PMSTPCOL PEmails

From: Ballinger, Amy [aballinger@STPEGS.COM]
Sent: Tuesday, October 21, 2008 12:52 PM
To: Adrian Muniz; Belkys Sosa; George Wunder; Loren Plisco; Raj Anand; Rocky Foster; Tekia Govan; Tom Tai
Subject: Request for Additional Information
Attachments: ABR-AE-08000075 (new).pdf

Good Morning,

Attached, please find a courtesy copy of the cover letter with attachments which answers the NRC's Request for Additional Information. The official paper copy was sent overnight according to the letter addressee list.

If you have any questions, please contact Coley Chappell at (361) 972-4745 or Bill Mookhoek at (361) 972-7274.

Have a great day!!!

Amy Ballinger
STP Units 3 & 4
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Hearing Identifier: SouthTexas34Public_EX
Email Number: 969

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From: Ballinger, Amy

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Recipients:
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Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

October 21, 2008
ABR-AE-08000075

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

The purpose of this letter is to respond to the NRC staff's Request for Additional Information (RAI) letter number 52 related to South Texas Project Units 3 & 4 Combined License Application (COLA) Part 2, Tier 2 Section 2.5S. Attached is the response to RAI question number 02.05.04-1. This submittal completes the response to RAI letter number 52.

No COLA revision is required as a result of this RAI response.

There are no commitments in this letter.

If you have any questions regarding the attached response, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 10/21/08

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

ccc

Attachments:

1. Question 02.05.04-1
2. Power Block Boring Location Plan (Question 02.05.04-1)
3. Boring Logs B-443, B-444, B-445, B-940, B-949 (Question 02.05.04-1)
4. CPT Log C-405S (Question 02.05.04-1)

STI# 32366319

cc: w/o attachment except*
(paper copy)

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R. K. Temple
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 02.05.04-1:

QUESTION:

Figure 2.5S.4-2, Power Block Plan STP COLA site, does not show borings located within the footprint of the STP 4 Radwaste building or the pump houses at the UHS Basin. The STP Unit 4 Radwaste building substructure and UHS structure are Category 1 safety related structures (see ABWR DCD Table 3.2-1). Soil profiles underlying specific structures may vary from site-wide soil properties, and soil data within the footprint of each Category 1 structure is specified by Regulatory Guide (RG) 1.132. Please provide static and dynamic soil data and the related stability analyses for the Radwaste Building and UHS structure, based on considerations of subsurface data obtained at those locations.

RESPONSE:

This response was developed using the information presented in STP 3&4 COLA Revision 1 which was under review at the time this RAI question was sent. Prior to this RAI response, the Ultimate Heat Sinks and associated structures were redesigned and relocated, and the Radwaste Building classification was changed, as described in Revision 2 of the COLA. The following analysis, although not applicable to the current UHS location, is accurate for the locations of the additional boring logs obtained in the third quarter of 2007 based on the structure locations and classifications as described in COLA Revision 1.

This response presents: (1) data that were obtained from the supplemental subsurface investigation performed in July through September of 2007 (Reference 1) for the Unit 4 Radwaste Building, for the pump houses for the Ultimate Heat Sink (UHS), and for the Reactor Service Water (RSW) tunnel; (2) a comparison of the geotechnical properties based on the data from the original subsurface investigation (Reference 2) and the values based on the original plus the supplemental subsurface investigation; and (3) results of bearing capacity, settlement and liquefaction analysis for the Unit 4 Radwaste Building, the UHS, and the RSW tunnel based on the parameters from the original and supplemental subsurface investigations.

(1) The power block subsurface investigation plan (Attachment 2) shows the locations, ground surface elevations and depths of the sample borings and cone penetrometer tests (CPTs) performed for the supplemental subsurface investigation. Borings B-443, 444 and 445 and CPT C-405S were conducted beneath the Unit 4 Radwaste Building location, borings B-940 and 949 were conducted beneath the UHS pump houses, and the remaining eight borings and ten CPTs were conducted beneath the RSW tunnel. For the Unit 4 Radwaste Building and the UHS pump houses, the logs of the borings are in Attachment 3 and the CPT logs are in Attachment 4.

The subsurface profile beneath the Unit 4 Radwaste Building based on the supplemental investigation results is shown on Figure 1. The subsurface profile beneath the UHS based on the results of the original and the supplemental investigations is shown on Figure 2. These figures indicate the thickness of each layer and the high strain (or static)

elastic modulus (E_s) and the stratum thickness (H) employed in the settlement analysis described in (3) below.

(2) Table 1 shows the geotechnical engineering properties derived from the subsurface investigation data for each stratum. Note that, at the STP Units 3 and 4 site, the properties are generally consistent for each stratum. Some scatter is expected due to inherent sampling and testing variations. However, no pattern to the scatter and no distinct sets of properties at different locations were identified. Thus the properties are derived on a site-wide basis, rather than beneath each structure.

In Table 1, where a single value is shown, the property value did not change (within the shown significant numbers) with the addition of the data from the supplemental investigation. Where two values are shown for a property (in bold), the first value is the value derived from the original investigation data while the second value is derived from the data from the original investigation plus the supplemental investigation. (Note that the results from the 16 Resonant Column Torsional Shear (RCTS) tests from the original investigation which were not available for Revision 1 of the FSAR have now been added to the data from the original plus the supplemental investigations in Table 1. Natural moisture content and Atterberg limits were measured as part of the ten RCTS tests on clay, and unit weight was measured as part of all 16 of the RCTS tests. Thus, although the deepest supplemental boring [B-443 under the Unit 4 Radwaste Building] was drilled to 200 feet depth, i.e., into Stratum J [Clay 2], there are differences in the Table 1 properties below Stratum J due to the inclusion of the moisture content, Atterberg limits, and unit weight results from the RCTS tests. The Atterberg limits and unit weights, in turn, can have an effect on the elastic and shear moduli values. Also, the difference in the measured N-values for Sand N in Table 1 [N = 97 and 98] are due to rounding differences, not to any new data; similarly, the differences in the shear modulus for this stratum are due to rounding differences.)

The only additional dynamic testing that was performed for the supplemental field and laboratory investigation was a seismic CPT (C-405S) to 100 feet depth beneath the Unit 4 Radwaste Building. The shear wave velocity results from C-405S were enveloped by the large amount of data generated during the initial investigation, and thus no modifications were made to the previously established shear wave velocity profile.

(3) Analyses were made to estimate the bearing capacity and settlement beneath the Unit 4 Radwaste Building and the UHS, and to assess the liquefaction potential of the soil beneath these structures and the RSW tunnel.

The bearing capacity, c, of the soil supporting each structure was computed using the method presented in Section 2.5S.4.10.3 of Revision 1 of the FSAR (no change for Revision 2), applying weighted average parameters from the layers within the effective shear depth below the foundation.

Settlement was estimated using the elastic compression approach and Boussinesq-type stress distribution outlined in Section 2.5S.4.10.4 of Revision 1 of the FSAR (no change for Revision 2).

Liquefaction analyses were performed using the methods described in Section 2.5S.4.8.2 of Revision 1 of the FSAR. Each boring standard penetration test (SPT) N-value, each CPT reading, and each shear wave velocity measurement from the supplemental program was analyzed.

Results of these analyses are presented below:

Unit 4 Radwaste Building

This structure will be approximately 127 ft x 217 ft in plan dimensions (see Attachment 2) with foundation base at El. -20 ft, or about 54 ft below final grade.

Bearing Capacity

For the Unit 4 Radwaste Building, computed c = 73.5 ksf. The estimated demand, d, (design load) under static loading conditions is 4 ksf. Thus, c/d ≈ 18. (Note that for the Unit 3 Radwaste Building, computed c = 91.8 ksf, giving c/d ≈ 23.)

Settlement

Estimated pre-consolidation pressures exceeded the combined stresses from existing overburden and applied load at the center of each stratum, and thus virgin compression was not considered. The computed average settlement beneath the Unit 4 Radwaste Building = 0.8 inches.

Liquefaction

One SPT sample indicated a factor of safety (FS) against liquefaction of 1.0, less than the required 1.1. This sample is above the foundation elevation and will thus be excavated out.

There were four CPT readings with computed FS values ranging from 0.96 to 1.1. These were all from relatively near-surface strata that will be excavated out.

There was one shear wave velocity reading that gave a FS reading lower than 1.1. This was in Stratum A, which is a non-liquefiable clay and will be excavated out.

UHS Structure

The UHS basin is approximately 380 ft in diameter, with 110 ft x 125 ft pump houses on the northeast and southwest ends (see Attachment 2). The basin embedment depth is about 32 ft below final grade and the floor of each pump house is 7 ft below the basin floor. For bearing capacity and settlement, the UHS structure is considered as a whole; the pump houses are not considered separately. However, the results of the two supplemental borings under the pump houses have been included in the analyses.

Bearing Capacity

Since the area occupied by the UHS is so large and there is some variability in stratum thickness across this area, different soil strata occur within the same elevation range below the UHS. Two soil conditions/profiles were thus developed for bearing capacity calculation purposes. These were labeled "Clay Preferred" and "Sand Preferred." For soil conditions/profiles with the label "Clay Preferred," the clay stratum below the foundation and its characteristic undrained shear strength, s_u, represent the elevation range containing the different soil types. Similarly, for soil conditions/profiles with the label "Sand Preferred," the sand stratum below the foundation and its characteristic friction angle, Φ', represent the elevation range containing the different soil types. It is expected that these two subsurface profiles will provide the lower and upper boundaries of bearing capacity.

With the data from the supplemental borings beneath the pump houses included, for the UHS the computed c = 26.8 ksf for the "Clay Preferred" profile and c = 174.9 ksf for the "Sand Preferred" profile. The estimated demand, d, (design load) under static loading conditions is 6 ksf. Thus, c/d ≈ 4.5 for the "Clay Preferred" profile and c/d ≈ 29 for the "Sand Preferred" profile. Without the data from the supplemental borings beneath the pump houses included, for the UHS the computed c = 24.7 ksf for the "Clay Preferred" profile and c = 170.6 ksf for the "Sand Preferred" profile. This gives c/d ≈ 4.1 for the "Clay Preferred" profile and c/d ≈ 28 for the "Sand Preferred" profile.

Settlement

Estimated pre-consolidation pressures exceed the combined stresses from existing overburden and applied load at the center of each stratum, and thus virgin compression was not considered. With the data from the supplemental borings beneath the pump houses included, the computed average settlement beneath the UHS is 6.1 inches. Without the data from the supplemental borings beneath the pump houses included, the computed average settlement beneath the UHS is 6.0 inches.

Liquefaction

Analysis of the SPT N-values from the supplemental UHS pump house borings indicates no FS values less than 1.1. No CPTs or shear wave velocity measurements were taken below the pump houses.

RSW Tunnel

The RSW tunnels are 39-ft wide, 14.5-ft high structures that link the UHS pump house to the Control Building of each unit (see Attachment 2).

Bearing Capacity and Settlement

Since the overburden pressure from the soil removed to construct the tunnel will be as large as or greater than the weight of the tunnel itself, then there should be no bearing capacity issues with the tunnel, and settlements should be negligible. This will be confirmed during final design.

Liquefaction

Analysis of the SPT N-values from the eight supplemental RSW tunnel borings indicates no FS values less than 1.1.

Factors of safety against liquefaction of less than 1.1 were computed for several readings from CPTs along the RSW tunnel route. At all locations except one, these soils will either be excavated out during construction for the tunnel (Strata A and B), and/or are clay soils that are considered non-liquefiable (Stratum D). A 1.4 ft-thick interval in sand Stratum C in C-949 has a FS less than 1.1. The RSW tunnel will be a large mat-supported structure, capable of spanning limited areas with reduced subgrade support, and thus limited zones of potentially liquefiable material should not be a problem.

No shear wave velocity measurements were taken below the RSW tunnel.

Summary

Static and dynamic soil data and the results of the related stability analyses for the Radwaste Building and UHS structure have been provided, based on considerations of subsurface data obtained at those locations. The locations of the supplemental explorations points beneath these structures, as well as subsurface profiles beneath these structures, have also been provided. The soil strata properties derived from the supplemental investigation are tabulated in this response, and are shown to be very similar to those derived based on the original investigation.

There is a current NRC commitment (COM 2.5S-2) to update STP 3 & 4 FSAR Section 2.5S to include confirmatory subsurface investigation to accommodate the addition of the Radwaste Building in the STP 4 area, although the classification of the Radwaste Building was changed in Revision 2. In addition, the UHS as described in Revision 1 of the COLA was relocated as described in Revision 2. Necessary changes to the COLA in response to COM 2.5S-2 and to reflect subsurface investigations associated with the relocation of the UHS and associated structures will be provided in a future COLA revision in accordance with a current NRC commitment (COM 3H-2). The information presented in this RAI response will be included in a future COLA revision as part of the general site characterization, in accordance with the above NRC commitments.

References

1. MACTEC Engineering and Consulting, Inc. “Attachment J – Addendum to Subsurface Investigation and Laboratory Testing Data Report Summary, STP COL Project Units 3 and 4,” Charlotte, NC, July 2008.

2. MACTEC Engineering and Consulting, Inc. “Geotechnical Subsurface Investigation Data Report, Combined Operating License Application Project, South Texas Project, Matagorda County, Texas”, Raleigh, NC, April 2007.

Table 1: Summary of Geotechnical Engineering Properties

Parameter[1]	Stratum				
	A FILL	**A CLAY**	**B SILT**	**C SAND**	**D CLAY**
Average thickness, feet	2	18	7.5	**19.5, 19**	**21.5, 22**
USCS symbol	GP	CH, CL	ML, CL, SM	SM, SP-SM	CH, CL
Natural moisture content (MC), %	5	**23, 24**	24	**24, 23**	**25, 26**
Moist unit weight (γ_{moist}), pcf	124	124	121	122	**121, 122**
Fines content , %	N/A[2]	95	70	25	**70, 75**
Liquid limit (LL), %	N/A[2]	57	38[3]	N/A[2]	**58, 57**
Plasticity index (PI), %	N/A[2]	40	20[3]	N/A[2]	40
Measured SPT N-value, bpf	8	10	9	25	15
Adjusted SPT $(N_1)_{60}$-value, bpf	15	15	10	35	15
Shear Wave Velocity, ft/sec	N/A[2]	575	725	785	925
Undrained shear strength (s_u), ksf	1.9	1.6	N/A[2]	N/A[2]	3.0
Friction angle (Ø'), degree Cohesion (c'), ksf	N/A[2]	N/A[2]	30	35	16 1.0
Elastic modulus (high strain) (E_s), ksf	N/A[2]	1,050	460	850	2,500
Shear modulus (high strain) (G_s), ksf	N/A[2]	360	180	320	850
Coefficient of Subgrade Reaction (k_1), kcf (for 1-ft. sq. area)	N/A[2]	150	160	600	300
Earth Pressure Coefficients					
Active (K_a)	N/A[2]	0.5	0.3	0.3	0.5
Passive (K_p)	N/A[2]	2.0	3.0	3.7	2.0
At Rest (K_0)	N/A[2]	0.7	0.5	0.4	0.7
Coefficient of Sliding	N/A[2]	0.30	0.35	0.40	0.30
Consolidation Properties					
C_c [C_r]	N/A[2]	0.235 [0.017]	N/A[2]	N/A[2]	**0.255, 0.285 [0.023], [0.026]**
P_p', ksf [OCR]	N/A[2]	6.3 [7.0]	N/A[2]	N/A[2]	12.3 [3.3]

Notes.
[1]The values tabulated above are for use as a guideline only. Reference should be made to specific boring and CPT logs and laboratory test results for appropriate modifications at specific locations and for specific calculations.
[2]N/A indicates that the properties are either not measured or not applicable.
[3]Nine of 17 Atterberg Limit tests for Stratum B yield Non-Plastic results. Values shown are average of Plastic results.

Table 1: Summary of Geotechnical Engineering Properties (Cont'd)

Parameter[1]	Stratum				
	E SAND	**F CLAY**	**H SAND**	**J (CLAY)**	**J (SAND)**
Average thickness, feet	18	**16.5, 17**	**19, 18**	61[3]	37.5[4]
USCS symbol	SP-SM, SM	CH, CL	SP-SM, SM	CH, CL	SM, ML
Natural moisture content (MC), %	21	**24, 25**	19	23	23
Moist unit weight (γ_{moist}), pcf	**122, 123**	125	**128, 125**	125	125
Fines content , %	20	90	**15, 25**	90	**40, 50**
Liquid limit (LL), %	N/A[2]	58	N/A[2]	54	N/A[2]
Plasticity index (PI), %	N/A[2]	40	N/A[2]	35	N/A[2]
Measured SPT N-value, bpf	35	22	44	31	65
Adjusted SPT $(N_1)_{60}$-value, bpf	30	15	30	15	35
Shear Wave Velocity, ft/sec	1,080	945	1,075	1,145	1,275
Undrained shear strength (s_u), ksf	N/A[2]	**3.2, 3.3**	N/A[2]	**3.5, 3.4**	N/A[2]
Friction angle (ϕ'), degree Cohesion (c'), ksf	35	8 2.0	35	8 2.5	33
Elastic modulus (high strain) (E_s), ksf	1,100	**2600, 2650**	**1150, 1130**	**3500, 3450**	1,500
Shear modulus (high strain) (G_s), ksf	**425, 430**	**900, 920**	**450, 430**	**1200, 1190**	**600, 580**
Coefficient of Subgrade Reaction (k_1), kcf (for 1-ft. sq. area)	600	300	600	N/A[2]	N/A[2]
Earth Pressure Coefficients					
Active (K_a)	0.3	0.5	0.3	N/A[2]	N/A[2]
Passive (K_p)	3.7	2.0	3.7	N/A[2]	N/A[2]
At Rest (K_0)	0.4	0.7	0.4	N/A[2]	N/A[2]
Coefficient of Sliding	0.40	0.30	0.40	N/A[2]	N/A[2]
Consolidation Properties					
C_c [C_r]	N/A[2]	**0.24, 0.238 [0.039][0.028]**	N/A[2]	**0.228, 0.224 [0.040][0.035]**	N/A[2]
P_p', ksf [OCR]	N/A[2]	15.5 [2.6]	N/A[2]	**16.5** [1.7]	N/A[2]

Notes.
[1]The values tabulated above are for use as a guideline only. Reference should be made to specific boring and CPT logs and laboratory test results for appropriate modifications at specific locations and for specific calculations.
[2]N/A indicates that the properties are either not measured or not applicable.
[3]Thickness of J (CLAY 1) (29 ft) & J (CLAY 2) (32 ft) combined.
[4]Thickness of J (Interbed 1) (**9**, **8.5** ft), J (SAND 1) (13.5 ft), & J (Interbed 2) (**15**, **14.5** ft) combined.

Table 1: Summary of Geotechnical Engineering Properties (Cont'd)

Parameter[1]	Stratum					
	K (CLAY)	**K (SAND)**	**L CLAY**	**M SAND**	**N (CLAY)**	**N (SAND)**
Average thickness, feet	18.5	25.5	5	15	228[3]	93.5[4]
USCS symbol	CL, CH	SM, ML	CH	SP-SM	CH, CL	SM, SP-SM
Natural moisture content (MC), %	**20, 23**	21	29	21[5]	25	**23, 22**
Moist unit weight (γ_{moist}), pcf	**129, 124**	127	**129, 124**[6]	127[5]	**121, 123**	128
Fines content , %	75	45	75[6]	45[5]	75	20
Liquid limit (LL), %	**39, 50**	N/A[2]	73	N/A[2]	65	N/A[2]
Plasticity index (PI), %	**25, 35**	N/A[2]	50	N/A[2]	45	N/A[2]
Measured SPT N-value, bpf	15	75	23	75[5]	33	**98, 97**
Adjusted SPT $(N_1)_{60}$-value, bpf	6	30	8	30[5]	7	20
Shear Wave Velocity, ft/sec	1,170	1,370	975	1,165	1,290	1,655
Undrained shear strength (s_u), ksf	3.0	N/A[2]	3.0	N/A[2]	3.0	N/A[2]
Friction angle (Ø'), degree Cohesion (c'), ksf	N/A[2]	33	N/A[2]	33[5]	N/A[2]	36
Elastic modulus (high strain) (E_s), ksf	**3100, 3500**	1,650	**3100, 3000**	1,300	4,500	2,100
Shear modulus (high strain) (G_s), ksf	**1050, 1200**	630	**1050, 1020**	500	**1500, 1560**	**800, 820**
Coefficient of Subgrade Reaction (k_1), kcf (for 1-ft. sq. area)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Earth Pressure Coefficients						
Active (K_a)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Passive (K_p)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
At Rest (K_0)	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Coefficient of Sliding	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Consolidation Properties						
C_c [C_r]	0.176 [0.017]	N/A[2]	0.176[6] [0.017][6]	N/A[2]	0.336 [0.050]	N/A[2]
P_p', ksf [OCR]	18.3 [1.7]	N/A[2]	16.0 [1.0]	N/A[2]	28.5 [1.0]	N/A[2]

Notes.
[1]The values tabulated above are for use as a guideline only. Reference should be made to specific boring and CPT logs and laboratory test results for appropriate modifications at specific locations and for specific calculations.
[2]N/A indicates that the properties are either not measured or not applicable.
[3]Thickness of N (CLAY1) (59 ft), N (CLAY 2) (8 ft), N (CLAY 3) (8.5 ft), N (CLAY 4) (30 ft), N (CLAY 5) (54 ft), & N (CLAY 6) (68.5 ft) combined.
[4]Thickness of N (SAND 1) (17 ft), N (SAND 2) (32.5 ft), N (SAND 3) (18.5 ft), N (SAND 4) (8 ft), & N (SAND 5) (17.5 ft) combined.
[5]Value for K (SAND) adopted.
[6]Value for K (CLAY) adopted.

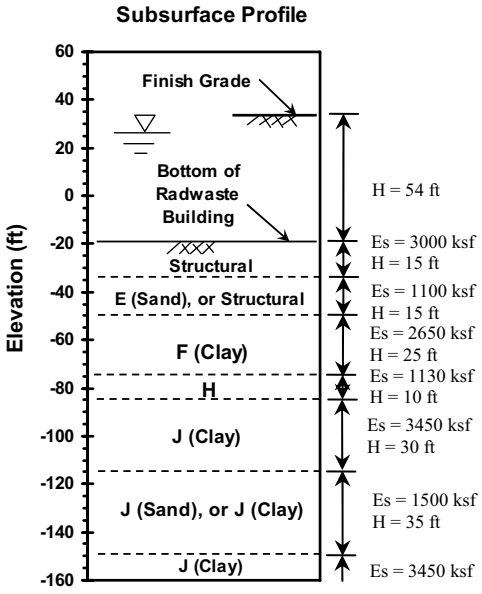


Figure 1: Subsurface Profile at Unit 4 Radwaste Building

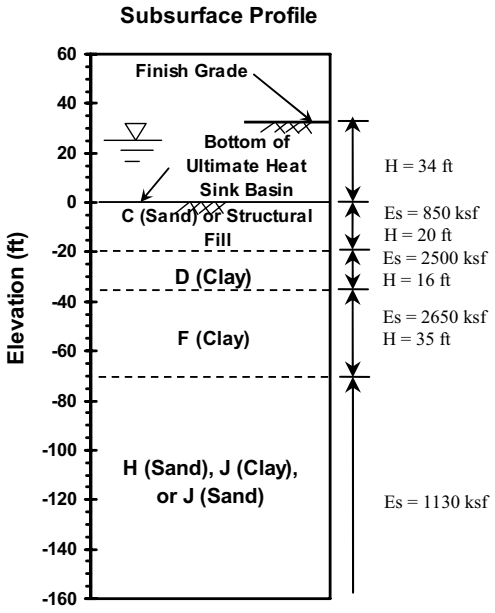
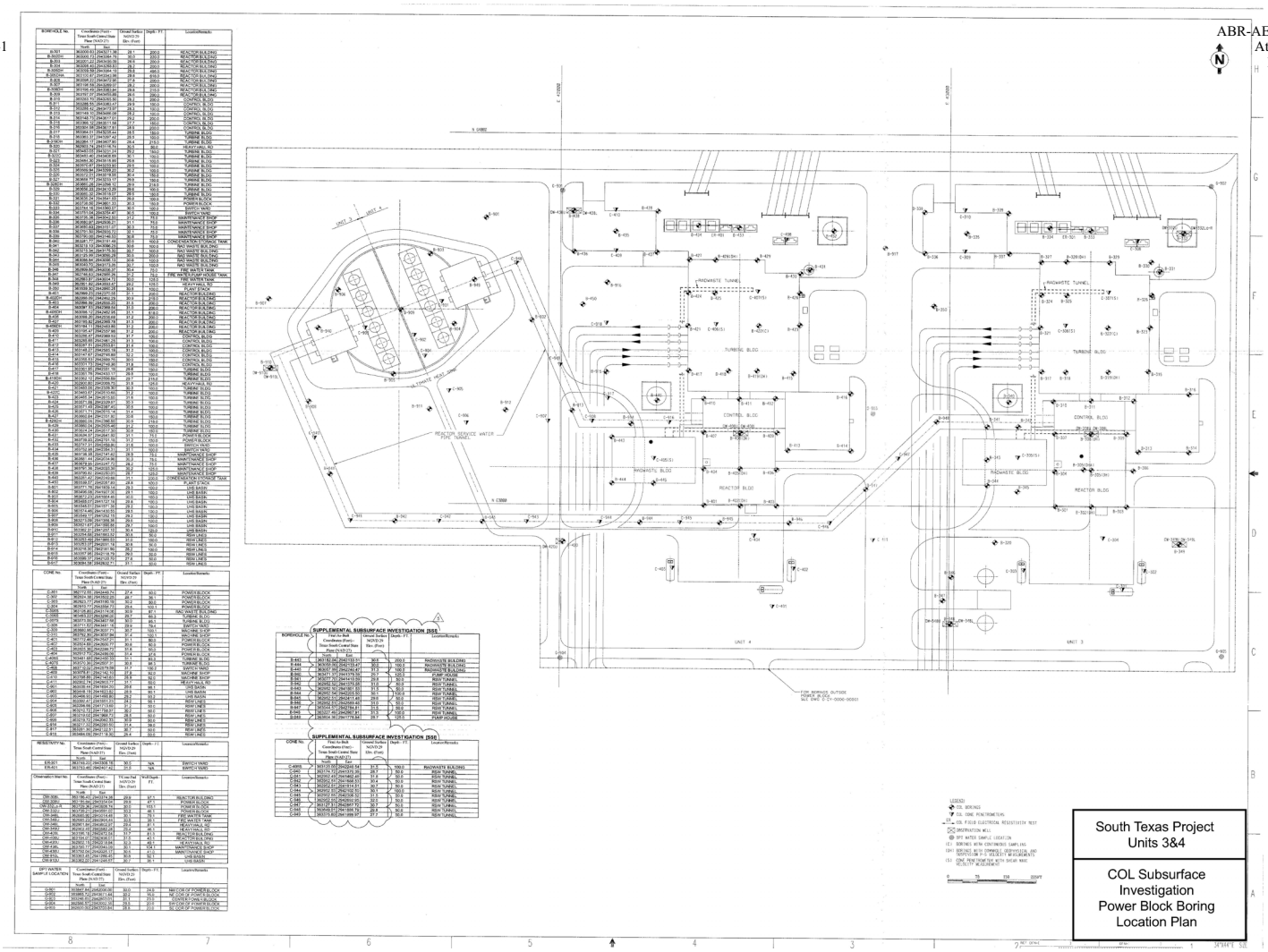


Figure 2: Subsurface Profile at UHS

Question
02.05.04-1

ABR-AE-08000075
Attachment 2
Page 1 of 1



STP SOIL STP2007.GPJ WLA.GDT 5/20/08

Project Name :STP COL PROJECT
Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-443

Type and Diameter of Boring: Solid Stem Auger/Mud Rotary / 6 inches/4 inches	Boring Location: RADWASTE BUILDING N 363182.01 E 2942133.49		Total Depth: 200 feet
Drilling Contractor and Rig: JEDI Drilling / CME 75	Elevation at boring: 30.61 feet	Ground Water Depth: See Remarks	Depth to Bedrock: Not Encountered
Sampling Method: Split Spoon/UD	Sample Driving Hammer/Drop: 139.2 / 29.5 inches	No. of Samples: 61	Date Started: 7/30/07
	Borehole Inclination: 0	Logged by: A. Osorio/M. Cooke	Date Completed: 8/5/07

Reviewed by / Date MJH 5-25-08
Reviewed by / Date KAW 5.28.08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0-1	X	SS 1	5 7 11	12/18					SP-SM	FILL; yellowish brown (10YR 5/6); silt, SAND (SP-SM) -dry; firm; poorly graded; fine to medium; tan CLAY on tip of spoon at 1.5 feet.	FILL to 0.5 feet
2-3	X	SS 2	2 3 4	12/18					CH	BEAUMONT; greenish gray (Gley 1 10Y-6/1); CLAY (CH) - moist; firm; high plasticity.	4 inch O.D. Solid Stem Augers to 12.0 feet
4	X	SS 3	2 3 4	10/18						BEAUMONT; greenish gray (Gley 1 10Y-6/1); CLAY (CH) - dry; firm; high plasticity; medium to high toughness; some black ferrous sulfate nodules.	
5-6	X	SS 4	2 4 6	18/18							
7	X	SS 5	5 5 7	18/18					CL-ML	BEAUMONT; light olive brown (2.5YR-5/3); CLAY (CH) - dry; stiff; high plasticity; high toughness; some black nodules.	
8	X	SS 6	3 4 7	18/18						Gradiational contact to silty CLAY at 6.0 feet.	
9-10	X	SS 7	5 5 6	8/18					ML	BEAUMONT; light gray (2.5Y-7/1); silt, CLAY (CL-ML) - dry; stiff; low plasticity; low toughness; reddish orange mottles; trace fine sand.	
11	X	SS 8	3 6 7	18/18					SM	BEAUMONT; light gray (2.5Y-7/1); silt, CLAY (CL-ML) - dry; stiff; low plasticity; low toughness; reddish orange mottles; trace fine sand.	
12-13	X	SS 9	2 4 12	18/18						BEAUMONT; light gray (2.5Y-7/1); sand, SILT (ML) - moist; stiff; nonplastic; little fine sand.	Wet Spoon at 12.0 feet Water level measuered to 12 feet at time of drilling Switch to Mud Rotary 4 inch Nominal Drag Bit at 12.0 feet
14-15	X	SS 10	2 3 6	18/18					CH	BEAUMONT; brown (7.5YR-5/4); silt, SAND (SM) - moist to wet; firm; fine; little silt; quartz; trace mica (muscovite).	
16-18										BEAUMONT; brown (7.5YR-5/4); silt, SAND (SM) - moist to wet; firm; fine; little silt; quartz; trace mica (muscovite). 3 inch seam of clay SAND (SC) at 13.0 feet.	
19-20	X	SS 11	2 3 5	18/18						BEAUMONT; brown (7.5YR-5/4); silt SAND (SM) - moist to wet; loose; fine; little silt; quartz; trace mica (muscovite). Strong brown CLAY at 14.75 feet.	
21-23										BEAUMONT; strong brown (7.5YR-4/6); CLAY (CH) - dry; firm; high plasticity; high toughness; greenish gray mottles.	
24	X	SS 12	2 3 7	18/18					CL-ML	BEAUMONT; strong brown (7.5YR-4/6); sand, silt CLAY (CL-ML) - wet; stiff; nonplastic; little to some fine sand; reddish brown silty SAND on tip of spoon at 25 feet.	
25-28									SM		
29	X	SS 13	4 7 8	10/18						BEAUMONT; reddish brown (5YR-5/4); silt, SAND (SM) - wet; firm; fine; poorly graded; little to some silt; quartz; trace mica (muscovite).	
30-33											
34	X	SS 14	3 5 9	16/18						BEAUMONT; reddish brown (5YR-5/4); silt, SAND (SM) - wet; firm; fine; poorly graded; little to some silt; quartz; mica (muscovite).	
35-38											
39	X	SS 15	5 5 6	12/18						BEAUMONT; strong brown (7.5YR 5/6); silt, SAND	
40											

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-443

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SM	(SM) - wet; firm; fine; poorly graded; little to some silt; quartz; mica (muscovite).	
44	X	SS 16	3 5 6	18/18					CH	BEAUMONT; strong brown (7.5YR-4/6); CLAY (CH) - moist to dry; stiff; high plasticity; high toughness; blocky texture; some light brownish tan striations	Moderately Difficult Drilling 45 to 48.5 feet.
49	X	SS 17	3 3 4	18/18						BEAUMONT; gray (7.5YR-5/1); CLAY (CH) - moist; firm; high plasticity; high toughness; firm; scattered shell hash.	
54	X	SS 18	4 6 7	18/18						BEAUMONT; greenish gray (Gley 1 6/1); CLAY (CH) - moist; stiff; high plasticity; high toughness; some gravel; presence of some calcite nodules.	
59	X	SS 19	8 11 13	18/18					CL	BEAUMONT; brown (7.5 YR 5.4) mottled with greenish gray (Gley 1 6/1); silt, CLAY (CL) - moist; very stiff; high plasticity; high toughness; some gravel; presence of some calcite deposits.	
64	X	SS 20	5 8 7	18/18	20.4	97.1	39/25			BEAUMONT; brown (7.5YR-5.4); mottled with greenish gray (Gley 1 6/1); silt; CLAY (CL) - moist; stiff; high plasticity; high toughness; some gravel; some calcite deposits.	
69	X	SS 21	7 7 8	18/18						BEAUMONT; brown (7.5YR-5/4) mottled with greenish gray (Gley 1 6/1) silt; CLAY (CL) - moist; stiff; high plasticity; high toughness; presence of some silty clay materials from 69 to 69.25 feet with medium toughness and plasticity.	
74	X	SS 22	23 49 47	12/18	16.8	10.0			SP-SM	BEAUMONT; reddish brown (5YR-4/4); silt, SAND (SP-SM) - moist; very dense; non plastic; fine to medium grained; poorly graded; color transition to yellowish brown (10YR-5/4) at about 74.5 feet bgs.	
79	X	SS 23	21 34 26	15/18					SP	BEAUMONT; yellowish brown (10YR-5/4); SAND (SP) - moist; very dense; nonplastic; poorly graded;	

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SOIL LOG - Boring No. B-443

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP	some black stripes at about 79 to 79.5 feet bgs.	
81											
82											
83											
84	X	SS 24	8 13 13	18/18	26.6	98.3	52/34		CH	BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; very stiff; high plasticity; high toughness; some calcite deposits.	
85											
86											
87		UD 1		25.5/24	22.7		61/37			BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; high plasticity; high toughness.	
88											
89	X	SS 25	7 11 14	20.5/18						BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; very stiff; high plasticity; high toughness; some calcite deposits.	
90											
91											
92		UD 2		0/24						POOR RECOVERY; sample obtained on side of tube appeared to be a brown CLAY (CH).	
93											
94		UD 2A		27.5/24	25.7		55/31			BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; high plasticity; high toughness.	
95											
96											
97		UD 3		24/24	25.6		62/37			BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; high plasticity; high toughness.	
98											
99	X	SS 26	7 10 12	18/18						BEAUMONT; brown (7.5YR-4/4); CLAY (CH) - moist; very stiff; high plasticity; high toughness; some calcite deposits.	
100											
101											
102		UD 4		24/24	29.1		55/30			BEAUMONT; brown (7.5YR-4/4) mottled with some greenish gray (Gley 1-6/1); CLAY (CH) - moist; high plasticity; high toughness.	
103											
104	X	SS 27	3 10 20	18/18	25	55.8				BEAUMONT; brown (7.5YR-4/4); mottled with some dark gray (7.5YR-4/1); CLAY (CH) - moist; very stiff; high plasticity; high toughness, grading to sand.	
105									ML		
106		UD 5		2/7					SM	BEAUMONT; gray (7/5YR-5/1); sand SILT (ML) - moist; very stiff; nonplastic; mostly medium grained sand; poorly graded.	
107											
108		UD 5A		0/14.5						BEAUMONT; brown (7.5YR-5/4); silt SAND (SM) - moist; nonplastic; with some silt; fine grained sand. NO RECOVERY	
109											
110	X	SS 28	14 8 5	18/18	21.7	43.8			CH	BEAUMONT; brown (7.5YR-5/4); silt, SAND (SM) - moist; firm; nonplastic; poorly graded; with gravel up to about 1" in diameter.	Switch to 6 inch Drag Bit Reamed Hole to 112 feet
111											
112										BEAUMONT; brown (7.5YR-5/4); mottled with some greenish gray Gley1-6/1; CLAY (CH) - moist; stiff; high plasticity; high toughness.	
113		UD 6		12/24	26.7		63/36				
114										BEAUMONT; greenish gray (Gley1-6/1); CLAY (CH) - moist; high plasticity; high toughness.	
115	X	SS 29	7 12 12	18/18	25	96.7				BEAUMONT; greenish gray (Gley1-6/1); CLAY (CH) - moist; very stiff; high plasticity; high toughness.	
116											
117											
118											
119	X	SS 30	10 10 14	18/18						BEAUMONT; greenish gray (Gley1-6/1) mottled	
120											

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Project Name :STP COL PROJECT

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SOIL LOG - Boring No. B-443

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	with brown (10YR-5/6); CLAY (CH) - moist; very stiff; high plasticity; high toughness.	
121										BEAUMONT; yellowish brown (10YR-5/6); mottled with greenish gray (Gley1-6/1); CLAY (CH) - moist; high plasticity; high toughness.	
122		UD 7		5/24							
123									CL	BEAUMONT; yellowish brown (10YR-5/6); mottled with greenish gray (Gley1-6/1); silt, CLAY (CL) - moist; high plasticity; high toughness.	
124		UD 7A		24/24	23.4		48/29				
125											
126										NO RECOVERY IN SHELBY TUBE	
127		UD 8		0/24							
128											
129		SS 31	10 13 18	18/18	23.9	99.0			CH	BEAUMONT; reddish brown (5YR-4/4) with slight mottling of greenish gray (Gley 1-6/1); CLAY (CH) - moist; high plasticity; high toughness.	
130											
131										NO RECOVERY IN SHELBY TUBE	
132		UD 9		0/24							
133											
134		UD 9A		22/24	16.3		52/18			BEAUMONT; reddish brown (5YR-4/4) with slight mottling of greenish gray (Gley 1-6/1); CLAY (CH) - moist; high plasticity; high toughness.	
135									ML		
136		SS 32	8 14 18	18/18	16.3	72.3				BEAUMONT; greenish gray (Gley1-6/1) with slight yellowish brown (10YR-5/8); sand, SILT (ML) to CLAY (CH) - moist; hard; high toughness; presence of calcite deposits.	
137											
138											
139		SS 33	10 13 14	18/18					CH		UD-10 Not Performed Replaced by SS-32 and SS-33 as directed by BECHTEL
140										BEAUMONT; greenish gray (Gley1-6/1) with slight yellowish brown (10YR-5/8); CLAY (CH) - moist; very stiff; high plasticity; high toughness; presence of calcite deposits; strong reaction to HCl.	
141										BEAUMONT; greenish gray (Gley1-6/1); mottled with brown (10YR-5/3); CLAY (CH) - moist; high plasticity; high toughness.	
142		UD 11		12.5/24			61/42				
143											
144		SS 34	19 25 20	16.5/18	20.1	64.2	26/9		CL	BEAUMONT; greenish gray (Gley1-6/1); sandy lean CLAY (CL) - moist; hard; medium plasticity; high to medium toughness; fine grained sand; some hard dense sand at bottom of shoe.	
145											
146											
147											
148											
149		SS 35	15 23 22	14/18	20.2	41.8			SM	BEAUMONT; yellowish brown (10YR5/8); silt, SAND (SM); moist, dense, nonplastic, poorly graded; fine grained sand; some gray dense sand at about 149.5 feet bgs (~2 inches thick).	
150										NO RECOVERY	
151		UD 12		0/24							
152											
153											
154		UD 13		3/24						BEAUMONT; yellowish brown (10YR 5/6); silt, SAND with clay (SM); moist; firm; poorly graded; fine; some fines; quartz.	Begin Logging by Matt Cooke 8/4/07
155											
156									CH		Difficult Drilling with Pitcher Sampler for UD-14 156 to 158 feet
157		UD 14		13.5/24	24.2		67/43			BEAUMONT; strong brown (7.5YR 5/6); CLAY (CH); moist to dry; high plasticity; greenish gray mottles.	
158											
159		SS 36	19 24 25	18/18	18.5	92.4			ML	BEAUMONT; strong brown (7.5YR 5/6); sand, SILT	Difficult Drilling 158.5 to 163.5 feet
160											

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SOIL LOG - Boring No. B-443

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
160										(ML); moist; hard; low plasticity; little fine sand.	
161											
162											
163											
164	X	SS 37	13 19 22	18/18	26.2	96.7	24/3			BEAUMONT; strong brown (7.5YR 4/6); sand, SILT (ML); moist; hard; nonplastic; some fine sand.	
165											
166											
167									CH		
168											
169	X	SS 38	9 14 15	18/18	21.7	99.5	54/37			BEAUMONT; strong brown (7.5YR 4/6); silt, CLAY (CH); moist; very stiff; low plasticity; little fine sand; blocky texture.	
170											
171											
172											
173		UD 15		14.5/24	25.7		51/31			BEAUMONT; strong brown (7.5YR 4/6); silt CLAY (CH); moist; low plasticity; little fine sand; blocky texture.	Pitcher Sampler Used for UD-15
174											Switch Back to 4 inch Drag Bit at 174 feet
175											
176											
177											
178											
179	X	SS 39	9 14 14	18/18	20.0	94.8			CL	BEAUMONT; strong brown (7.5YR 4/6); CLAY (CL); dry; very stiff; high plasticity; medium toughness; very stiff; trace fine sand; blocky texture.	Difficult Drilling 178.5 to 183.5 feet
180											
181											
182											
183											
184	X	SS 40	10 16 19	18/18					CH	BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; hard; high plasticity; medium toughness; blocky texture; yellowish brown mottles.	
185											
186											
187											
188											
189	X	SS 41	7 12 14	18/18	29.5		72/43			BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; high plasticity; medium toughness; blocky texture; yellowish brown mottles.	Difficult Drilling 188.5 to 193.5 feet
190											
191											
192											
193											
194	X	SS 42	7 38 50/3"	18/18						TOP 15 inches of sample SS-42 = BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; hard; high plasticity; medium toughness; blocky texture; yellowish brown mottles.	
195									SP-SM		Difficult Drilling to 195 to 198.5 feet
196											
197									CL	BOTTOM 3 inches of SS-42 = BEAUMONT; yellowish brown (10YR 5/4); silt, SAND (SP-SM); wet; very dense; fine; poorly graded; few fines; quartz.	
198											
199	X	SS 43	8 16 17	14/18	19.3	81.2	29/16			BEAUMONT; brown (10YR 5/3); silt, sand, CLAY	
200											

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SOIL LOG - Boring No. B-443

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
200										(CL), moist; hard; some fine sand.	
201										Boring Terminated at 200 ft bgs	
202											
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Project Name :STP COL PROJECT
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MACTEC

SOIL LOG - Boring No. B-444

Type and Diameter of Boring: Solid Stem Auger/Mud Rotary / 4 inches	Boring Location: RADWASTE BUILDING N 363057.98 E 2942133.5		Total Depth: 100 feet
Drilling Contractor and Rig: JEDI Drilling / CME 75	Elevation at boring: 30.01 feet	Ground Water Depth: See Remarks	Depth to Bedrock: Not Encountered
Sampling Method: Split Spoon/UD	Sample Driving Hammer/Drop: 139.2 / 29.5 inches	No. of Samples: 27	Date Started: 7/23/07
	Borehole Inclination: 0	Logged by: A. Osorio/M. Cooke	Date Completed: 7/24/07

Reviewed by / Date MJH 5-25-08
Reviewed by / Date KAW 5-28-08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0-1		SS 1	5 3 3	7/18					SM	FILL; yellowish brown (10 YR 5/8) SAND (SM) with gravel; moist; loose; non plastic; medium grained sand with gravel	
2-3		SS 2	2 4 5	16.5/18					CH	BEAUMONT; dark greenish gray (Gley 1, 4/1); CLAY (CH); moist; stiff; high plasticity; high toughness; presence of few black ferrous sulfate nodules.	
4		SS 3	2 4 5	21/18						BEAUMONT; dark greenish gray (Gley 1, 4/1); CLAY (CH); moist; stiff; high plasticity; high toughness; presence of black ferrous sulfate nodules; some fine gravel; roots	
5-6		SS 4	3 2 5	21/18						BEAUMONT; dark greenish gray (Gley 1, 4/1); CLAY (CH); moist; firm; high plasticity; high toughness; presence of fine gravel	
7		SS 5	2 3 4	4/18						BEAUMONT; dark greenish gray (Gley 1, 4/1); CLAY (CH); moist; firm; high plasticity; high toughness; presence of fine gravel	
8-9		SS 6	3 3 5	18/18						BEAUMONT; yellowish red (5 YR, 5/6); CLAY (CH); dry; firm; high plasticity; high toughness; presence of gravel and sulfate nodules	
10		SS 7	3 5 6	16.5/18						BEAUMONT; yellowish red (5YR, 5/6); CLAY (CH); dry; stiff; high plasticity; high toughness; presence of calcite nodules; black ferrous sulfate nodules and gravel.	
11-12		SS 8	3 6 7	19/18						BEAUMONT; yellowish red (5 YR 5/6); mottled with greenish gray (Gley 1, 6/1); CLAY (CH); dry; stiff; high plasticity; high toughness; presence of calcite nodules; black ferrous sulfate; gravel	Auger to 15 feet begin mud rotary 7:30 am 7/24/07 Groundwater not encountered prior to filling hole with drilling fluid. Groundwater not measured.
13		SS 9	3 6 9	23/18						BEAUMONT; red (5 YR, 5/6); mottled with some greenish gray (Gley 1, 6/1), CLAY (CH); dry; stiff; high plasticity; high toughness; presence of calcite nodules; black ferrous sulfate; gravel	
14-15		SS 10	2 6 9	18.5/18	21.6				CL-ML	BEAUMONT; yellowish red (5 YR, 5/6); mottled with some greenish gray (Gley 1, 6/1); CLAY (CH); dry; stiff; high plasticity; high toughness; presence of calcite nodules; black ferrous sulfate; some fine gravel.	difficult drilling at 22 feet
16-18											
19		SS 11	3 3 3	24/18						BEAUMONT; strong brown (7.5 YR 4/6); silt; CLAY (CL-ML); moist; firm; medium plasticity; some silt; medium toughness	
20-23											
24		SS 12	5 4 8	12/18					SM	BEAUMONT; strong brown (7.5 YR, 5/6); silt; SAND (SM); moist; firm; non to low plasticity; some silt; fine grained sand.	
25-28											
29		SS 13	7 7 8	12/18					SP-SM	BEAUMONT; dark yellowish brown (10 YR 4/6); silt; SAND (SP-SM); moist; firm; non plastic; with some silt; poorly graded; fine sand and quartz.	
30-33											
34		SS 14	4 8 10	13.5/18						BEAUMONT; dark yellowish brown (10 YR 4/6); silt SAND (SP-SM); moist; firm; non plastic; some silt; poorly graded fine grained sand	
35-38											
39		SS 15	10 14 13	15/18						BEAUMONT; yellowish brown (10 YR 5/6); silt SAND (SP-SM); moist; very firm; non plastic; trace	
40											

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

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SOIL LOG - Boring No. B-444

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP-SM	silt; poorly graded fine grained sand	
44	X	SS 16	5 6 6	24.5/18					CH	BEAUMONT; yellowish red (5 YR 5/6); CLAY (CH); moist; stiff; high plasticity; high toughness; presence of some calcite	difficult drilling at 45 feet
49	X	SS 17	3 2 4	26/18						BEAUMONT; dark greenish gray (Gley 1, 4/1); mottled with trace yellowish red (5 YR 4/6); CLAY (CH); moist; firm; high plasticity; high toughness; trace silt; presence of pieces of shells	
54	X	SS 18	5 5 8	24/18						BEAUMONT; greenish gray (Gley 2, 5/1); CLAY (CH); moist; stiff; high plasticity; high toughness	
59	X	SS 19	5 7 8	17/18					SC-SM	BEAUMONT; strong brown (7.5 YR 5/6); silt, CLAY, SAND (SC-SM); moist; firm; low to medium plasticity; with silt; medium and fine grained sand; some gravel	
64	X	SS 20	4 6 8	19.5/18	20.7		26/11		CL	BEAUMONT; strong brown (7.5 YR 4/6); silt; sand CLAY (CL); moist; stiff; medium plasticity; some silt; some gravel; presence of calcite nodules	
69	X	SS 21	13 28 29	18/18	20.9	54.3			ML	BEAUMONT; strong brown (7.5 YR 5/6); sand, SILT (ML); moist; very dense; non plastic; some silt; fine grained sand	
74	X	SS 22	28 43 32	16/18	19.8	15.8			SM	BEAUMONT; brown (7.5 YR 4/4); silt; SAND (SM); moist; very dense; non plastic; some silt; poorly graded medium grained sand	
79	X	SS 23	14 28 32	15/18					SP-SM	BEAUMONT; brown (10 YR 5/3) silt; SAND (SP-SM); moist; very dense; non plastic; trace silt;	

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-444

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP-SM	poorly graded medium grained sand	
84	X	SS 24	8 9 12	18/18	24.2		50/28		CH	BEAUMONT; brown (7.5 YR 4/4); CLAY (CH); moist; very stiff; high plasticity; high toughness; slight mottling of greenish gray (Gley 1 6/1) at about 84.5 ft	
89	X	SS 25	9 10 11	20.5/18	25.6					BEAUMONT; brown (7.5 YR 4/4); CLAY (CH); moist; very stiff; high plasticity; high toughness	
94	X	SS 26	7 10 12	21/18	30.0	99.2				BEAUMONT; brown (7.5 YR 4/4); CLAY (CH); moist; very stiff; high plasticity; high toughness	
99	X	SS 27	7 9 11	24/18	33.2					BEAUMONT; brown (7.5 YR 4/4); CLAY (CH); moist; very stiff; high plasticity; high toughness	
100										Boring Terminated at 100 ft bgs	

STP SOIL STP2007.GPJ WLA.GDT 5/20/08

Project Name :STP COL PROJECT
Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-445

Type and Diameter of Boring: Solid Stem Auger/Mud Rotary / 4 inches	Boring Location: RADWASTE BUILDING N 363058.02 E 2942240.48		Total Depth: 100 feet
Drilling Contractor and Rig: JEDI Drilling / CME 75	Elevation at boring: 31.34 feet	Ground Water Depth: See Remarks	Depth to Bedrock: Not Encountered
Sampling Method: Split Spoon	Sample Driving Hammer/Drop: 139.2 / 29.5 inches	No. of Samples: 27	Date Started: 8/6/07
	Borehole Inclination: 0	Logged by: M. Cooke	Date Completed: 8/7/07

Reviewed by / Date: MJH 5-25-08
Reviewed by / Date: KAW 5.28.08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0-1	X	SS 1	2 1 3	2/18					CH	SURFACE = grass and thin layer of topsoil, scattered gravel BEAUMONT; black (7.5YR 2.5/1); CLAY (CH); dry; soft; high plasticity; scattered small to medium sized roots.	4 inch O.D. Solid Stem Augers to 15 feet.
2-3	X	SS 2	2 4 7	12/18						BEAUMONT; black (7.5YR 2.5/1); CLAY (CH); dry; stiff; high plasticity; small roots.	
4	X	SS 3	3 4 6	12/18						BEAUMONT; brown (7.5YR 4/4); CLAY (CH); dry; stiff; high plasticity.	
5-6	X	SS 4	2 4 6	15/18						BEAUMONT; greenish gray (Gley1 10Y 5/1); CLAY (CH); dry; stiff; high plasticity; brown staining; black nodules; white calcareous nodules.	
7	X	SS 5	2 5 9	14/18						BEAUMONT; greenish gray (Gley1 10Y 5/1); CLAY (CH); dry, stiff, mixed with some brown 7.5YR 4/4; large calcareous nodules.	
8-9	X	SS 6	3 6 6	18/18						BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; stiff; abundant calcareous nodules; little fine sand; gravel sized calcareous nodules.	
10	X	SS 7	3 2 5	18/18						BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; firm, abundant calcareous nodules; little sand; gravel sized calcareous nodules.	
11-12	X	SS 8	3 4 5	18/18						BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; stiff, abundant calcareous nodules; little fine sand; gravel sized calcareous nodules.	
13	X	SS 9	3 4 6	18/18						BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; stiff; high plasticity; blocky texture; white calcareous nodules.	Switched to Mud Rotary 4 inch nominal drag bit at 15 feet.
14-15	X	SS 10	2 5 6	14/18						BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; stiff; high plasticity; blocky texture; white calcareous nodules.	Groundwater not encountered prior to filling hole with drilling fluid. Groundwater not measured.
16-18											
19-20	X	SS 11	3 4 7	11/18						BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; stiff; high plasticity; greenish gray mottles; blocky texture.	SPT Energy Test Performed SS-11
21-23											
24	X	SS 12	2 1 3	12/18					SM	BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM); wet; very loose; poorly graded; fine; quartz; little fines.	SPT Energy Test Performed SS-12
25-28											
29	X	SS 13	12 12 7	12/18						BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM); wet; firm; poorly graded; fine; quartz; little fines.	SPT Energy Test Performed SS-13
30-33											
34	X	SS 14	2 3 4	15/18						BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM); wet; loose; poorly graded; fine; little silt; quartz; muscovite.	
35-38											
39	X	SS 15	6 7 7	14/18						BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM);	
40											

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-445

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SM	wet; firm; poorly graded; fine; little silt; quartz; muscovite.	Moderately difficult drilling 53.5 to 58.5 feet
41											
42											
43											
44	X	SS 16	4 3 6	18/18					CH	BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; stiff; high plasticity; blocky texture.	
45											
46											
47											
48											
49	X	SS 17	2 2 2	18/18					CL-ML	BEAUMONT; dark gray (7.5YR 4/1); silt, CLAY (CL-ML); moist; soft; medium plastic; trace fine sand.	
50											
51											
52											
53											
54	X	SS 18	3 4 5	18/18						BEAUMONT; greenish gray (10GY 5/1); silt CLAY (CL-ML); dry; stiff; medium plastic; trace fine sand.	
55											
56											
57											
58											
59	X	SS 19	6 9 10	18/18						BEAUMONT; greenish gray (10GY 5/1); silt, CLAY (CL-ML); dry; very stiff; medium plastic; trace fine sand.	
60											
61											
62											
63											
64	X	SS 20	7 6 9	14/18					SM	BEAUMONT; brown (7.5YR 5.3); silt, SAND (SM); wet; firm; poorly graded; fine; quartz; muscovite; few heavy minerals; brown clay on tip of spoon; little fines.	
65											
66											
67											
68											
69	X	SS 21	8 20 28	15/18	21.3	13.8				BEAUMONT; brown (7.5YR 5.3); silt SAND (SM); wet; dense; poorly graded; fine; quartz; muscovite; few heavy minerals; brown clay on tip of spoon; little fines, some light gray clayey mottles.	
70											
71											
72											
73											
74	X	SS 22	39 40 35	14/18	18.2	23.6				BEAUMONT; brown (7.5YR 5/3); silt, SAND (SM); wet to moist; very dense; poorly graded; fine; few fines; quartz; muscovite; few heavy black minerals	
75											
76											
77											
78											
79	X	SS 23	13 26 26	13/18	21.6	10.4			SP-SM	BEAUMONT; brown (7.5YR 5/3); silt; SAND (SP-SM); moist to wet; very dense; poorly graded;	
80											

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-445

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									SP-SM	fine; quartz; muscovite; some heavy dark minerals; subrounded.	
84	X	SS 24	18 42 37	12/18	17.8					BEAUMONT; brown (7.5YR 5/3); silt; SAND (SP-SM); moist to wet; very dense; poorly graded; fine; quartz; muscovite; some heavy dark minerals; subrounded.	
89	X	SS 25	6 9 12	18/18	28.5		58/39		CH	BEAUMONT; brown (7.5YR 5.4); CLAY (CH); dry; very stiff; high plasticity; blocky texture; greenish gray mottles.	Difficult drilling 88.5 to 93.5 feet.
94	X	SS 26	7 11 14	18/18	26.7		52/31			BEAUMONT; brown (7.5YR 5/4); CLAY (CH); dry; very stiff; high plasticity; blocky texture.	
99	X	SS 27	6 10 12	18/18	29.5					BEAUMONT; brown (7.5YR 5/4); CLAY (CH); dry; very stiff; high plasticity; blocky texture.	
100										Boring Terminated at 100 ft bgs	

STP SOIL STP2007.GPJ WLA.GDT 5/19/08

Project Name :STP COL PROJECT
Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-940

Type and Diameter of Boring: Solid Stem Auger/Mud Rotary / 6 inches/4 inches	Boring Location: PUMP HOUSE, N 363443.68 E 2941391.11		Total Depth: 125 feet
Drilling Contractor and Rig: LEWIS ENV / Mobile B-57	Elevation at boring: 29.66 feet	Ground Water Depth: See Remarks	Depth to Bedrock: Not Encountered
Sampling Method: Split Spoon/UD	Sample Driving Hammer/Drop: 139.92 / 29.75	No. of Samples: 40	Date Started: 8/1/07
	Borehole Inclination: 0	Logged by: M. Cooke	Date Completed: 8/3/07

Reviewed by / Date: MJH 5-25-08
Reviewed by / Date: KAW 5.28.08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0-1	X	SS 1	4 3 1	8/18					GM	CRUSHED STONE AT SURFACE (old road bed near RR Tracks)	Begin drilling 8/1/07 at 1245 using 4 inch O.D. solid stem augers to 15 feet.
2-3	X	SS 2	1 2 3	12/18					CH	FILL; dark gray (7.5YR 4/1); silty, sandy, GRAVEL (GM); moist; very loose; poorly graded; subrounded to subangular; road fill.
3-4	X	SS 3	1 2 3	14/18						BEAUMONT; very dark gray (7.5YR 3/1); CLAY (CH); moist; firm; high plasticity; high toughness.
4-5	X	SS 4	2 2 3	18/18						BEAUMONT; very dark gray (7.5YR 3/1); CLAY (CH); moist; firm; high plasticity; high toughness.
6-7	X	SS 5	2 2 2	18/18						BEAUMONT; brown (7.5YR 4/2); CLAY (CH); moist; firm; high plasticity; high toughness
8-9	X	SS 6	2 1 3	3/18						BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; soft; medium to high plasticity; medium toughness; blocky texture
10	X	SS 7	2 3 6	12/18						BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; soft; medium to high plasticity; medium toughness; blocky texture
11-12	X	SS 8	4 4 7	14/18					CL	BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; stiff; high plasticity; medium toughness; tan mottles; blocky texture; light gray calcareous nodules.
12-13	X	SS 9	3 4 6	13/18						BEAUMONT; yellowish red (5YR 4/6); silt, CLAY (CL); dry; stiff; medium plastic; low toughness; tan mottles; blocky texture; calcareous nodules.
14	X	SS 10	3 4 7	13/18						BEAUMONT; yellowish red (5YR 4/6); silt, CLAY (CL); dry; stiff; medium plastic; low toughness; tan mottles; blocky texture; calcareous nodules.
15-18											Switch to mud rotary at 15 feet. 6 inch nominal drag bit. Groundwater not encountered prior to filling hole with drilling fluid.
19-20	X	SS 11	3 4 5	14/18					SM	BEAUMONT; brown (7.5YR 5.4); silt, SAND (SM); wet; loose; fine; some silt; quartz; trace muscovite; poorly graded	Groundwater not measured.
24-25	X	SS 12	7 9 10	0/18						NO RECOVERY; firm	Moderately difficult drilling 25 to 28.5 feet.
29-30	X	SS 13	7 6 7	8/18						BEAUMONT; strong brown (7.5YR 5.8); silt, SAND (SM); wet; firm; fine; poorly graded; quartz; trace muscovite.
32-33	X	UD 1		8/24						BEAUMONT; strong brown (7.5YR 5.8); silt, SAND (SM); wet; fine; poorly graded; quartz; trace muscovite; some fines.	Pitcher Sampler Used UD-1
34-35	X	UD 2		10.5/24						BEAUMONT; strong brown (7.5YR 5.8); silt, SAND (SM); wet; firm; fine; poorly graded; quartz; trace muscovite; some fines.	Pitcher Sampler Used UD-2
36-37	X	SS 14	7 3 4	9/18						BEAUMONT; strong brown (7.5YR 5.8); silt, SAND (SM); wet; loose; fine; poorly graded; quartz; trace muscovite; some fines.	Obtained additional SPT sample 35.5 to 37.0 feet as instructed by BECTHEL rep. G. Lefevre
39-40	X	SS 15	7 7 8	9/18	24.9	52.9			ML	BEAUMONT; strong brown (7.5YR 5.8); sand, SILT (ML); wet; stiff; fine; poorly graded; quartz; trace	Moderately difficult drilling 35.5 to 38.5 feet

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT

Project Number: 6234-07-4257

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SOIL LOG - Boring No. B-940

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									ML	muscovite; some fines.	
41											
42		UD 3		16/24	28.4		67/41		CH	BEAUMONT; strong brown (7.5YR 5.8); sand SILT (ML); wet; fine; poorly graded; quartz; trace muscovite; some fines.	
43											
44		SS 16	4 6 10	18/18	27.0	99.7	62/41			BEAUMONT; strong brown (7.5YR 5/8); CLAY (CH); moist; dry; high plasticity; medium toughness; greenish gray staining.	
45											
46										BEAUMONT; strong brown (7.5YR 5/8); CLAY (CH); moist; very stiff; high plasticity; medium toughness; greenish gray staining.	Switch to 4 inch nominal drag bit at 45 feet.
47		UD 4		24/24	32.1		61/38			BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); moist; high plasticity; medium toughness.	
48											
49		SS 17	4 4 5	18/18	35.4	98.9				BEAUMONT; greenish gray (Gley 1 10Y 5/1); silt, CLAY (CH); moist; stiff; medium to low plasticity; low toughness; some brown mottles.	
50											
51											
52											
53											
54		SS 18	5 7 10	18/18						BEAUMONT; greenish gray (Gley 1 10Y 5/1); silt, CLAY (CH); moist; very stiff; medium to low plasticity; low toughness; some brown mottles; scattered black nodules	
55											
56											
57		UD 5		24/24	27.0		50/32			BEAUMONT; greenish gray (Gley 1 10Y 5/1); silt, CLAY (CH); moist; medium to low plasticity; low toughness; some brown mottles; scattered black nodules; strong brown at bottom of tube	
58											
59		SS 19	6 9 11	18/18	22.2	99.0				BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; high plasticity; medium toughness; blocky texture; scattered calcareous nodules	
60											
61											
62											
63											
64		SS 20	6 10 13	18/18						BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; high plasticity; medium toughness; scattered calcareous nodules; black staining or nodules.	
65											
66											
67		UD 6		24/24	25.1		54/33			BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; high plasticity; medium toughness; scattered calcareous nodules; black staining or nodules.	
68											
69		SS 21	6 8 10	18/18	26.5	99.1				BEAUMONT; yellowish red (5YR 4/6); CLAY (CH); dry; very stiff; high plasticity; medium toughness; scattered calcareous nodules; black staining or nodules.	
70											
71											
72											
73											
74		SS 22	5 9 11	18/18						BEAUMONT; reddish brown (5YR 5/4); CLAY (CH); dry; very stiff; high plasticity; medium toughness; scattered calcareous nodules; black staining or nodules.	
75											
76											
77		UD 7		22.5/24	22.1		55/34			BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; high plasticity; medium toughness.	
78											
79		SS 23	5 8 12	18/18	25.3	96.9				BEAUMONT; brown (7.5YR 5/4); CLAY (CH);	
80											

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Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-940

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									CH	moist; very stiff, high plasticity; medium toughness; scattered calcareous nodules.	Moderately difficult drilling ~81 to 83.5 feet.
84	X	SS 24	6 8 10	18/18						BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; very stiff, high plasticity; medium toughness; scattered calcareous nodules.	
89	X	SS 25	4 7 9	18/18						BEAUMONT; brown (7.5YR 5/4); CLAY (CH); moist; very stiff, high plasticity; medium toughness; scattered calcareous nodules.	
92		UD 8		24/24	24.4		61/39			BEAUMONT; brown (7.5YR 5.4);CLAY (CH); dry; high plasticity; medium toughness; white calcareous nodules.	
94	X	SS 26	4 8 11	18/18	23.4	90.5				BEAUMONT; brown (7.5YR 5.4);CLAY (CH); dry; very stiff; high plasticity; medium toughness; white calcareous nodules; scattered small shell fragments.	
99	X	SS 27	9 14 21	18/18	21.1	86.6			ML	BEAUMONT; brown (7.5YR 5.4); sand, SILT (ML); moist; hard; non-plastic;some fine sand; occassional cemented sand nodules.	Difficult drilling 100 to 103.5 feet
104	X	SS 28	6 8 11	18/18	20.3		46/33		CL	BEAUMONT; greenish gray (Gley 1 10Y 6/1); silt, CLAY with sand (CL); dry; very stiff; medium plastic; medium toughness; reddish brown staining.	
109	X	SS 29	5 7 10	18/18					CH	BEAUMONT; greenish gray (Gley 1 10Y 6/1); CLAY (CH); dry; very stiff; medium plastic; calcareous nodules; brownish red mottling.	
114	X	SS 30	7 9 12	18/18	24.2		60/44			BEAUMONT; greenish gray (Gley 1 10Y 6/1); CLAY (CH); dry; very stiff; medium plastic; calcareous nodules more abundant; brownish red mottling.	
119	X	SS 31	13 15 20	18/18						BEAUMONT; greenish gray (Gley 1 10Y 6/1);	
120											

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Project Name :STP COL PROJECT

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SOIL LOG - Boring No. B-940

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CH	CLAY (CH); dry; hard; medium plastic; calcareous nodules more abundant; brownish red mottling.	
121											
122											
123											
124	X	SS 32	5 8 12	18/18	21.4		40/26		CL	BEAUMONT; greenish gray (Gley 1 10Y 6/1) and brown; silt CLAY (CL); dry; very stiff; medium plastic; calcareous nodules.	
125										Boring Terminated at 125 ft bgs	
126											
127											
128											
129											
130											
131											
132											
133											
134											
135											
136											
137											
138											
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160											

STP SOIL STP2007.GPJ WLA.GDT 5/20/08

Project Name :STP COL PROJECT
Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-949

Type and Diameter of Boring: Solid Stem Auger/Mud Rotary / 4 inches/6 inches	Boring Location: PUMP HOUSE N 363604.32 E 2941778.93		Total Depth: 125 feet
Drilling Contractor and Rig: LEWIS ENV / Mobile B57	Elevation at boring: 28.67 feet	Ground Water Depth: See Remarks	Depth to Bedrock: Not Encountered
Sampling Method: Split Spoon	Sample Driving Hammer/Drop: 139.92 / 29.75 inches	No. of Samples: 40	Date Started: 7/24/07
	Borehole Inclination: 0	Logged by: M. Cooke	Date Completed: 8/1/07

Reviewed by / Date MJH 5-25-08
Reviewed by / Date KAW 5.28.08

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
0										TOPSOIL - top 2 inches	
1	X	SS 1	2 2 2	18/18					CH	BEAUMONT; black (10YR 2/1); CLAY (CH); moist; soft; high plasticity; medium toughness; small roots; scattered caliche nodules.	Begin drilling with 4 inch O.D. Solid Stem Augers
2	X	SS 2	2 2 3	14/18						BEAUMONT; black (10YR 2/1); CLAY (CH); moist; soft; high plasticity; medium toughness; small roots; scattered caliche nodules.	
3	X	SS 3	2 3 4	14/18						BEAUMONT; pale brown (10YR 6/3); CLAY with sand (CH); dry to moist; firm, high plasticity; trace sand; medium to high toughness; abundance of caliche	
4	X	SS 4	2 2 4	14/18						BEAUMONT; brown (7.5YR5/4); CLAY with sand (CH); dry to moist; firm, high plasticity; trace sand; medium to high toughness; abundance of caliche	
5	X	SS 5	2 4 6	16/18						BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; firm, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations	
6	X	SS 6	4 4 6	14/18						BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; firm, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations	
7	X	SS 7	2 2 5	18/18						BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; firm, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations; firm; light gray laminations	
8	X	SS 8	3 4 8	18/18						BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; stiff, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations	
9	X	SS 9	3 6 8	14/18							
10	X	SS 10	3 4 8	15/18							
11											Switch to Mud Rotary at 15 feet 4 inch drag bit Groundwater not encountered prior to filling hole with drilling fluid. Groundwater not measured. Install 8 inch I.D. PVC casing to 5 feet Ream borehole to 18.5 feet with 6 inch drag bit
12											
13											
14											
15											
16											
17											
18											
19	X	SS 11	5 3 6	18/18					ML	BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; stiff, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations	
20											
21											
22									SM	BEAUMONT; yellowish red (5YR 5/6); CLAY with sand (CH); dry to moist; stiff, high plasticity; trace sand; medium to high toughness; abundance of caliche; thin tan laminations	
23											
24	X	SS 12	5 5 7	12/18						BEAUMONT; reddish brown (2.5YR 5/3); CLAY (CH); moist to dry; stiff, high plasticity; medium toughness; few fine to medium sand	Some difficult drilling 25 to 28.5 feet Likely cemented sand layers based on SS-13 Cemented sand layers
25											
26											
27										BEAUMONT; strong brown (7.5YR 5/6); sand; SILT (ML); moist; stiff; nonplastic; some fine sand Estimated contact; likely gradational	
28											
29	X	SS 13	7 6 5	12/18	21.9	52.6			ML	BEAUMONT; brown (7.5YR 4/4); silt, SAND (SM) wet; firm; fine; little silt; subrounded; quartz; trace mica (muscovite)	Difficult drilling 28.5 to 33.5 feet
30											
31										BEAUMONT; brown; (7.YR 4/4); sand; SILT (ML); wet; fine; little silt; stiff; strongly cemented gravel sized sandstone fragments; likely cemented layers broken by the SPT sampler	
32											
33											
34	X	SS 14	12 9 12	14/18					SM	Cemented sand layers 30 to 33.5 based on rig chatter	
35										BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM); wet; very firm; fine; little silt; poorly graded; quartz sand (subrounded); trace mica.	
36											
37											
38											
39	X	SS 15	12 17 21	14/18	21.2	10.2			SP-SM	BEAUMONT; brown (7.5YR 4/4); silt, SAND (SP-SM); moist to wet; dense; poorly graded; fine;	
40											

STP SOIL STP2007.GPJ WLA.GDT 4/24/08

Project Name :STP COL PROJECT
Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-949

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
40									SP-SM	few silt; subrounded; quartz; trace mica.	
41											
42									CH	Estimated contact at 41.5 feet.	
43											
44	X	SS 16	4 4 7	18/18						BEAUMONT; brown (7.5YR 4/3); CLAY (CH); moist to dry; stiff; high plasticity; high toughness; blocky texture; some tan vertical and horizontal laminations	
45											
46											
47											
48											
49	X	SS 17	5 5 9	18/18	27.3		51/33			BEAUMONT; greenish gray (Gley 1 5GY 6/1); CLAY (CH); dry; stiff; highly plastic; high toughness; some reddish brown iron oxide staining	SPT Energy Test performed SS-17
50											
51										BEAUMONT; greenish gray (Gley 1 5GY 6/1); CLAY (CH); dry; high plasticity	
52		UD 1		26/24							UD-1 THICK WALLED (14 gauge) TUBE USED
53											
54		UD 2		21/24	32.3		65/36			BEAUMONT; greenish gray (Gley 1 5GY 6/1); CLAY (CH); dry; highly plastic	UD-2 obtained from 53.5 to 55.5 feet to replace UD-1
55											
56	X	SS 18	7 7 12	18/18	31.1	97.4				BEAUMONT; greenish gray (Gley 1 5GY 6/1); CLAY (CH); dry; very stiff; highly plastic; high toughness; some reddish brown iron oxide staining; some scattered hard white caliche nodules	SPT Energy Test performed SS-18
57											
58											
59	X	SS 19	8 9 19	18/18	22.0		53/37			BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; highly plastic; high toughness; some black MN staining; blocky texture	SPT Energy Test performed SS-19
60											
61										BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; highly plastic; high toughness; blocky texture	
62		UD 3		22/24	23.3		54/31				
63											End Drilling 7/25/07 at 63 feet
64	X	SS 20	6 8 13	18/18						BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; highly plastic; high toughness; blocky texture	Water level at 2 feet Begin Drilling 7/26/07 Heavy AM rainfall
65											
66											
67											
68											
69	X	SS 21	6 8 13	18/18	28.4					BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; highly plastic; high toughness; blocky texture	
70											
71											
72		UD 4		16/24	24.9		56/32			BEAUMONT: strong brown (7.5YR 4/6); CLAY (CH); dry; highly plastic; high toughness; blocky texture	
73											
74	X	SS 22	6 9 12	18/18	27.4	99.4				BEAUMONT; strong brown (7.5YR 4/6); CLAY (CH); dry; very stiff; highly plastic; high toughness; some light green and tan mottles.	
75											
76											
77											
78											
79	X	SS 23	9 8 12	18/18	25.0		52/33			BEAUMONT; strong brown (7.5YR 5/6); CLAY	
80											

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Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-949

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
80									CH	(CH); dry; very stiff; high plasticity; high to medium toughness	
81											
82		UD 5		0/24						NO RECOVERY	NO RECOVERY UD-5 Attempt another UD at 83.5 to 85.5 feet
83											
84		UD 6		22.5/24	24.0		66/43			BEAUMONT; strong brown (7.5YR 5/6); CLAY (CH); dry; high plasticity; high toughness	
85											
86											
87											
88											
89	X	SS 24	6 8 13	18/18	26.1	99.4				BEAUMONT; strong brown (7.5YR 5/6); CLAY (CH); dry; very stiff; high plasticity; high toughness	
90											
91											
92		UD 7		24/24	28.1		60/36			BEAUMONT; brown (7.5YR 4/3); CLAY (CH); dry; medium plastic; medium toughness; blocky texture	
93											
94	X	SS 25	9 7 10	18/18					CL-ML	BEAUMONT; brown (7.5YR 4/3); silt, CLAY (CL-ML); dry; very stiff; medium plastic; medium toughness; blocky texture	
95											
96											
97											
98											
99	X	SS 26	20 22 34	13/18					SM	BEAUMONT; light brown (7.5YR 6/4); silt; SAND (SM); wet to moist; very dense; poorly graded, fine to medium; few silt; subrounded; quartz; mica; trace dark minerals.	
100											
101											
102		UD 8		16.5/24	18.6	19.2				BEAUMONT; light brown (7.5YR 6/4); silt; SAND (SM); wet to moist; poorly graded, fine to medium; few silt; subrounded; quartz; mica; trace dark minerals.	
103											
104	X	SS 27	6 8 16	10/18						BEAUMONT; brown (7.5YR 5/4); silt; SAND (SM); wet to moist; very firm; fine to medium; few silt; subrounded; quartz; mica; trace dark minerals.	
105											
106											
107										Cemented/gravely layers	
108											
109	X	SS 28	11 6 4	14/18						BEAUMONT; brown (7.5YR 5/4); silt, SAND (SM); wet; loose; medium to coarse; poorly graded; quartz; cemented sand and calcareous nodules	
110									CH	BEAUMONT; brown (7.5YR 4/3); CLAY (CH); moist; firm; high plasticity; high toughness; trace fine to medium sand	
111									CL	BEAUMONT; brown (7.5YR 4/3); sandy lean CLAY (CL) wet; medium to coarse; poorly graded; little gravel; some sand; 1" diameter subrounded gravel in bottom of tube	
112		UD 9		8/24	13.7	54.6	27/17				
113											
114		UD 10		4.5/24						BEAUMONT; brown (7.5YR 4/3); sand lean CLAY (CL) wet; medium to coarse; poorly graded; little gravel; some sand; 1" diameter subrounded gravel in bottom of tube; very coarse sand and gravel Pitcher sampler refusal at 115 feet.	
115											
116											
117											
118											
119	X	SS 29	9 14 17	18/18	21.6		48/31			BEAUMONT; yellowish red (5YR 4/6); silt, CLAY	
120											

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Project Name :STP COL PROJECT

Project Number: 6234-07-4257

MACTEC

SOIL LOG - Boring No. B-949

Depth (feet)	Sample	Sample Type & No.	Uncorrected Blows/6 inches	Recovery (inches)	Water Content	Fines Content	Atterberg Limits	Lithology	Soil Type (USCS)	Lithology	Remarks
120									CL	(CL); dry; hard; low plasticity; low toughness; greenish gray mottles	
121											
122											
123											
124	X	SS 30	10 12 18	18 18	19.4	90.6	39/28			BEAUMONT; yellowish red (5YR 4/6); silt, CLAY (CL); dry; very stiff; low plasticity; low toughness; greenish gray mottles; some fine sand at bottom of interval	
125										Boring Terminated at 125 feet bgs	
126											
127											
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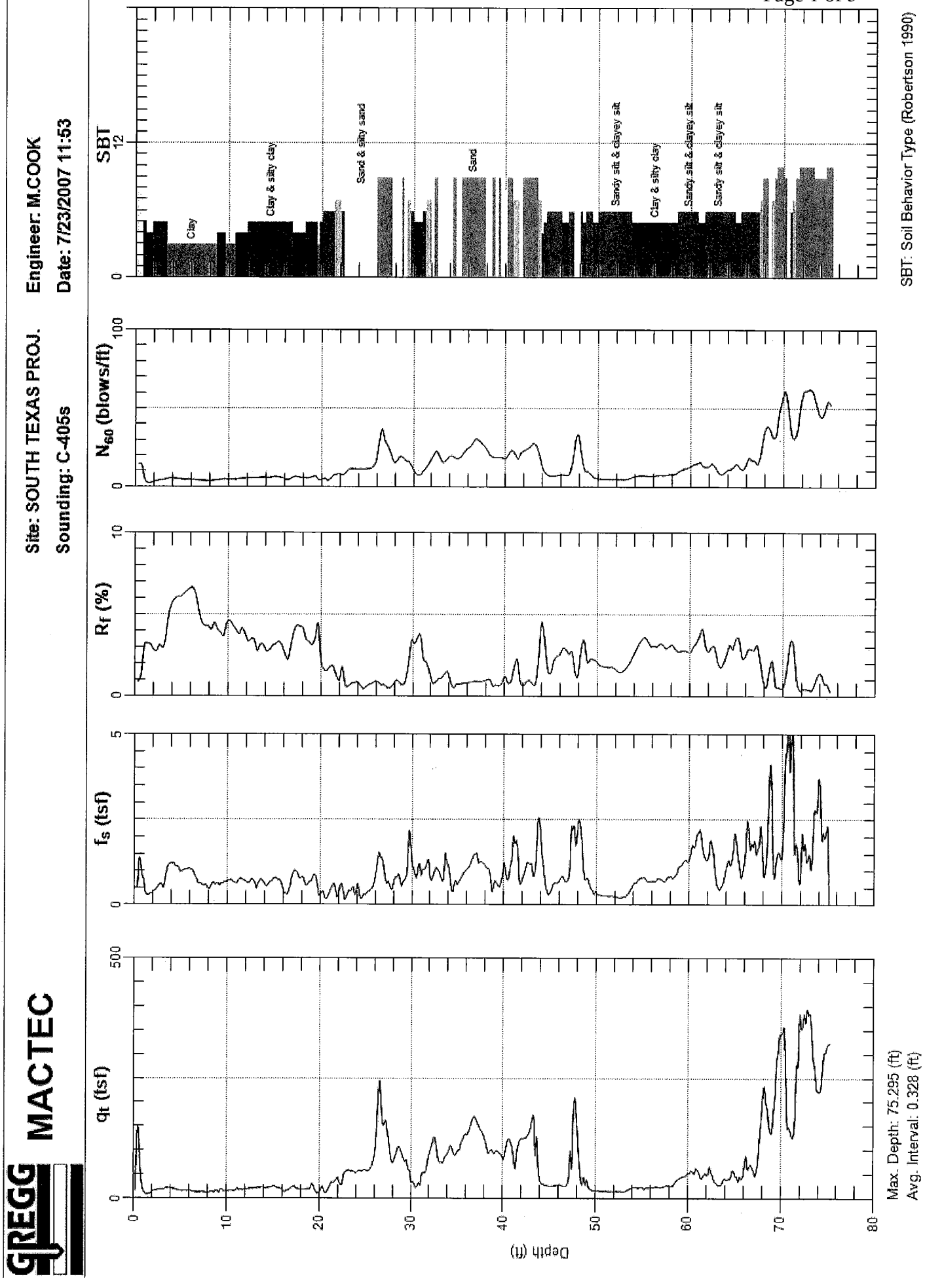
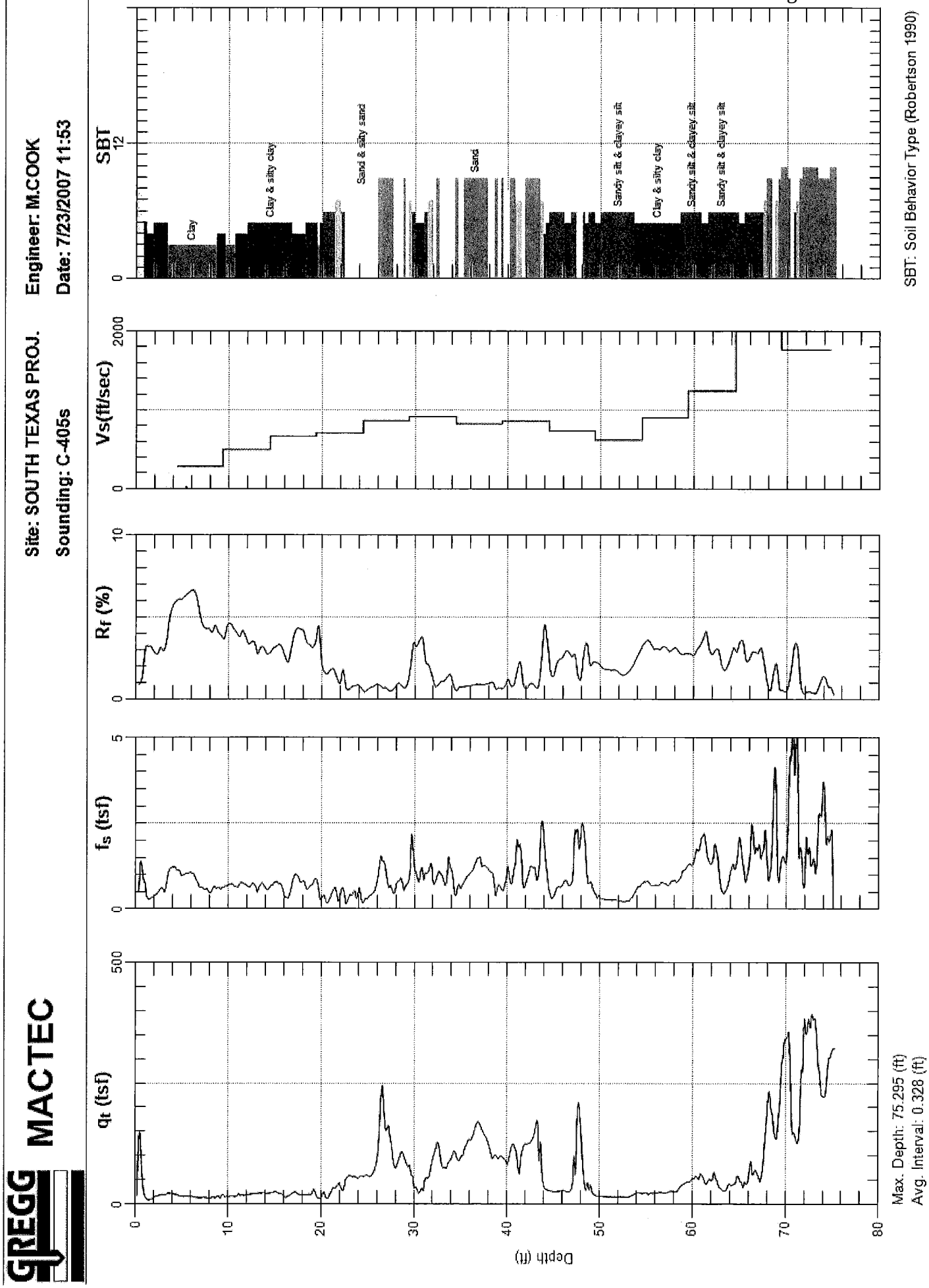

GREGG MACTEC
Site: SOUTH TEXAS PROJ.
Sounding: C-405s
Engineer: M.COOK
Date: 7/23/2007 11:53
SBT
Clay
Clay & silty clay
Sand & silty sand
Sand
Sandy silt & clayey silt
Clay & silty clay
Sandy silt & clayey silt
Sandy silt & clayey silt
N_{60} (blows/ft)
R_f (%)
f_s (tsf)
q_t (tsf)
Depth (ft)
SBT: Soil Behavior Type (Robertson 1990)
Max. Depth: 75.295 (ft)
Avg. Interval: 0.328 (ft)


GREGG MACTEC
Site: SOUTH TEXAS PROJ.
Sounding: C-405s
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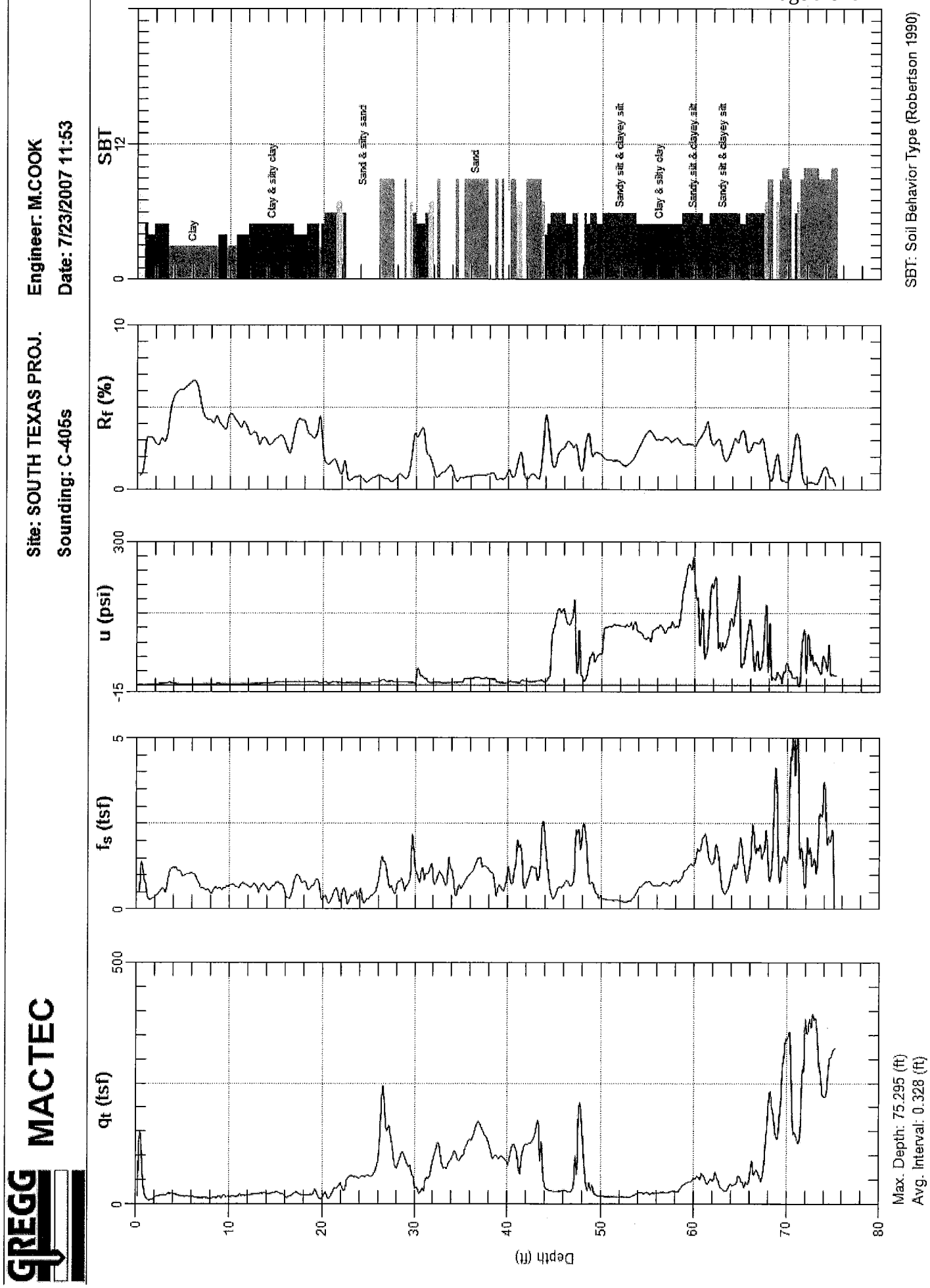
Date: 7/23/2007 11:53
SBT
Clay
Clay & silty clay
Sand & silty sand
Sand
Sandy silt & clayey silt
Clay & silty clay
Sandy silt & clayey silt
Sandy silt & clayey silt
Vs(ft/sec)
Rf (%)
fs (tsf)
qt (tsf)
Depth (ft)
SBT: Soil Behavior Type (Robertson 1990)
Max. Depth: 75.295 (ft)
Avg. Interval: 0.328 (ft)


GREGG MACTEC
Site: SOUTH TEXAS PROJ.
Sounding: C-405s
Engineer: M.COOK
Date: 7/23/2007 11:53
SBT
Clay
Clay & silty clay
Sand & silty sand
Sand
Sandy silt & clayey silt
Clay & silty clay
Sandy silt & clayey silt
Sandy silt & clayey silt
SBT: Soil Behavior Type (Robertson 1990)
Rf (%)
u (psi)
fs (tsf)
qt (tsf)
Depth (ft)
Max. Depth: 75.295 (ft)
Avg. Interval: 0.328 (ft)