Additional Geotechnical Investigation
Shoreline Protection/Marsh Creation
Lake Borgne at Bayou Dupre' and Shell Beach
DNR Contract No. 2503-03-15 PO-30

For:
State of Louisiana
Department of Natural Resources
Baton Rouge, Louisiana
March 2003

LOUIS J. CAPOZZOLI & ASSOCIATES, INC. Geotechnical Engineers

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26 March 2003

State of Louisiana
Department of Natural Resources
P. O. Box 44027 - Capitol Station
Baton Rouge, Louisiana 70804-4027

Attention: Mr. Luke E. LeBas, P.E.

Re: Additional Geotechnical Investigation
Shoreline Protection/Marsh Creation
Lake Borgne at Bayou Dupre' and Shell Beach
DNR Contract No. 2503-03-15 PO-30
LJC&A File: 02-115

Gentlemen:

This is our report for the above project per our proposal of 6 January 2003 for additional work at this site. This report presents site and subsurface conditions followed by an evaluation of our analyses. Geotechnical engineering analyses were done for soil bearing stability, settlement and rate of settlement. Conclusions are in a summary. Appendices provide supporting details.

PROJECT DESCRIPTION

The initial study in our report dated 23 December 2002 for 12 borings in Lake Borgne indicated three areas (borings 2, 7, and 10) had weak soils which prevent construction of a 4 foot rock structure in 2 feet of water. The 12 borings were spaced on relatively wide spacings and it was determined that borings at intermittent locations would be taken to determine the amenability of such a structure on either side of these weaker borings.

SITE AND SUBSURFACE CONDITIONS

A site and boring plan is on sheets 1 and 2. The new borings were done in 1 to 2 feet of water. The following descriptions and graphical presentations on sheets 3A and 4A are general for the 12 borings done for this additional geotechnical investigation. For details, refer to the individual borings logs at the back of this report. A field and laboratory analyses is given in an appendix. The soils at new borings 13 through 24 were essentially the same as those encountered in our original report for borings 1 through 12.

Our reference datum was using elevation zero feet at the water surface. The upper soils are very soft organic clay, peat, and clay to elevation -8 feet to as deep as - 15 feet. Beneath this, the soils are very soft slightly organic clay and clay with some occasional layers of loose shells and soft clay. These occur to the final boring elevations of -21 to -22 feet (20 feet below soil surface).

Water. The water surface elevation was assumed to be elevation zero feet at the time of our borings. This water elevation can vary by 1 foot or slightly more.

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EVALUATION

The soils at Lake Borgne near the edge of the marsh are very soft materials as determined by laboratory data on tables 1 through 6. For borings 13 through 24 (including 17A), which were done for this additional investigation, mini-vane shear tests were also performed. The results are shown on tables 7 through 9. Also, refer to the boring and laboratory test results in our original report.

Using the results of laboratory tests along with our experience with similar soils, we determined soil bearing pressures for the soil conditions at each of the borings. These were then used to compute safety factors from loadings for a Class 1 structure which is 4 feet of No. 250 rip-rap placed on a geotextile fabric in 2 feet of water. What we designated as Class 8 is 2 feet of rock on a geotextile fabric placed on the marsh at the edge of the water can be used at the entire Lake Borgne project, except at the mouth of waterways. The Case 1 evaluation for borings 13 through 24 are shown on sheet 19A. Six of the new borings have adequate soil bearing safety factors and 6 borings have unacceptable soil bearing pressures for the Case 1 condition. All borings provide adequate soil bearing for the Case 8 condition.

SOIL BEARING STABILITY

Using a recommended minimum safety factor of 1.2 against a bearing failure of the soil, 6 of the borings had safety factors which were too low for the Case 1 construction. These borings are 13, 15, 16, 18, 19, and 20. Considering these together with borings 2 and 7 from our previous investigation, essentially shows that the Case 1 structure is not feasible for the western half of Bayou Dupre' site and the western half of the Shell Beach site. Refer to sheets 1 and 2 which indicate this with the notation "NG". For Case 8, the safety factors for all 24 borings are given on sheet 20A. This shows that all the borings can use a 2 foot rock structure on geotextile fabric on the marsh at the edge of the water.

We re-evaluated boring 10 soil conditions and shear strengths and based on this together with surrounding boring information and the mini-vane shear strength for a sample of soil at boring 10, it is now determined that boring 10 is acceptable for the Case 1 construction.

It is pointed out that a significant safety factor is 1.0. The safety factor 1.0 is incipient failure and any safety factor below that means failure will probably occur. Safety factors less than 1.2 could creep to failure with time. A safety of 1.2 is low for soil bearing, but it is recommended by us as appropriate for these types of structures.

SETTLEMENT

Consolidation settlement and rate of settlement have been done for this project. Total and rate of settlement at the 12 borings for Case 1 for this additional project are depicted on sheet 21A. For Case 8, the total settlement and approximate time of consolidation settlement is shown for all 24 borings on sheet 22A. The rate of consolidation settlement is the same as we predicted in our original report. Settlement is important because over time a section could settle or sink close to the water and thus would not continue to perform as desired. The rate of settlement indicates when renourishment of the rock structure should be done. This depends on the amount of subsidence of the structure and how much embankment above water is needed after partial settlement.

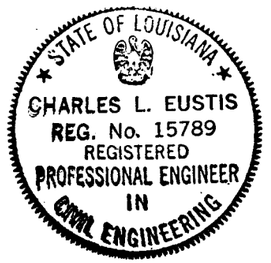
In addition to consolidation settlement, elastic or immediate settlement during the time of placement of rip-rap could be about 20% of the consolidation settlement total.

SUMMARY

The Case 1 structure with 4 feet of rock in 2 feet of water can be essentially constructed at the eastern half of the Bayou Dupre' and eastern half of Shell Beach portions of this project. Refer to the boring plans which indicate which areas are not good (NG) for this structure. The Case 8 condition of 2 feet of rock on a geotextile fabric can be constructed at the entire project. We have provided ultimate soil bearing pressures and safety factors for Case 1 and Case 8 loadings. Total settlement at each boring is given. The rate of consolidation is given in the form time versus settlement over a 20 year period. Fifty percent consolidation will occur about 3.5 years after construction of the rock structures.

Very truly yours,

Louis J. Capozzoli & Associates, Inc.



Charles L. Eustis

CLE/cc

Enclosures: Appendix, Field and Laboratory Analyses
Sheets 1 and 2, Boring Plans
Sheets 3A and 4A, Subsurface Profiles
Sheet 19A, Case 1 Soil Bearing Pressures/Safety Factors
Sheet 20A, Case 8 Soil Bearing Pressures/Safety Factors
Sheet 21A, Case 1 Approximate Time of Consolidation Settlement
Sheet 22A, Case 8 Approximate Time of Consolidation Settlement
Tables 1 through 6, Laboratory Data
Table 7 through 9, Mini-Vane Shear Test Results
Logs of Borings 13 through 24 (including 17A)

LOUIS J. CAPOZZOLI & ASSOCIATES, INC.

FIELD AND LABORATORY ANALYSES

Borings. As per our supplemental investigation for *DNR Contract No. 2503-03-15, Shoreline Protection/Marsh Creation in Lake Borgne, PO-30*, 13 borings - ranging in depth from 24 to 28 feet - were taken between 17 through 19 February 2003 at the locations shown on sheet 1. Boring 17A was washed down to where Boring 17 encountered shells and then it was sampled. Drilling was performed with one of our Failing 1500 truck-mounted rotary type drill rigs mounted on a shallow draft elevating boat. The borings were advanced with a wet drilling process method. Undisturbed soil samples, suitable for laboratory analyses, were obtained by hydraulically pushing a 30 inch long, 3 inch O.D. thinwall Shelby tube sampler into the ground a distance of 24 inches at a time. Classification samples of shells were obtained by performing the Standard Penetration Test (SPT). This test consists of driving a 24 inch long, 2 inch O.D. sampler into the ground with blows from a 140 pound hammer falling 30 inches. The resulting penetration resistance is the total number of blows required to drive the sampler 12 inches after first seating it for 6 inches. The borings were sampled continuously in the top 10 feet below the mudline, and then on 5 foot centers to borehole termination. The samples were classified in the field by our technician and were then prepared for transport.

Field work particulars in tabularized form are:

Inwater Boring Number	Total Depth (Feet)	Continuous Sampling (Feet)
13	28	10
14	28	10
15	28	10
16	28	10
17	24	10
17A	26	4
18	28	10
19	28	10
20	28	10
21	28	10
22	28	10
23	28	10
24	28	10
Totals	**359**	**124**

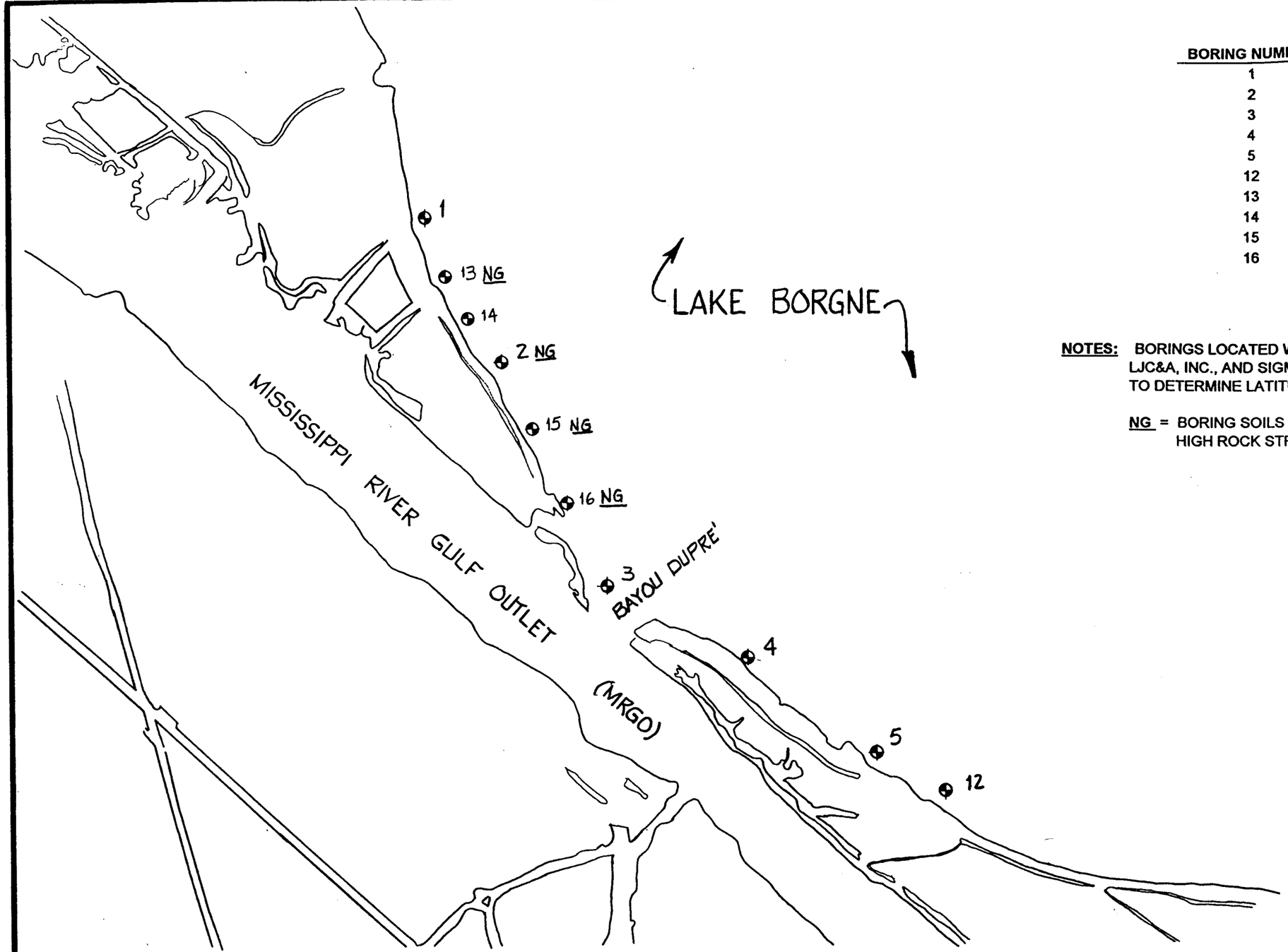
The detailed boring logs are attached.

Expenses incurred were: mobilization/demobilization of our drill equipment plus crew travel from our Baton Rouge office to the site; mobilization/demobilization/rental of shallow draft elevating boat; rig-up/rig-down; travel between boreholes; plus 3 days crew living expenses.

Laboratory. All soil samples from the above field operations were taken to our soil mechanics laboratory where additional analyses were performed. Laboratory testing included 90 unconfined and 4 unconsolidated drained triaxial compression tests with moisture content and density determinations; 25 Atterberg limit determinations; 1 separate moisture content determination; plus 90 miniature vane shear tests.

The compression - unconfined, triaxial, and vane shear - tests provided the strength properties of the soil. The moisture content, density, Atterberg limit determinations and sieve analyses data furnished additional soil classifications to supplement field methods and provided other design parameters. The results of these analyses are on tables 1 through 6.

Field and laboratory analyses provide the basis, along with our expertise and experience, for evaluating this site for the proposed project. All field and laboratory testing conformed to appropriate ASTM standards.



BORING NUMBER	LATITUDE NORTH	LONGITUDE WEST
1	29° 57' 27.90"	89° 50' 48.00"
2	29° 57' 08.52"	89° 50' 36.24"
3	29° 56' 38.10"	89° 50' 20.22"
4	29° 56' 28.02"	89° 49' 58.02"
5	29° 56' 15.36"	89° 49' 37.92"
12	29° 56' 09.78"	89° 49' 27.06"
13	29° 57' 20.95"	89° 50' 44.05"
14	29° 57' 14.28"	89° 50' 40.56"
15	29° 56' 59.34"	89° 50' 30.72"
16	29° 56' 49.56"	89° 50' 25.38"

NOTES: BORINGS LOCATED WITH ASSISTANCE OF LA. DNR REPRESENTATIVE, LJC&A, INC., AND SIGMA CONSULTING GROUP, INC. USED GPS INSTRUMENTS TO DETERMINE LATITUDE AND LONGITUDE.

NG = BORING SOILS DO NOT HAVE ADEQUATE SOIL BEARING FOR A 4 FOOT HIGH ROCK STRUCTURE IN 2 FEET OF WATER.

PLAN

SCALE: 1 IN. = 1500 FT.

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Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Louis J. Capozzoli & Associates, Inc.
Geotechnical Engineers
Baton Rouge, Louisiana

Scale Shown	Dwn. BJB 2 DEC 02 Ckd. 12 FEB 03	File No. 02-115
Boring Plan		Sheet No. 1

BORING NUMBER	LATITUDE NORTH	LONGITUDE WEST
6	29° 52' 17.34"	89° 41' 55.82"
7	29° 51' 59.20"	89° 40' 54.87"
8	29° 51' 57.39"	89° 40' 35.66"
9	29° 52' 01.42"	89° 40' 17.46"
10	29° 51' 50.63"	89° 39' 49.78"
11	29° 51' 41.37"	89° 39' 19.45"
17	29° 52' 11.28"	89° 41' 43.02"
18	29° 52' 03.99"	89° 41' 17.76"
19	29° 52' 02.50"	89° 41' 08.60"
20	29° 52' 01.08"	89° 40' 59.64"
21	29° 51' 58.98"	89° 40' 47.01"
22	29° 51' 48.03"	89° 39' 56.58"
23	29° 51' 44.06"	89° 39' 40.87"
24	29° 51' 42.85"	89° 39' 30.77"

SEE NOTE ON SHEET 1

LAKE BORGNE

OLD FORT BEAUREGARD

FORT BAYOU

MRGO

LA. HWY 46

BAYOU YSCLOSKEY

DOULLUT'S CANAL

MRGO

PLAN

SCALE: 1 IN. = 1500 FT.

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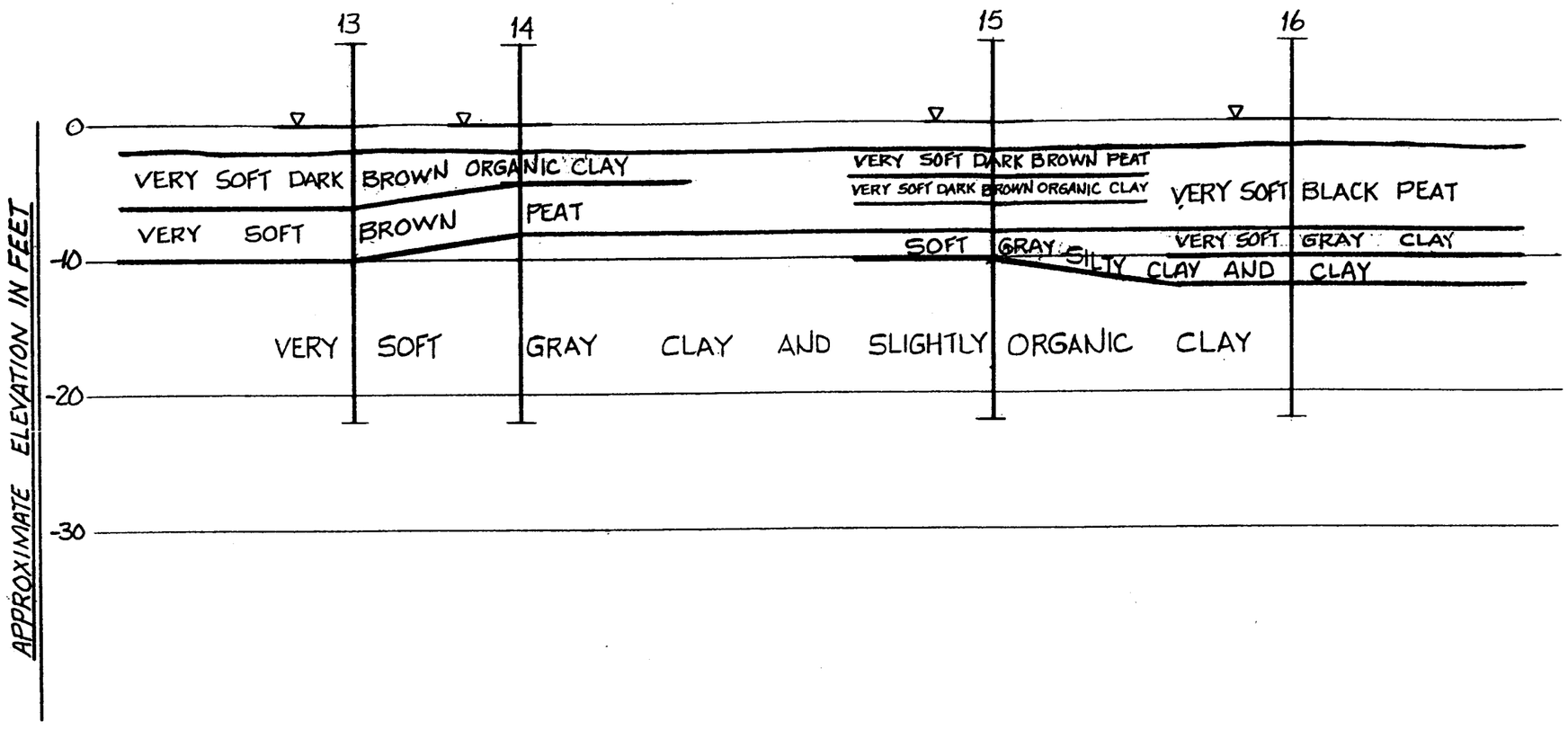
Scale Shown	Dwn. BJB 2 DEC 02 Ckd. 12 FEB 03	File No. 02-115
Boring Plan		Sheet No. 2



NOTE:

SOIL STRATIFICATION SHOWN BETWEEN BORINGS IS A NECESSARY INTERPOLATION WHICH MAY OR MAY NOT AGREE WITH THE ACTUAL SOIL CONDITION OUTSIDE OF THE BORINGS.

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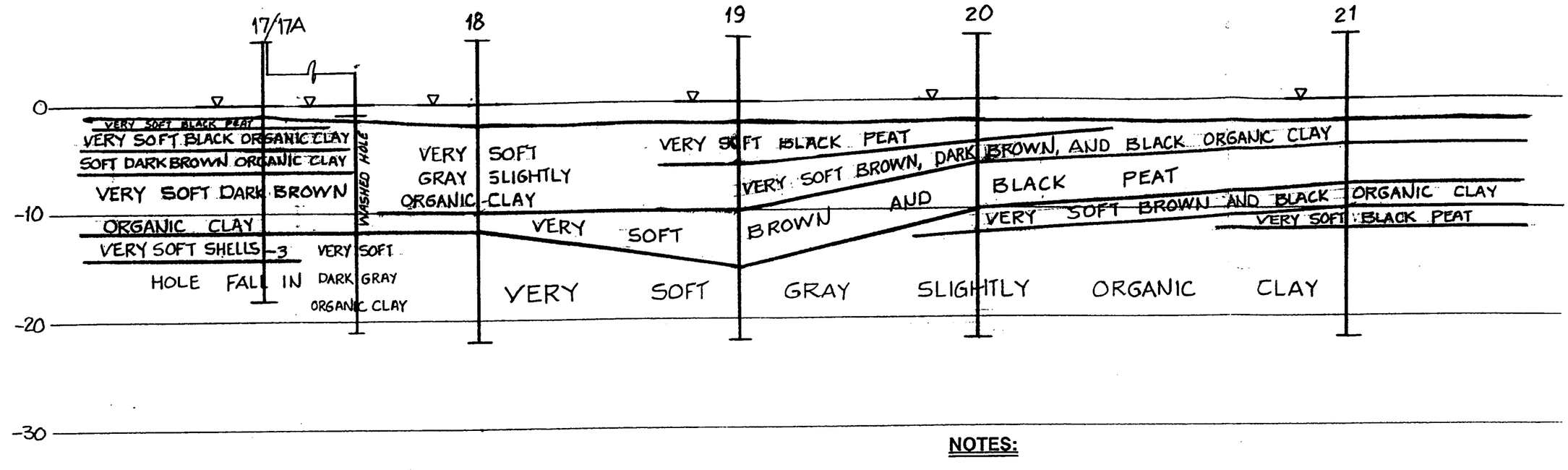
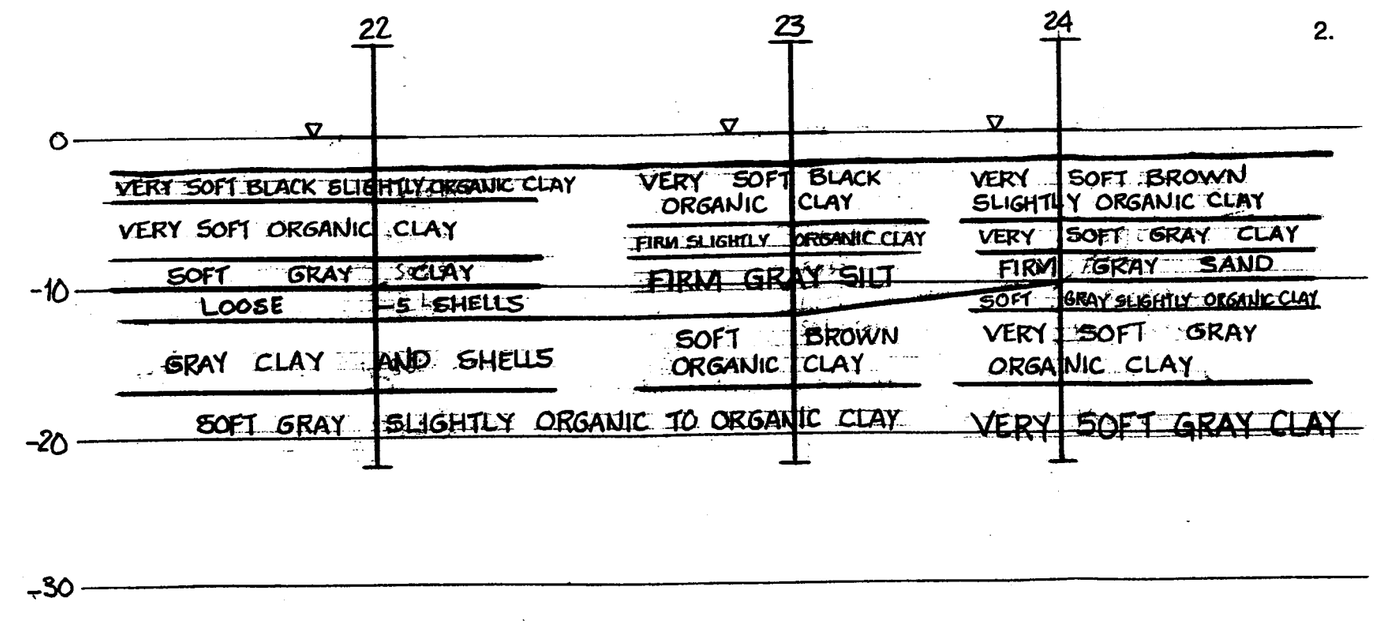
Scale Shown	Dwn. BJB 13 MAR 03 Ckd. LJC 18 MAR 03	File No. 02-115
Subsurface Profile		Sheet No. 3A





NOTES:

1. SOIL STRATIFICATION SHOWN BETWEEN BORINGS IS A NECESSARY INTERPOLATION WHICH MAY OR MAY NOT AGREE WITH THE ACTUAL SOIL CONDITION OUTSIDE OF THE BORINGS.

2. THE NUMBERS AT RIGHT SIDE OF BORINGS ARE PENETRATION RESISTANCES IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES.

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Scale Shown	Dwn. BJB 13MAR03 Ckd. [illegible]	File No. 02-115
Subsurface Profile		Sheet No. 4A

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CASE 1

Boring Number	Ultimate Soil Bearing Pressure (psf)	Safety Factor with P = 454 psf
13	423	0.93
14	555	1.22 ✓
15	382	0.84
16	399	0.88
17	566	1.25 ✓
18	513	1.13
19	486	1.07
20	493	1.09
21	645	1.42 ✓
22	667	1.47 ✓
23	850	1.87 ✓
24	530	1.17

✓ > 1.2 SF

Note: Case 1 is P = 454 psf is for 4 foot high section of rock in 2 feet of water.

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CASE 8

Boring Number	Ultimate Soil Bearing Pressure (psf)	Safety Factor with P = 310 psf
1	666	2.15
2	400	1.29
3	775	2.50
4	844	2.72
5	722	2.33
6	648	2.09
7	404	1.30
8	1058	3.41
9	1055	3.40
10	444	1.43
11	1885	6.08
12	2220	7.16
13	423	1.36
14	555	1.79
15	382	1.23
16	399	1.29
17	566	1.83
18	513	1.65
19	486	1.57
20	493	1.59
21	645	2.08
22	667	2.15
23	850	2.74
24	530	1.71

Note: Case 8 is P = 310 psf for 2 feet of rock at edge of marsh; not in water.

CASE 1: **APPROXIMATE TIME OF CONSOLIDATION SETTLEMENT** *02-115, Sheet 21A*

CONSOLIDATION SETTLEMENT IN INCHES AT:

Boring No.	½ Year	1 Yr.	3.3 Yrs.	5 Yrs.	10 Yrs.	20 Yrs.	TOTAL
13, 14, 15, 16, 17, 19, 20 & 21	7	10	18	22	29	34	36
18	6	8.5	15	21	25	28	30
22 & 24	4.5	6.5	12	15	19	22.5	24
23	3.5	5	9	11	14.5	17	18

CASE 8:	APPROXIMATE TIME OF CONSOLIDATION SETTLEMENT ~50% in 3+ years						02-115, Sheet 22A
Boring No.	½ Year	1 Yr.	3.3 Yrs.	5 Yrs.	10 Yrs.	20 Yrs.	TOTAL
1,2,3,6,7,14,15,16, 17, 19, 20 & 21	4.8	6.8	12.3	15.0	19.8	23.2	24.6
4,22&24	3.4	4.4	8.2	9.9	13.0	15.7	16.4
5,8,9,11&12	1.7	2.3	4.1	5.1	6.5	7.9	8.2
18	4.1	5.8	10.2	14.3	17.1	19.1	20.5
23	2.4	3.4	6.1	7.5	9.9	11.6	12.3

1 of 3

2 of 4

3, 3, of 4

3

4

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SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 1 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT WET PCF	UNIT WEIGHT DRY PCF	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	COMPRESSION TEST TSF	COMPRESSION TEST % STRAIN	COMPRESSION TEST START PRESSURE KSF	TYPE FAILURE	TEST TYPE
1	8.0 - 10.0	172	76.2	28.0	147	52	95	0.09	15		Yield	U
1	10.0 - 12.0	183	76.8	27.1	169	55	114	0.12	13		Multiple Shear	U
1	12.0 - 14.0	216	74.4	23.6	242	105	137	0.15	14		Multiple Shear	U
1	14.0 - 16.0	254	68.1	19.2				0.10	6		Multiple Shear	U
1	16.0 - 18.0	570	59.0	8.8	749	400	349	0.15	10		Multiple Shear	U
1	21.0 - 23.0	125	84.7	37.7				0.13	15		Yield	U
2	8.0 - 10.0	166	73.0	27.5	173	75	98	0.06	13		Multiple Shear	U
2	10.0 - 12.0	447	64.8	11.9				0.08	14		Multiple Shear	U
2	12.0 - 14.0	613	69.2	9.7				0.08	14		Multiple Shear	U
2	14.0 - 16.0	561	76.4	11.6				0.07	13		Multiple Shear	U
2	16.0 - 18.0	36	111.6	82.0				0.07	11		Bulge	U
2	21.0 - 23.0	83	102.8	56.2	79	37	42	0.17	15		Yield	U
2	26.0 - 28.0	72	100.9	58.8				0.13	9		Multiple Shear	U
2	31.0 - 33.0	87	96.4	51.6				0.15	11		Multiple Shear	U
2	36.0 - 38.0	78	93.3	52.3	81	27	54	0.11	13		Multiple Shear	U
2	41.0 - 43.0	87	93.4	49.9				0.19	15		Yield	U
3	23.0 - 25.0	279	75.0	19.8	374	150	224	0.11	7		Multiple Shear	U
3	25.0 - 27.0	65	98.4	59.7				0.06	10		Multiple Shear	U
3	27.0 - 29.0	53	100.3	65.6				0.09	10		Multiple Shear	U
3	29.0 - 31.0	37	113.7	82.9	41	22	19	0.16	15		Yield	U
3	31.0 - 33.0	39	113.1	81.5				1.84	13	.52	Bulge	QU
3	36.0 - 38.0	67	96.1	57.6	71	31	40	0.20	8		SLS (60 Degrees)	U
3	41.0 - 43.0	35	117.5	87.2				0.23	15		Yield	U
3	46.0 - 48.0	55	95.3	61.4	78	33	45	0.32	15		Yield	U
3	51.0 - 53.0	73	99.7	57.8				0.26	15		Yield	U
3	56.0 - 58.0	65	96.4	58.5				0.37	15		Yield	U
3	61.5 - 63.0											Dry Sieve
3	66.0 - 68.0	22	116.9	96.0				1.08	15	2.56	Yield	QU
3	71.5 - 73.0											Dry Sieve
4	8.0 - 10.0	106	93.6	45.6				0.17	15		Yield	U
4	10.0 - 12.0	358	76.3	16.6	200	87	113	0.11	15		Yield	U
4	12.0 - 14.0	345	69.6	15.7				0.10	15		Yield	U
4	14.0 - 16.0	391	68.3	13.9				0.10	15		Yield	U
4	16.0 - 18.0	148	97.4	39.3	93	30	63	0.20	15		Yield	U
4	21.0 - 23.0	73	105.9	61.2	55	22	33	0.23	15		Yield	U
4	26.5 - 28.0											Dry Sieve

SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 2 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT		ATTERBERG LIMITS			COMPRESSION TEST				
			WET PCF	DRY PCF	LL	PL	PI	TSF	% STRAIN	START PRESSURE KSF	TYPE FAILURE	TEST TYPE
4	31.0 - 33.0	32	120.4	91.2	26	26	0	0.88	7	1.40	Multiple Shear	QU
4	36.5 - 38.0											Dry Sieve
4	41.5 - 43.0											Dry Sieve
5	9.0 - 11.0	73	92.3	53.5	84	36	48	0.09	15		Yield	U
5	11.0 - 13.0	197	82.8	27.9	141	52	89	0.20	10		Multiple Shear	U
5	13.0 - 15.0	73	90.9	52.7	98	41	57	0.09	9		Multiple Shear	U
5	15.0 - 17.0	46	114.3	78.3				0.49	12		Multiple Shear	U
5	17.0 - 19.0	28	119.1	93.2	25	22	3	0.74	9	1.04	Bulge	QU
5	22.5 - 24.0											Dry Sieve
6	10.0 - 12.0	203	76.8	25.4	175	81	94	0.09	15		Yield	U
6	12.0 - 14.0	228	67.2	20.5				0.09	13		Multiple Shear	U
6	14.0 - 16.0	85	95.7	51.8	99	41	58	0.09	10		Multiple Shear	U
6	16.0 - 18.0	51	91.5	60.7				0.13	11		Multiple Shear	U
6	18.0 - 20.0	144	87.1	35.8	158	62	96	0.19	10		Multiple Shear	U
6	23.0 - 25.0	43	98.7	69.0	122	41	81	0.11	10		Multiple Shear	U
7	10.0 - 12.0	162	82.1	31.4				0.10	9		Multiple Shear	U
7	12.0 - 14.0	158	83.0	32.2	138	50	88	0.08	13		Multiple Shear	U
7	14.0 - 16.0	391	73.6	15.0				0.09	10		Multiple Shear	U
7	16.0 - 18.0	146	86.1	35.0				0.05	14		Multiple Shear	U
7	18.0 - 20.0	296	74.9	18.9	248	111	137	0.15	8		Multiple Shear	U
7	23.0 - 25.0	279	81.1	21.4	173	57	116	0.07	10		Multiple Shear	U
7	28.0 - 30.0	148	81.4	32.8				0.07	8		Multiple Shear	U
7	33.0 - 35.0	112	87.2	41.1	95	37	58	0.07	14		Multiple Shear	U
7	38.0 - 40.0	372	75.5	16.0				0.10	15		Yield	U
7	43.0 - 45.0	85	97.3	52.7				0.22	9		Vertical Shear	U
8	10.0 - 12.0	68	105.8	63.1	43	20	23	0.28	14		Multiple Shear	U
8	12.0 - 14.0	63	108.3	66.5	50	18	32	0.24	10		Multiple Shear	U
8	14.0 - 16.0	193	87.2	29.7				0.26	7		Multiple Shear	U
8	16.0 - 18.0	76	90.8	51.6	109	42	67	0.15	10		Multiple Shear	U
8	18.0 - 20.0	45	107.4	74.0				0.15	13		Multiple Shear	U
8	23.0 - 25.0	102	95.6	47.4	122	37	85	0.28	11		Multiple Shear	U
9	12.0 - 14.0	54	105.6	68.4				0.13	11		Multiple Shear	U
9	14.0 - 16.0	61	111.0	69.0	46	25	21	0.27	15		Yield	U
9	16.0 - 18.0	53	104.2	67.9				0.18	15		Yield	U

SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 3 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT WET PCF	UNIT WEIGHT DRY PCF	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	COMPRESSION TEST TSF	COMPRESSION TEST % STRAIN	COMPRESSION TEST START PRESSURE KSF	COMPRESSION TEST TYPE FAILURE	TEST TYPE
9	18.0 - 20.0	62	106.1	65.4				0.18	15		Yield	U
9	20.0 - 22.0	30	117.0	89.8				0.65	8	.52	Bulge	QU
9	25.0 - 27.0	77	94.2	53.4	187	72	115	0.27	6		Multiple Shear	U
9	30.0 - 32.0	86	94.4	50.7	128	59	69	0.40	9		Multiple Shear	U
9	35.0 - 37.0	38	109.5	79.4				0.36	15		Yield	U
9	40.0 - 42.0	34	109.5	81.9				0.39	15		Yield	U
9	45.0 - 47.0	42	105.1	74.2	87	34	53	0.40	9		Multiple Shear	U
10	8.0 - 10.0	68	97.1	57.9	75	28	47	0.08	15		Yield	U
10	12.5 - 14.0											Dry Sieve
10	14.5 - 16.0											Dry Sieve
10	21.5 - 23.0											Dry Sieve
11	9.0 - 11.0	54	104.3	67.6	55	25	30	0.21	15		Yield	U
11	11.0 - 13.0	76	98.6	56.2	21	19	2	0.68	9	.19	Bulge	QU
11	13.0 - 15.0	27	119.3	94.2				1.05	7	.30	Bulge	QU
11	15.0 - 17.0	52	104.6	68.8	45	24	21	0.08	15		Yield	U
11	17.0 - 19.0	155	87.2	34.2				0.21	11		Multiple Shear	U
11	22.0 - 24.0	285	74.3	19.3	358	130	228	0.17	8		Multiple Shear	U
11	27.0 - 29.0	50	120.5	80.2	30	17	13	0.80	9	1.09	Bulge	QU
11	32.0 - 34.0	29	120.3	92.9				0.75	15	1.40	Yield	QU
11	37.5 - 39.0											Dry Sieve
11	42.0 - 44.0	50	105.9	70.5				0.36	4		SLS (50 Degrees)	U
12	10.0 - 12.0	45	122.0	84.2	68	26	42	0.33	10		Multiple Shear	U
12	12.0 - 14.0	36	122.9	90.2				0.64	10		Multiple Shear	U
12	14.0 - 16.0	36	117.0	86.1	61	26	35	0.38	10		SLS (45 Degrees)	U
12	16.0 - 18.0	41	118.5	83.9				0.42	14		Multiple Shear	U
12	18.0 - 20.0	67	108.1	64.7	78	36	42	0.23	11		Multiple Shear	U
12	23.5 - 25.0											Dry Sieve
12	28.5 - 30.0				27	21	6					
12	33.5 - 35.0											Dry Sieve
12	38.5 - 40.0											Dry Sieve
12	43.5 - 45.0											Dry Sieve
13	8.0 - 10.0	143	74.5	30.6				0.03	4		Bulge	U
13	10.0 - 12.0	169	69.1	25.7	404	188	216	0.08	9		Multiple Shear	U
13	12.0 - 14.0	604	69.0	9.8				0.09	9		Bulge	U
13	14.0 - 16.0	784	56.6	6.4	849	462	387	0.04	5		Multiple Shear	U

SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 4 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT WET PCF	UNIT WEIGHT DRY PCF	ATTERBERG LIMITS LL	ATTERBERG LIMITS PL	ATTERBERG LIMITS PI	COMPRESSION TEST TSF	COMPRESSION TEST % STRAIN	COMPRESSION TEST START PRESSURE KSF	TYPE FAILURE	TEST TYPE
13	16.0 - 18.0	165	79.7	30.1				0.10	6		Multiple Shear	U
13	18.0 - 20.0	108	90.1	43.3				0.11	12		Bulge	U
13	23.0 - 25.0	55	102.4	66.1				0.08	8		Bulge	U
13	26.0 - 28.0	79	92.2	51.5				0.08	9		Bulge	U
14	8.0 - 10.0	585	60.3	8.8				0.07	7		Multiple Shear	U
14	10.0 - 12.0	851	69.3	7.3	793	478	315	0.19	14		Multiple Shear	U
14	12.0 - 14.0	531	58.8	9.3				0.07	7		Multiple Shear	U
14	14.0 - 16.0	181	78.9	28.1	182	49	133	0.09	7		Multiple Shear	U
14	16.0 - 18.0	123	88.2	39.6				0.09	11		Multiple Shear	U
14	18.0 - 20.0	86	91.1	49.0				0.08	6		Multiple Shear	U
14	23.0 - 25.0	107	93.4	45.1				0.12	15		Yield	U
14	26.0 - 28.0	80	94.5	52.6				0.09	7		Bulge	U
15	8.0 - 10.0	377	59.1	12.4	434	135	299	0.03	2		Bulge	U
15	10.0 - 12.0	215	77.1	24.4				0.10	10		Multiple Shear	U
15	12.0 - 14.0	327	74.2	17.4				0.07	8		Bulge	U
15	14.0 - 16.0	39	109.4	78.6				0.33	15		Yield	U
15	16.0 - 18.0	79	96.6	54.1				0.10	10		Bulge	U
15	18.0 - 20.0	71	90.4	52.8	94	31	63	0.12	7		Bulge	U
15	23.0 - 25.0	69	93.5	55.3				0.13	12		Multiple Shear	U
15	26.0 - 28.0	72	96.7	56.3				0.04	3		Bulge	U
16	8.0 - 10.0	400	70.4	14.1				0.09	9		Multiple Shear	U
16	10.0 - 12.0	597	51.5	7.4	621	330	291	0.05	4		Multiple Shear	U
16	12.0 - 14.0	289	74.0	19.0				0.07	8		Multiple Shear	U
16	14.0 - 16.0	48	91.0	61.4				0.18	13		Multiple Shear	U
16	16.0 - 18.0	47	104.4	71.0	59	24	35	0.30	15		Yield	U
16	18.0 - 20.0	81	95.2	52.6				0.17	7		Multiple Shear	U
16	23.0 - 25.0	26	102.7	81.4				0.21	11		Multiple Shear	U
16	26.0 - 28.0	37	97.3	70.9				0.14	13		Multiple Shear	U
17	7.0 - 8.0	387	63.6	13.1	279	144	135	0.09	7		Multiple Shear	U
17	8.0 - 10.0	187	66.6	23.2				0.07	5		Multiple Shear	U
17	10.0 - 12.0	248	83.8	24.1	249	82	167	0.11	8		Multiple Shear	U
17	12.0 - 14.0	176	79.8	28.9				0.15	9		Multiple Shear	U
17	14.0 - 16.0	116	82.5	38.2				0.08	5		Multiple Shear	U
17 A	18.0 - 20.0	106	81.0	39.3				0.11	6		Multiple Shear	U

SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 5 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT		ATTERBERG LIMITS			COMPRESSION TEST				
			WET PCF	DRY PCF	LL	PL	PI	TSF	% STRAIN	START PRESSURE KSF	TYPE FAILURE	TEST TYPE
17 A	23.0 - 25.0	339	74.6	17.0				0.18	9		Multiple Shear	U
17 A	25.0 - 27.0	78	95.2	53.6				0.14	9		Bulge	U
18	8.0 - 10.0	148	68.0	27.4				0.06	6		Multiple Shear	U
18	10.0 - 12.0	144	69.9	28.6	420	227	193	0.07	7		Multiple Shear	U
18	12.0 - 14.0	112	92.4	43.5				0.09	9		Bulge	U
18	14.0 - 16.0	115	89.8	41.7				0.10	7		Bulge	U
18	16.0 - 18.0	512	60.4	9.9	510	240	270	0.09	6		Multiple Shear	U
18	18.0 - 20.0	79	95.8	53.6				0.08	8		Bulge	U
18	23.0 - 25.0	84	91.3	49.7				0.11	8		Bulge	U
18	26.0 - 28.0	89	92.7	49.0				0.14	7		Bulge	U
19	8.0 - 10.0	322	69.3	16.4				0.06	4		Multiple Shear	U
19	10.0 - 12.0	442	71.1	13.1				0.07	6		Multiple Shear	U
19	12.0 - 14.0	174	83.5	30.4	141	56	85	0.10	9		Multiple Shear	U
19	14.0 - 16.0	267	79.9	21.8				0.10	7		Multiple Shear	U
19	16.0 - 18.0	301	69.2	17.2				0.06	3		Multiple Shear	U
19	18.0 - 20.0	439	63.0	11.7				0.12	8		Multiple Shear	U
19	23.0 - 25.0	66	84.5	50.8	113	52	61	0.04	4		Multiple Shear	U
19	26.0 - 28.0	138	90.6	38.1				0.15	7		Multiple Shear	U
20	8.0 - 10.0	447	65.7	12.0	436	233	203	0.08	8		Multiple Shear	U
20	10.0 - 12.0	195	65.0	22.1				0.07	7		Multiple Shear	U
20	12.0 - 14.0	329	67.2	15.7				0.11	9		Bulge	U
20	14.0 - 16.0	329	71.4	16.6	407	188	219	0.10	10		Multiple Shear	U
20	16.0 - 18.0	184	71.7	25.2				0.08	7		Multiple Shear	U
20	18.0 - 20.0	105	78.9	38.5				0.10	7		Multiple Shear	U
20	23.0 - 25.0	88	88.9	47.2				0.06	4		Bulge	U
20	26.0 - 28.0	89	86.4	45.6				0.11	7		Bulge	U
21	8.0 - 10.0	251	70.6	20.1				0.15	12		Bulge	U
21	10.0 - 12.0	488	73.3	12.5	163	52	111	0.12	7		Multiple Shear	U
21	12.0 - 14.0	329	76.8	17.9				0.08	8		Bulge	U
21	14.0 - 16.0	148	74.1	29.9				0.09	10		Multiple Shear	U
21	16.0 - 18.0	340	69.1	15.7				0.13	10		Multiple Shear	U
21	18.0 - 20.0	114	85.6	39.9				0.07	6		Bulge	U
21	23.0 - 25.0	59	92.0	57.7	80	33	47	0.08	5		Multiple Shear	U
21	26.0 - 28.0	95	92.3	47.4				0.21	7		Multiple Shear	U

SHORELINE PROTECTION AT LAKE BORGNE

LABORATORY DATA

TABLE 6 FILE NO: 02-115

BORING NUMBER	DEPTH FEET	MOISTURE %	UNIT WEIGHT		ATTERBERG LIMITS			COMPRESSION TEST				
			WET PCF	DRY PCF	LL	PL	PI	TSF	% STRAIN	START PRESSURE KSF	TYPE FAILURE	TEST TYPE
22	8.0 - 10.0	50	86.4	57.8				0.07	6		Bulge	U
22	10.0 - 12.0	136	83.6	35.4	124	34	90	0.16	9		Multiple Shear	U
22	12.0 - 14.0	134	93.6	39.9				0.12	12		Bulge	U
22	14.0 - 16.0	43	115.6	80.8	55	20	35	0.26	12		Multiple Shear	U
22	18.0 - 20.0	14										MC
22	23.0 - 25.0	122	86.0	38.7				0.27	9		Multiple Shear	U
22	26.0 - 28.0	74	92.3	53.1				0.20	7		Multiple Shear	U
23	8.0 - 10.0	166	93.0	35.0				0.14	9		Multiple Shear	U
23	10.0 - 12.0	70	91.2	53.5	113	38	75	0.11	11		Bulge	U
23	12.0 - 14.0	89	109.7	58.1				0.39	8	.75	Bulge	QD
23	14.0 - 16.0	38	117.4	85.3				0.59	4	.86	Bulge	QD
23	16.0 - 18.0	44	101.3	70.5	25	25	0	0.43	9	.99	Yield	QD
23	18.0 - 20.0	224	79.0	24.4				0.25	8		Multiple Shear	U
23	23.0 - 25.0	125	87.1	38.7				0.30	9		Multiple Shear	U
23	26.0 - 28.0	142	83.8	34.6	242	100	142	0.27	10		Multiple Shear	U
24	8.0 - 10.0	68	89.4	53.1	65	27	38	0.11	10		Bulge	U
24	10.0 - 12.0	123	90.6	40.6				0.08	8		Bulge	U
24	12.0 - 14.0	50	97.2	64.8				0.09	11		Bulge	U
24	14.0 - 16.0	27	105.3	82.7	25	23	2	0.67	5	.86	Bulge	QD
24	16.0 - 18.0	77	80.2	45.4				0.31	9		Multiple Shear	U
24	18.0 - 20.0	255	82.0	23.1				0.19	10		Bulge	U
24	23.0 - 25.0	52	101.3	66.8				0.16	12		Bulge	U
24	26.0 - 28.0	51	98.9	65.6				0.17	15		Yield	U

MINI VANE SHEAR TEST RESULTS

TABLE 1, FILE NO: 02-115

Boring	Depth (Feet)			Dial Reading	TSF	Notes
13	8	-	10	5	0.03	
13	10	-	12	12	0.06	
13	12	-	14	14	0.07	
13	14	-	16	7	0.04	
13	16	-	18	17	0.09	
13	18	-	20	9	0.05	
13	23	-	25	18	0.09	
13	26	-	28	14	0.07	
14	8	-	10	12	0.06	
14	10	-	12	26	0.13	
14	12	-	14	13	0.07	
14	14	-	16	13	0.07	
14	16	-	18	15	0.08	
14	18	-	20	15	0.08	
14	23	-	25	12	0.06	
14	26	-	28	16	0.08	
15	8	-	10	5	0.03	
15	10	-	12	16	0.08	
15	12	-	14	12	0.06	
15	14	-	16	29	0.15	
15	16	-	18	18	0.09	
15	18	-	20	17	0.09	
15	23	-	25	22	0.11	
15	26	-	28	9	0.05	
16	8	-	10	15	0.08	
16	10	-	12	10	0.05	
16	12	-	14	14	0.07	
16	14	-	16	22	0.11	
16	16	-	18	38	0.19	
16	18	-	20	25	0.13	
16	23	-	25	29	0.15	
16	26	-	28	27	0.14	
17	7	-	8	15	0.08	
17	8	-	10	12	0.06	
17	10	-	12	17	0.09	
17	12	-	14	24	0.12	
17	14	-	16	11	0.06	
17A	18	-	20	19	0.10	
17A	23	-	25	29	0.15	
17A	25	-	27	25	0.13	

MINI VANE SHEAR TEST RESULTS

TABLE 8, FILE NO: 02-115

Boring	Depth (Feet)			Dial Reading	TSF	Notes
18	8	-	10	12	0.06	
18	10	-	12	12	0.06	
18	12	-	14	15	0.08	
18	14	-	16	15	0.08	
18	16	-	18	11	0.06	
18	18	-	20	12	0.06	
18	23	-	25	11	0.06	
18	26	-	28	17	0.09	
19	8	-	10	12	0.06	
19	10	-	12	13	0.07	
19	12	-	14	11	0.06	
19	14	-	16	16	0.08	
19	16	-	18	16	0.08	
19	18	-	20	13	0.07	
19	23	-	25	10	0.05	
19	26	-	28	22	0.11	
20	8	-	10	15	0.08	
20	10	-	12	14	0.07	
20	12	-	14	14	0.07	
20	14	-	16	22	0.11	
20	16	-	18	14	0.07	
20	18	-	20	15	0.08	
20	23	-	25	11	0.06	
20	26	-	28	18	0.09	
21	8	-	10	27	0.14	
21	10	-	12	20	0.10	
21	12	-	14	16	0.08	
21	14	-	16	17	0.09	
21	16	-	18	21	0.11	
21	18	-	20	10	0.05	
21	23	-	25	11	0.06	
21	26	-	28	36	0.18	
22	8	-	10	12	0.06	
22	10	-	12	24	0.12	
22	12	-	14	19	0.10	
22	14	-	16	38	0.19	
22	16.5	-	18	-	SPT	
22	18	-	20	-	-	Shells
22	23	-	25	36	0.18	
22	26	-	28	31	0.16	

MINI VANE SHEAR TEST RESULTS TABLE 9, FILE NO: 02-115

Boring	Depth (Feet)			Dial Reading	TSF	Notes
23	8	-	10	22	0.11	
23	10	-	12	16	0.08	
23	12	-	14	-	-	Silt
23	14	-	16	-	-	Silt
23	16	-	18	-	-	Silt
23	18	-	20	41	0.21	
23	23	-	25	48	0.24	
23	26	-	28	44	0.22	
24	8	-	10	18	0.09	
24	10	-	12	14	0.07	
24	12	-	14	11	0.06	
24	14	-	16	-	-	Sand
24	16	-	18	47	0.24	
24	18	-	20	36	0.18	
24	23	-	25	24	0.12	
24	26	-	28	26	0.13	

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 13
File: 02-115
Date: 17-Feb-03
Technician: BT

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 57' 7.91"
W 89° 50' 43.74"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 feet top of barge deck to water surface
5		2 feet water surface to mudline
	■	Very soft dark brown organic clay
10	■	Very soft dark brown organic clay
	■	Very soft dark brown peat
15	■	Very soft brown peat
	■	Very soft gray organic clay
	■	Very soft gray slightly organic clay
20		
	■	Very soft gray clay with organic matter traces
25	■	Very soft gray slightly organic clay
30		

LOUIS J. CAPOZZOLI & ASSOCIATES, INC.
Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 14
File: 02-115
Date: 17-Feb-03
Technician: BT

Undisturbed Sample
Standard Penetration Test
Classification Sample
(SLS) Slickensided

N 29° 57' 14.28"
W 89° 50' 40.56"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
		Very soft brown organic clay
10		Very soft brown peat
		Very soft brown peat
15		Very soft brown organic clay
		Very soft gray organic clay
		Very soft gray slightly organic clay
20		
		Very soft gray slightly organic clay with 1" clay layer
25		
		Very soft gray slightly organic clay
30		

LOUIS J. CAPOZZOLI & ASSOCIATES, INC.
Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 15
File: 02-115
Date: 17-Feb-03
Technician: BT

Undisturbed Sample
Standard Penetration Test
Classification Sample
(SLS) Slickensided

N 29° 56' 59.34"
W 89° 50' 30.72"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
		Very soft dark brown peat
10		Very soft dark brown organic clay
		Very soft dark brown peat
15		Soft gray silty clay
		Very soft gray slightly organic clay
		Very soft gray slightly organic clay
20		
		Very soft gray slightly organic clay
25		Very soft gray slightly organic clay
30		

LOUIS J. CAPOZZOLI & ASSOCIATES, INC.
Geotechnical Engineers

LOG OF BORING

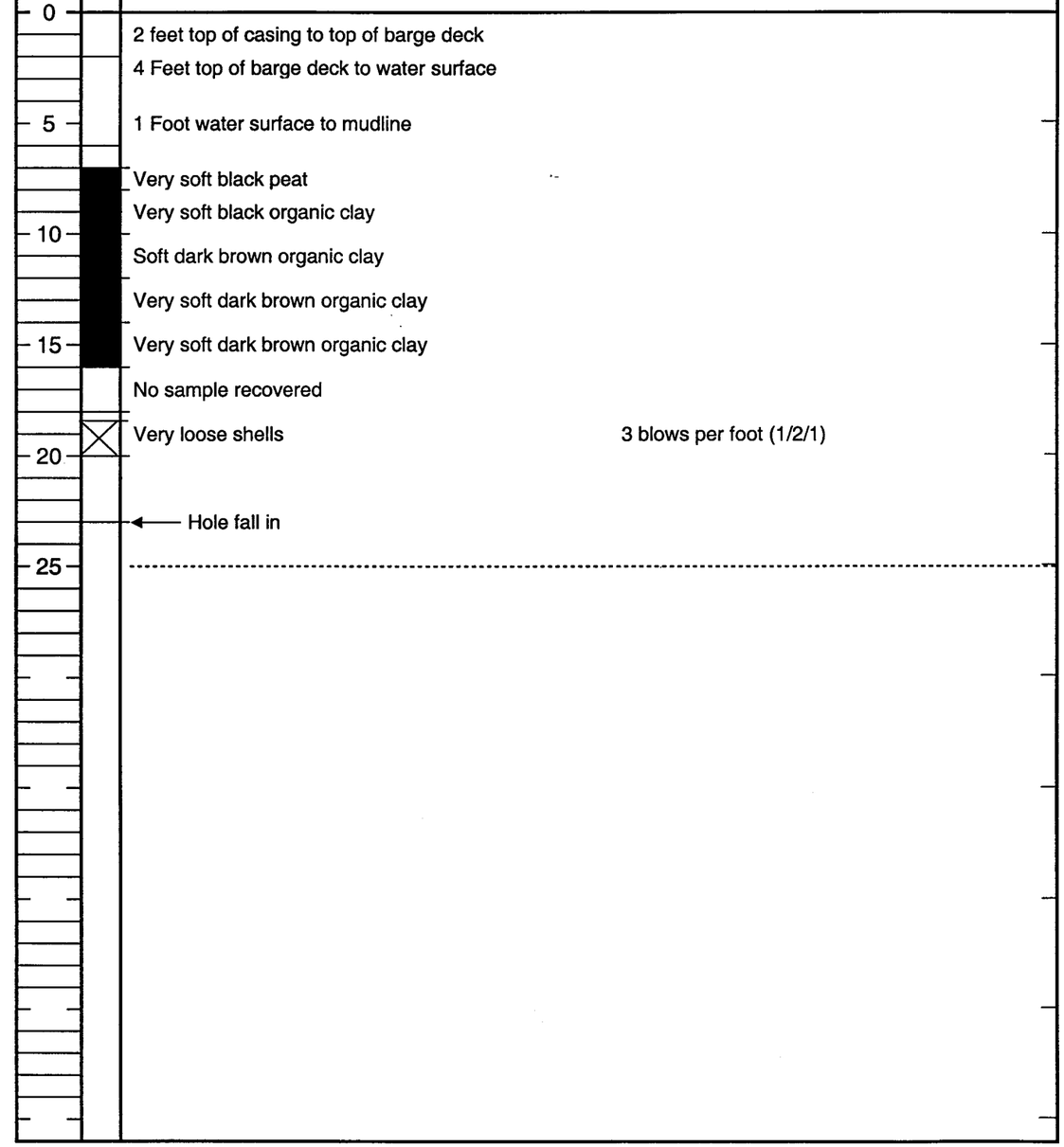
Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 17
File: 02-115
Date: 18-Feb-03
Technician: BT

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 52' 11.28"
W 89° 41' 43.02"

Boring Depth: 24 Feet



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Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 17A
File: 02-115
Date: 18-Feb-03
Technician: BT

Depth Feet | SAMPLES

■ Undisturbed Sample
⊠ Standard Penetration Test
▯ Classification Sample
(SLS) Slickensided

Location was 20 ft. west of boring 17. No GPS Coordinates were taken.

Boring Depth: 27 Feet

0
2 feet top of casing to top of barge deck
4 Feet top of barge deck to water surface
5
1 Foot water surface to mudline
10
WASHED HOLE
15
20
■ Very soft dark gray organic clay with shells
25
■ Very soft slightly organic clay

LOUIS J. CAPOZZOLI & ASSOCIATES, INC.
Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 18
File: 02-115
Date: 18-Feb-03
Technician: BT

Depth Feet | SAMPLES

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 52' 03.99"
W 89° 41' 17.76"

Boring Depth: 28 Feet

0 — 2 feet top of casing to top of barge deck
4 Feet top of barge deck to water surface
5 — 2 Feet water surface to mudline
10 — Very soft black organic clay
Very soft black organic clay
Very soft gray slightly organic clay
15 — Very soft gray slightly organic clay
Very soft brown peat
Very soft gray slightly organic clay with shells
20 —
Very soft gray slightly organic clay
25 —
Very soft gray slightly organic clay
30 —

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Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 19
File: 02-115
Date: 18-Feb-03
Technician: BT

Depth Feet | SAMPLES

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 52' 02.50"
W 89° 41' 08.60"

Boring Depth: 28 Feet

0 — 2 feet top of casing to top of barge deck
4 Feet top of barge deck to water surface
5 — 2 Feet water surface to mudline
10 — Very soft black peat
Very soft black peat
Very soft dark gray organic clay
15 — Very soft dark gray organic clay
Very soft brown peat
Very soft brown peat
20 —
Very soft gray slightly organic clay
25 —
Very soft gray organic clay
30 —

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LOG OF BORING

Project:	Shoreline Protection/Marsh Creation at Lake Borgne	Boring:	20
	DNR Contract No. 2503-03-15 PO-30	File:	02-115
For:	State of Louisiana, Department of Natural Resources	Date:	18-Feb-03
	c/o Sigma Consulting Group, Inc.	Technician:	BT

Depth Feet | SAMPLES

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 52' 01.08"
W 89° 41' 59.64"

Boring Depth: 28 Feet

0 — 2 feet top of casing to top of barge deck

4 Feet top of barge deck to water surface

5 — 2 Feet water surface to mudline

10 — Very soft brown peat

Very soft brown organic clay

Soft brown peat

15 — Very soft brown peat

Very soft brown organic clay

Very soft gray slightly organic clay

20 —

Very soft gray slightly organic clay

25 —

Soft gray slightly organic clay

30 —

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Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

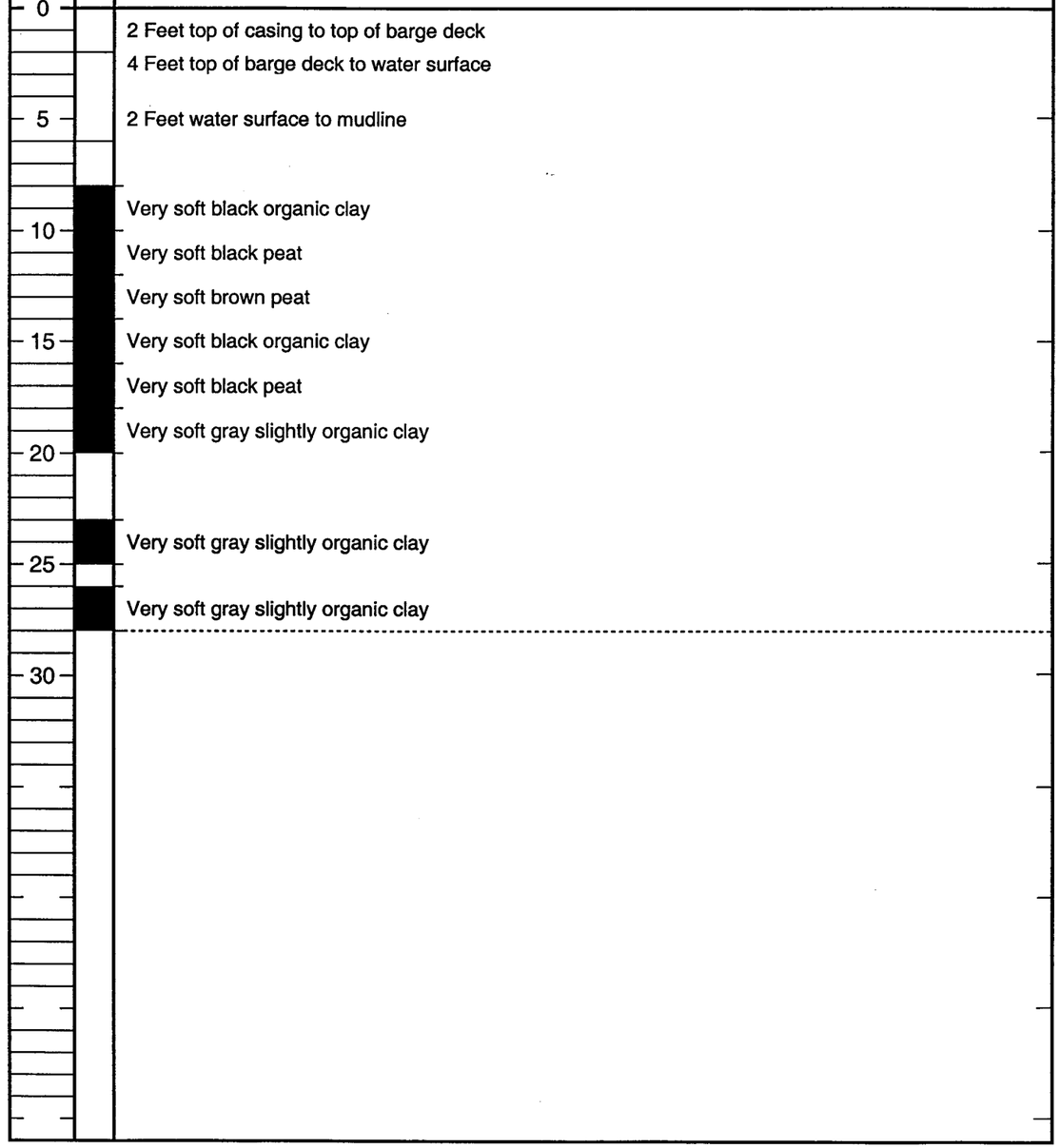
Boring: 21
File: 02-115
Date: 18-Feb-03
Technician: BT

Depth Feet | SAMPLES

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 58.98"
W 89° 47.01"

Boring Depth: 28 Feet



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Geotechnical Engineers

LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 22
File: 02-115
Date: 19-Feb-03
Technician: BT

Undisturbed Sample
Standard Penetration Test
Classification Sample
(SLS) Slickensided

N 29° 51' 48.04"
W 89° 39' 56.58"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
		Very soft black slightly organic clay with silt streaks
10		Very soft dark gray organic clay
		Very soft gray organic clay with shells
15		Soft gray clay with silt streaks and shells
		Loose shell with clay traces — 5 Blows per foot (2/3/2)
		Gray clay and shells
20		
		Soft gray organic clay
25		Soft gray slightly organic clay
30		

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LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 23
File: 02-115
Date: 19-Feb-03
Technician: BT

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 51' 44.06"
W 89° 39' 40.87"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
	■	Very soft black organic clay
10	■	Very soft black organic clay
	■	Firm gray slightly organic silt with clay traces
15	■	Firm gray silt with clay traces
	■	Firm gray silt with 1" clay layer
	■	Soft brown organic clay
20		
	■	Soft gray slightly organic clay
25		
	■	Soft gray slightly organic clay
30		

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LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne
DNR Contract No. 2503-03-15 PO-30
For: State of Louisiana, Department of Natural Resources
c/o Sigma Consulting Group, Inc.

Boring: 24
File: 02-115
Date: 19-Feb-03
Technician: BT

■ Undisturbed Sample
⊠ Standard Penetration Test
◫ Classification Sample
(SLS) Slickensided

N 29° 51' 42.85"
W 89° 39' 30.77"

Boring Depth: 28 Feet

Depth Feet	SAMPLES	
0		2 feet top of casing to top of barge deck
		4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
	■	Very soft brown slightly organic clay
10	■	Very soft gray slightly organic clay
	■	Very soft gray clay
15	■	Firm gray sand with clay traces
	■	Soft gray slightly organic clay
	■	Very soft gray organic clay
20		
	■	Very soft gray clay with organic matter traces
25	■	Very soft gray clay with organic matter traces

30		

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