



Aptim Environmental & Infrastructure, LLC

6401 Congress Avenue, Suite 140

Boca Raton, Florida 33487

Phone # 1-561-391-8102

Legend for Geotechnical Data

Grain Size Scale for Sediments

Unified Soil Classification System (USCS) (ASTM D2487/2488)		APTIM Standard Sieve Stack		
		Sieve Number	Size (phi)	Size (mm)
Gravel	Coarse Gravel	3/4	-4.25	19.03
	Fine Gravel	5/8	-4.00	16.00
		7/16	-3.50	11.20
		5/16	-3.00	8.00
		3 1/2	-2.50	5.60
		4	-2.25	4.75
Sand	Coarse Sand	5	-2.00	4.00
		7	-1.50	2.80
		10	-1.00	2.00
	Medium Sand	14	-0.50	1.40
		18	0.00	1.00
		25	0.50	0.71
		35	1.00	0.50
	Fine Sand	45	1.50	0.36
		60	2.00	0.25
		80	2.50	0.18
		120	3.00	0.13
		170	3.50	0.09
		200	3.75	0.08
Fines	Silt/Clay	230	4.00	0.06

Proportional Definition of Descriptive Terms

<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %

Consistency of Cohesive Soils

Description	Consistency Index	Approximate Undrained Shear Strength (kPa)	Field Identification
Hard		Over 300	Indented with difficulty by thumbnail, brittle.
Very Stiff	>1	150-300	Readily indented by thumbnail, still very tough.
Stiff	0.75-1	75-150	Readily indented by thumb but penetrated only with difficulty. Cannot be moulded in the fingers.
Firm	0.5-0.75	40-75	Can be penetrated several centimeters by thumb with moderate effort and moulded in fingers by strong pressure.
Soft	< 0.5	20-40	Easily penetrated several centimeters by thumb, easily moulded.
Very Soft		Less than 20	Easily penetrated several centimeters by fist, exudes between fingers when squeezed in fist.

Source: *Engineering Properties of Soils and Rocks, Fourth Edition by Fred G. Bell*

USCS Classifications

Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the #200 sieve. Classification of materials on the core logs based on visual field examinations are identified on the core logs under the Classification of Materials Description. Classifications based on laboratory sieve analyses are identified on the core logs in the Legend and under Remarks.

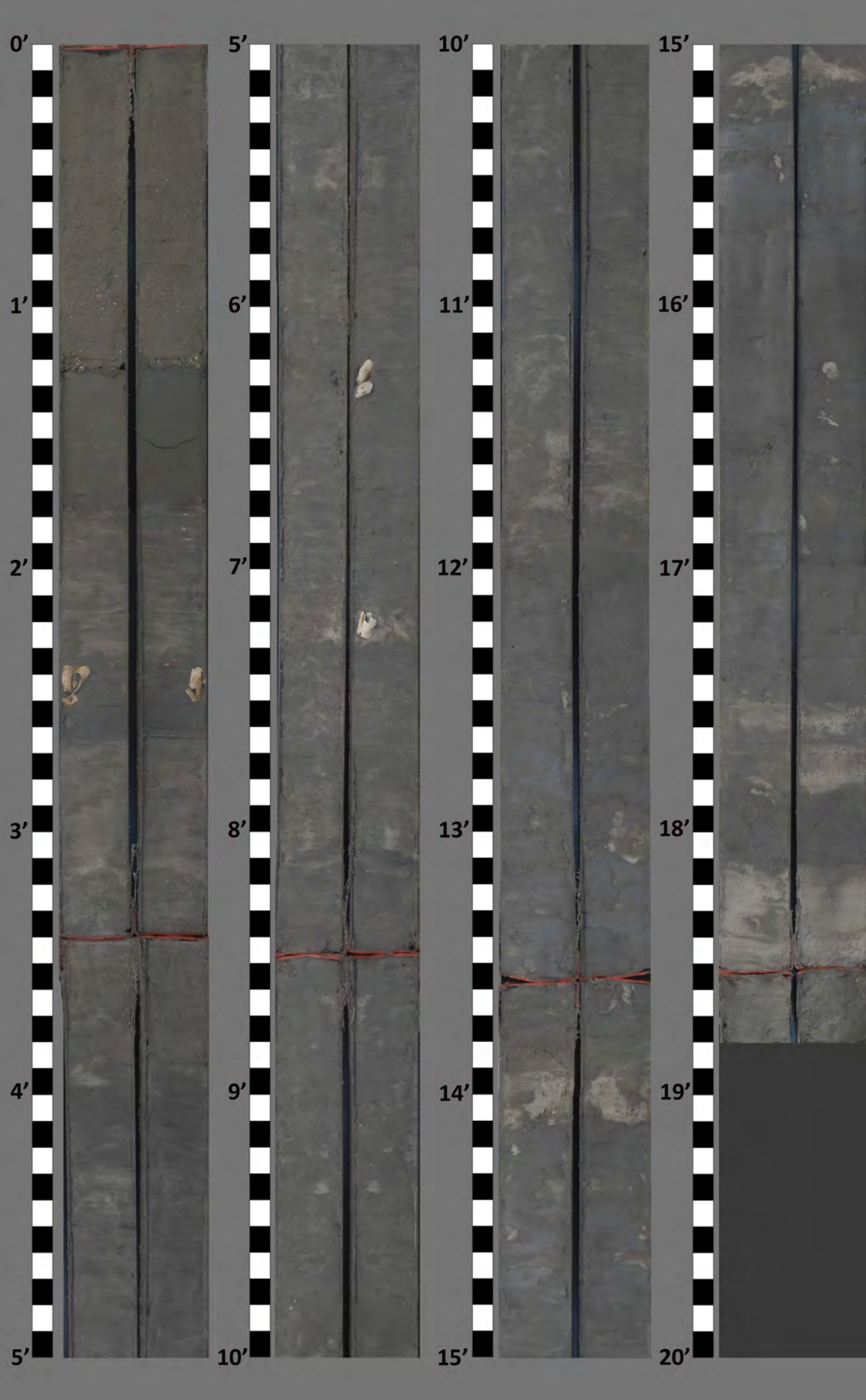
GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1
1. PROJECT TX GLO Region 1 Recon Geotechnical Sand Search Jefferson, Chambers, Galveston and Brazoria Co.			9. SIZE AND TYPE OF BIT 3.0 In.	
2. BORING DESIGNATION TXGLO1-VC-23-075			10. COORDINATE SYSTEM/DATUM Texas State Plane South	
3. DRILLING AGENCY APTIM			11. MANUFACTURER'S DESIGNATION OF DRILL APTIM SEAS VC-700 Vibracore	
4. NAME OF DRILLER APTIM			☐ AUTO HAMMER ☐ MANUAL HAMMER	
5. DIRECTION OF BORING ☒ VERTICAL ☐ INCLINED			12. TOTAL SAMPLES 3	
6. THICKNESS OF OVERBURDEN 0.0 Ft.			13. TOTAL NUMBER CORE BOXES	
7. DEPTH DRILLED INTO ROCK 0.0 Ft.			14. ELEVATION GROUND WATER	
8. TOTAL DEPTH OF BORING 19.3 Ft.			15. DATE BORING 10-16-23	
			16. ELEVATION TOP OF BORING -39.6 Ft.	
			17. TOTAL RECOVERY FOR BORING 18.8 Ft.	
			18. SIGNATURE AND TITLE OF INSPECTOR SM	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS The USCS classification system defines silt as the percent passing the No.200 (0.075 mm) sieve	
-39.6	0.0						
-40.9	1.3		SAND, fine grained, quartz, some silt, trace shell hash, shell hash typically distributed throughout layer and in laminae at base of layer, shell hash increases with depth in layer, dark greenish gray (10Y-4/1), (SM).		1	Sample #1, Depth = 0.7' Mean (mm): 0.10, Phi Sorting: 0.41 Fines (230): 20.20%	
-41.4	1.8		FAT CLAY, firm, greenish gray (10Y-5/1), (CH).		T1	Fines (200): 31.70% (SM) Sample #T1, Depth = 1.6' Ave. Field Vane (tsf): 0.08	
			SAND, fine grained, quartz, trace clay, trace shell fragments, trace shell hash, trace silt, trace whole shell, clay typically distributed in pockets up to 0.5", (0.5" x 1.5") whole articulated bivalve @ 2.5', 1.5" clay pocket @ 2.6', (0.5" x 1.0") whole articulated bivalve @ 6.2', 1.0" bivalve fragment @ 7.2', color is mottled gray (2.5Y-5/1) and dark gray (2.5Y-4/1), (SM).		2	Sample #2, Depth = 4.0' Mean (mm): 0.13, Phi Sorting: 0.55 Fines (230): 23.79% Fines (200): 27.70% (SM)	5
-51.6	12.0				3	Sample #3, Depth = 9.0' Mean (mm): 0.15, Phi Sorting: 0.49 Fines (230): 21.82% Fines (200): 23.09% (SM)	10
-55.0	15.4		FAT CLAY, firm, some sand, fine grained, quartz, sand distributed in pockets up to 1.75", possible bioturbation throughout layer, color is mottled gray (2.5Y-5/1) and dark gray (5Y-4/1), (CH).		T2	Sample #T2, Depth = 13.4' Ave. Field Vane (tsf): 0.05	15
-55.7	16.1		FAT CLAY, hard, greenish black (10Y-2.5/1), (CH).		T3	Sample #T3, Depth = 15.9' Ave. Field Vane (tsf): 0.41	
-57.0	17.4		FAT CLAY, very stiff, some sand, fine grained, quartz, sand distributed in pockets up to 0.5", sand decreases with depth in layer, possible bioturbation between 16.1' & 17.2', color is mottled gray (2.5Y-5/1) and dark gray (5Y-4/1), (CH).		T4	Sample #T4, Depth = 17.1' Ave. Field Vane (tsf): 0.26	
-58.4	18.8		SAND, fine grained, quartz, trace clay, trace silt, 3.0" clayey pocket @ 17.8'. Bit sample from 18.5' to 18.8', gray (2.5Y-5/1), (SM).				
-58.9	19.3		No recovery.				
			End of Boring				25

REGION 1 RECON GEOTECH GP.1 3/25/24



Texas General
Land Office

Texas GLO
Region 1
Geotechnical
Reconnaissance
Survey

TXGLO1-VC-23-075

Date Collected: 10/16/23
Top Elev. (ft NAVD88): -39.6
Bottom Elev. (ft NAVD88): -58.4
Core Length (ft): 18.8



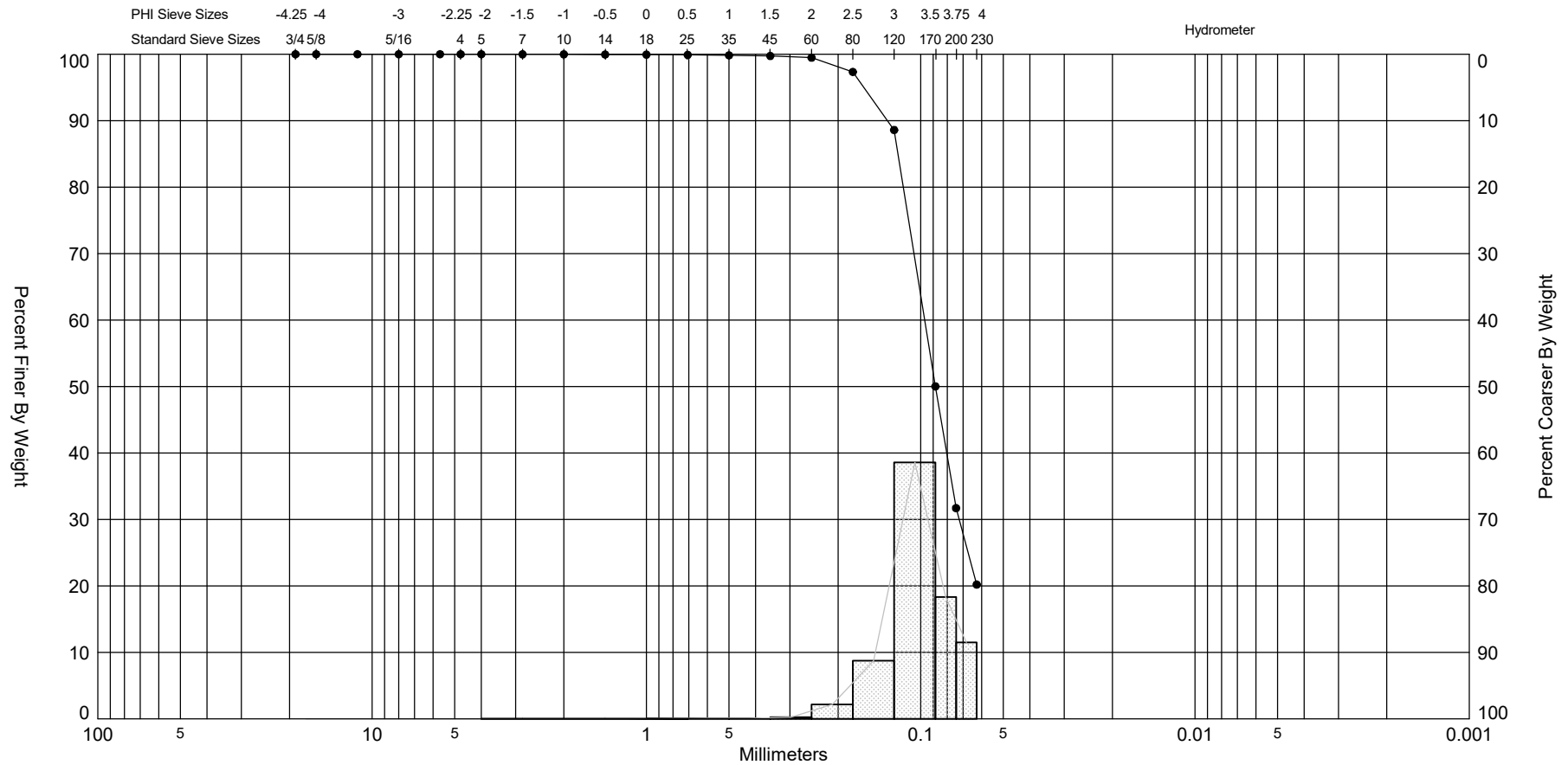
6401 Congress Avenue, Suite 140
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Granularmetric Report				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Depths and elevations based on measured values							
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-075 #1							
Analysis Date: 02-12-24							
Analyzed By: WMM							
Easting (ft):		Northing (ft):		Coordinate System:		Elevation (ft):	
3,230,013		13,598,230		Texas State Plane South		-40.3 NAVD88	
USCS:		Munsell:		Comments:			
SM		Wet - 10Y-4/1 Dry - 5Y-4/1 Washed - 5Y-7/1					
Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
103.99	89.42	6.44	0.00	#200 - 31.70 #230 - 20.20			
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.00	0.00	0.00	0.00	
4	-2.25	4.76	0.00	0.00	0.00	0.00	
5	-2.00	4.00	0.00	0.00	0.00	0.00	
7	-1.50	2.83	0.01	0.01	0.01	0.01	
10	-1.00	2.00	0.01	0.01	0.02	0.02	
14	-0.50	1.41	0.02	0.02	0.04	0.04	
18	0.00	1.00	0.02	0.02	0.06	0.06	
25	0.50	0.71	0.04	0.04	0.10	0.10	
35	1.00	0.50	0.07	0.07	0.17	0.17	
45	1.50	0.35	0.09	0.09	0.26	0.26	
60	2.00	0.25	0.27	0.26	0.53	0.52	
80	2.50	0.18	2.24	2.15	2.77	2.67	
120	3.00	0.13	9.08	8.73	11.85	11.40	
170	3.50	0.09	40.12	38.58	51.97	49.98	
200	3.75	0.07	19.05	18.32	71.02	68.30	
230	4.00	0.06	11.96	11.50	82.98	79.80	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
		3.90	3.50	3.18	3.06	2.63	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	3.33	0.10	0.41	-1.9	14.72		

Granularmetric Report				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Depths and elevations based on measured values							
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-075 #2							
Analysis Date: 02-12-24							
Analyzed By: WMM							
Easting (ft):		Northing (ft):		Coordinate System:		Elevation (ft):	
3,230,013		13,598,230		Texas State Plane South		-43.6 NAVD88	
USCS:		Munsell:		Comments:			
SM		Wet - 2.5Y-4/1 Dry - 2.5Y-5/1 Washed - 2.5Y-8/1					
Dry Weight (g):	Wash Weight (g):	Pan Retained (g):	Sieve Loss (%):	Fines (%):	Organics (%):	Carbonates (%):	Shell Hash (%):
107.99	85.01	2.70	0.02	#200 - 27.70 #230 - 23.79			
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.15	0.14	0.15	0.14	
4	-2.25	4.76	0.00	0.00	0.15	0.14	
5	-2.00	4.00	0.00	0.00	0.15	0.14	
7	-1.50	2.83	0.00	0.00	0.15	0.14	
10	-1.00	2.00	0.00	0.00	0.15	0.14	
14	-0.50	1.41	0.01	0.01	0.16	0.15	
18	0.00	1.00	0.00	0.00	0.16	0.15	
25	0.50	0.71	0.00	0.00	0.16	0.15	
35	1.00	0.50	0.00	0.00	0.16	0.15	
45	1.50	0.35	0.02	0.02	0.18	0.17	
60	2.00	0.25	1.88	1.74	2.06	1.91	
80	2.50	0.18	14.52	13.45	16.58	15.36	
120	3.00	0.13	24.25	22.46	40.83	37.82	
170	3.50	0.09	31.89	29.53	72.72	67.35	
200	3.75	0.07	5.35	4.95	78.07	72.30	
230	4.00	0.06	4.22	3.91	82.29	76.21	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
		3.92	3.21	2.71	2.51	2.11	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	2.94	0.13	0.55	-2.21	22.89		

Granularmetric Report Depths and elevations based on measured values				 APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102			
Project Name: TX GLO Region 1 Recon Geotechnical Sand Search							
Sample Name: TXGLO1-VC-23-075 #3							
Analysis Date: 02-12-24							
Analyzed By: WMM							
Easting (ft): 3,230,013		Northing (ft): 13,598,230		Coordinate System: Texas State Plane South		Elevation (ft): -48.6 NAVD88	
USCS: SM		Munsell: Wet - 5Y-4/1 Dry - 5Y-4/1 Washed - 2.5Y-8/1		Comments:			
Dry Weight (g): 108.71	Wash Weight (g): 85.90	Pan Retained (g): 0.91	Sieve Loss (%): 0.02	Fines (%): #200 - 23.09 #230 - 21.82	Organics (%):	Carbonates (%):	Shell Hash (%):
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained	
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00	
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00	
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00	
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00	
3.5	-2.50	5.66	0.00	0.00	0.00	0.00	
4	-2.25	4.76	0.00	0.00	0.00	0.00	
5	-2.00	4.00	0.05	0.05	0.05	0.05	
7	-1.50	2.83	0.00	0.00	0.05	0.05	
10	-1.00	2.00	0.01	0.01	0.06	0.06	
14	-0.50	1.41	0.01	0.01	0.07	0.07	
18	0.00	1.00	0.00	0.00	0.07	0.07	
25	0.50	0.71	0.02	0.02	0.09	0.09	
35	1.00	0.50	0.01	0.01	0.10	0.10	
45	1.50	0.35	0.06	0.06	0.16	0.16	
60	2.00	0.25	3.18	2.93	3.34	3.09	
80	2.50	0.18	24.10	22.17	27.44	25.26	
120	3.00	0.13	31.69	29.15	59.13	54.41	
170	3.50	0.09	20.94	19.26	80.07	73.67	
200	3.75	0.07	3.52	3.24	83.59	76.91	
230	4.00	0.06	1.38	1.27	84.97	78.18	
Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95	
		3.60	2.92	2.49	2.29	2.04	
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
Statistics	2.74	0.15	0.49	-0.62	8.7		

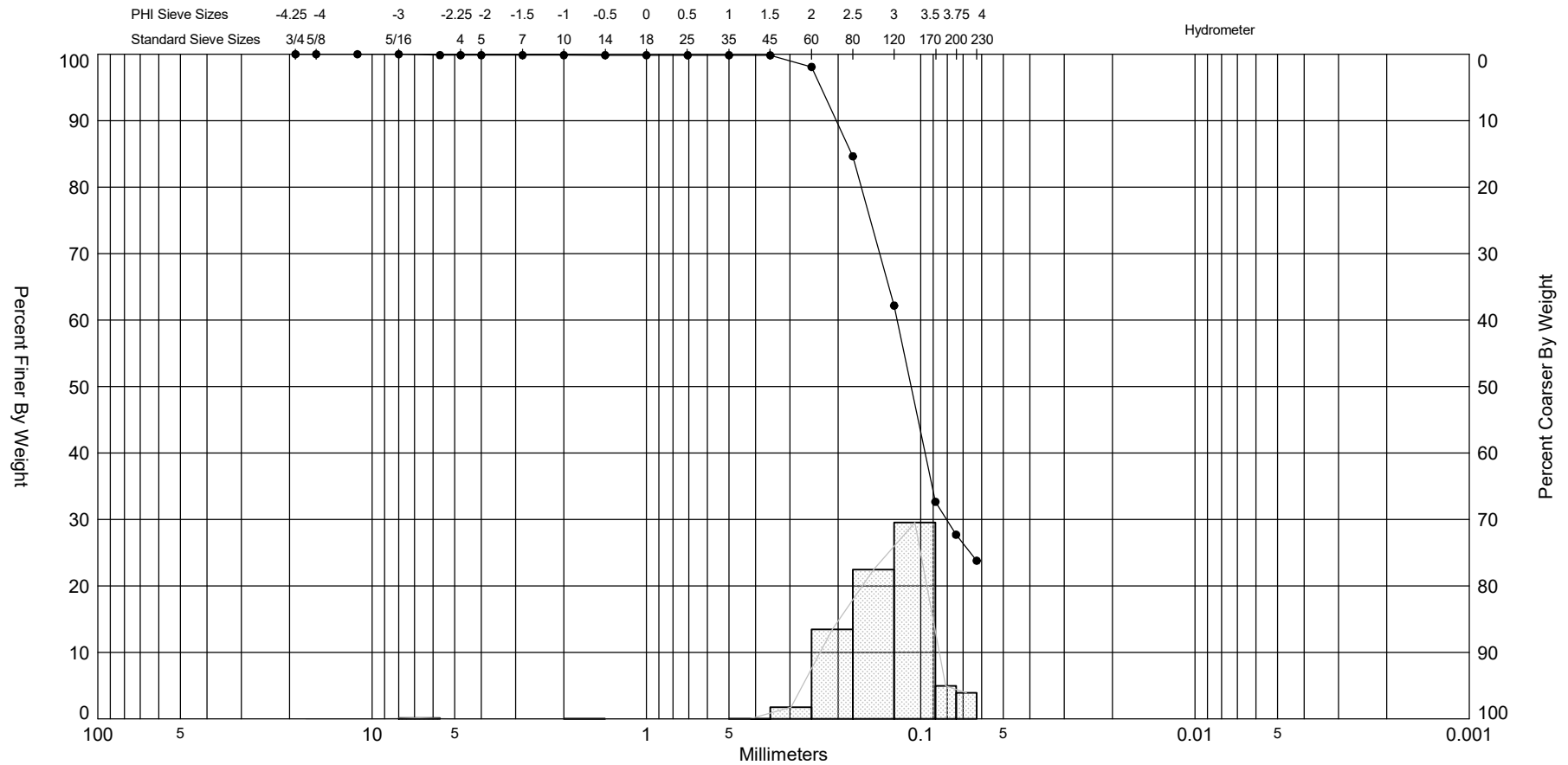
REGION1_RECON_GEOTECH.GPJ 3/6/24



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-075 #1	—●—	-40.3	SM	#200 - 31.70 #230 - 20.20			3.5	3.33	-1.9	14.72	0.41	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	02-12-24
Depths and elevations based on measured values												Analyzed By:	WMM
							APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102					Easting (X, ft):	3,230,013
												Northing (Y, ft):	13,598,230
												Horizontal Datum:	NAD 1983
												Vertical Datum:	NAVD88

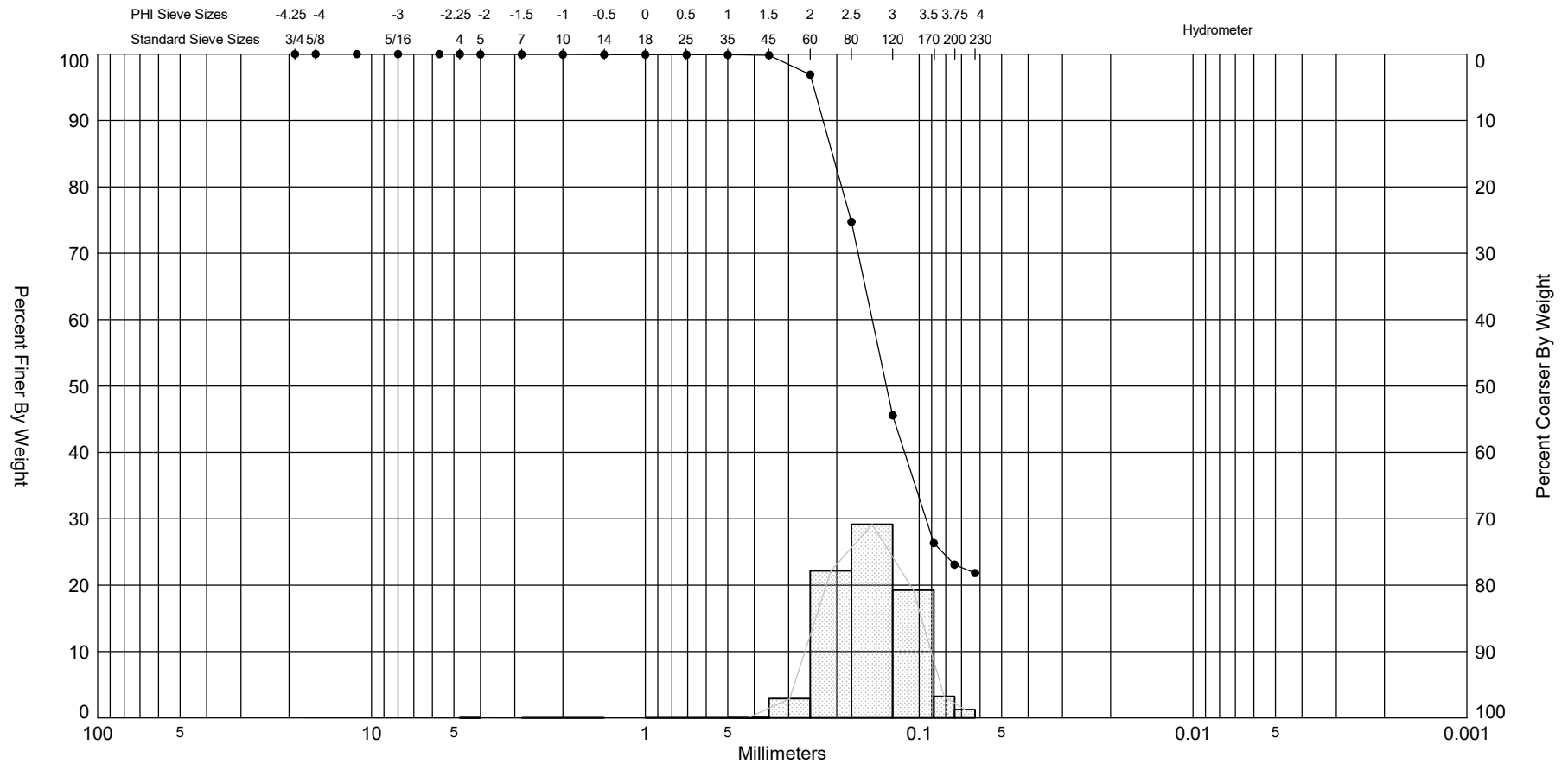
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Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-075 #2	—●—	-43.6	SM	#200 - 27.70 #230 - 23.79			3.21	2.94	-2.21	22.89	0.55	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	02-12-24
Depths and elevations based on measured values												Analyzed By:	WMM
							APTIM					Easting (X, ft):	3,230,013
							6401 Congress Avenue, Suite 140					Northing (Y, ft):	13,598,230
							Boca Raton, FL 33487					Horizontal Datum:	NAD 1983
							ph (561) 391-8102					Vertical Datum:	NAVD88

REGION1_RECON_GEOTECH.GPJ 3/6/24



Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
TXGLO1-VC-23-075 #3	—●—	-48.6	SM	#200 - 23.09 #230 - 21.82			2.92	2.74	-0.62	8.7	0.49	Project Name:	TX GLO Region 1 Recon Geotechnical Sand Search
Comments:												Analysis Date:	02-12-24
Depths and elevations based on measured values												Analyzed By:	WMM
							APTIM 6401 Congress Avenue, Suite 140 Boca Raton, FL 33487 ph (561) 391-8102					Easting (X, ft):	3,230,013
												Northing (Y, ft):	13,598,230
												Horizontal Datum:	NAD 1983
												Vertical Datum:	NAVD88



Mini Vane Shear Test Results

CORE ID	SAMPLE DEPTH (ft)	TORVANE (kg/cm ²)	TORVANE (tsf)	TORVANE (kpa)	DESCRIPTION ¹
TXGLO1-VC-23-071	2.0	0.3	0.03	24.52	Soft
	5.0	0.5	0.05	49.03	Firm
	6.4	2.5	0.26	245.17	Very Stiff
	7.4	5.0	0.51	490.33	Hard
	8.2	4.3	0.44	416.78	Hard
	9.0	3.5	0.36	343.23	Hard
	9.8	3.0	0.31	294.20	Very Stiff
	11.0	2.0	0.20	196.13	Very Stiff
	12.4	3.0	0.31	294.20	Very Stiff
	14.4	2.3	0.23	220.65	Very Stiff
	16.3	3.0	0.31	294.20	Very Stiff
	17.2	7.0	0.72	686.47	Hard
TXGLO1-VC-23-072	2.5	0.0	0.00	0.00	Very Soft
	7.5	4.3	0.44	416.78	Hard
	11.3	5.0	0.51	490.33	Hard
	14.5	3.0	0.31	294.20	Very Stiff
TXGLO1-VC-23-073	9.2	5.0	0.51	490.33	Hard
TXGLO1-VC-23-074	0.5	0.0	0.00	0.00	Very Soft
	3.0	3.5	0.36	343.23	Hard
	5.5	5.8	0.59	563.88	Hard
	8.2	3.5	0.36	343.23	Hard
	14.0	8.0	0.82	784.53	Hard
TXGLO1-VC-23-075	1.6	0.8	0.08	73.55	Firm
	13.4	0.5	0.05	49.03	Firm
	15.9	4.0	0.41	392.27	Hard
	17.1	2.5	0.26	245.17	Very Stiff
TXGLO1-VC-23-076	0.8	0.3	0.03	24.52	Soft
	2.0	0.5	0.05	49.03	Firm
	3.6	1.0	0.10	98.07	Stiff
	6.5	2.0	0.20	196.13	Very Stiff
	13.4	5.0	0.51	490.33	Hard
TXGLO1-VC-23-077	6.7	5.0	0.51	490.33	Hard
	12.6	4.0	0.41	392.27	Hard
	17.0	7.0	0.72	686.47	Hard
TXGLO1-VC-23-078	3.0	2.0	0.20	196.13	Very Stiff
	6.7	4.5	0.46	441.30	Hard
	10.6	3.0	0.31	294.20	Very Stiff
	13.7	4.0	0.41	392.27	Hard
	16.5	5.5	0.56	539.37	Hard
TXGLO1-VC-23-079	0.5	0.0	0.00	0.00	Very Soft
	1.2	1.0	0.10	98.07	Stiff
	3.5	3.5	0.36	343.23	Hard
	12.1	4.0	0.41	392.27	Hard
TXGLO1-VC-23-080	0.1	0.0	0.00	0.00	Very Soft