,VS,Gy
3.00	33-	CH,VS,Gy&R
4.50	20-	CH,H,Gy
2.75	23-	CH,VS,Gy
3.25	21-	CH,VS,Gy&R
2.50	22-	CH,VS,Gy&R
4.00	30-	CH,VS,Gy
3.25	20-	CH,VS,Gy
3.50	19-	CH,VS,Gy&R
3.00	21-	CH,VS,Gy
2.50	21-	CH,VS,Gy&Tn
1.75	28-	CH,W/Rts,VS,Gy
2.00	28-	CH,VS,Gy
1.50	28-95, 73-22,	CH,Slks,VS,Tn&Gy
2.00	27-	CH,W/CalcNod,S,Gy&Tn
4.50	26-	CH,Slks,H,Gy&RBn
3.25	26-	CH,W/SiPoc,VS,Gy&RBn
4.50	25-	CH,Slks,W/SiPoc,H,R&Gy

07-31
N.=13,843,832.85, E.=3,155,714.45

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
2.50	22-	CH,VS,Gy&R
3.75	18-	CI,VS,Gy&R
2.50	19-	CI,W/CalcNod,VS,Gy&R
4.50	34-	CH,VS,Gy
3.50	35-	CH,H,Gy&R
4.25	22-	CH,VS,Gy&R
3.50	20-	CH,VS,Gy&R
3.00	26-	CH,VS,Gy&RBn
3.00	26-	CH,VS,Gy&R
2.75	19-	CH,VS,Gy&Tn
2.75	40-	CH,VS,Gy&R
2.50	26-93, 91-27,	CH,W/CalcNod,VS,Gy&R
4.50	20-	CH,VS,Gy

07-32
N.=13,843,308.16, E.=3,155,741.26

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
4.50	21-	CH,H,R&Gy
3.50	20-	CH,VS,R&Gy
2.00	30-	CH,W/SdCISms,VS,Gy&R
3.00	21-	CH,VS,Gy&R
3.50	28-	CH,W/SdSms,VS,Gy&R
3.25	30-	CH,VS,R&Gy
1.75	24-98, 90-25,	CH,Slks,S,Gy&R
3.00	21-	CH,VS,Gy
4.50	20-	CH,H,Gy&R
2.25	23-	CH,VS,Gy&R
2.00	19-	CH,VS,R&Gy
3.75	20-	CH,VS,Gy
4.25	21-	CH,W/CalcNod,VS,Gy&R

07-33
N.=13,842,900.96, E.=3,155,618.63

W.T. NOT FOUND

P. P.	MC-UDW,LL-PL	
1.75	20-	CH,VS,R&Gy
4.50	21-	CH,H,R&Gy
3.75	27-	CH,VS,R&Gy
1.50	33-	CH,S,Gy&R
1.25	40-79, 96-29,	CH,Slks,S,R&Gy
3.00	25-	CH,VS,Gy&R
2.00	28-	CH,VS,Gy&R
3.00	20-	CH,VS,Gy
3.75	32-	CH,H,R&Gy
3.00	23-	CH,VS,R&Gy
2.50	23-	CH,S,Gy&R
3.50	20-	CH,VS,Gy&Tn
4.50	20-	CH,VS,Gy
2.75	29-	CH,VS,Gy&R
2.75	29-	CH,H,Gy&R
3.00	30-	CH,VS,Gy&R
1.50	25-98.2,80-23,	CH,VS,Gy&R
2.00	26-	CH,W/CalcDep,VS,Gy&Tn
2.00	28-	CH,W/CalcNod,VS,Gy&Tn
3.75	23-	CH,S,R&Gy

ELEVATIONS IN FEET, N.G.V.D. 88

NOTE:

FOR BORING LOG NOTES AND CLASSIFICATIONS, SEE DRAWING NO. F-46.

SOLICITATION NO. W912HY-08-B-0016

US Army Corps of Engineers
Galveston District

Rev.	Description	BY:$USER$	Date	By

TIME:$TIME$ DATE:$DATE$

Drawn by: | Date: APRIL, 2008 | Rev. --
Designed by: SK,SL,RB | Scale: AS SHOWN
Checked by: SL,RB | Approval Recommended: HARRISON T. SUTCLIFFE, P.E. Chief, Engineering Branch
Submitted by: LORI K. THOMAS, P.E. Det/Section & Structure Section
Approved by: PETE G. PEREZ, P.E. Chief, Engineering and Construction Division

U.S. ARMY ENGINEER DISTRICT, GALVESTON
CORPS OF ENGINEERS
GALVESTON, TEXAS

PREPARED UNDER THE DIRECTION OF DAVID C. WESTON, COL., C.E.
DISTRICT COMMANDER

HOUSTON SHIP CHANNEL, TEXAS
HOUSE TRACT PLACEMENT AREA
INTERIOR REHABILITATION, EXTERIOR LEVEE REHABILITATION, AND DRAINAGE DITCH REPAIR

LOGS OF BORINGS

Drawing No.: F-45
Sheet 48 of 49

File No. HSC 401-515

File:$FILE$