# 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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Hole No. 07-31

| BORING LOG | DISTRICT | INSTALLATION | SHEET 1 OF 1 SHEETS |
|---|---|---|---|

| | |
|---|---|
| 1. PROJECT<br>House Tract Placement Area | 7. ELEVATION OF HOLE<br>55.94 ft |
| 2. LOCATION (Coordinates or Station)<br>N=13840496.38 E=3154268.12 | 8. DATUM FOR ELEVATION |
| 3. DRILLING AGENCY<br>T.R.I. | 9. ELEVATION OF GROUNDWATER<br>▽ TOD: ▼ 24-HR: |
| 4. LABORATORY TESTING AGENCY<br>Tolunay-Wong Engineers, Inc. | 10. DRILLING DATE and TIME<br>STARTED: 2/22/07 COMPLETED: 2/22/07 |
| 5. DEPTH OF WATER<br>▽ TOD: ▼ 24-HR: | 11. CLASSIFICATION REFERENCE |
| 6. DEPTH OF HOLE<br>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"**, stiff, reddish brown & gray | | 1 | 56 | | 2.50 | | 21.8 | | | | |
| | 53.9 | | **SANDY LEAN CLAY"FILL"**, very stiff, gray & tan, w/ sand pockets, ferrous & calcareous nodules | | 2 | 63 | | 3.75 | | 18.1 | | | | |
| 5 | | | -stiff below 4' | | 3 | 42 | | 2.50 | | 19.4 | | | | |
| | 49.9 | | **FAT CLAY"FILL"**, very stiff-hard, gray & tan, w/ ferrous nodules & sand pockets | | 4 | 67 | | 4.50 | | 33.6 | | | | |
| | | | -very stiff @ 8' - 18'<br>-gray & reddish brown below 8' | | 5 | 58 | | 3.50 | | 35.0 | | | | |
| 10 | | | | | 6 | 56 | | 4.25 | | 22.4 | | | | |
| | | | | | 7 | 58 | | 3.50 | | 19.9 | | | | |
| 15 | | | | | 8 | 63 | | 3.00 | | 25.8 | | | | |
| | | | | | 9 | 71 | | 3.00 | | 26.0 | | | | |
| | | | -stiff @ 18' - 24' | | 10 | 65 | | 2.75 | | 18.5 | | | | |
| 20 | | | | | 11 | 54 | | 2.75 | | 40.1 | | | | |
| | | | -w/ calcareous nodules @ 22' - 24' | | 12 | 58 | | 2.50 | 92.7 | 26.3 | 91 | 27 | 64 | |
| | 31.9 | | | | 13 | 100 | | 4.50 | | 19.9 | | | | |
| 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:$FILE$