COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT (CWPPRA) DEMONSTRATION: LA-06 SHORELINE PROTECTION FOUNDATION IMPROVEMENTS VERMILION PARISH, LA

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COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT (CWPPRA) DEMONSTRATION: LA-06 SHORELINE PROTECTION FOUNDATION IMPROVEMENTS VERMILION PARISH, LA

Objective:

White Lake is located 55 miles southeast of Lake Charles, Louisiana in Vermilion Parish. The south shoreline of White Lake is retreating at an estimated average rate of 15 feet-per-year. As the shoreline erodes, the potential increases for low marsh management levees to breach and subject interior marsh to increased wave erosion. Poor soil conditions limit the effectiveness of shoreline protection dikes because of high rates of subsidence which require frequent and expensive project maintenance, lowering overall project cost effectiveness. The objective is to improve the cost effectiveness of shoreline protection projects by applying a sand foundation beneath rock dikes to achieving bearing capacity and consolidation settlement design tolerances to reduce 20-year project life cycle costs, as compared to traditional approaches.

Design and Instrumentation:

The demonstration project proposed a rigorous test design that included two replicates of two foundation improvement treatments with a separate control to meet engineering and statistical data and analysis requirements. The test design located with design soil reach #6 included six 900-linear foot sample sections with 50 foot intervals between sections. For engineering data control, all improved sample sections were adjacent to one control sample section. To determine the effects of the foundation improvements, each sample section was instrumented with four sets each of crown, front and rear settlement plates, inclinometers, and extensometers, at approximately 180-foot intervals. See Figure 1 for the dimensions of the demonstration sections and Figure 2 for the location of each demonstration section.

Demonstration Section A: This design included two 900-foot improved sample sections (A1 and A2) consisting of a sand foundation that displaced soft near-surface material. During construction, 2.5 feet of sand fill was placed on the existing ground to elevation +1.0 to induce initial settlement. Rock armor was then placed to an elevation of +3.5.

Demonstration Section B: This design included two 900-foot improved sample sections (B1 and B2) with soft near-surface material removed via dredging and backfilled with sand to match the existing ground surface. Rock armor was then placed to an elevation on +3.5.

Demonstration Section C: This design included two 900-foot unimproved control sections (C1 and C2) consisting of rock armor placed to an elevation on +3.5 without sand.

Instrumentation Results:
Settlement and deflection data was collected over a five-year period from 2006 to 2011 for each of the 6 demonstration reaches. Settlement data collected in 2009 and 2010 was not used for determining a preferred construction procedure since there appears to be some error in the surveys. The data points during this timeframe show results much lower than the previous data points from 2008 and showed an increase in the rate of settlement. This is not expected since no extra load was added so the 2009 and 2010 settlement data was removed. From the compiled data, average settlement and deflection was determined for each of the designs.

Deflection: The lateral deflection is determined by inclinometers at the P/S toe and F/S toe.

Demonstration Section A

Reach	Avg. Deflection (in.) Direction A	Avg. Deflection (in.) Direction B
A1	0.93	1.01
A2	0.78	0.84
Total Avg. Deflection (in.)	0.86	0.93

Demonstration Section B

Reach	Avg. Deflection (in.) Direction A	Avg. Deflection (in.) Direction B
B1	1.63	1.17
B2	1.03	1.48
Total Avg. Deflection (in.)	1.33	1.33

Demonstration Section C

Reach	Avg. Deflection (in.) Direction A	Avg. Deflection (in.) Direction B
C1	0.68	1.03
C2	1.58	0.88
Total Avg. Deflection (in.)	1.13	0.95

*Note: Direction A = perpendicular to the dike centerline
Direction B = parallel to the dike centerline

The inclinometer data shows about an inch of lateral movement of the foundation soil for each of the sections. The expected result was Demonstration Section B would have had the least amount of lateral deflection because the foundation soils (expected to deflect laterally) were dredged and replaced by sand (expected to deflect laterally a small amount). With the minimal lateral movement of the foundation soils and the similarity in the values, all sections performed well and a more preferred section cannot be chosen.

Settlement: The settlement of the demonstration sections was determined by settlement gauges placed in the centerline of the demonstration section.

Demonstration Section A

Reach	Max. Settlement (ft)	Avg. Settlement (ft)
A1	0.30 (Reach A1-4C)	0.18
A2	0.31 (Reach A2-C3)	0.26
Total Avg. Settlement (ft)		**0.22**

Demonstration Section B

Reach	Max. Settlement (ft)	Avg. Settlement (ft)
B1	0.52 (Reach B1-C2)	0.44
B2	0.50 (Reach B2-1C)	0.38
Total Avg. Settlement (ft)		**0.41**

Demonstration Section C

Reach	Max. Settlement (ft)	Avg. Settlement (ft)
C1	0.16 (Reach C1-2C)	0.13
C2	0.24 (Reach C2-4C)	0.15
Total Avg. Settlement (ft)		**0.14**

The settlement data shows between 2 inches and 5 inches of foundation settlement for the sections tested. Demonstration Section B (excavate and replace design) appears to have performed marginally worse than Section A and Section C. However, with the similarity in the results and minimal foundation settlement, all sections performed well and a more preferred section cannot be chosen. Graphs of the centerline elevations vs. time and $\log_{10}$ trend-line of the elevations vs. time of the demonstration section are shown in Appendix A.

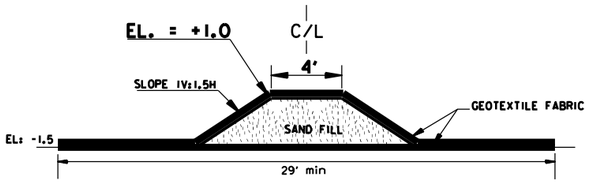
Conclusions:

Given the data, all three sections proved to be stable structures with minimal foundation settlement and lateral movement in the foundation. The purpose of the test was to find a suitable construction procedure to building rock dikes. At this site, all three sections would be suitable and a more preferred construction procedure cannot be recommended from the test data.

Lesson Learned:

For a more effective demonstration section, a site with more expected foundation settlement and lateral movement should have been chosen. This would provide a greater magnitude of values and most likely, a range of values from one section to the other. The site chosen predicted settlements too small to be compared because the survey error of 0.2 feet overlaps some of the data and small differences in values (settlement and lateral movement) between sections are too similar to provide a recommendation.

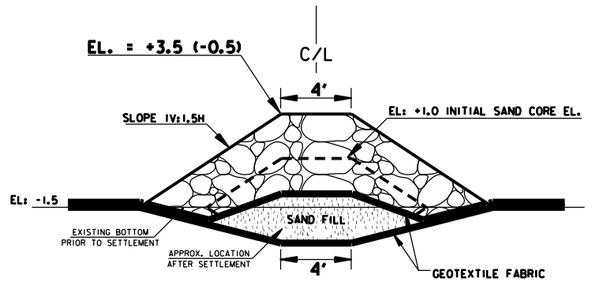
NOTES:
1) Non-excavated dike alignment, sand core placement prior to rock placement
2) Geotextile Fabric placed above and below (29' min) sand core
3) All instrumentation installed prior to placement of sand and geotextile fabric



SAND CORE, DEMONSTRATION SECTION "A"
Stations 139+00 - 148+00, 186+50 - 195+50

SCALE: N.T.S.

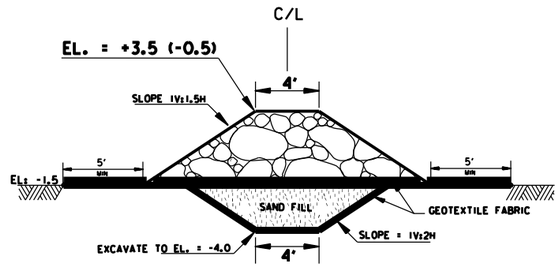
NOTES:
1) Non-excavated dike alignment, sand core placement prior to rock armor
2) Geotextile Fabric placed above and below (29' min) sand core
4) Riprap placement will proceed from toe to centerline in level "lifts"



TYPICAL DEMONSTRATION SECTION "A"
Stations 139+00 - 148+00, 186+50 - 195+50

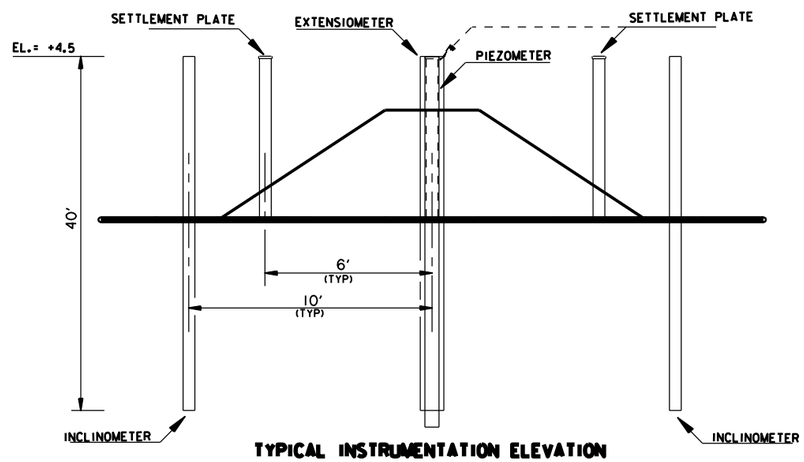
SCALE: N.T.S.

NOTES:
1) Excavate dike alignment to EL:-4.0, sand backfill level with adjacent waterbottoms
2) Geotextile Fabric placed above and below (29' width) sand backfill
4) Riprap placement will proceed from toe to centerline in level "lifts"



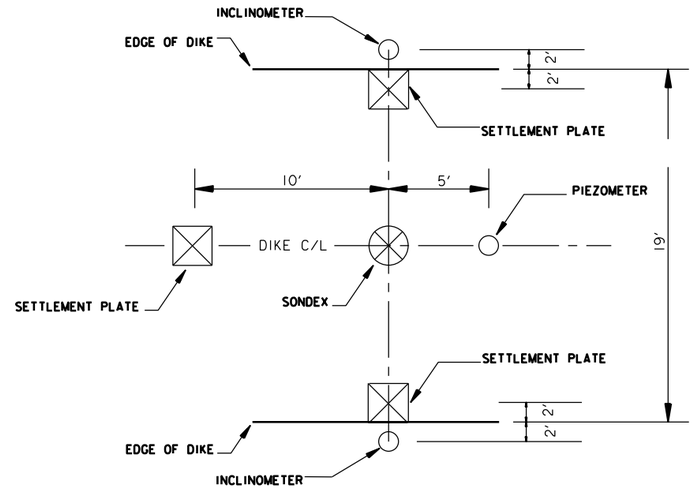
TYPICAL DEMONSTRATION SECTION "B"
Stations 158+00 - 167+00, 167+50 - 176+50

SCALE: N.T.S.

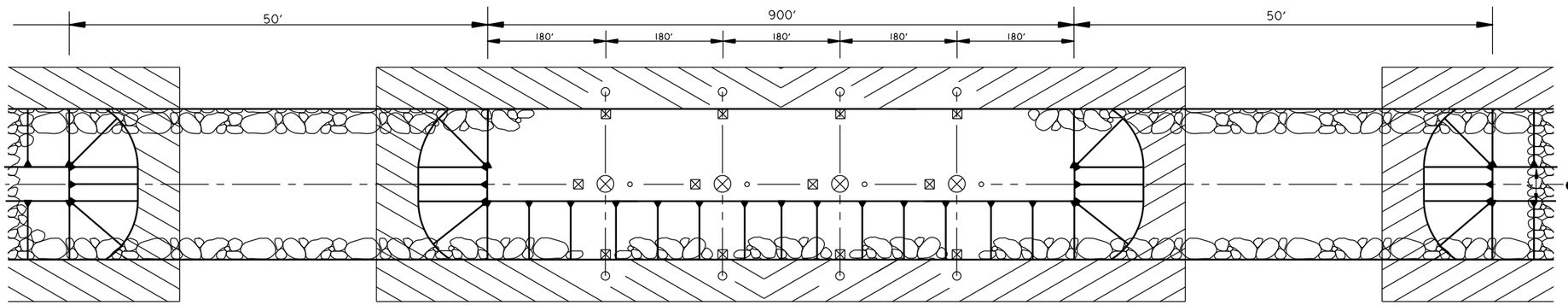


TYPICAL INSTRUMENTATION ELEVATION

SCALE: N.T.S.



INSTRUMENTATION SCHEMATIC (TYPICAL)



INSTRUMENTATION PLAN (TYPICAL)

SCALE: N.T.S.

Safety is a Part of Your Contract

US Army Corps of Engineers New Orleans District

DESIGNED BY:	MSF
CHECKED BY:	KJD
DRAWN BY:	MSF
DATE:	JUL 05

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PLOT SCALE:	5:1
PLOT DATE:	07/29/04
DESIGN FILE NAME:	4606-14.DGN
SUBMITTED BY:	X
SOLICITATION NO.	DACW29- X

COASTAL WETLAND PLANNING PROTECTION AND RESTORATION ACT
SOUTH SHORE LAKE
SHORELINE PROTECTION PROJECT
STA 23+25 - 28+25
DEMONSTRATION SECTIONS
INSTRUMENTATION DETAILS
VERMILION PARISH, LA.

Fig. 1

WHITE LAKE

5,650 ft. Demo Reach
Approx. STA: 139+00 to 195+50
A – C – B – B – C – A

MATCHLINE – DWG: 6

MATCHLINE – DWG: 4

TENNESSEE GAS PIPELINE CO

ROCK DIKE

FLOTATION CHANNEL

FISH DIP

DEMONSTRATION A

DEMONSTRATION C

DEMONSTRATION B

DEMONSTRATION B

DEMONSTRATION C

DEMONSTRATION A

ROCK DIKE

FLOTATION CHANNEL

FISH DIP

SWL-9U

V-4

30

29

28

27

NOTES:

1. SEE DWG. 2 FOR GENERAL NOTES.
2. DEMONSTRATION SECTION A : NON-EXCAVATED SAND FILL BASE.
3. DEMONSTRATION SECTION B: EXCAVATED SAND FILL BASE.
4. DEMONSTRATION SECTION C: NO SAND, 100% ROCK DIKE SECTION.
5. SEE DRAWING #14 FOR INSTRUMENTATION LAYOUT / ELEVATIONS OF DEMONSTRATION REACH.

SCALE: 1" = 200'

200' 0 200' 400' 600' 800'

ELEVATIONS IN FEET NAVD88

197+69 195+50 186+50 186+00 177+00 176+50 167+50 167+00 158+00 157+50 148+50 148+00 139+00 122+25

US Army Corps of Engineers New Orleans District

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: MSF
CHECKED BY: KJO
DRAWN BY: MSF
DATE: FEB 05

PLOT SCALE: 200
PLOT DATE: 7/29/04

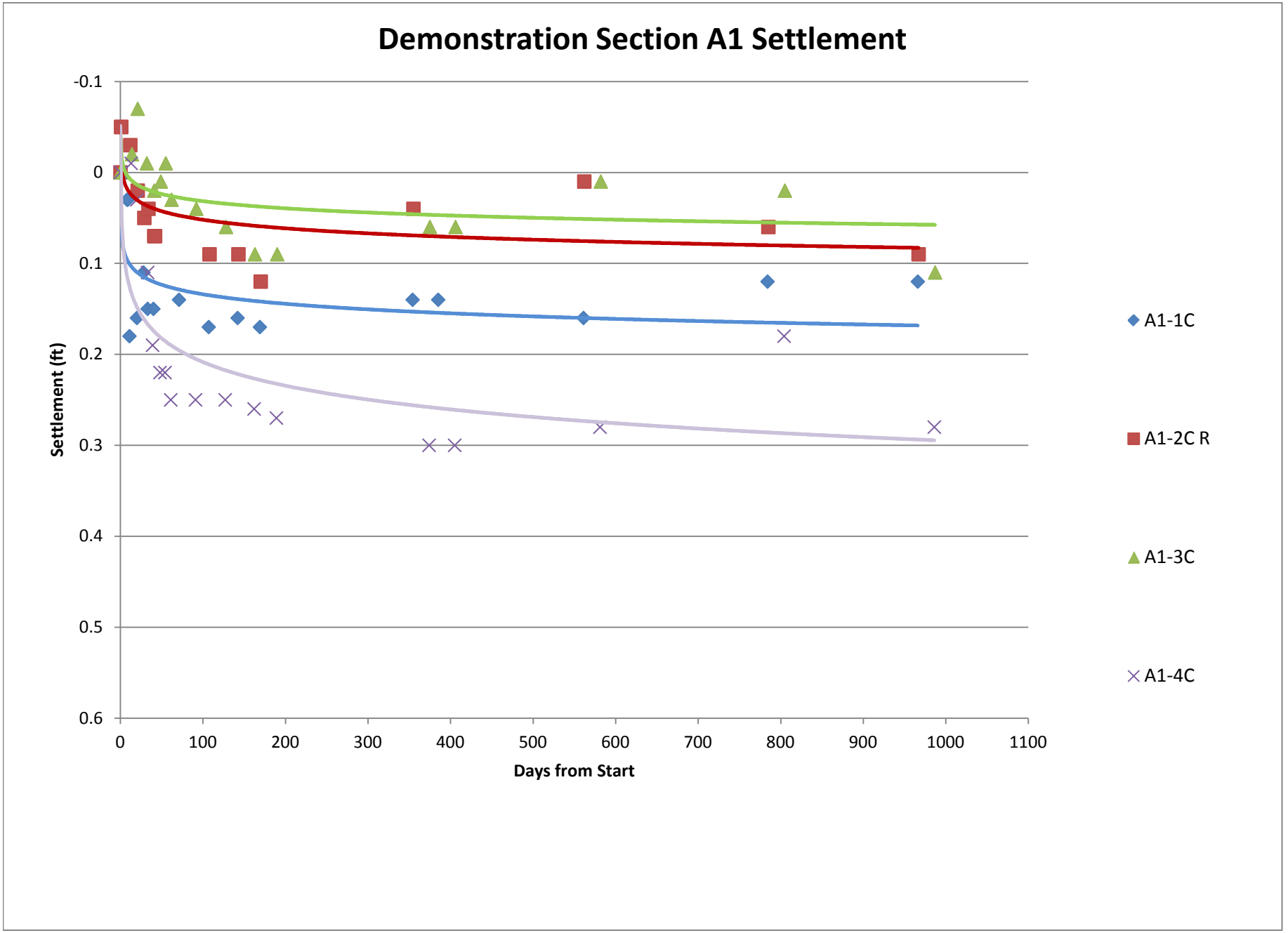
SUBMITTED BY:

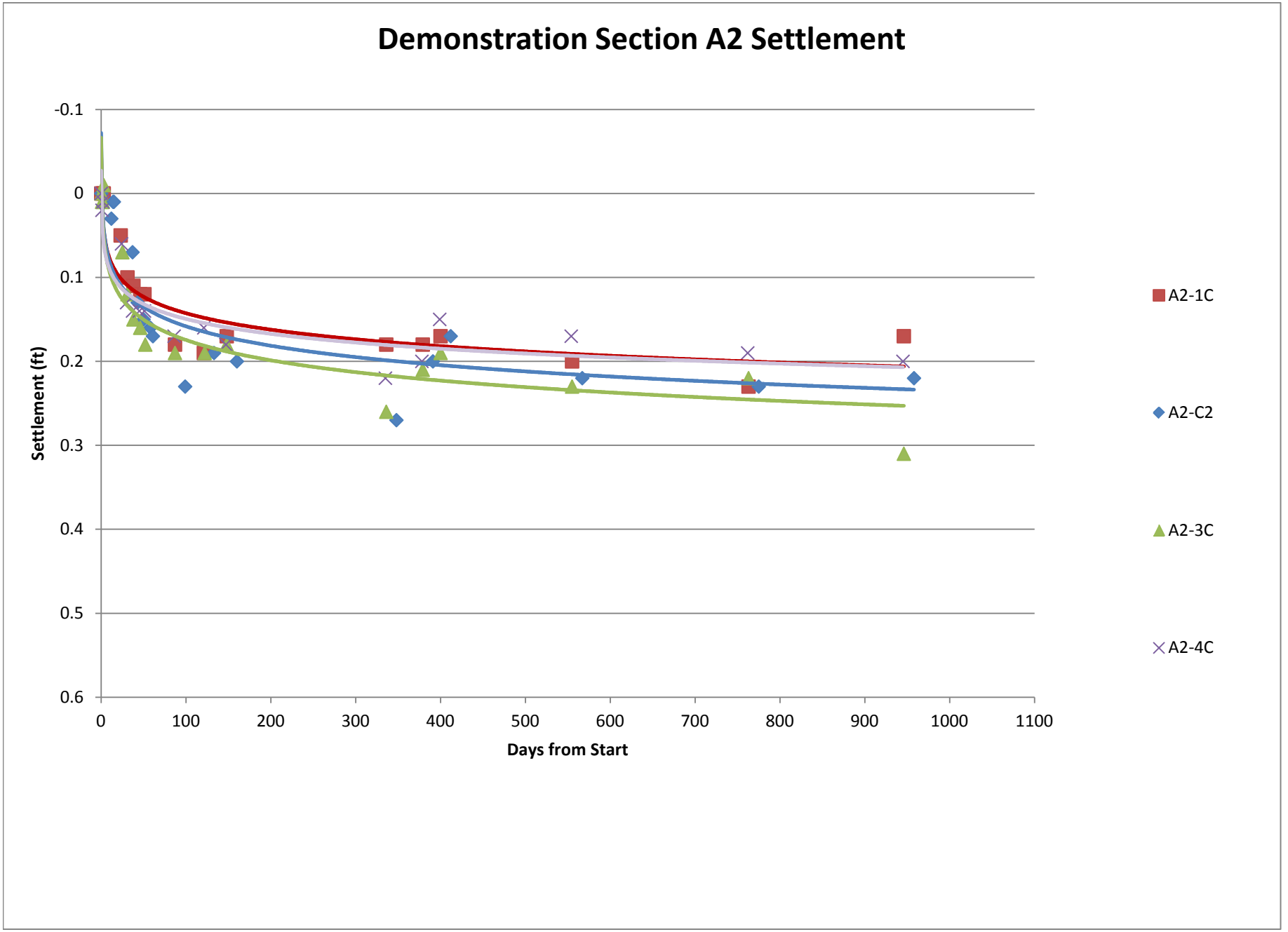
SOLICITATION NO. DACW29-8

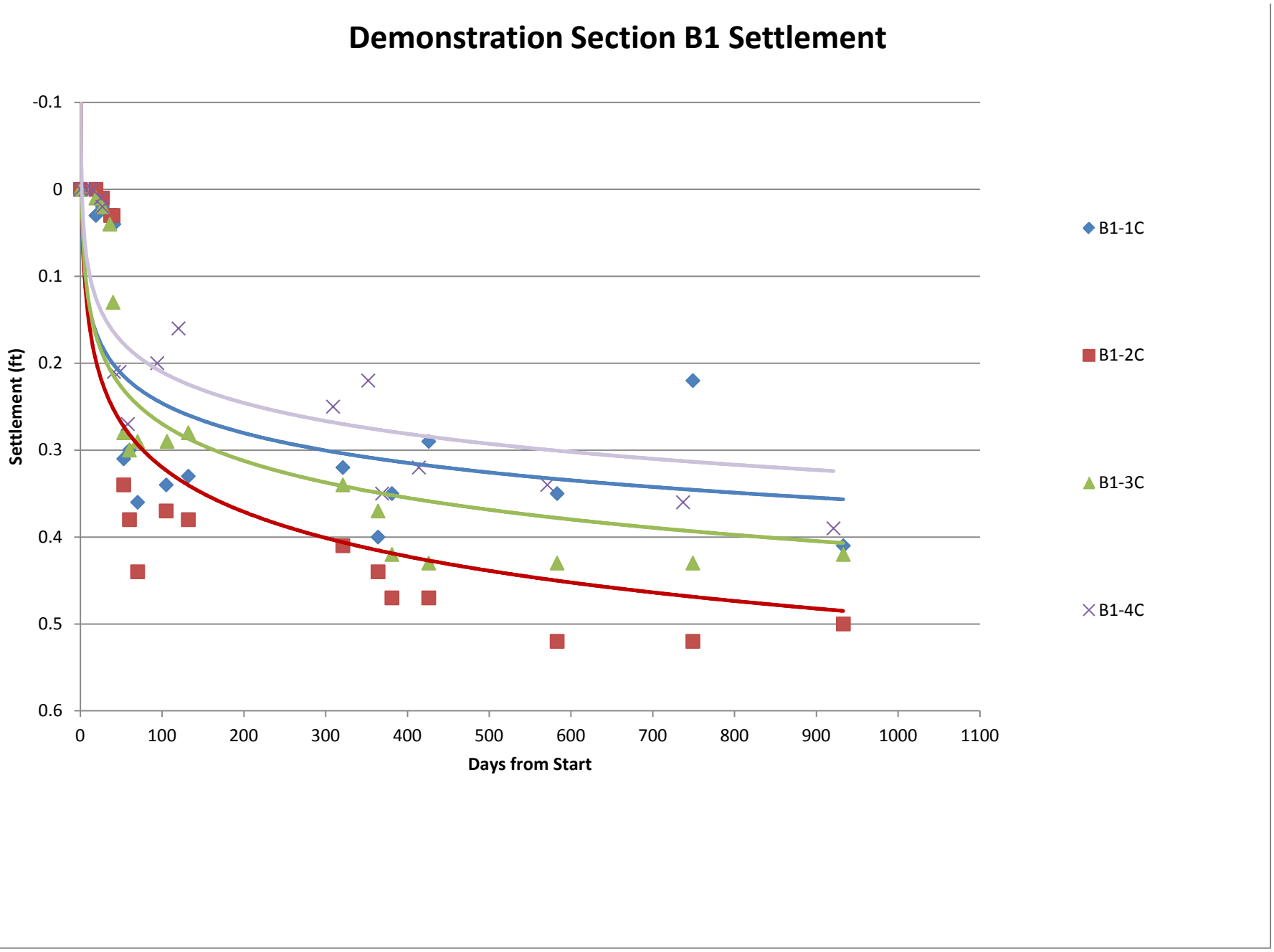
Fig. 2

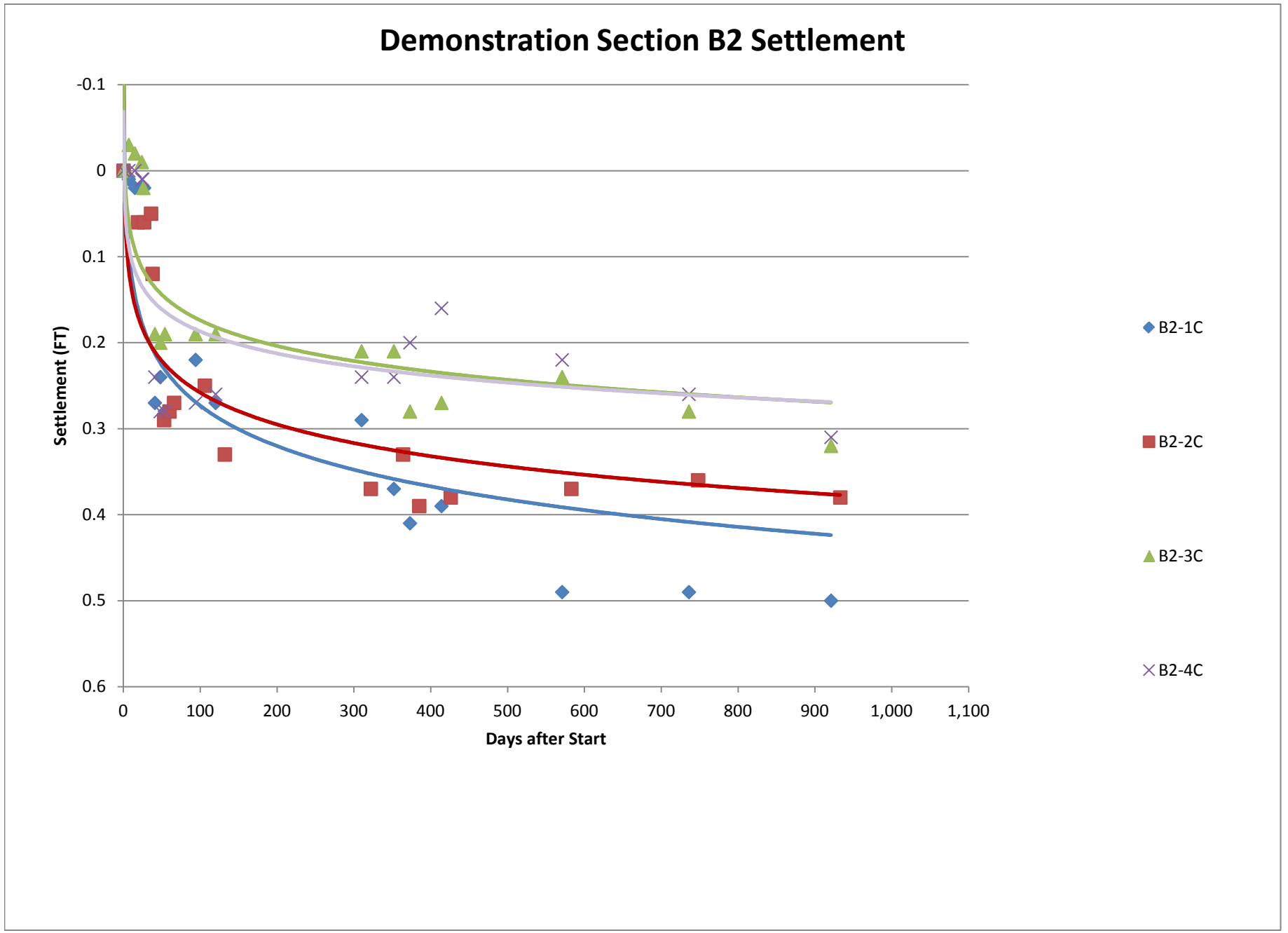
APPENDIX A

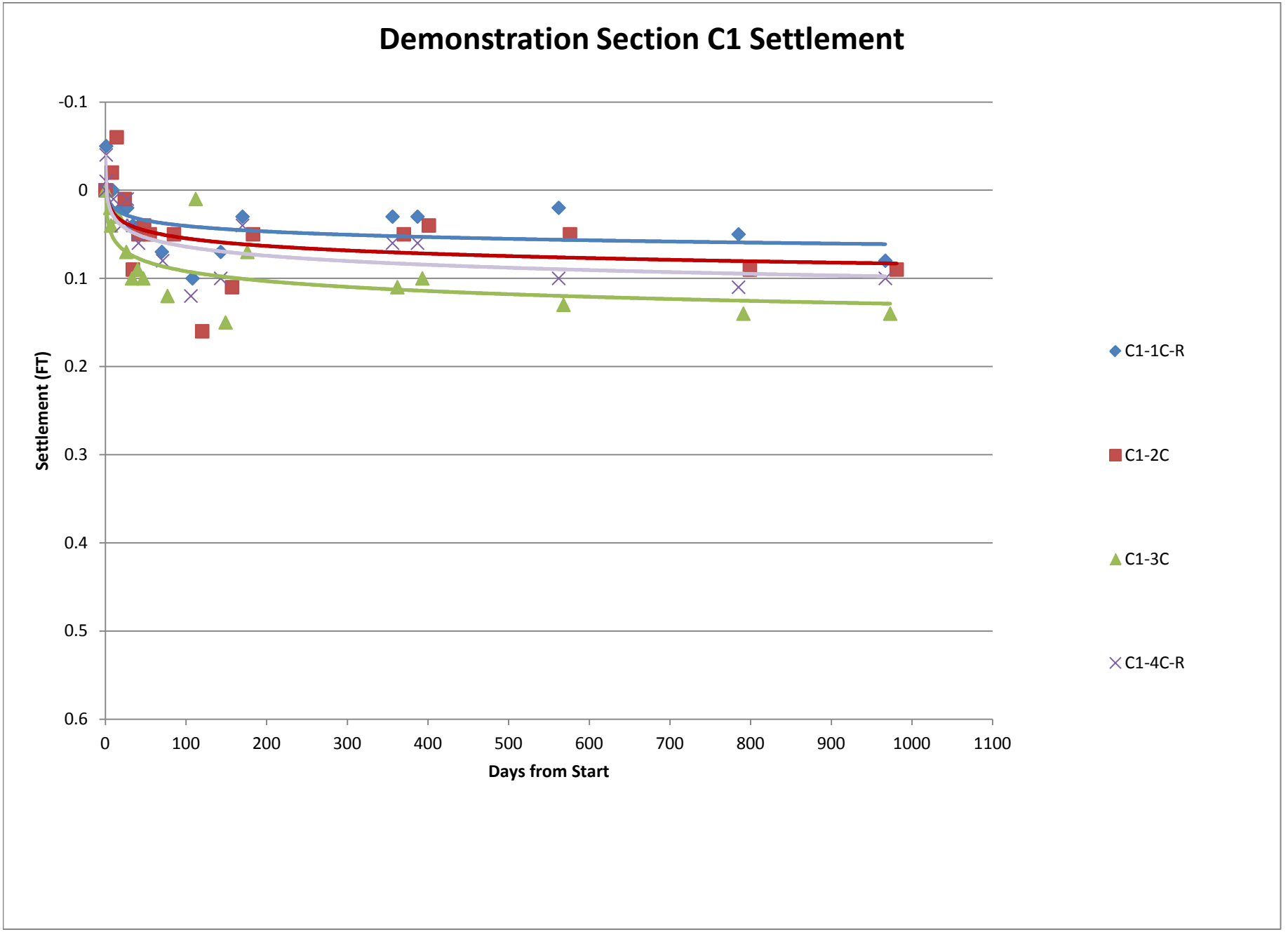
SETTLEMENT GRAPHS

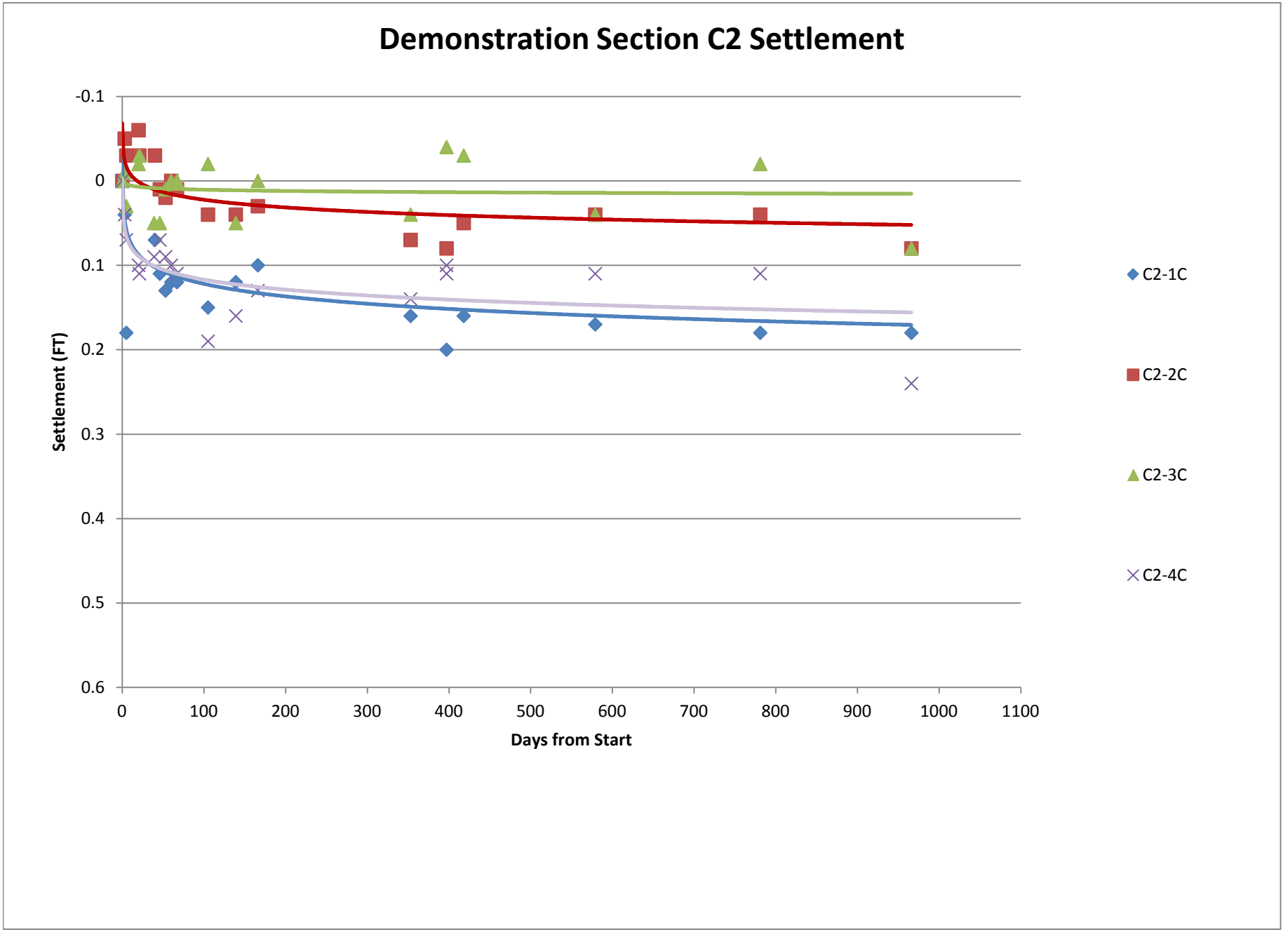

Demonstration Section A1 Settlement
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Settlement (ft)
0
100
200
300
400
500
600
700
800
900
1000
1100
Days from Start
A1-1C
A1-2C R
A1-3C
A1-4C


Demonstration Section A2 Settlement
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Settlement (ft)
0
100
200
300
400
500
600
700
800
900
1000
1100
Days from Start
A2-1C
A2-C2
A2-3C
A2-4C


Demonstration Section B1 Settlement
Settlement (ft)
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
0
100
200
300
400
500
600
700
800
900
1000
1100
Days from Start
B1-1C
B1-2C
B1-3C
B1-4C


Demonstration Section B2 Settlement
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Settlement (FT)
0
100
200
300
400
500
600
700
800
900
1,000
1,100
Days after Start
B2-1C
B2-2C
B2-3C
B2-4C


Demonstration Section C1 Settlement
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Settlement (FT)
0
100
200
300
400
500
600
700
800
900
1000
1100
Days from Start
C1-1C-R
C1-2C
C1-3C
C1-4C-R


Demonstration Section C2 Settlement
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
Settlement (FT)
0
100
200
300
400
500
600
700
800
900
1000
1100
Days from Start
C2-1C
C2-2C
C2-3C
C2-4C

APPENDIX B

COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT

SOUTH WHITE LAKE SHORELINE PROTECTION PROJECT
FEDERAL PROJECT AND STATE PROJECT #ME-22
VERMILION PARISH, LA

SOILS REPORT

CEMVN-ED-FD
12 MARCH 2004

COASTAL WETLANDS PLANNING, PROTECTION AND RESTORATION ACT (CWPPRA)
SOUTH WHITE LAKE SHORELINE PROTECTION PROJECT
FEDERAL PROJECT AND STATE PROJECT #ME-22
VERMILION PARISH, LA

1. General. White Lake is located 55 miles southeast of Lake Charles, Louisiana in Vermilion Parish. The south shoreline of White Lake is retreating at an estimated average rate of 15 feet-per-year. As the shoreline erodes, the potential increases for low marsh management levees to breach and subject interior marsh to increased wave erosion. The objective of this project is to reduce shoreline erosion along the southern shoreline of White Lake in Vermilion Parish, Louisiana. Shoreline stabilization will diminish the threat of wave erosion on the low marsh levees and the interior marshes.

2. Field Investigations.

a. Surveys. Surveys extend the entire project length (~11-miles) and were taken in September 2003 at intervals of approximately 500 feet. The 109 cross sections varied in length from approximately 500 to 2000-feet extending lakeward from the near shoreline. The survey coverage fully defines the proposed dike and floatation channel placement area. The surveys revealed a very gradually sloping shoreline into the lake. The surveyed points range in elevation from El. +3.3 near the shoreline to El. −6.6 out into the lake.[1] The average elevation of the nearest shoreline points is El. +1.4 with the majority of points ranging between El. +1.0 to +2.0.

b. Soil Borings. Five 40-foot undisturbed borings (5-inch diameter), four 25-foot undisturbed borings, and four 25-foot general-type borings (3-inch diameter) were taken in September 2003 and were spaced over the proposed project's length. Additionally, five vibra-core borings ranging in length from 8.4 to 11.2-feet were obtained in July 2001 during the initial planning effort for CWPPRA's 11th Project Priority List. These borings provided all of the soils information necessary to design the shoreline

[1] All elevations refer to feet $NAVD_{88}$ unless otherwise specified.

protection measures. Boring locations are shown in plate 1 of this report and boring logs can be found on plates 2 thru 11.

3. General Geology. The study area is located in a region of low relief with surface elevations averaging between El. +1.0 to +2.0 along the banks of White Lake.

The surface and shallow subsurface deposits are generally composed of marsh, swamp, lacustrine, and Pleistocene deposits. The project area is defined by 2 geologic profiles (Plate 12 and Plate 13) that parallel the shoreline of White Lake. The project area is overlain by approximately 8 to 24 feet of marsh and swamp deposits that generally thicken towards the east end. Marsh and swamp deposits interfinger throughout the area and were therefore classified as marsh/swamp on the sections. Marsh/swamp deposits consist of very soft to soft fat clay with lenses and layers of lean clay, silt, and peat with relatively high moisture contents and wood. Approximately 4 to 10 feet of lacustrine deposits are found within the marsh/swamp deposits from approximate distance 11,000 to 16,250-feet and from 45,000 to 53,000-feet[2]. Lacustrine deposits consist of very soft to soft fat and lean clays with shell fragments. Pleistocene age deposits underlie marsh/swamp, and lacustrine deposits. The top of the Pleistocene is found between approximately –6 to –10 feet MLG[3] at the western end of the study area and trends down to between approximately –18 to –25 feet MLG towards the eastern end. Although Pleistocene deposits were not encountered in borings SWL-11G and SWL-12U, it is estimated that the Pleistocene is at approximately –25 feet MLG. Pleistocene deposits extend to the bottom of the borings and consist of stiff to very stiff clays, silts, silty sand, and sands with low water content. Groundwater is at or near the surface in the study area.

Long-term relative subsidence rates average approximately 0.25 ft/century in the study area. Future eustatic sea level rise is currently estimated to contribute an additional 1.0 foot/century to the relative subsidence rates (EPA, 1995). Combined, the relative

[2] All distances are referenced from the west end of the project with 0 beginning at the western-most boring SWL-1U.

[3] All boring surface elevations were referenced to the gage at Schooner Bayou which is in Mean Low Gulf (MLG). The conversion from MLG to $NAVD_{88}$ for this project area is –1.5 feet.

subsidence rate is estimated to be 1.25 feet/century over the next 100 years.

4. Design Parameters. The alignment for the project was selected to generally coincide with the El. -1.5 contour and generally parallel the shoreline of the lake. Centerline stationing along the project alignment went from Sta. 0+00 (west end)to 576+87(east end). Since the depth of the marsh/swamp deposits vary from 8 to 24-feet along the project alignment, the project length was divided into seven soils reaches mainly based upon the depth of the very soft to soft marsh/swamp deposits. The limits of the seven reaches are summarized in Table 1 and are listed according to the centerline stationing along the length of the proposed segmented rock dike.

The design shear strengths and unit weights for the proposed construction area were based on the results of shear strength (3- and 1-point unconsolidated-undrained triaxial compression tests (Q-tests) and unconfined compression tests (UCT)) and unit weight testing. The design shear strengths and unit weights for each of the seven reaches are shown on plates 14 thru 20. The vertical datum for all of the shear strength and unit weights plates is in MLG. Conversion of all the stratum breaks to $NAVD_{88}$ is shown for each soil stratum on each of these plates. Shear strengths for the upper marsh/swamp layer range from 150 to 250 pounds-per-square-foot (psf). For all soils reaches the shear strength starts off with a value of 150 psf at the surface and extends down to an elevation ranging from El. -4.5 to -26.5 depending upon the reach. Shear strengths for all but reach 2 increase slightly with increasing depth to values ranging from 200 to 250 psf at the bottom of the marsh/swamp strata depending upon the reach.

For all soils reaches the saturated unit weight starts off with values ranging from 80 to 95 pounds-per-cubic-foot (pcf) and in reaches 4 thru 7, generally increases to values ranging from 95 to 109 pcf at the bottom of the marsh/swamp deposits. All shear strength data for the Pleistocene clays were grouped on one shear strength plate (see plate 21) and a single design trend for the Pleistocene clays shear strength was used for the entire project extent. The design shear strength chosen for the Pleistocene clays was 650 psf and the saturated unit weight used for this layer was 119 pcf.

Borings SWL-1U and SWL-4U show sand layers extending from El. -38.5 and El. -28.5 to the extent of each boring, respectively. In reach 1 which reflects the stratigraphy from boring SWL-1U, the sand is poorly graded. In reach 3 which reflects the stratigraphy of boring SWL-4U, the sand layer consists of both a silty-sand and a poorly graded sand. Design parameters for the sand layers were conservatively assumed to be γ=122 pcf and ϕ=30°. For the stability analyses, it was assumed conservatively that the sand layer did not extend into reach 2 and pleistocene clay was assumed below the extent of the borings for this reach. Substantial and continuous silt and sand strata were not evident in any other borings taken. For design purposes, continuous clay layers were conservatively assumed for the project length. Design parameters for the stone were assumed to be γ=132 pcf and ϕ=40°. The potential for silt inclusion within the stone is considered low to moderate given the location of the proposed dike and especially for consideration of the controlling end-of-construction case.

5. Design Procedure, Methodology and Recommendations. The minimum dike section required to meet the objectives of the project was developed by Hydraulics and Hydrology Branch, Coastal Section. This dike section consisted of a crown width of four feet, crest of El. +3.5, side slopes of 1 V on 1.5 H, and the following rock gradation:

Rock Gradation

	24-inch Size
Percent Lighter by Weight	Weight (pounds)
100	650 - 260
50	280 - 130
15	130 - 40

The estimates for construction settlement ranged from 30 to 50 percent of the dike height which is typically 5-feet and is summarized according to reach in Table 1. The construction settlement estimates were solely based upon previous experience in this type of soils environment. Factors influencing the estimates were depth of marsh/swamp deposit and quantity of organics present in the borings. Data from the rock dike built by the Louisiana Department of Natural Resources (LDNR) on the banks of Grand Lake which is in the close vicinity were utilized as a check of these estimates in similar stratigraphy. The Grand Lake

project was a similar rock dike project and the area contained similar depths of marsh/swamp soils strata as found in the White Lake Reaches 1 thru 4. The construction settlement experienced on the Grand Lake Project was an average of 33 percent for the entire project. Estimates for Reaches 1 thru 4 for White Lake vary from 30 to 35 percent which is very similar to what was experienced at the Grand Lake project. Estimates for Reach 5 thru 7 for White Lake vary from 35 to 50 percent due to the greater depth of marsh/swamp deposits.

A consolidation settlement estimate was conducted for each reach and results are also summarized in Table 1. Ultimate consolidation settlement estimates for the rock dike vary from approximately 0.5 to 1.3-feet and the time-rate consolidation settlement estimates for the 20-year project life vary from approximately 0.4 to 1.0-feet. Estimates for Reaches 1 thru 3 assume double drainage given the available shallow sand strata for bottom drainage, and therefore the 20-year estimates are almost equivalent to the ultimate values. As stated earlier, with the estimated combined relative subsidence rate of 1.25-feet-per-century, the total estimated settlement for the 20-year project life ranges from approximately 0.7 to 1.3-feet.

Table 1. CWPPRA, South White Lake Shoreline Stabilization
Summary of Construction and Consolidation Settlement Estimates

Reach	C/L Station Limits	Construction Settlement % Of Dike Height	20 year Settlement Range			Ultimate Settlement ft.
			ft.		ft.	
1	0+00 to 34+00	35%	0.61	to	0.69	0.69
2	34+00 to 122+00	30%	0.48	to	0.52	0.52
3	122+00 to 176+00	30%	0.62	to	0.64	0.64
4	176+00 to 322+00	35%	0.58	to	0.94	1.04
5	322+00 to 474+00	40%	0.51	to	1.03	1.27
6	474+00 to 558+00	50%	0.45	to	0.95	1.24
7	558+00 to 576+87	35%	0.47	to	0.86	1.00

Bearing capacity analyses indicated an adequate factor of safety (FS_{min}=1.30) against failure for the given dike section. In checking bearing capacity, the applied loading for the proposed dike included the amount of construction

settlement as additional loading for each reach analyzed. For reaches 5 and 6, adjacent surcharge loading applied to the equivalent footing widths for embankments was utilized to accomplish the necessary factor of safety of 1.3. The adjacent surcharge loading is provided by the supporting dike slope and increases the bearing capacity of an equivalent footing width. This method for bearing capacity analyses of embankments was summarized in a paper by R.K. Rowe and K.L. Sodeman[4].

For each reach, a stability analysis was conducted for each cross section with the given dike section including the additional load due to estimated construction settlements. Using these analyses, we identified the two cross sections for each reach having the lowest factors of safety for further detailed analyses. Shear sliding stability analyses were conducted for the two worst cross sections for each reach for two cases of water levels, extreme low and average low, El. -0.2 and El. 0.6, respectively. These analyses determined the required geotextile reinforcement strength and checked for adequate embedment. Table 2 summarizes the results of these analyses. Stability analysis plates graphically show the results of the most critical cross section for each reach for each water case on plates 22 thru 35. The minimum acceptable factors of safety against failure were 1.20 for the extreme low water level and 1.30 for the average low water level including geotextile reinforcement. These design criteria are summarized in Table 3. The minimum factors of safety without consideration of the geotextile reinforcement were 1.02 for the extreme low water case and 1.06 for the average low water case, both in reach 2 for line number 101[5]. For the rock dike design, a geotextile reinforcement was required for all reaches to meet the minimum required factors of safety. We recommend the use of a reinforcement geotextile embedded from toe to toe with a minimum tensile strength of 200 pounds-per-inch at 5 percent strain based upon the wide-width test. A printout of spreadsheets that were used to calculate the tensile strength requirements and to check for sufficient embedment

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[4]Rowe, R. K. and Soderman, K. L. (1988), "*Stabilization of Very Soft Soils Using High Strength Geosynthetics: the Role of Finite Element Analyses*," Proc. GRI-1, Soft Soil Stabilization Using Geosynthetics, Jour. Geotextiles and Geomembranes, Vol. 6, Nos. 1-3, pp. 53-80.

[5] Line numbers are referred to in lieu of station numbers since a baseline of the surveyed sections was not conducted.

of the geotextile reinforcement is included in the Appendix.

Table 2. CWPPRA, South White Lake Shoreline Protection Project

Summary of Results of Stability Analyses for Each Reach

Reach	Cross Section Line #	Water Elev. $NAVD_{88}$	Min FS	Min Factor Of Safety with Geotextile	Elev. Of Critical Failure Plane $NAVD_{88}$	Reinforcing Geotextile Required Strength Lbs/inch
1	102	-0.2	1.14	1.20	-4.5	16
	102	0.6	1.18	1.30	-4.5	29
	109	-0.2	1.18	1.20	-4.5	4
	109	0.6	1.23	1.30	-4.5	17
2	100	-0.2	1.03	1.20	-9.5	105
	100	0.6	1.06	1.30	-9.5	134
	101	-0.2	1.02	1.20	-9.5	109
	101	0.6	1.06	1.30	-9.5	136
3	81	-0.2	1.18	1.20	-4.5	6
	81	0.6	1.23	1.30	-4.5	19
	86	-0.2	1.17	1.20	-4.5	8
	86	0.6	1.22	1.30	-4.5	22
4	63	-0.2	1.13	1.20	-7.5	31
	63	0.6	1.19	1.30	-7.5	44
	66	-0.2	1.14	1.20	-7.5	24
	66	0.6	1.21	1.30	-7.5	37
5	23	-0.2	1.04	1.20	-6	59
	23	0.6	1.12	1.30	-6	63
	40	-0.2	1.11	1.20	-9	43
	40	0.6	1.16	1.30	-9	62
6	7	-0.2	1.09	1.20	-7	50
	7	0.6	1.13	1.30	-7	69
	9	-0.2	1.12	1.20	-10	44
	9	0.6	1.18	1.30	-7	49
7	2	-0.2	1.2	1.20	-4.5	Not required
	2	0.6	1.23	1.30	-4.5	18
	3	-0.2	1.2	1.20	-4.5	Not required
	3	0.6	1.25	1.30	-4.5	13

Table 3. Design Cases and Parameters

Loading Case	Minimum Factor of Safety
Average Low Water Case	1.30 with Shear Strengths from Q-Test with geotextile reinforcement included.
3Extreme Low Water Case	1.20 with Shear Strengths from Q-Test with geotextile reinforcement included.

6. List of Plates:

Plate 1 Boring and Project Location Map
Plate 2 Undisturbed Boring SWL-1U
Plate 3 Undisturbed Boring SWL-3U
Plate 4 Undisturbed Boring SWL-4U
Plate 5 Undisturbed Boring SWL-6U
Plate 6 Undisturbed Boring SWL-7U
Plate 7 Undisturbed Boring SWL-9U
Plate 8 Undisturbed Boring SWL-10U
Plate 9 Undisturbed Boring SWL-12U
Plate 10 Undisturbed Boring SWL-13U
Plate 11 General Type and Vibra-core Boring Logs
Plate 12 Soil and Geologic Profile
Plate 13 Soil and Geologic Profile
Plate 14 Reach 1 Shear Strengths and Unit Weights
Plate 15 Reach 2 Shear Strengths and Unit Weights
Plate 16 Reach 3 Shear Strengths and Unit Weights
Plate 17 Reach 4 Shear Strengths and Unit Weights
Plate 18 Reach 5 Shear Strengths and Unit Weights
Plate 19 Reach 6 Shear Strengths and Unit Weights
Plate 20 Reach 7 Shear Strengths and Unit Weights
Plate 21 Shear Strength and Unit Weights Pleistocene Clays
Plate 22 Reach 1 Stability Analysis Line 102 Water El.-0.2
Plate 23 Reach 1 Stability Analysis Line 102 Water El.+0.6
Plate 24 Reach 2 Stability Analysis Line 101 Water El.-0.2
Plate 25 Reach 2 Stability Analysis Line 101 Water El.+0.6
Plate 26 Reach 3 Stability Analysis Line 86 Water El. -0.2
Plate 27 Reach 3 Stability Analysis Line 86 Water El. +0.6
Plate 28 Reach 4 Stability Analysis Line 63 Water El. -0.2
Plate 29 Reach 4 Stability Analysis Line 63 Water El. +0.6
Plate 30 Reach 5 Stability Analysis Line 23 Water El. -0.2
Plate 31 Reach 5 Stability Analysis Line 23 Water El. +0.6
Plate 32 Reach 6 Stability Analysis Line 7 Water El. -0.2
Plate 33 Reach 6 Stability Analysis Line 7 Water El. +0.6

Plate 34 Reach 7 Stability Analysis Line 2 Water El. -0.2
Plate 35 Reach 7 Stability Analysis Line 2 Water El. +0.6
Plate 36 Soil Boring Legend Plate

WHITE LAKE

Alligator Lake

Grand Valle Lake

Bear Lake

TENNESSEE GAS PIPELINE CO

Lat 29° 42'54.4"
Lon 92° 34'16.9"

SWL-1U
AT 40' DEEP

V-1

Lat 29° 42'30.8"
Lon 92° 33'13.7"

SWL-2C
AT 25' DEEP

Lat 29° 42'51.5"
Lon 92° 32'48.7"

SWL-3U
AT 25' DEEP

V-2

Lat 29° 41'50.9"
Lon 92° 32'18.4"

SWL-4U
AT 40' DEEP

Lat 29° 41'30.1"
Lon 92° 31'49.6"

SWL-5C
AT 25' DEEP

Lat 29° 41'18.8"
Lon 92° 31'8.0"

SWL-6U
AT 25' DEEP

V-3

Lat 29° 40'41.6"
Lon 92° 30'22.9"

SWL-7U
AT 40' DEEP

Lat 29° 40'18.8"
Lon 92° 29'46.8"

SWL-8C
AT 25' DEEP

Lat 29° 40'9.1"
Lon 92° 29'11.2"

SWL-9U
AT 25' DEEP

V-4

Lat 29° 40'14.2"
Lon 92° 27'47.9"

SWL-10U
AT 40' DEEP

Lat 29° 40'16.5"
Lon 92° 27'9.9"

SWL-11C
AT 25' DEEP

Lat 29° 40'50.0"
Lon 92° 26'45.5"

V-5

Lat 29° 41'9"
Lon 92° 26'11"

SWL-12U
AT 25' DEEP

SWL-13U
AT 40' DEEP

HILCORP ENERGY, INC
ABANDONED PLATFORMS

TENNESSEE GAS PIPELINE CO

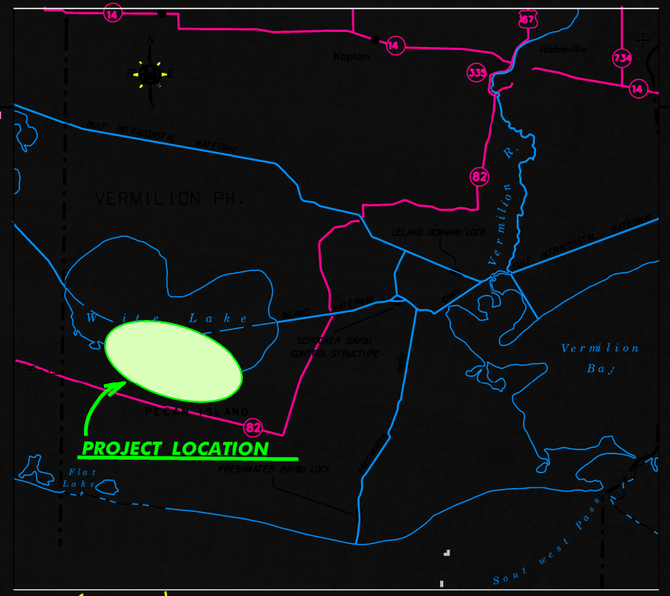
TENNESSEE GAS PIPELINE CO

TENNESSEE GAS PIPELINE CO

N

0 2000 4000
SCALE: 1:4000

UNDISTURBED BORING (5")
GENERAL BORING (3")
VIBRACORE



CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT

SOUTH WHITE LAKE

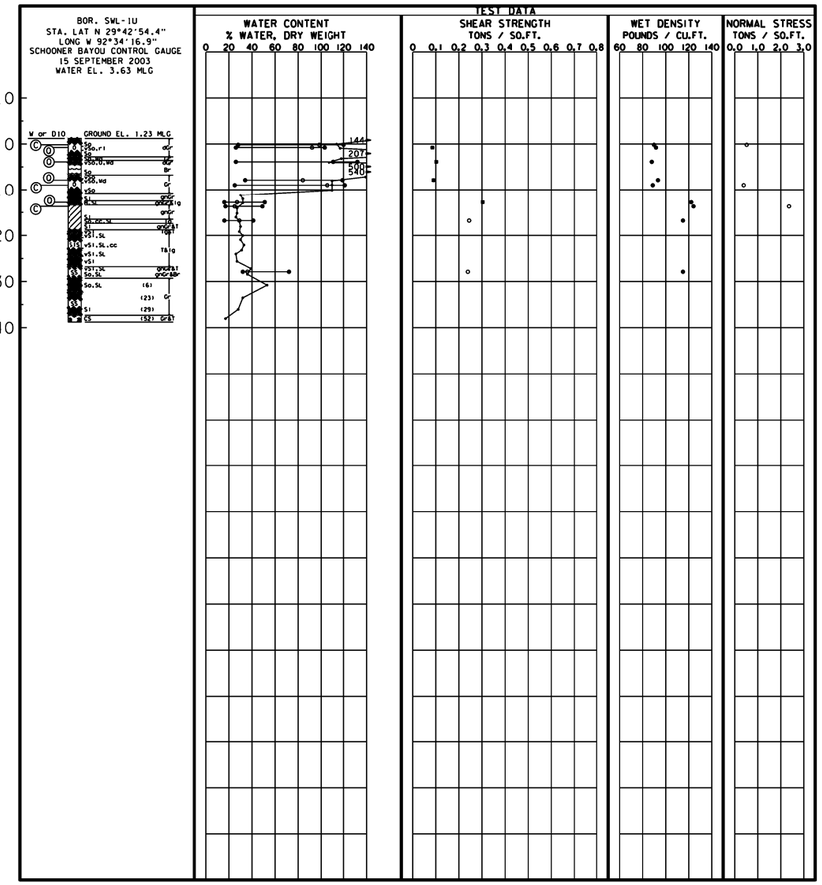
VERMILION PARISH, LOUISIANA

U.S. ARMY CORPS OF ENGINEERS, NEW ORLEANS

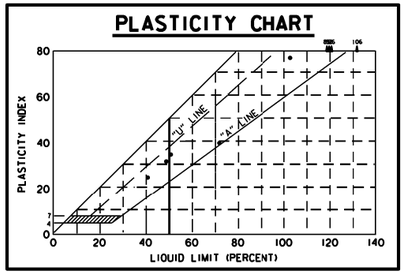
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:
DRAWN BY: J.S.B.
CHECKED BY: B.B.

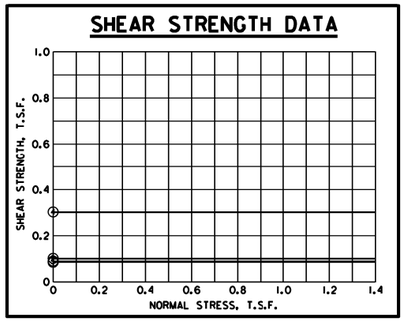
PLOT SCALE: 1"=3000'
PLOT DATE: MARCH 2004
CADD FILE:
FILE NO.



PLASTICITY CHART



SHEAR STRENGTH DATA



NOTES

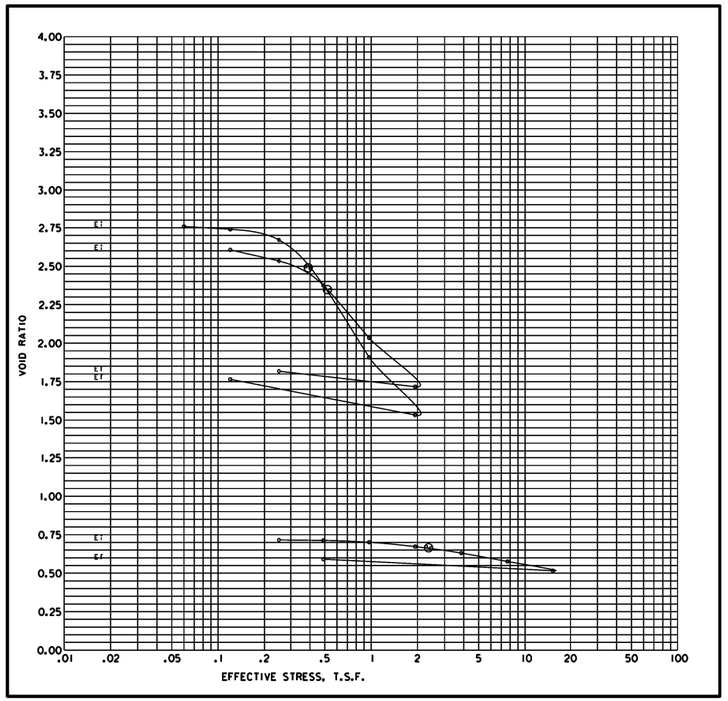
- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST

ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

TABULAR TEST DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.8	O	0.0	0.085	CH
2	-3.9	O	0.0	0.102	CH
3	-7.9	O	0.0	0.090	CH
4	-12.8	O	0.0	0.303	CH
5	-0.2	C			CH
6	-9.0	C			CH
7	-13.7	C			CL



CHANNEL, SABINE-NECHES CANAL
SHORELINE PROTECTION PROJECT

BORING SWL-IU

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

PLATE 2

BOR. SWL-3U
STA. LAT N 29°42'51.5"
LONG W 92°32'48.7"
SCHOONER BAYOU CONTROL GAUGE
14-15 SEPTEMBER 2003
WATER EL. 3.65 MLG

ELEVATIONS IN FEET - MLG

TEST DATA

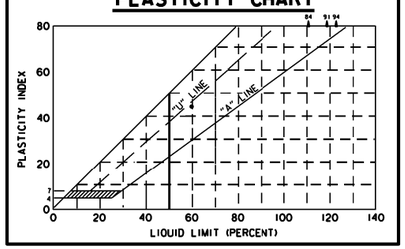
WATER CONTENT
% WATER, DRY WEIGHT
0 20 40 60 80 100 120 140

SHEAR STRENGTH
TONS / SQ.FT.
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

WET DENSITY
POUNDS / CU.FT.
60 80 100 120 140

NORMAL STRESS
TONS / SQ.FT.
0.0 1.0 2.0 3.0

PLASTICITY CHART



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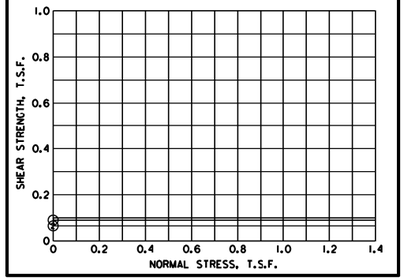


NOTES

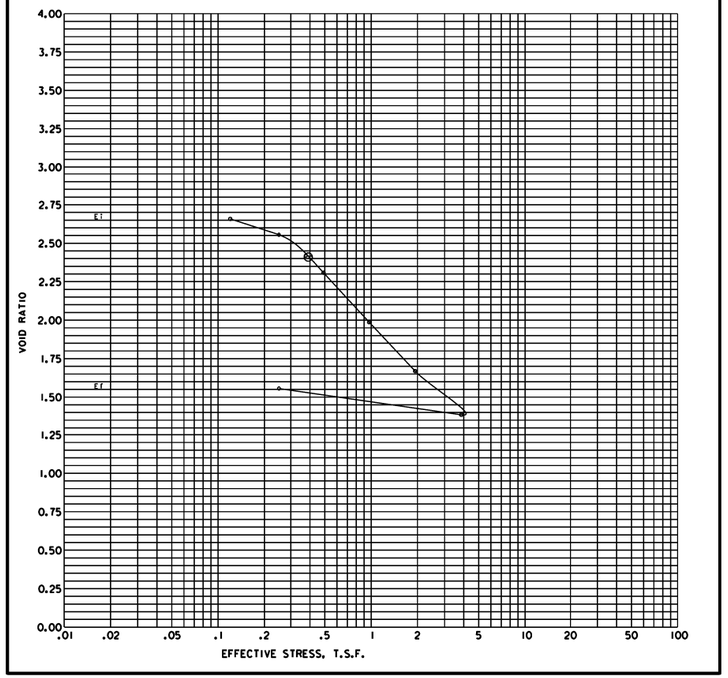
- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST

ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.8	0	0.0	0.090	CH
2	-4.8	0	0.0	0.065	CH
3	-1.6	C			CH



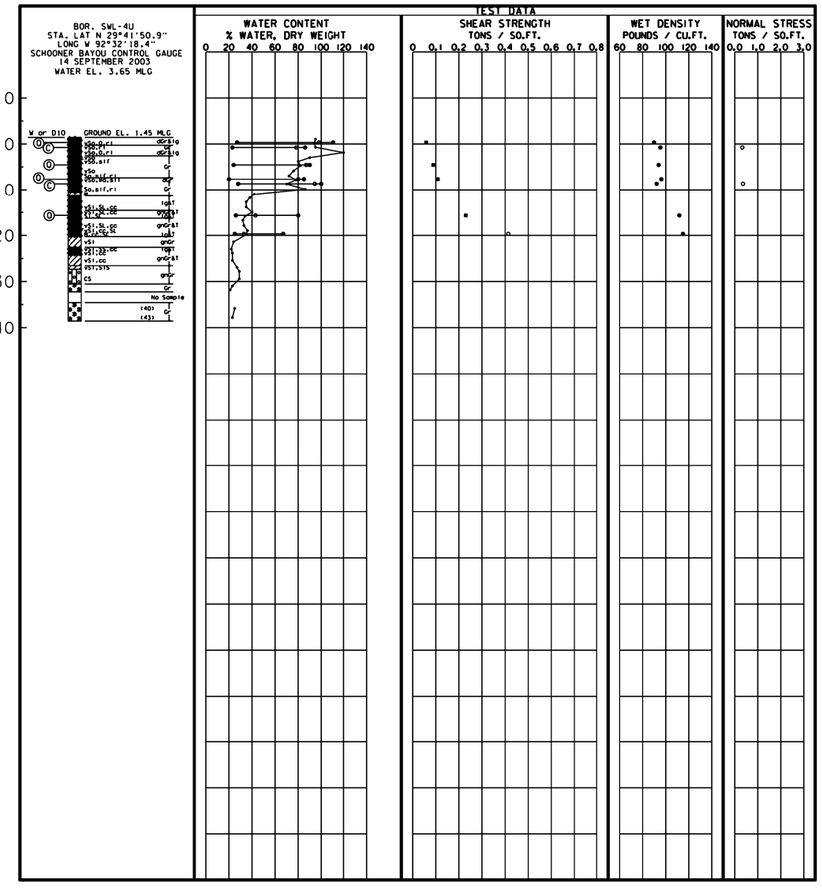
CHANNEL, STATION 1000 LINE
SHORELINE PROTECTION PROJECT

BORING SWL-3U

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

PLATE 3



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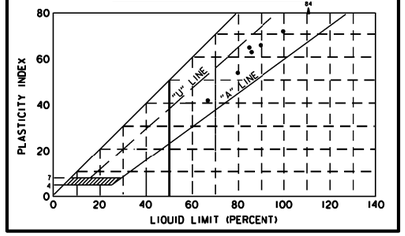
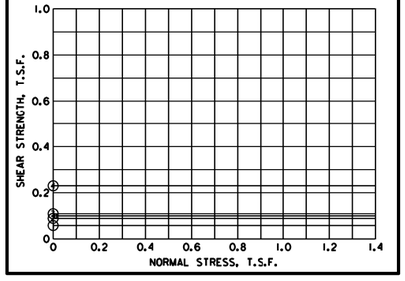
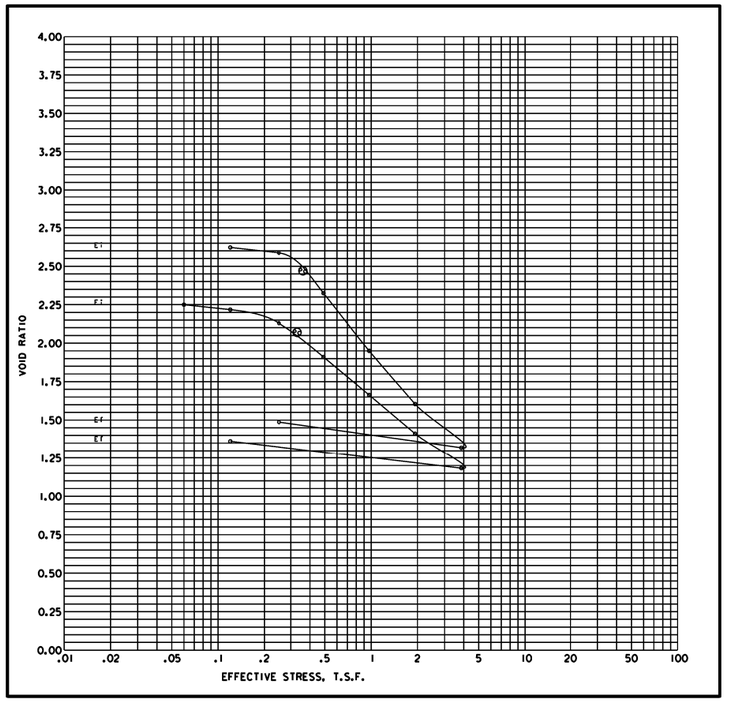


SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	0.3	Q	0.0	0.058	CH
2	-4.5	Q	0.0	0.089	CH
3	-7.6	Q	0.0	0.109	CH
4	-15.7	Q	0.0	0.230	CH
5	-0.8	C			CH
6	-8.7	C			CH



NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (Q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
- ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

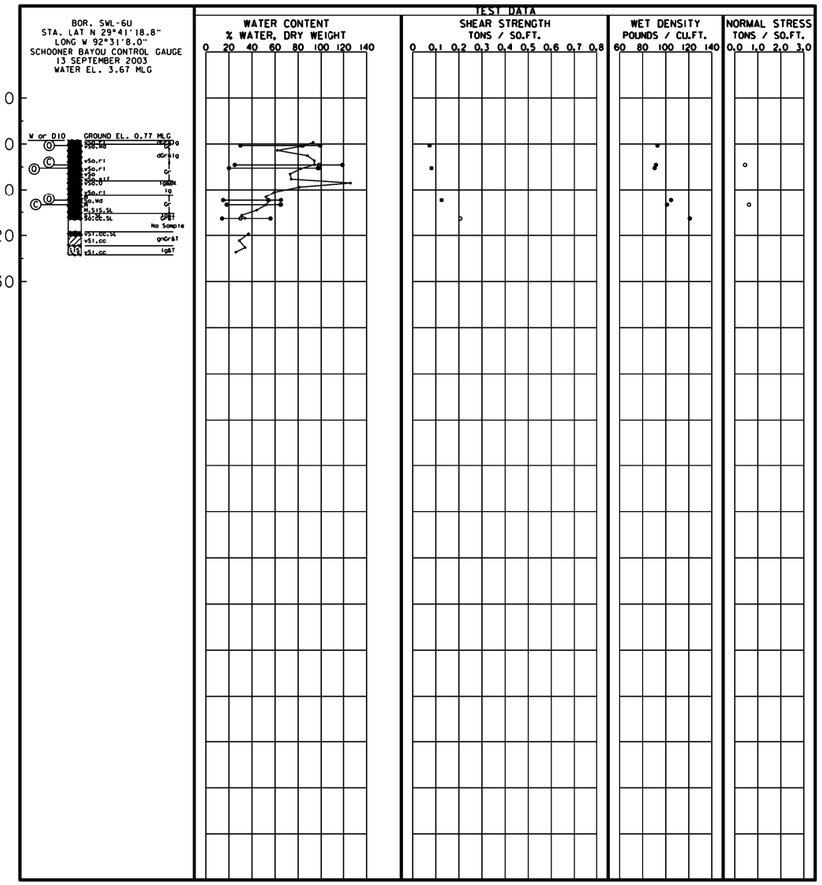
CAMERON, [illegible] LAKE
SHORELINE PROTECTION PROJECT

BORING SWL-4U

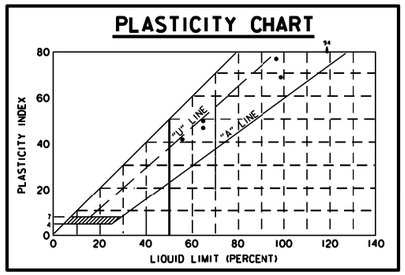
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: ELSTIS	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

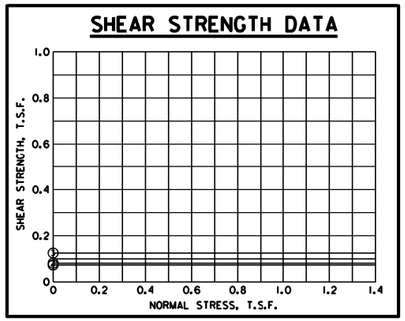
PLATE 4



PLASTICITY CHART

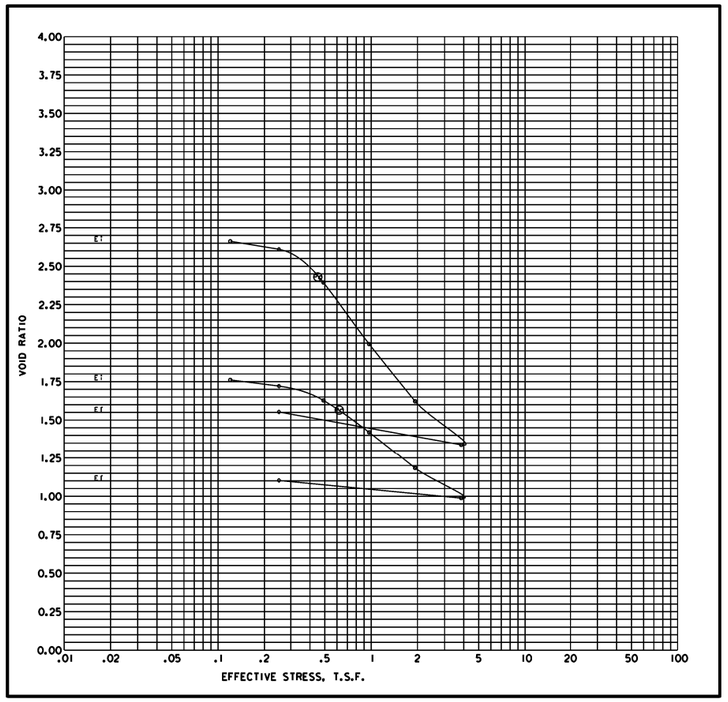


SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.3	0	0.0	0.073	CH
2	-5.2	0	0.0	0.081	CH
3	-12.3	0	0.0	0.125	CH
4	-4.5	C			CH
5	-13.3	C			CH



NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
- ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

CHANNEL, SHIP ISLAND LAKE
SHORELINE PROTECTION PROJECT

BORING SWL-6U

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSFIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

PLATE 5

BOR. SWL-7U
STA. LAT N 29°40'41.6"
LONG W 92°30'22.9"
SCHOONER BAYOU CONTROL GAUGE
12-13 SEPTEMBER 2003
WATER EL. 3.15 MLG

ELEVATIONS IN FEET - MLG

TEST DATA

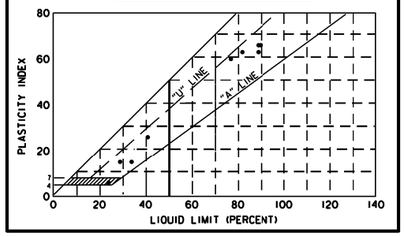
WATER CONTENT
% WATER, DRY WEIGHT
0 20 40 60 80 100 120 140

SHEAR STRENGTH
TONS / SQ.FT.
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

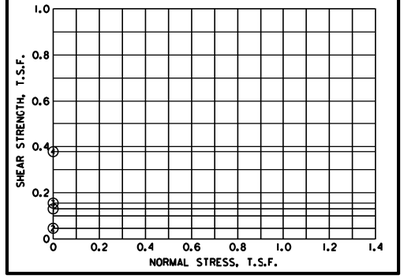
WET DENSITY
POUNDS / CU.FT.
60 80 100 120 140

NORMAL STRESS
TONS / SQ.FT.
0.0 1.0 2.0 3.0

PLASTICITY CHART

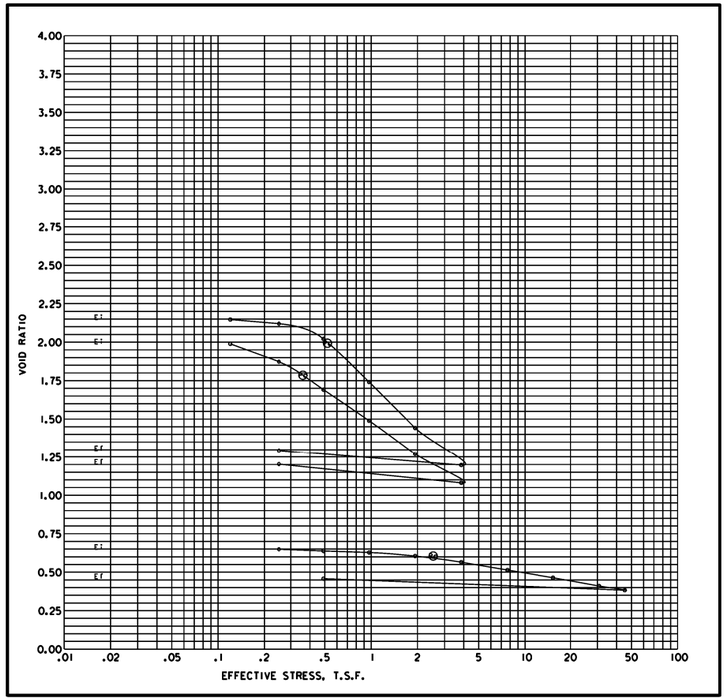


SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-3.9	0	0.0	0.130	CH
2	-8.8	0	0.0	0.046	CH
3	-11.9	0	0.0	0.155	CH
4	-22.9	0	0.0	0.378	CL
5	-5.1	C			CH
6	-9.8	C			CH
7	-19.1	C			CL



NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
- ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

CHANNEL, SABINE-MERMENTAU LINE
SHORELINE PROTECTION PROJECT

BORING SWL-7U

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

PLATE 6

BOR. SWL-9U
STA. LAT N 29°40'9.1"
LONG W 92°29'11.2"
SCHOONER BAYOU CONTROL GAUGE
12 SEPTEMBER 2003
WATER EL. 3.15 MLG

ELEVATIONS IN FEET - MLG

TEST DATA

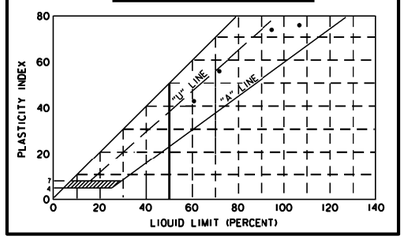
WATER CONTENT
% WATER, DRY WEIGHT
0 20 40 60 80 100 120 140

SHEAR STRENGTH
TONS / SQ.FT.
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

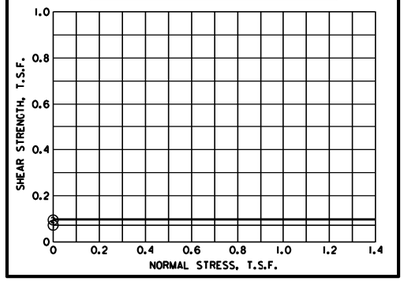
WET DENSITY
POUNDS / CU.FT.
60 80 100 120 140

NORMAL STRESS
TONS / SQ.FT.
0.0 1.0 2.0 3.0

PLASTICITY CHART



SHEAR STRENGTH DATA



NOTES

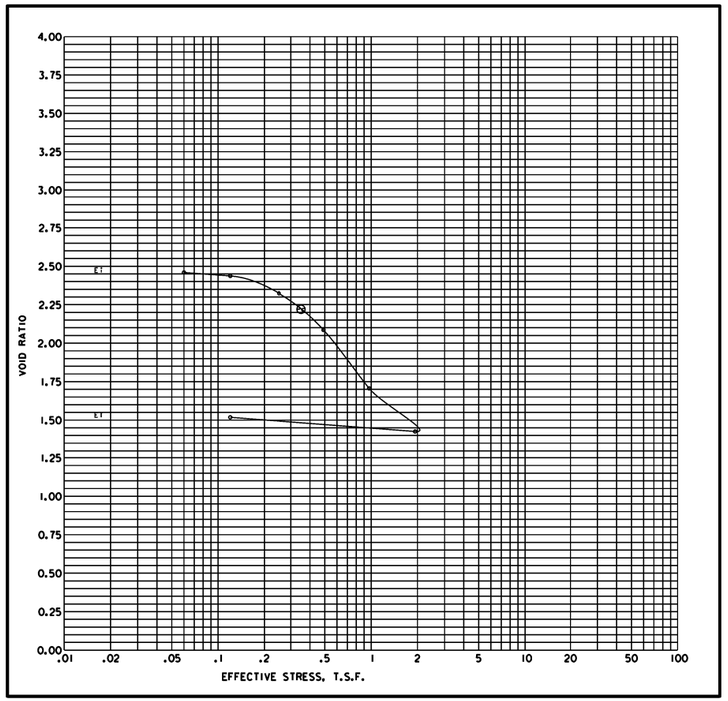
- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST

ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.8	O	0.0	0.072	CH
2	-12.8	O	0.0	0.095	CH
3	-4.9	C			CH



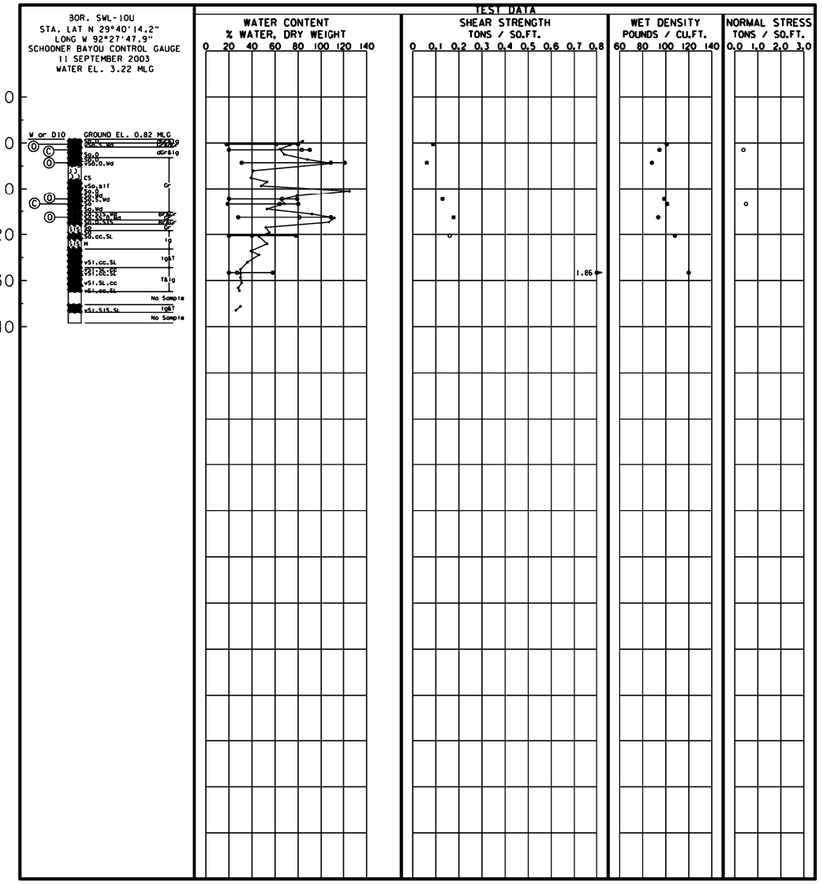
CHANNEL, SABINE-MERMENTAU LINE
SHORELINE PROTECTION PROJECT

BORING SWL-9U

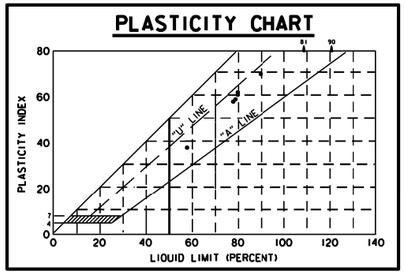
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.C.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

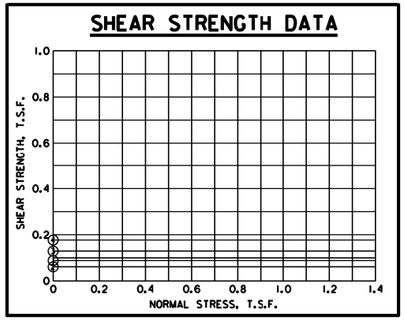
PLATE 7



PLASTICITY CHART



SHEAR STRENGTH DATA



NOTES

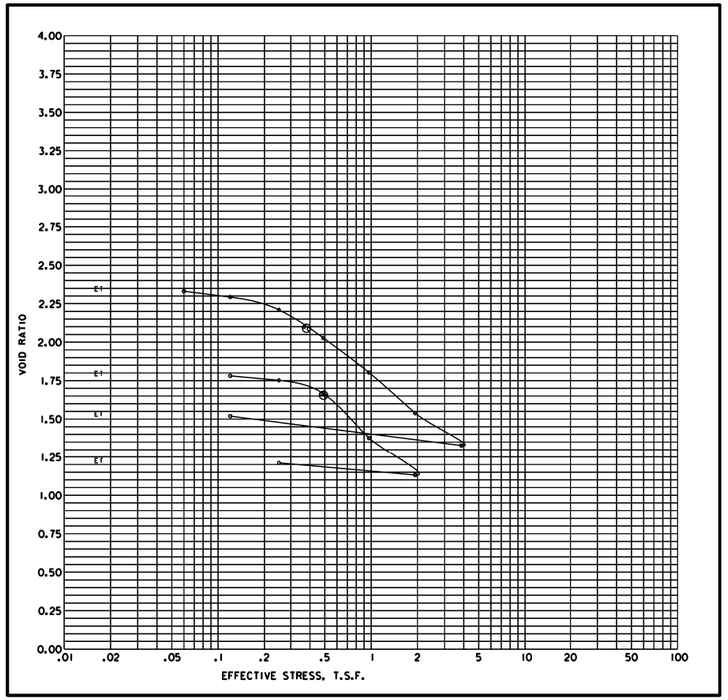
- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST

ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.3	0	0.0	0.088	CH
2	-4.3	0	0.0	0.061	CH
3	-12.3	0	0.0	0.129	CH
4	-16.3	0	0.0	0.177	CH
5	-1.5	C			CH
6	-13.4	C			CH



[redacted] LAKE
SHORELINE PROTECTION PROJECT

BORING SWL-10U

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B	DATE:		

PLATE 8

BOR. SWL-12U
STA. LAT N 29°40'50.0"
LONG W 92°26'45.5"
SCHOONER BAYOU CONTROL GAUGE
11 SEPTEMBER 2003
WATER EL. 3.22 MLG

ELEVATIONS IN FEET - MLG

W or DIO — GROUND EL. 1.22 MLG

TEST DATA

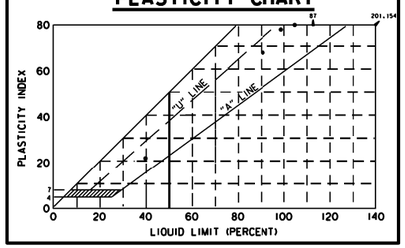
WATER CONTENT
% WATER, DRY WEIGHT
0 20 40 60 80 100 120 140

SHEAR STRENGTH
TONS / SQ.FT.
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8

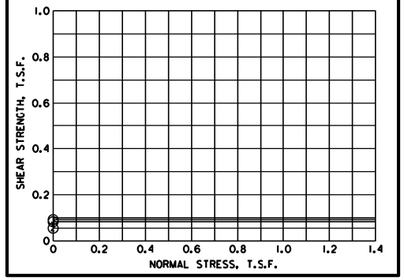
WET DENSITY
POUNDS / CU.FT.
60 80 100 120 140

NORMAL STRESS
TONS / SQ.FT.
0.0 1.0 2.0 3.0

PLASTICITY CHART

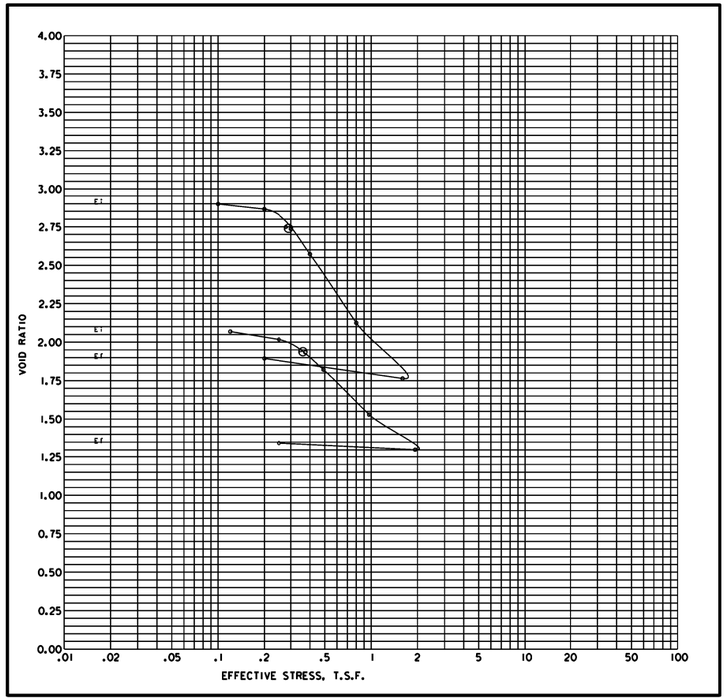


SHEAR STRENGTH DATA



TABULAR TEST DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-0.9	Q	0.0	0.083	CH
2	-5.8	Q	0.0	0.055	CH
3	-12.9	Q	0.0	0.092	CH
4	-6.6	C			CH
5	-13.9	C			CH



NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (Q) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST

ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

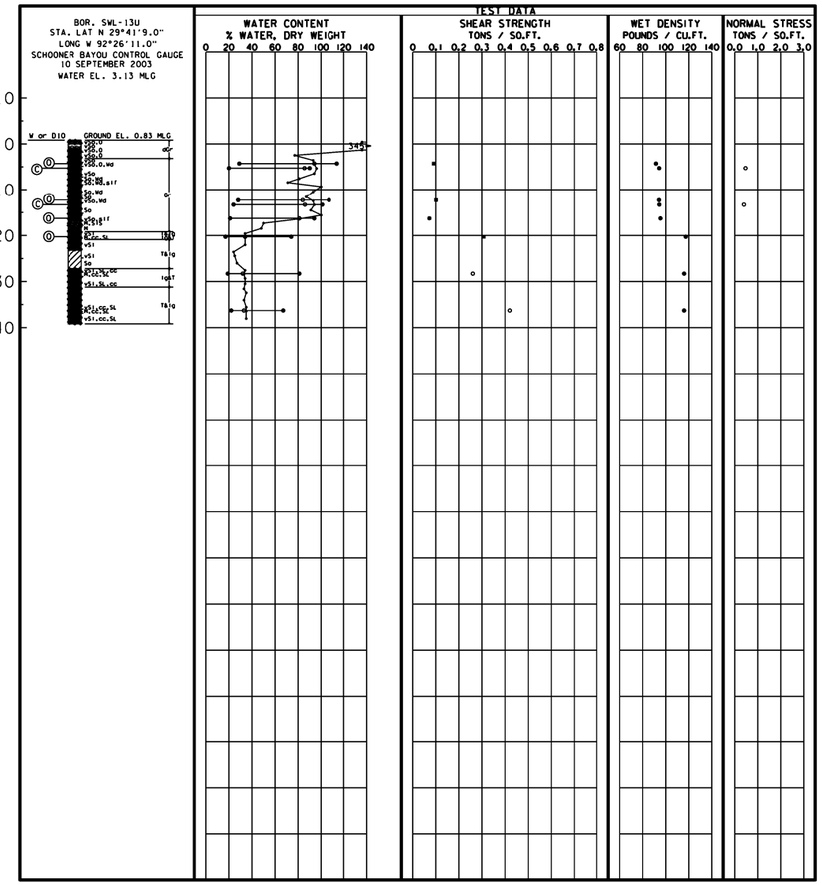
CHANNEL, SABINE-MISE LAKE
SHORELINE PROTECTION PROJECT

BORING SWL-12U

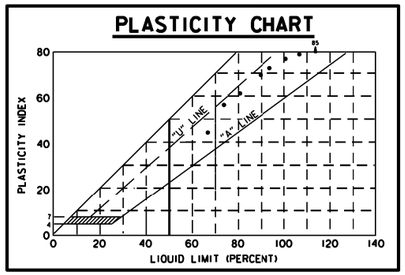
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

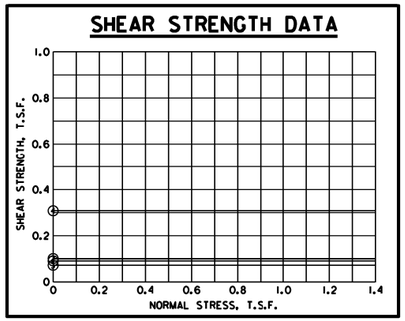
PLATE 9



PLASTICITY CHART



SHEAR STRENGTH DATA



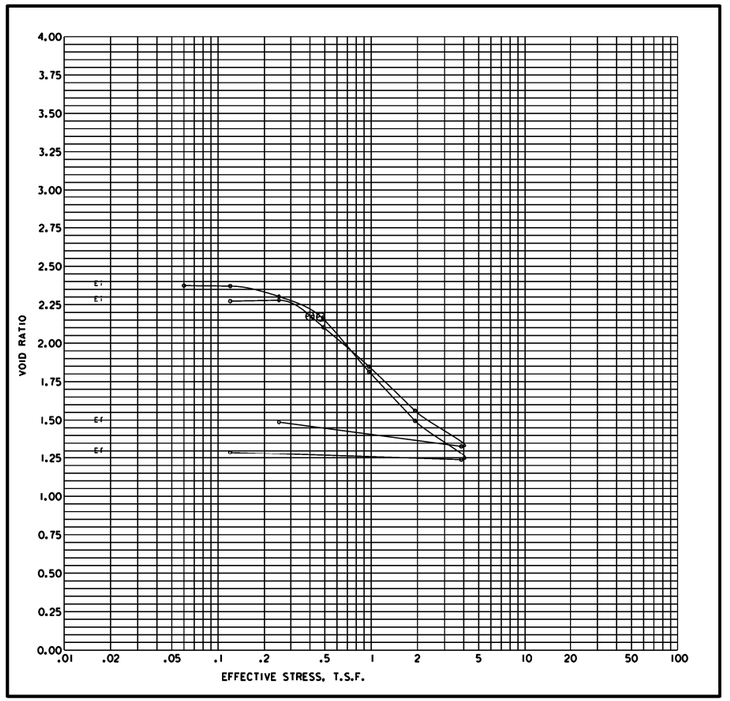
NOTES

- ○ - (UC) UNCONFINED COMPRESSION TEST
- ■ - (O) UNCONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ▲ - (R) CONSOLIDATED - UNDRAINED TRIAXIAL SHEAR TEST
- ⊡ - (S) CONSOLIDATED - DRAINED DIRECT SHEAR TEST
- ω_P ω_N ω_L ATTERBERG LIMITS

BORING WAS TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER.
FOR SOIL BORING LEGEND SEE PLATE A.
FOR LOCATION OF BORINGS SEE PLATE
FOR DETAILED TEST DATA SEE

TABULAR TEST DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - PSF	CLASS
1	-4.3	0	0.0	0.091	CH
2	-12.3	0	0.0	0.101	CH
3	-16.3	0	0.0	0.072	CH
4	-20.3	0	0.0	0.308	CH
5	-5.3	C			CH
6	-13.3	C			CH



CHANNEL, SABINE-MERMENTAU LINE
SHORELINE PROTECTION PROJECT

BORING SWL-13U

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: EUSTIS	PLOT SCALE:	PLOT DATE:	CARD FILE:
DRAWN BY: A.P.C.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

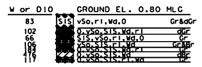
PLATE 10

ELEVATIONS IN FEET M.L.G.

10 0 -10 -20 -30

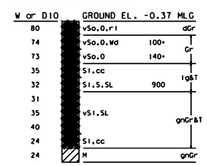
V-1

29°42'51.998" 92°33'48.1"
BOR. V-1 (20-401)
17-JUL-2001
VIBRACORE BORING



SWL-2G

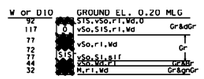
29°42'30.8" 92°33'13.7"
BOR. SWL-2G
15 SEPTEMBER 2003
WATER EL. 3.63 MLG



• DENOTES A ONE POINT "Q" TEST

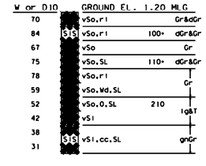
V-2

29°42'21.398" 92°32'36.2"
BOR. V-2 (20-401)
17-JUL-2001
VIBRACORE BORING



SWL-5G

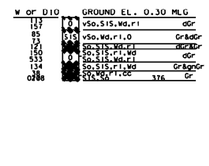
29°41'30.1" 92°31'49.6"
BOR. SWL-5G
14 SEPTEMBER 2003
WATER EL. 3.65 MLG



• DENOTES A ONE POINT "Q" TEST

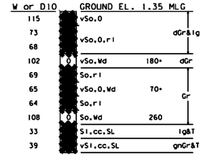
V-3

29°41'8.2" 92°30'24.502"
BOR. V-3 (20-401)
17-JUL-2001
VIBRACORE BORING



SWL-8G

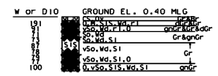
29°40'18.8" 92°29'46.8"
BOR. SWL-8G
12 SEPTEMBER 2003
WATER EL. 3.15 MLG



• DENOTES A ONE POINT "Q" TEST

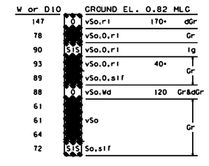
V-4

29°40'6.802" 92°28'32.999"
BOR. V-4 (20-401)
17-JUL-2001
VIBRACORE BORING



SWL-11G

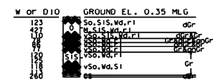
29°40'16.5" 92°27'9.9"
BOR. SWL-11G
11 SEPTEMBER 2003
WATER EL. 3.22 MLG



• DENOTES A ONE POINT "Q" TEST

V-5

29°41'3.098" 92°26'23.798"
BOR. V-5 (20-401)
17-JUL-2001
VIBRACORE BORING



ELEVATIONS IN FEET M.L.G.

10 0 -10 -20 -30

CH - Fat Clay
CL - Lean Clay
Pt - Peat
SM - Silty Sand

NOTE:
WATER TAKEN FROM GAUGE ID #76680 IN MGL

CAMERON, SOUTH MARSH LANE
SHORELINE PROTECTION PROJECT

GENERAL & VIBRACORE TYPE BORING LOG

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:	PLOT SCALE: 1"=20'	PLOT DATE:	CADD FILE:
DRAWN BY: J.S.B.			FILE NO.
CHECKED BY: B.B.	DATE: MARCH 2004		

PLATE 11

WEST

DISTANCE BY FEET

EAST

0 2000 4000 6000 8000 10000 12000 14000 16000 18000 20000 22000 24000 26000 28000 30000 32000

29°42'54.4" 92°34'16.9"
BOR. SWL-1U (04-18127)
15-SEP-2003
GROUND EL. 1.2

29°42'30.802" 92°33'13.702"
BOR. SWL-2G (04-18127)
15-SEP-2003
GROUND EL. -.4

29°42'51.502" 92°32'48.7"
BOR. SWL-3U (04-18127)
14-SEP-2003
GROUND EL. 1.4

29°41'50.899" 92°32'18.398"
BOR. SWL-4U (04-18127)
14-NOV-2003
GROUND EL. 1.5

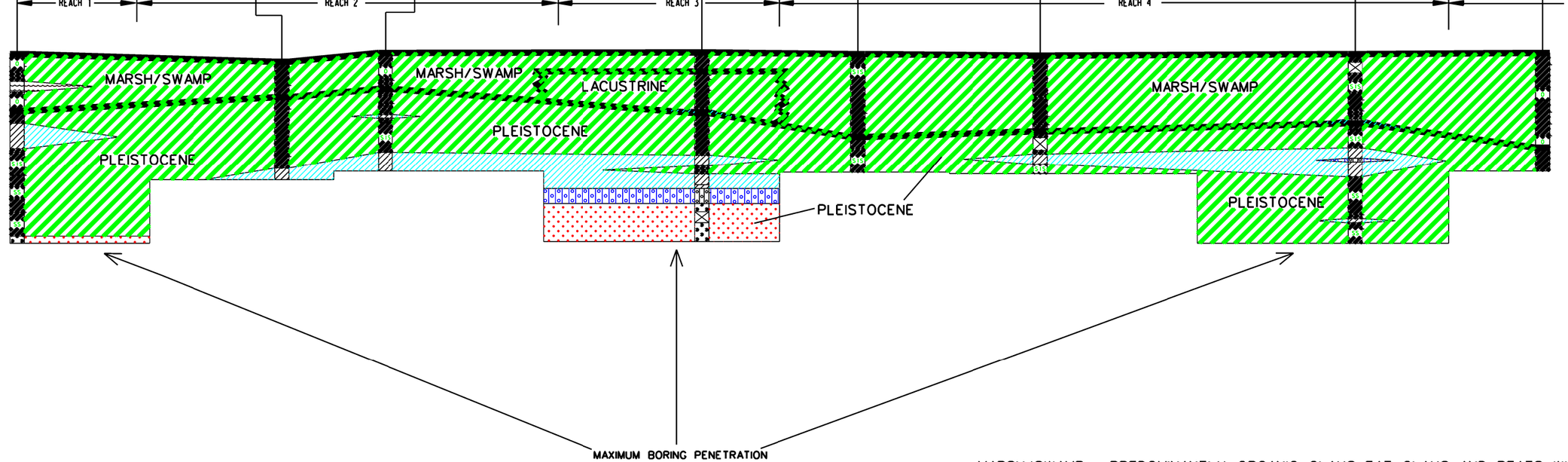
29°41'30.098" 92°31'49.598"
BOR. SWL-5G (04-18127)
14-SEP-2003
GROUND EL. 1.2

29°41'18.802" 92°31'8"
BOR. SWL-6U (04-18127)
13-SEP-2003
GROUND EL. .8

29°40'41.599" 92°30'22.9"
BOR. SWL-7U (04-18127)
13-SEP-2003
GROUND EL. 1.2

29°40'18.8" 92°29'46.799"
BOR. SWL-8G (04-18127)
12-SEP-2003
GROUND EL. 1.4

REACH 1 REACH 2 REACH 3 REACH 4



ELEVATION IN FEET MLG

10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120

MAXIMUM BORING PENETRATION

SOIL LEGEND

- CH - FAT CLAY
- CL - LEAN CLAY
- PT - PEAT
- ML - SILT
- SM - SILTY SAND
- SP - SAND POORLY-GRADED
- SI - SHELLS
- NO SAMPLE

HORIZONTAL SCALE IN FEET

1000 500 0 1000 2000 3000

MARSH/SWAMP - PREDOMINANTLY ORGANIC CLAYS, FAT CLAYS, AND PEATS WITH OCCASIONAL SAND AND SILT LAYERS

LACUSTRINE - CLAYS AND SILTS WITH SOME SAND AND SHELL FRAGMENTS

PLEISTOCENE - STIFF TO VERY STIFF OXIDIZED CLAYS INTERBEDDED WITH LAYERS AND LENSES OF SILTS AND SANDS

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEAN
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: D. DILLON	PLOT SCALE: 1 : 10	PLOT DATE: 15 DEC 2003	CADD FILE: whitelak.dgn
DRAWN BY: D. DILLON			FILE NO.
CHECKED BY: D. BRITSCH	DATE:		

PLATE 12

WEST

DISTANCE BY FEET

EAST

32000 34000 36000 38000 40000 42000 44000 46000 48000 50000 52000 54000 56000 58000 60000 62000 64000

29°40'18.8" 92°29'46.799" BOR. SWL-8G (04-18127) 12-SEP-2003 GROUND EL. 1.4

29°40'9.098" 92°29'11.198" BOR. SWL-9U (04-18127) 12-SEP-2003 GROUND EL. 1.4

29°40'14.2" 92°27'47.902" BOR. SWL-10U (04-18127) 11-SEP-2003 GROUND EL. .8

29°40'16.5" 92°27'9.9" BOR. SWL-11G (04-18127) 11-SEP-2003 GROUND EL. .8

29°40'50.002" 92°26'45.499" BOR. SWL-12U (04-18127) 11-SEP-2003 GROUND EL. 1.2

29°41'8.999" 92°26'11" BOR. SWL-13U (04-18127) 10-SEP-2003 GROUND EL. .8

REACH 5 REACH 6 REACH 7

MARSH/SWAMP

MARSH/SWAMP

PLEISTOCENE

PLEISTOCENE

LACUSTRINE

<PLEISTOCENE

MAXIMUM BORING PENETRATION

ELEVATION IN FEET MLG

10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120

SOIL LEGEND

- CH - FAT CLAY
- CL - LEAN CLAY
- PT - PEAT
- ML - SILT
- SM - SILTY SAND
- SP - SAND POORLY-GRADED
- SI - SHELLS
- NO SAMPLE

HORIZONTAL SCALE IN FEET

1000 500 0 1000 2000 3000

MARSH/SWAMP - PREDOMINANTLY ORGANIC CLAYS, FAT CLAYS, AND PEATS WITH OCCASIONAL SAND AND SILT LAYERS

LACUSTRINE - CLAYS AND SILTS WITH SOME SAND AND SHELL FRAGMENTS

PLEISTOCENE - STIFF TO VERY STIFF OXIDIZED CLAYS INTERBEDDED WITH LAYERS AND LENSES OF SILTS AND SANDS

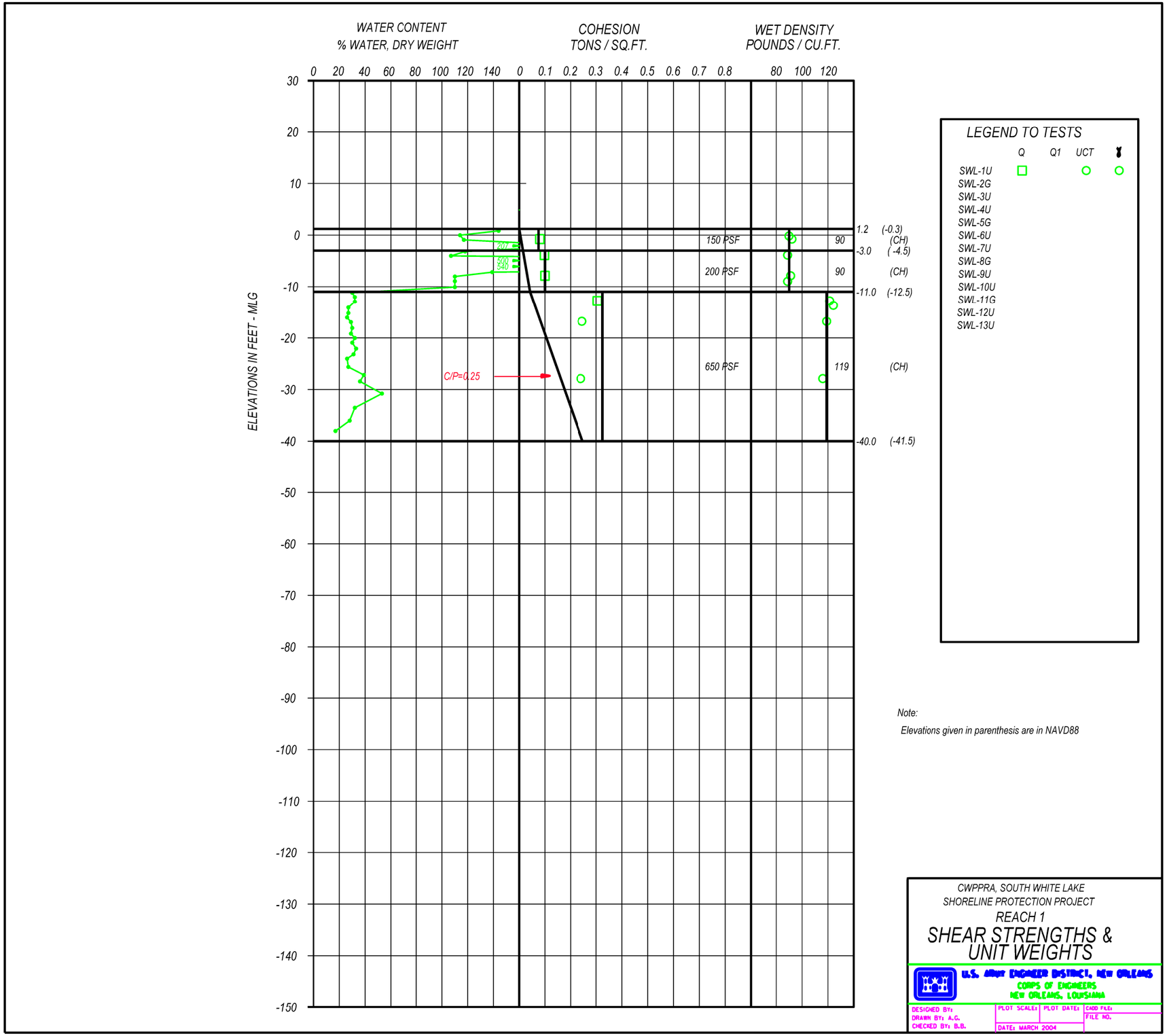
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT

SOIL AND GEOLOGIC PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEAN
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: D. DILLON	PLOT SCALE: 1 : 10	PLOT DATE: 15 DEC 2003	CADD FILE: whitelak.dgn
DRAWN BY: D. DILLON			FILE NO.
CHECKED BY: D. BRITSCH	DATE:		

PLATE 13



LEGEND TO TESTS

	Q	Q1	UCT	
SWL-1U	□		○	○
SWL-2G				
SWL-3U				
SWL-4U				
SWL-5G				
SWL-6U				
SWL-7U				
SWL-8G				
SWL-9U				
SWL-10U				
SWL-11G				
SWL-12U				
SWL-13U				

Note:

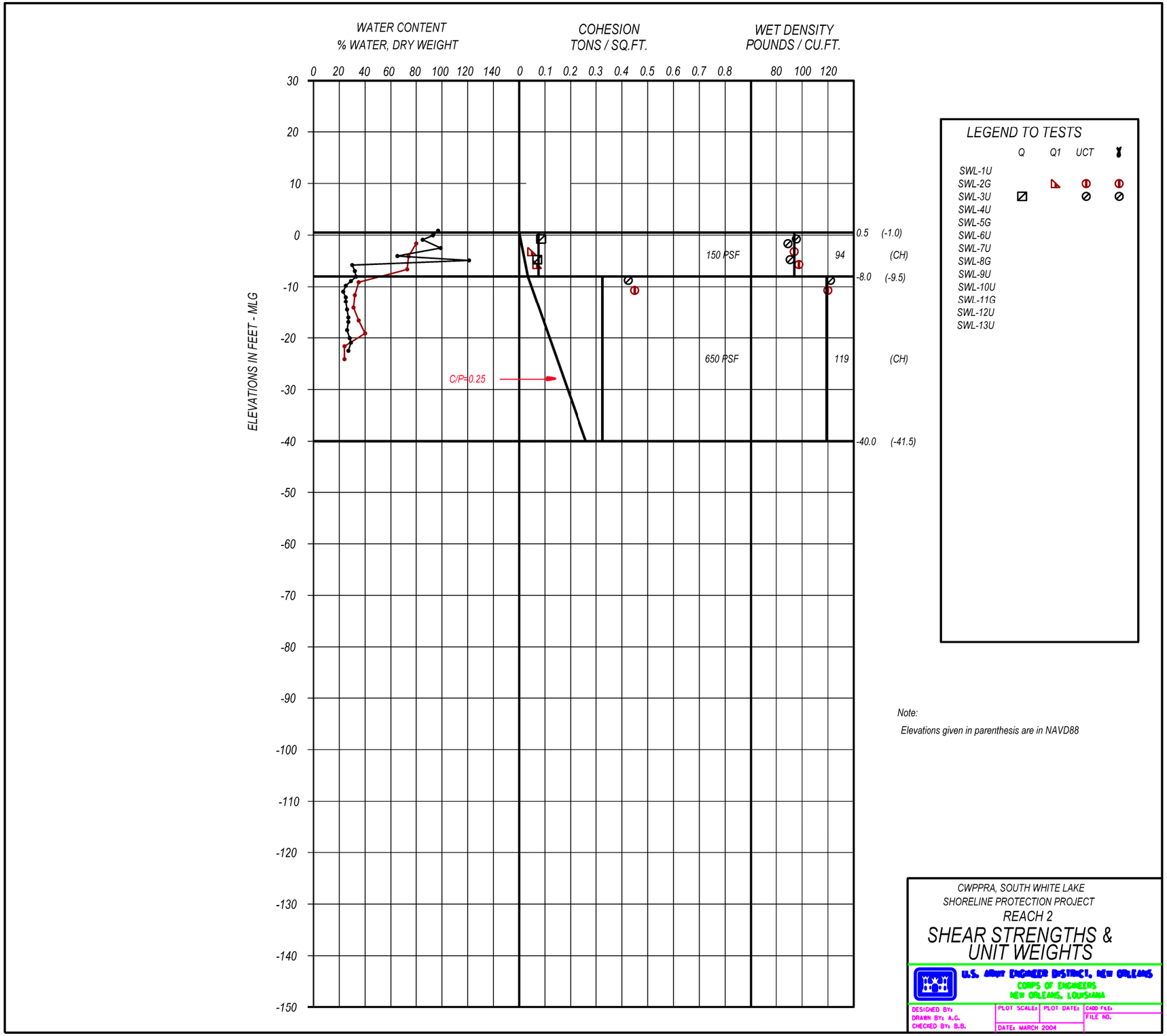
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 1

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.B.	DATE: MARCH 2004		



LEGEND TO TESTS

	Q	Q1	UCT	
SWL-1U				
SWL-2G		◺	◐	◐
SWL-3U	⊠		⊘	⊘
SWL-4U				
SWL-5G				
SWL-6U				
SWL-7U				
SWL-8G				
SWL-9U				
SWL-10U				
SWL-11G				
SWL-12U				
SWL-13U				

Note:

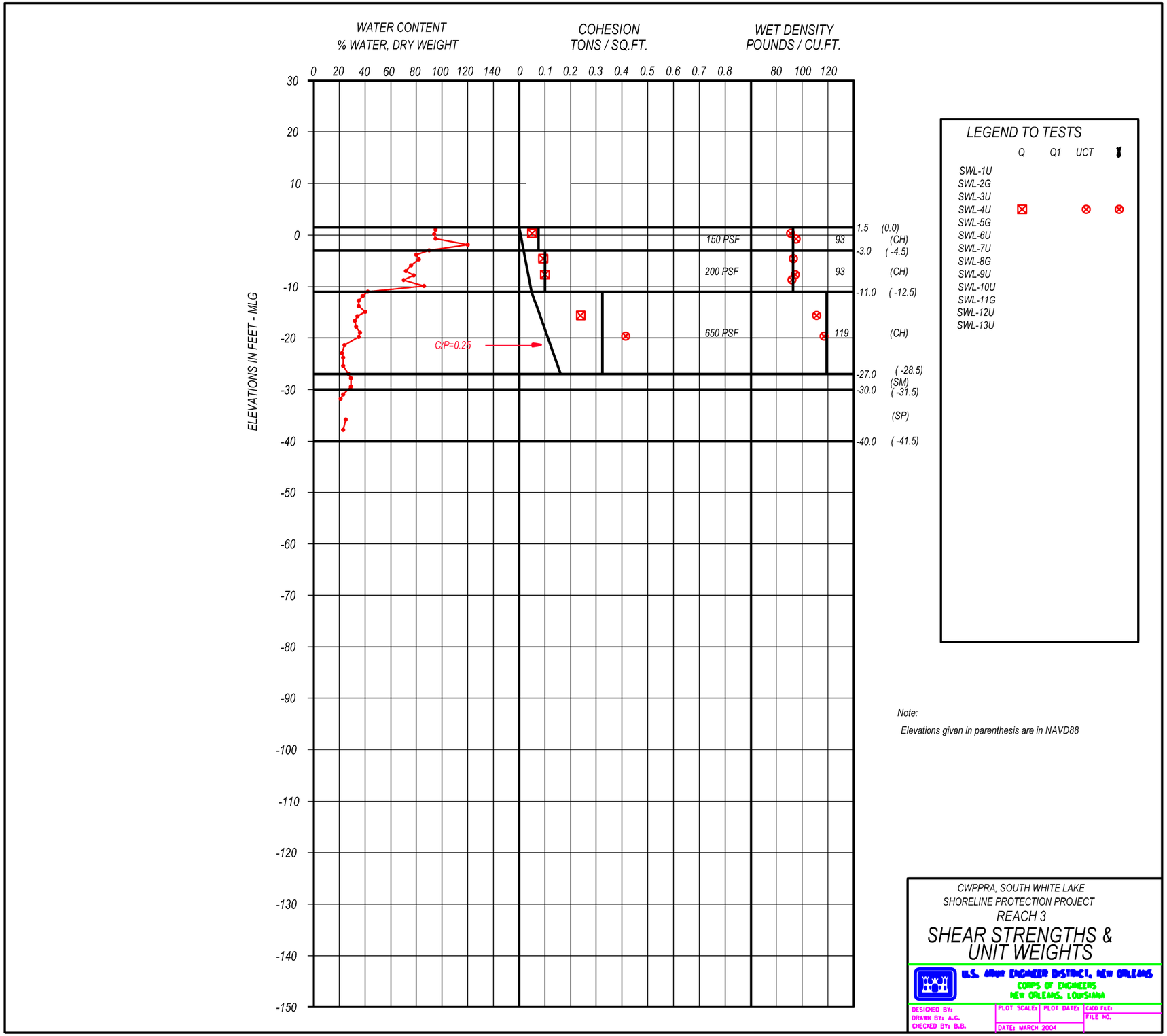
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 2

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.B.	DATE: MARCH 2004		



LEGEND TO TESTS

	Q	Q1	UCT	
SWL-1U				
SWL-2G				
SWL-3U				
SWL-4U	⊠		⊗	⊗
SWL-5G				
SWL-6U				
SWL-7U				
SWL-8G				
SWL-9U				
SWL-10U				
SWL-11G				
SWL-12U				
SWL-13U				

Note:

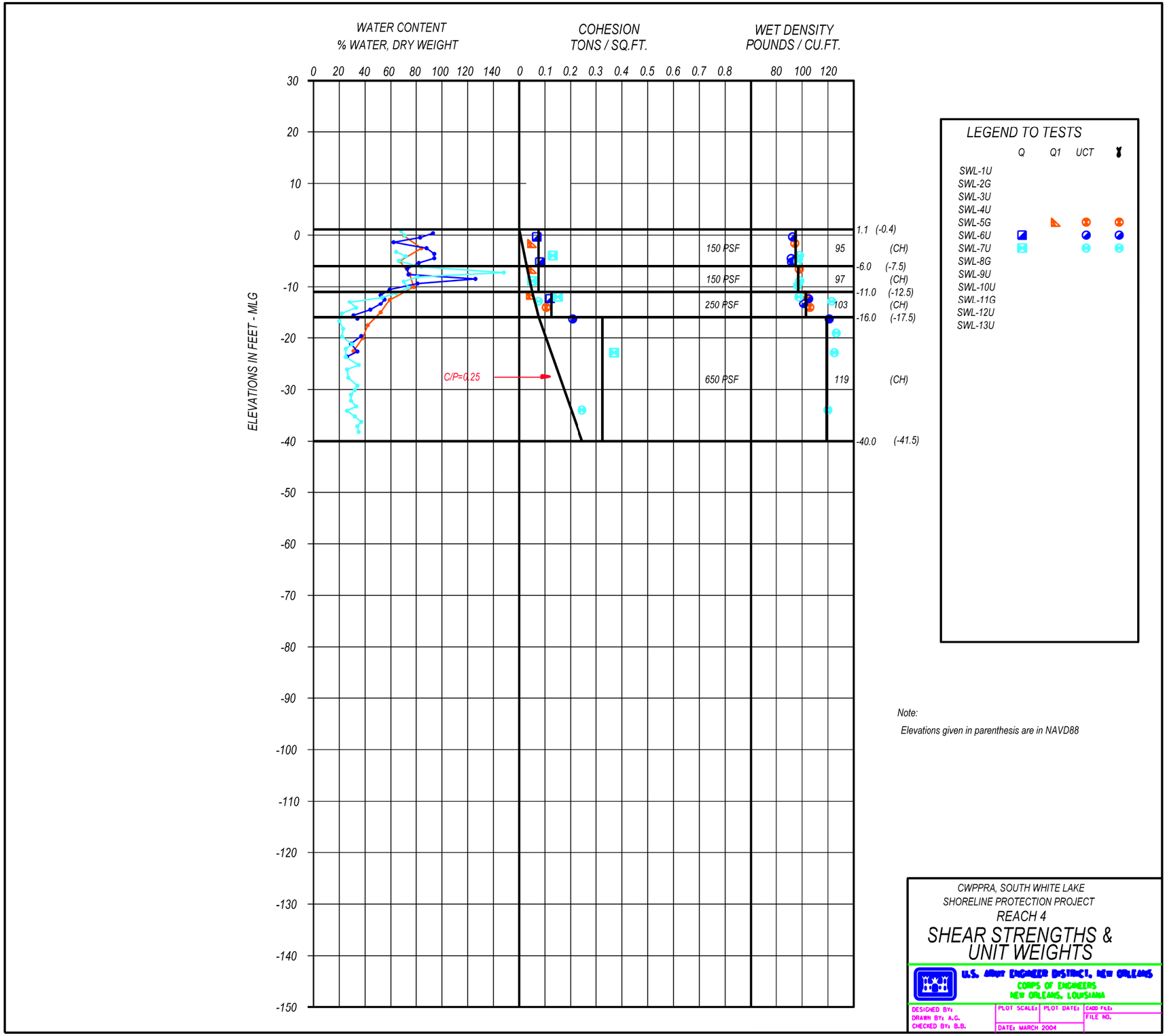
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 3

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.B.	DATE: MARCH 2004		



Note:

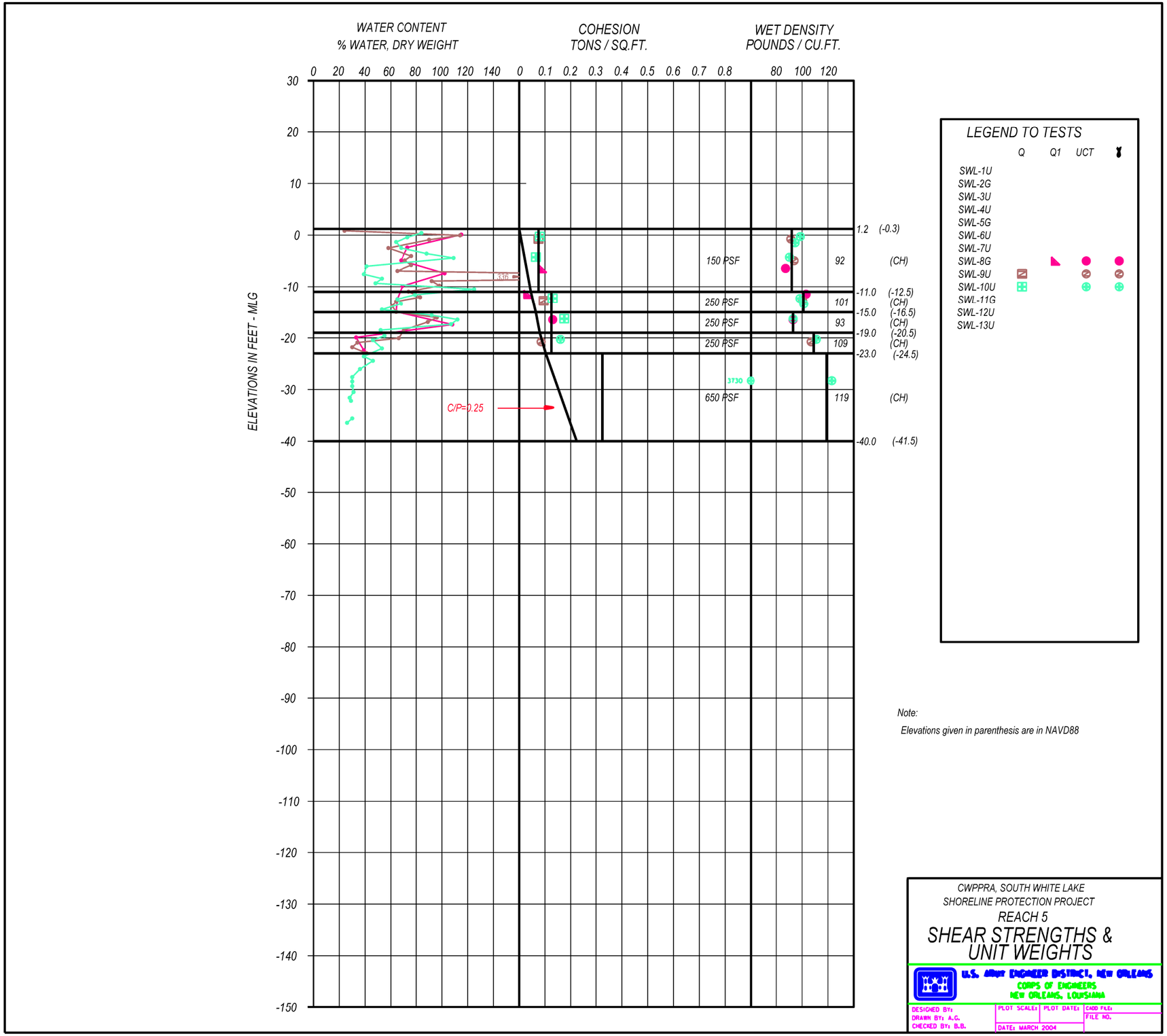
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 4

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:
DRAWN BY: A.G.
CHECKED BY: B.B.
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE: MARCH 2004



LEGEND TO TESTS

	Q	Q1	UCT	
SWL-1U				
SWL-2G				
SWL-3U				
SWL-4U				
SWL-5G				
SWL-6U				
SWL-7U				
SWL-8G		◣	●	●
SWL-9U	▨		⊘	⊘
SWL-10U	⊞		⊕	⊕
SWL-11G				
SWL-12U				
SWL-13U				

Note:

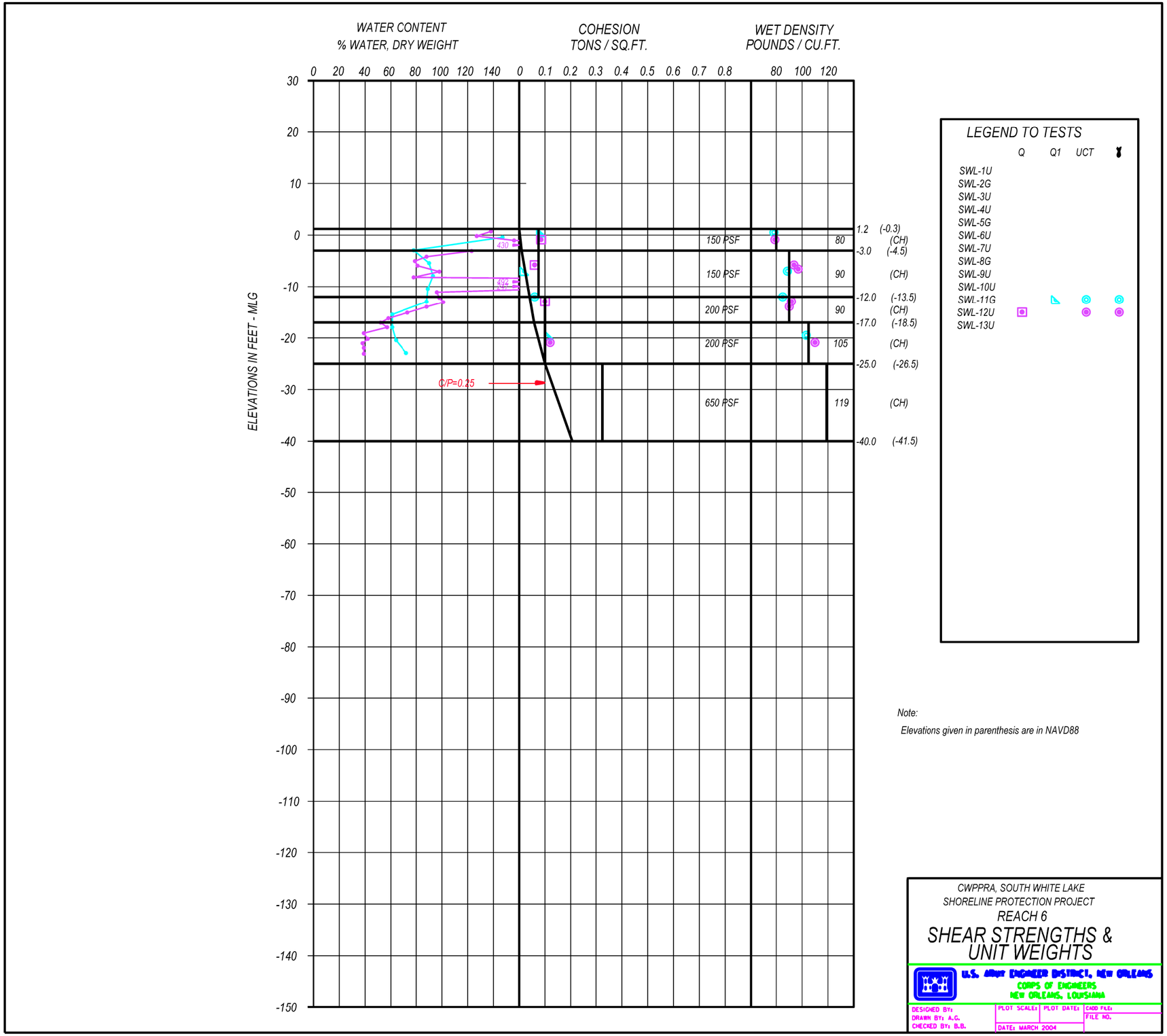
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 5

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.B.	DATE: MARCH 2004		



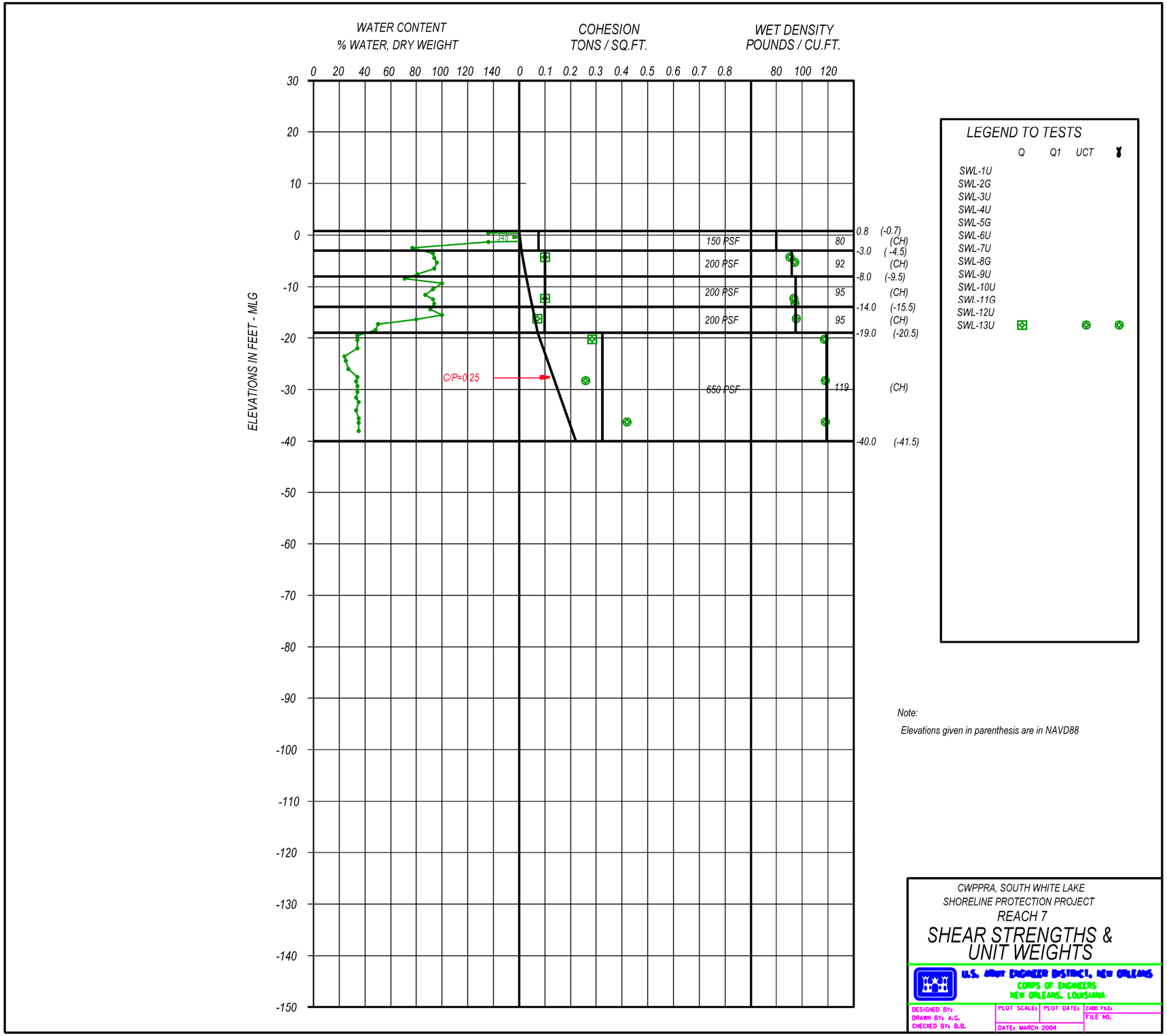
Note:
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 6

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:
DRAWN BY: A.G.
CHECKED BY: B.B.
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE: MARCH 2004



Note:

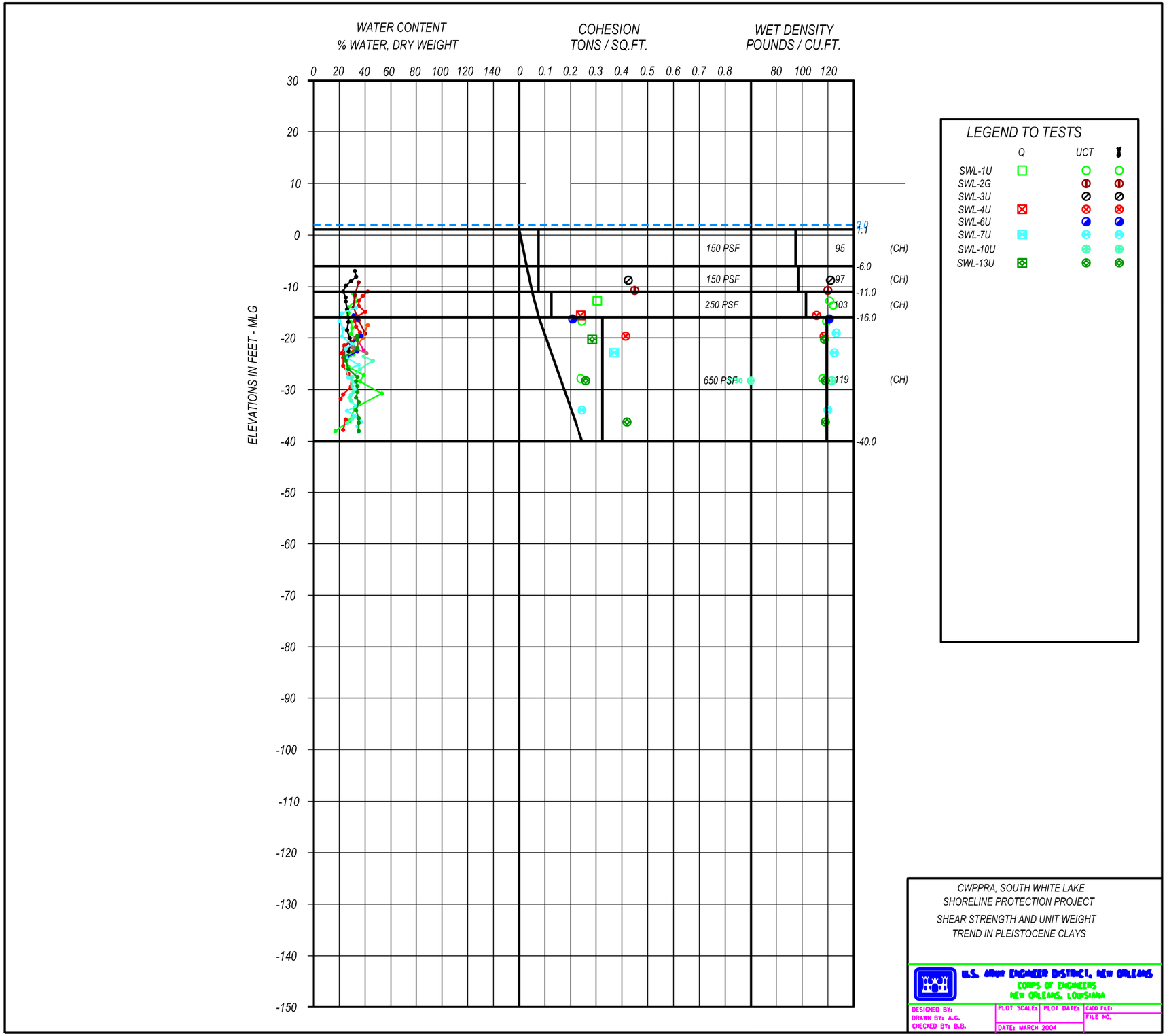
Elevations given in parenthesis are in NAVD88

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 7

SHEAR STRENGTHS & UNIT WEIGHTS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:
DRAWN BY: A.G.
CHECKED BY: B.B.
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE: MARCH 2004



LEGEND TO TESTS

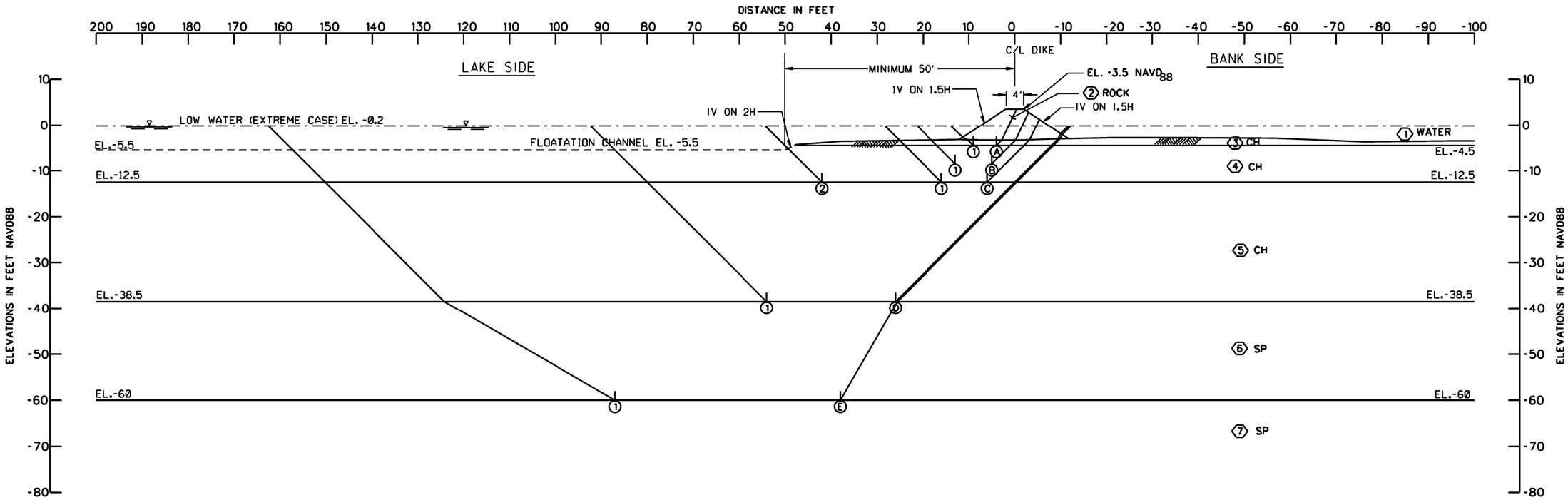
	Q	UCT	
SWL-1U			
SWL-2G			
SWL-3U			
SWL-4U			
SWL-6U			
SWL-7U			
SWL-10U			
SWL-13U			

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
SHEAR STRENGTH AND UNIT WEIGHT
TREND IN PLEISTOCENE CLAYS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY:
DRAWN BY: A.G.
CHECKED BY: B.B.
PLOT SCALE:
PLOT DATE:
CADD FILE:
FILE NO.
DATE: MARCH 2004

PLATE 21



GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 14 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2463	750	454	3981	764	3667	3217	1.14
Ⓑ ①	-8.5	4007	1600	1968	8399	2529	7575	5870	1.29
Ⓒ ①	-12.5	4730	2000	3536	13093	5885	10266	7208	1.42
Ⓒ ②	-12.5	4730	7200	2933	13093	5652	14863	7441	2.00
Ⓓ ①	-38.5	37486	18200	36600	81416	70595	92286	1082	8.53
Ⓔ ①	-60.0	71304	83685	135700	198099	186055	290689	12044	24.14

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
		VERT. 1	CENTER OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 1	DEGREES
①	WATER	62	0	0	0
②	ROCK	132	0	0	40
③	CH	90	150	150	0
④	CH	90	200	200	0
⑤	CH	119	650	650	0
⑥	SP	122	0	0	30
⑦	SP	122	0	0	30

NOTES

◇ -- STRATUM NUMBER
○ -- WEDGE NUMBER
ơ -- CROSSOVER POINT
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

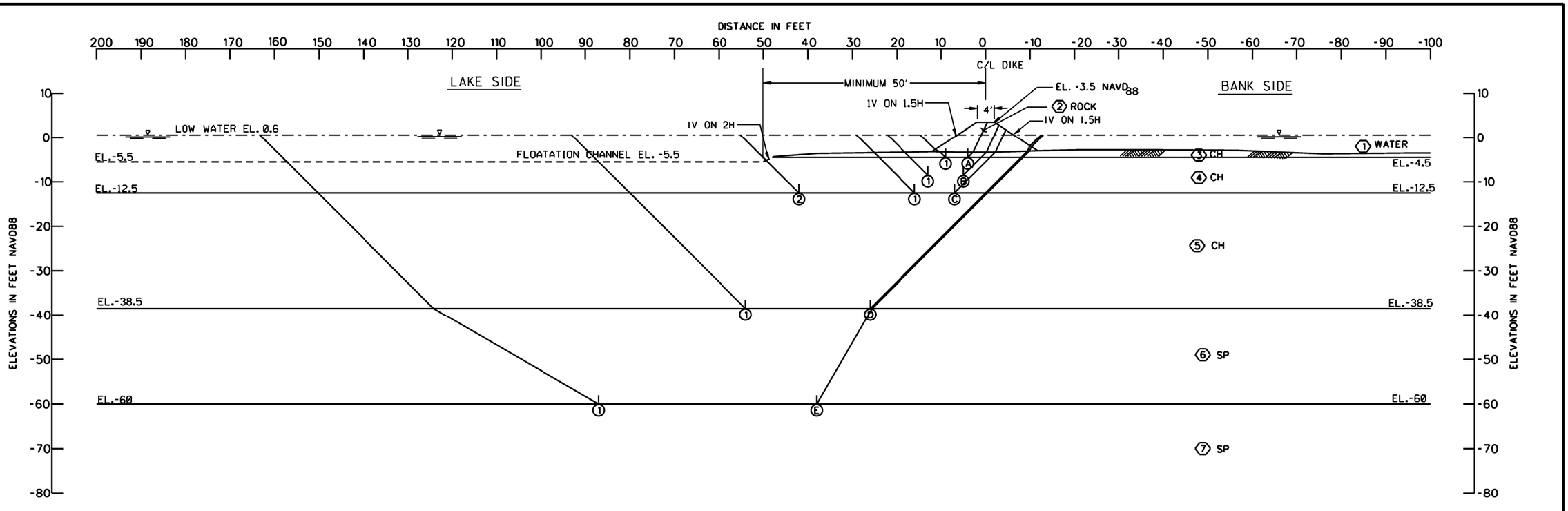
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH I
LINE 102, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R12

PLATE: 22



NOTES

- ⬡ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ⌒ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 14 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2326	750	454	3981	999	3530	2982	1.18
Ⓑ ①	-8.5	3870	1600	1968	8399	2963	7438	5436	1.37
Ⓒ ①	-12.5	4936	1800	3536	13199	6519	10272	6680	1.54
Ⓒ ②	-12.5	4936	7000	2933	13199	6286	14869	6913	2.15
Ⓓ ①	-38.5	37486	18200	36600	82658	72527	92286	10131	9.11
Ⓔ ①	-60.0	71303	83683	135697	200415	189060	290683	11355	25.60

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
⟨1⟩	WATER	62	0	0	0
⟨2⟩	ROCK	132	0	0	40
⟨3⟩	CH	90	150	150	0
⟨4⟩	CH	90	200	200	0
⟨5⟩	CH	119	650	650	0
⟨6⟩	SP	122	0	0	30
⟨7⟩	SP	122	0	0	30

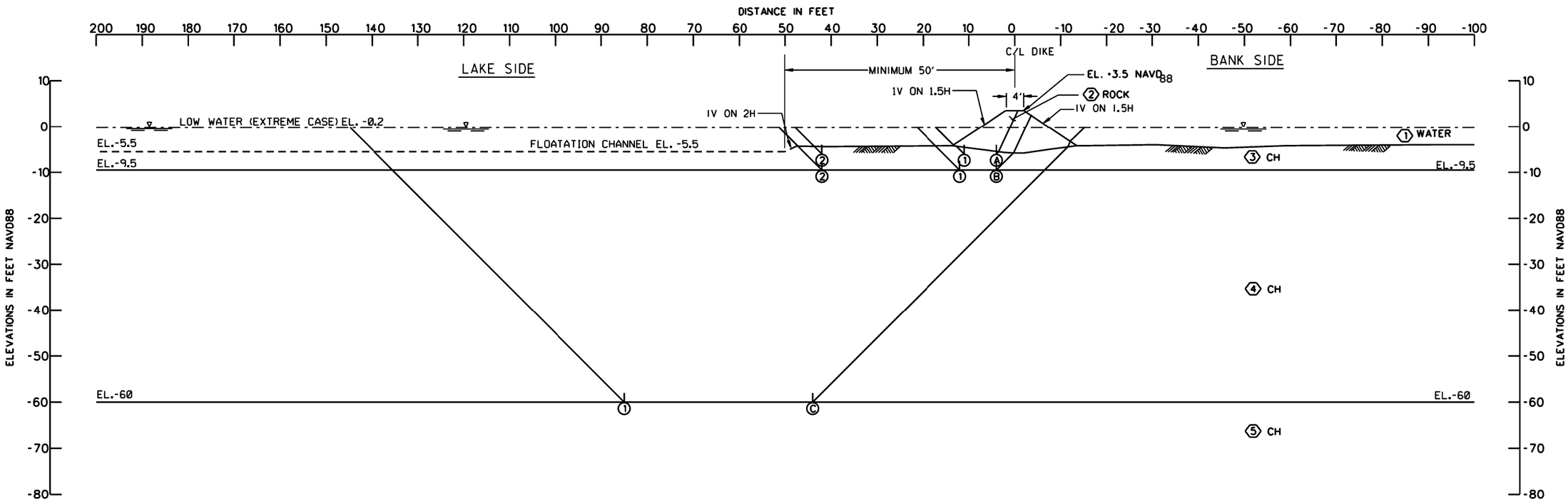
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH I
LINE 102, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B	DATE:		

INPUT DATA FILENAME: R16

PLATE: 23



NOTES

- ⬡ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ᔕ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \dfrac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 15 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-6.0	3483	1050	518	5649	1255	5051	4394	1.15
Ⓐ ②	-6.0	3483	5700	504	5649	1093	9687	4556	2.13
Ⓑ ①	-9.5	455	1200	1573	1039	3199	7324	7192	1.02
Ⓑ ②	-9.5	455	5700	1573	1039	3125	11824	7266	1.63
Ⓒ ①	-60.0	67217	26650	66850	20395	190374	160717	13577	11.84

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
⬡ 1	WATER	62	0	0	0
⬡ 2	ROCK	132	0	0	40
⬡ 3	CH	94	150	150	0
⬡ 4	CH	119	650	650	0
⬡ 5	CH	119	650	650	0

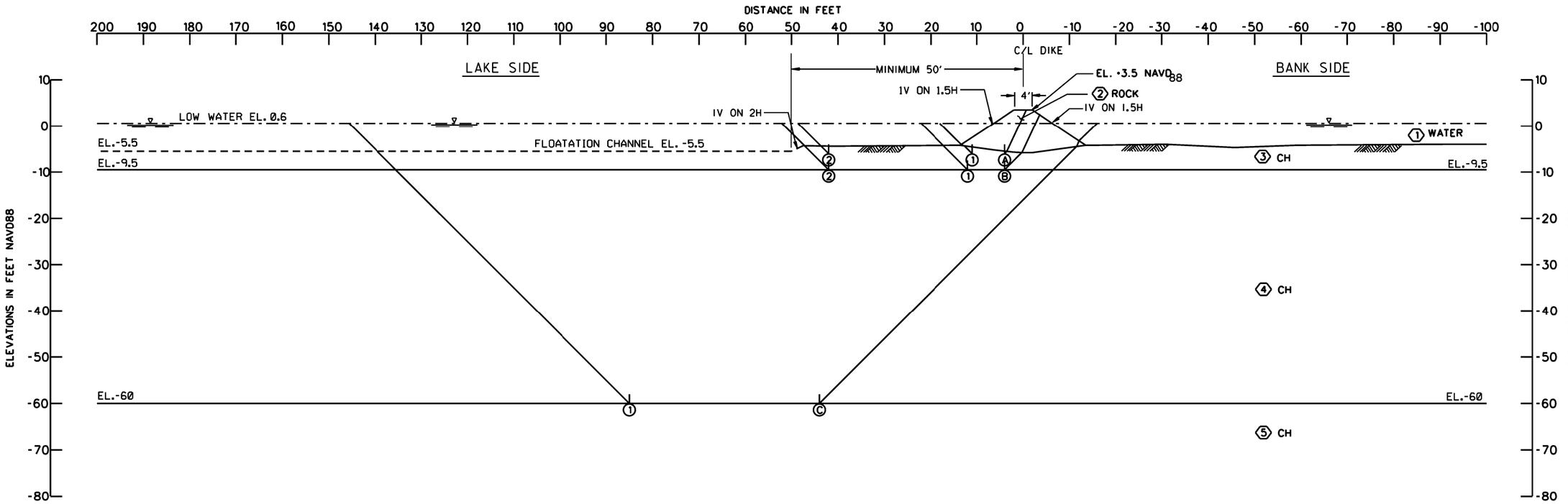
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 2
LINE 101, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R22

PLATE: 24



NOTES

- ◇ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ∽ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT,REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 15 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-6.0	3259	1050	518	5650	1565	4827	4085	1.18
Ⓐ ②	-6.0	3259	5700	504	5650	1403	9463	4247	2.23
Ⓑ ①	-9.5	4318	1200	1573	1039	3683	7091	6708	1.06
Ⓑ ②	-9.5	4318	5700	1573	1039	3609	11591	6782	1.71
Ⓒ ①	-60.0	67217	26650	66850	206266	193379	160717	12887	12.47

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 1	FRICTION ANGLE DEGREES
◇1	WATER	62	0	0	0
◇2	ROCK	132	0	0	40
◇3	CH	94	150	150	0
◇4	CH	119	650	650	0
◇5	CH	119	650	650	0

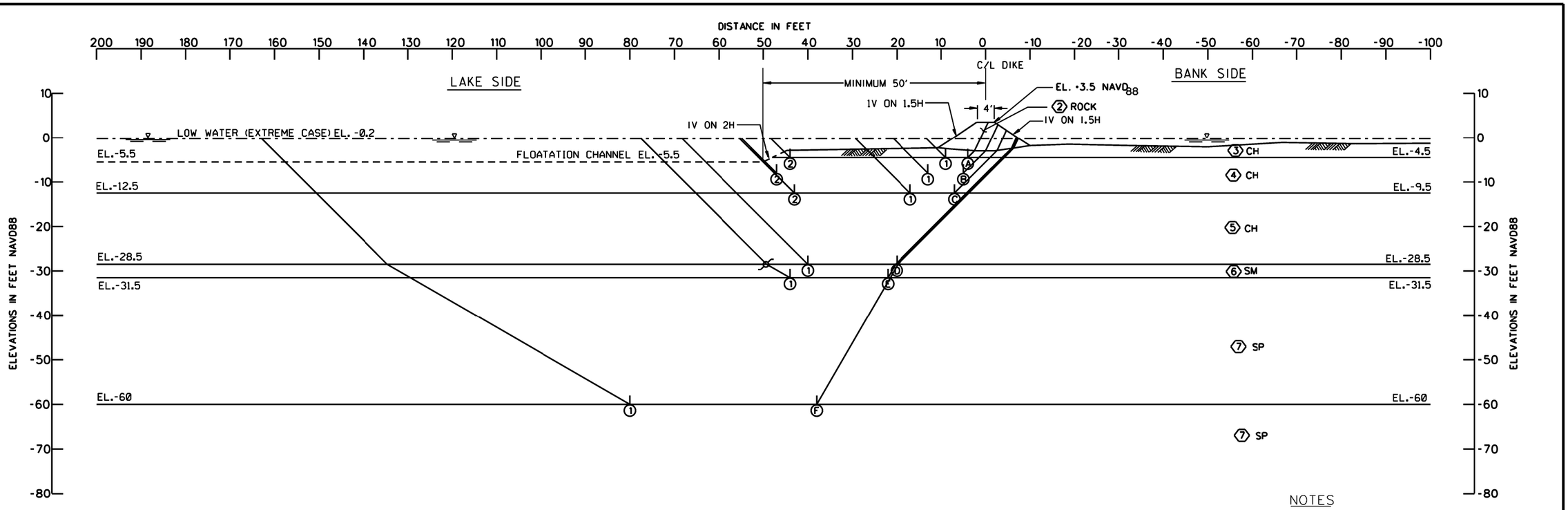
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 2
LINE 101, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R26

PLATE: 25



NOTES

- ◇ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ⌀ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \dfrac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 16 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2414	750	653	3983	721	3817	3262	1.17
Ⓐ ②	-4.5	2414	6000	399	3983	614	8813	3369	2.62
Ⓑ ①	-8.0	3781	1600	2023	7750	2382	7404	5368	1.38
Ⓑ ②	-8.0	3781	8400	1067	7750	2061	13248	5689	2.33
Ⓒ ①	-12.5	4926	2000	3772	13084	6252	10698	6832	1.57
Ⓒ ②	-12.5	4926	7200	2800	13084	5822	14926	7262	2.06
Ⓓ ①	-28.5	24907	13000	23600	46229	37007	61507	9222	6.67
Ⓔ ①	-31.5	27553	17560	31148	55699	45774	76261	9925	7.68
Ⓕ ①	-60.0	69986	73280	153392	200626	188027	296658	12599	23.55

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
◇1	WATER	62	0	0	0
◇2	ROCK	132	0	0	40
◇3	CH	93	150	150	0
◇4	CH	93	200	200	0
◇5	CH	119	650	650	0
◇6	SM	122	0	0	30
◇7	SP	122	0	0	30
◇8	SP	122	0	0	30

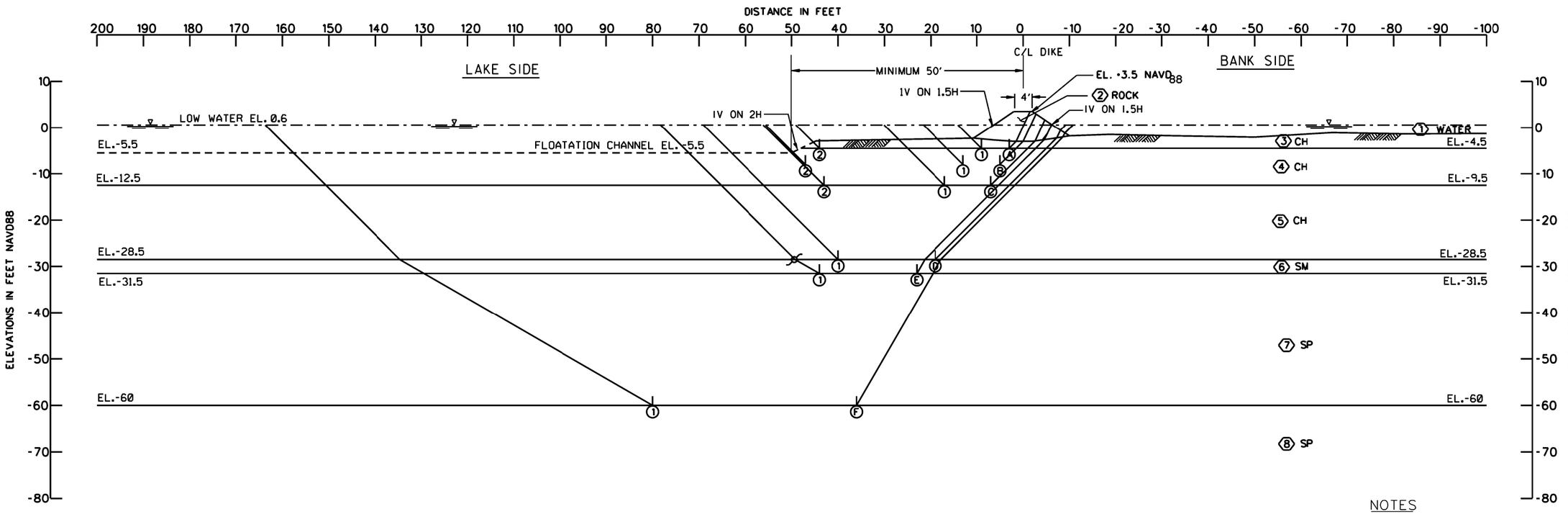
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 3
LINE 86, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.. DRAWN BY: A.G. CHECKED BY: B.P.B.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004
	DATE:	
CADD FILE:	FILE NO.	

INPUT DATA FILENAME: R32

PLATE: 26



NOTES

- ◇ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ⌒ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \dfrac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 16 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2314	900	653	4132	956	3867	3176	1.22
Ⓐ ②	-4.5	2314	6150	399	4132	848	8863	3284	2.70
Ⓑ ①	-8.0	3655	1600	2023	7750	2792	7278	4958	1.47
Ⓑ ②	-8.0	3655	8400	1067	7750	2470	13122	5280	2.49
Ⓒ ①	-12.5	4804	2000	3772	13095	6886	10576	6209	1.70
Ⓒ ②	-12.5	4804	7200	2800	13095	6456	14804	6639	2.23
Ⓓ ①	-28.5	24782	13650	23600	47014	38440	62032	8574	7.23
Ⓔ ①	-31.5	27663	16757	31147	56482	47357	75567	9125	8.28
Ⓕ ①	-60.0	69896	76843	153388	203082	191033	300127	12049	24.91

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
◇1	WATER	62	0	0	0
◇2	ROCK	132	0	0	40
◇3	CH	93	150	150	0
◇4	CH	93	200	200	0
◇5	CH	119	650	650	0
◇6	SM	122	0	0	30
◇7	SP	122	0	0	30
◇8	SP	122	0	0	30

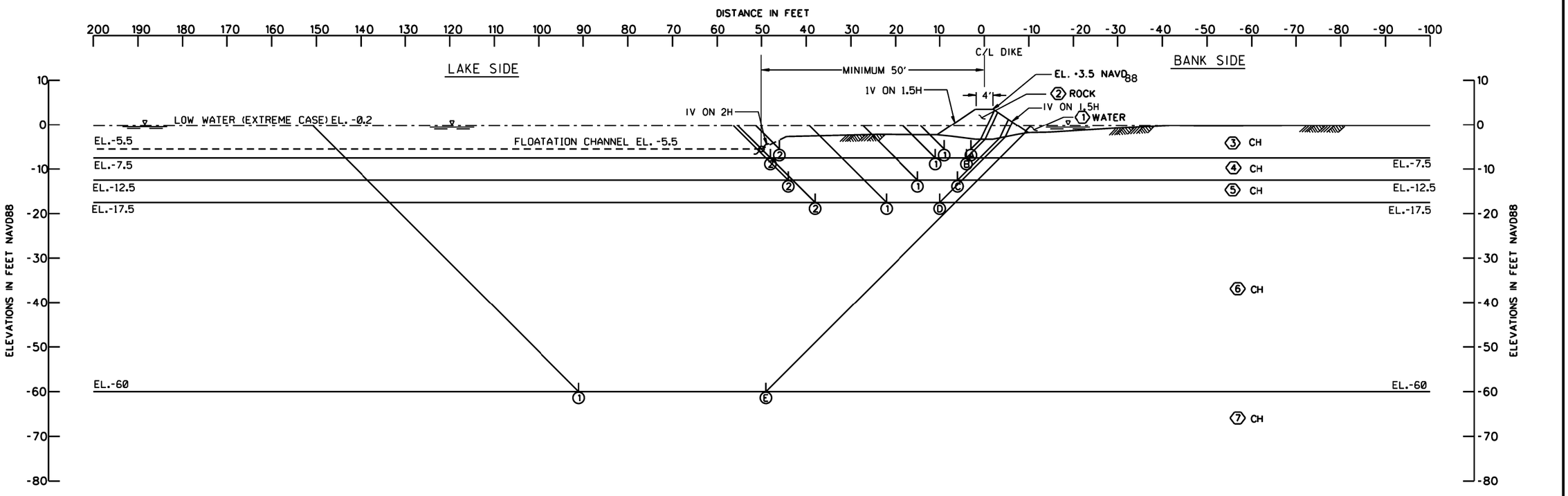
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 3
LINE 86, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R36

PLATE: 27



NOTES

- ○-- STRATUM NUMBER
- ○-- WEDGE NUMBER
- ⌀-- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 17 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE NO.	ASSUMED FAILURE SURFACE ELEV.	RESISTING FORCES R_A	RESISTING FORCES R_B	RESISTING FORCES R_P	DRIVING FORCES D_A	DRIVING FORCES $-D_P$	SUMMATION OF FORCES RESISTING	SUMMATION OF FORCES DRIVING	FACTOR OF SAFETY
Ⓐ ①	-5.5	2805	900	958	5198	1111	4663	4087	1.14
Ⓐ ②	-5.5	2805	6450	400	5198	920	9655	4278	2.26
Ⓑ ①	-7.5	3307	1050	1559	7336	2101	5916	5235	1.13
Ⓑ ②	-7.5	3307	6600	600	7336	1760	10507	5576	1.88
Ⓒ ①	-12.5	3854	1350	3076	13240	6455	8280	6785	1.22
Ⓒ ②	-12.5	3854	5700	2100	13240	5836	11654	7404	1.57
Ⓓ ①	-17.5	6038	3000	5498	20754	13257	14536	7497	1.94
Ⓓ ②	-17.5	6038	7000	4600	20754	12717	17638	8037	2.19
Ⓔ ①	-60.0	60928	27300	59850	197137	183956	148078	13181	11.23

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F. VERT. 1	C - UNIT COHESION - P.S.F. CENTER OF STRATUM VERT. 1	C - UNIT COHESION - P.S.F. BOTTOM OF STRATUM VERT. 1	FRICTION ANGLE DEGREES
①	WATER	62	0	0	0
②	ROCK	132	0	0	40
③	CH	95	150	150	0
④	CH	97	150	150	0
⑤	CH	103	250	250	0
⑥	CH	119	650	650	0
⑦	CH	119	650	650	0

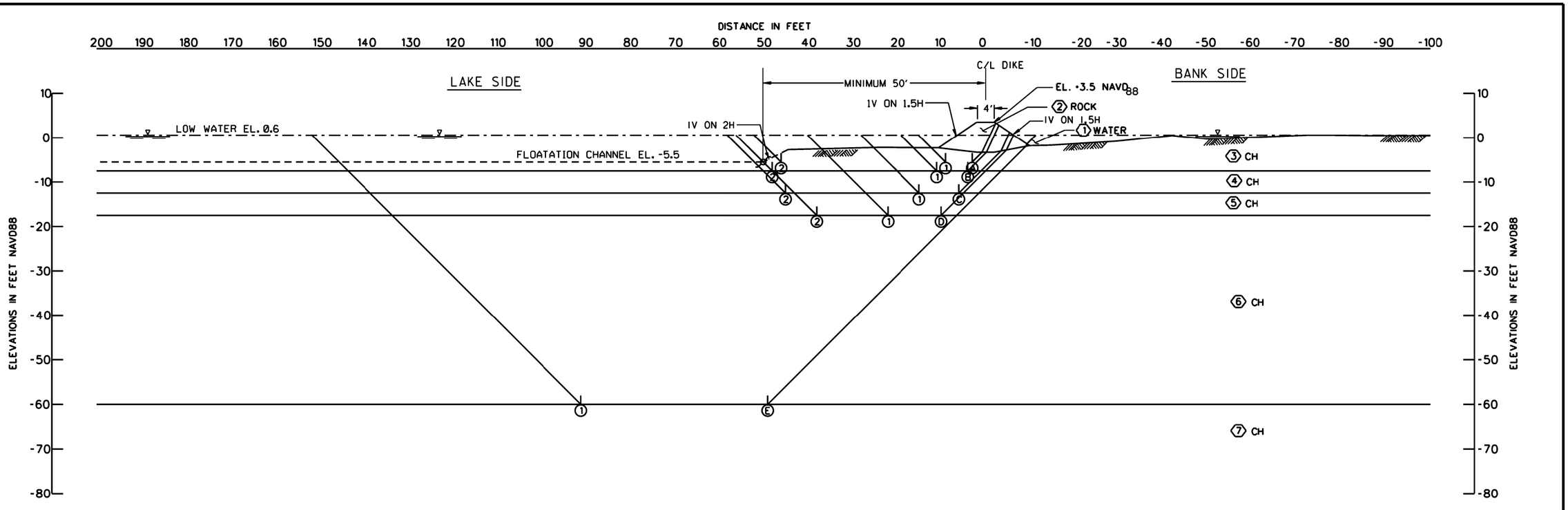
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 4
LINE 63, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R42

PLATE: 28



GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS.
SEE PLATES 17 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-5.5	2668	900	958	5198	1396	4526	3802	1.19
Ⓐ ②	-5.5	2668	6450	400	5198	1204	9518	3994	2.38
Ⓑ ①	-7.5	3170	1050	1559	7336	2485	5779	4851	1.19
Ⓑ ②	-7.5	3170	6600	600	7336	2145	10370	5191	2.00
Ⓒ ①	-12.5	3728	1350	3076	13240	7089	8154	6151	1.33
Ⓒ ②	-12.5	3728	5850	2100	13240	6381	11678	6859	1.70
Ⓓ ①	-17.5	5922	3000	5498	20909	1414	14420	6768	2.13
Ⓓ ②	-17.5	5922	7000	4600	20909	1360	17522	7308	2.40
Ⓔ ①	-60.0	60928	27300	59850	19945	18696	148078	12490	11.86

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
		VERT. 1	CENTER OF STRATUM VERT. 1	BOTTOM OF STRATUM VERT. 1	DEGREES
⟨1⟩	WATER	62	0	0	0
⟨2⟩	ROCK	132	0	0	40
⟨3⟩	CH	95	150	150	0
⟨4⟩	CH	97	150	150	0
⟨5⟩	CH	103	250	250	0
⟨6⟩	CH	119	650	650	0
⟨7⟩	CH	119	650	650	0

NOTES

⟨⟩ -- STRATUM NUMBER
○ -- WEDGE NUMBER
ᔕ -- CROSSOVER POINT
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \frac{R_A + R_B + R_P}{D_A - D_P}$

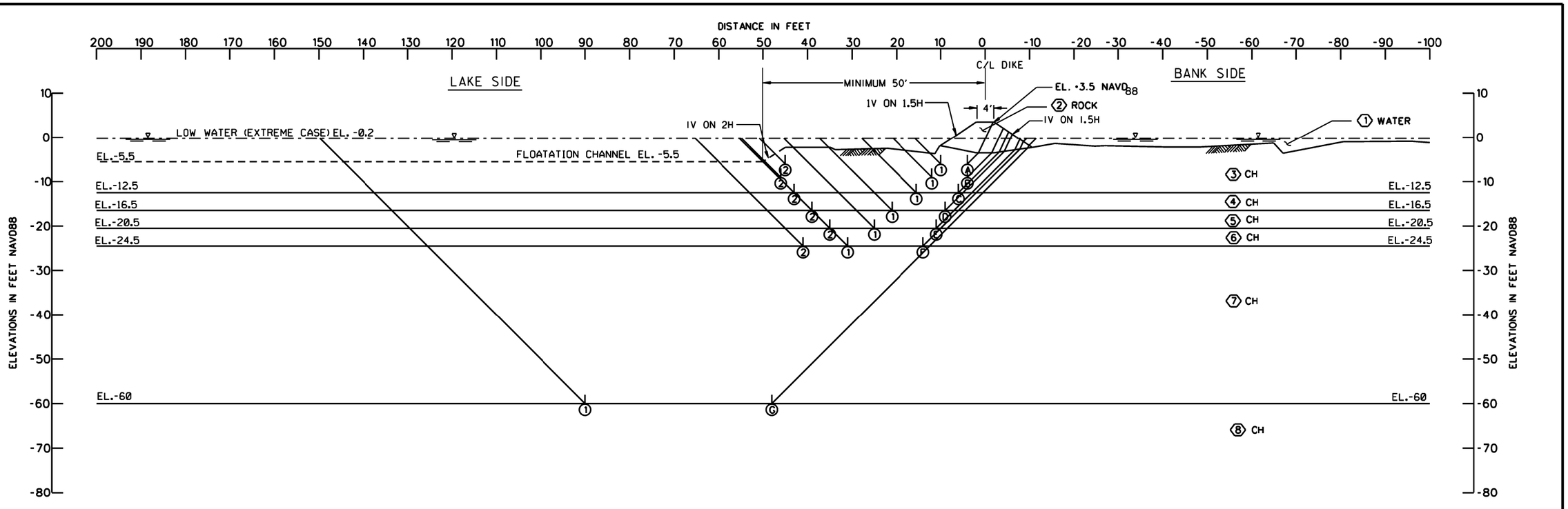
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 4
LINE 63, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R46

PLATE: 29



GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS.
SEE PLATES 18 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-6.0	3013	900	735	5636	117	4648	4465	1.04
Ⓐ ②	-6.0	3013	6150	676	5636	117	9839	4463	2.20
Ⓑ ①	-9.0	3484	1200	1826	8962	2903	6510	6059	1.07
Ⓑ ②	-9.0	3484	6300	1108	8962	2747	10892	6215	1.75
Ⓒ ①	-12.5	3953	1425	2981	1320	6133	8359	7068	1.18
Ⓒ ②	-12.5	3953	5550	2100	1320	5871	11603	7330	1.58
Ⓓ ①	-16.5	5612	3000	5051	18900	11216	13663	7684	1.78
Ⓓ ②	-16.5	5612	7500	4100	18900	10954	17212	7946	2.17
Ⓔ ①	-20.5	7142	3500	7057	25680	17875	17699	7805	2.27
Ⓔ ②	-20.5	7142	6000	6100	25680	17589	19242	8091	2.38
Ⓕ ①	-24.5	9058	4250	8100	33879	25798	21408	8081	2.65
Ⓕ ②	-24.5	9058	6750	8100	33879	24899	23908	8980	2.66
Ⓖ ①	-60.0	55192	27300	54250	189552	176893	136742	12659	10.80

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
①	WATER	62	0	0	0
②	ROCK	132	0	0	40
③	CH	92	150	150	0
④	CH	101	250	250	0
⑤	CH	93	250	250	0
⑥	CH	109	250	250	0
⑦	CH	119	650	650	0
⑧	CH	119	650	650	0

NOTES

◇ -- STRATUM NUMBER
○ -- WEDGE NUMBER
ᔕ -- CROSSOVER POINT
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \frac{R_A + R_B + R_P}{D_A - D_P}$

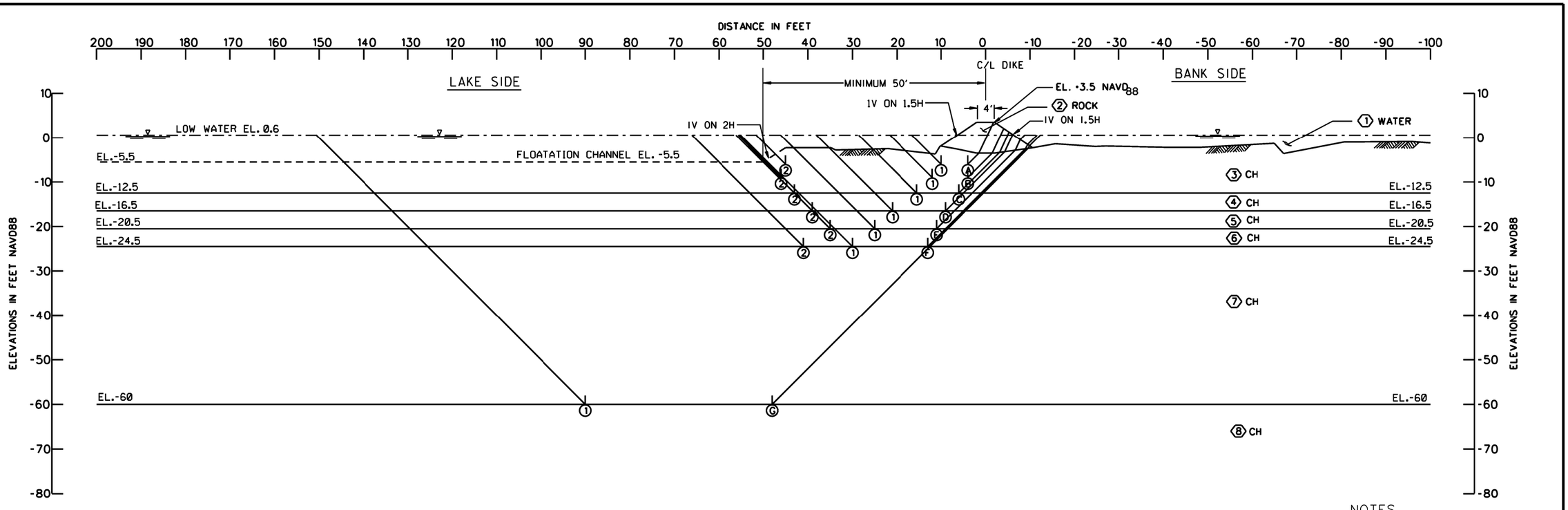
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 5
LINE 23, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE:	PLOT DATE:	CADD FILE:
DRAWN BY: A.G.	AS SHOWN	MAR 2004	FILE NO.
CHECKED BY: A.G.	DATE:		

INPUT DATA FILENAME: R52

PLATE: 30



GENERAL NOTES

CLASSIFICATION STRATIFICATION
SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS.
SEE PLATES 18 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-6.0	2869	900	735	5636	1480	4504	4156	1.08
Ⓐ ②	-6.0	2869	6150	676	5636	1482	9695	4154	2.33
Ⓑ ①	-9.0	3339	1200	1826	8962	3362	6365	5600	1.14
Ⓑ ②	-9.0	3339	6300	1108	8962	3206	10747	5756	1.87
Ⓒ ①	-12.5	3815	1425	2981	13202	6767	8221	6435	1.28
Ⓒ ②	-12.5	3815	5550	2100	13202	6505	11465	6697	1.71
Ⓓ ①	-16.5	548	3000	5051	19006	12050	13532	6956	1.95
Ⓓ ②	-16.5	548	7500	4100	19006	11788	1708	7218	2.37
Ⓔ ①	-20.5	7115	3500	7057	26007	18908	17672	7099	2.49
Ⓔ ②	-20.5	7115	6000	6100	26007	18623	19215	7384	2.60
Ⓕ ①	-24.5	9038	4250	8217	34503	27108	21505	7395	2.91
Ⓕ ②	-24.5	9038	7000	8100	34503	26132	24138	8371	2.88
Ⓖ ①	-60.0	55192	27300	54250	191867	179898	136742	11969	11.42

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
◇1	WATER	62	0	0	0
◇2	ROCK	132	0	0	40
◇3	CH	92	150	150	0
◇4	CH	101	250	250	0
◇5	CH	93	250	250	0
◇6	CH	109	250	250	0
◇7	CH	119	650	650	0
◇8	CH	119	650	650	0

NOTES

◇ -- STRATUM NUMBER
○ -- WEDGE NUMBER
ℊ -- CROSSOVER POINT
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

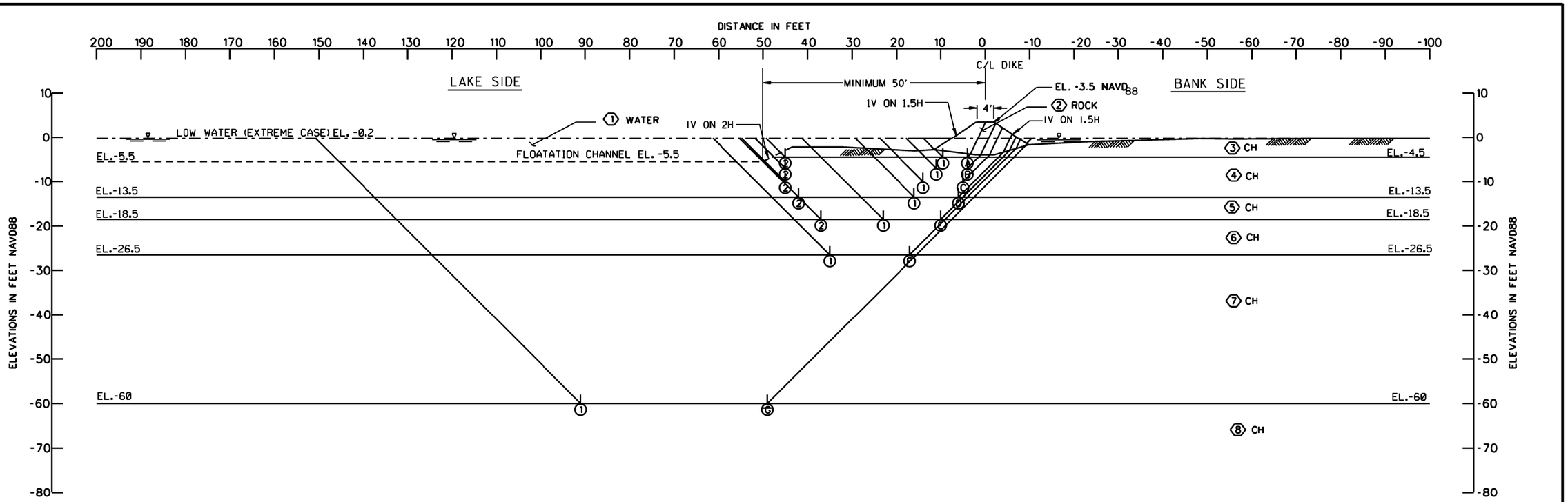
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 5
LINE 23, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: B.P.B.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004
DRAWN BY: A.C.		CADD FILE:
CHECKED BY: B.P.B.	DATE:	FILE NO.

INPUT DATA FILENAME: R56

PLATE: 31



GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 19 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2520	825	488	3940	703	3833	3237	1.18
Ⓐ ②	-4.5	2520	6150	299	3940	590	8969	3350	2.68
Ⓑ ①	-7.0	3438	1050	1195	6832	1596	5683	5236	1.09
Ⓑ ②	-7.0	3438	6150	799	6832	1536	10387	5296	1.96
Ⓒ ①	-10.0	4001	1350	2165	10214	3434	7516	6780	1.11
Ⓒ ②	-10.0	4001	6000	1400	10214	3283	11401	6931	1.65
Ⓓ ①	-13.5	3966	1500	3304	14528	6937	8770	7591	1.16
Ⓓ ②	-13.5	3966	5400	2400	14528	6744	11766	7784	1.51
Ⓔ ①	-18.5	5638	2600	5388	22023	13724	13626	8299	1.64
Ⓔ ②	-18.5	5638	5400	4400	22023	13462	15438	8561	1.80
Ⓕ ①	-26.5	8655	3600	7600	37912	28964	19855	8948	2.22
Ⓖ ①	-60.0	52233	27300	51150	185183	173328	130683	11855	11.02

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
◇1	WATER	62	0	0	0
◇2	ROCK	132	0	0	40
◇3	CH	80	150	150	0
◇4	CH	90	150	150	0
◇5	CH	90	200	200	0
◇6	CH	105	200	200	0
◇7	CH	119	650	650	0
◇8	CH	119	650	650	0

NOTES

- ◯ -- STRATUM NUMBER
- ◯ -- WEDGE NUMBER
- ◯ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

$$\text{FACTOR OF SAFETY} = \frac{R_A + R_B + R_P}{D_A - D_P}$$

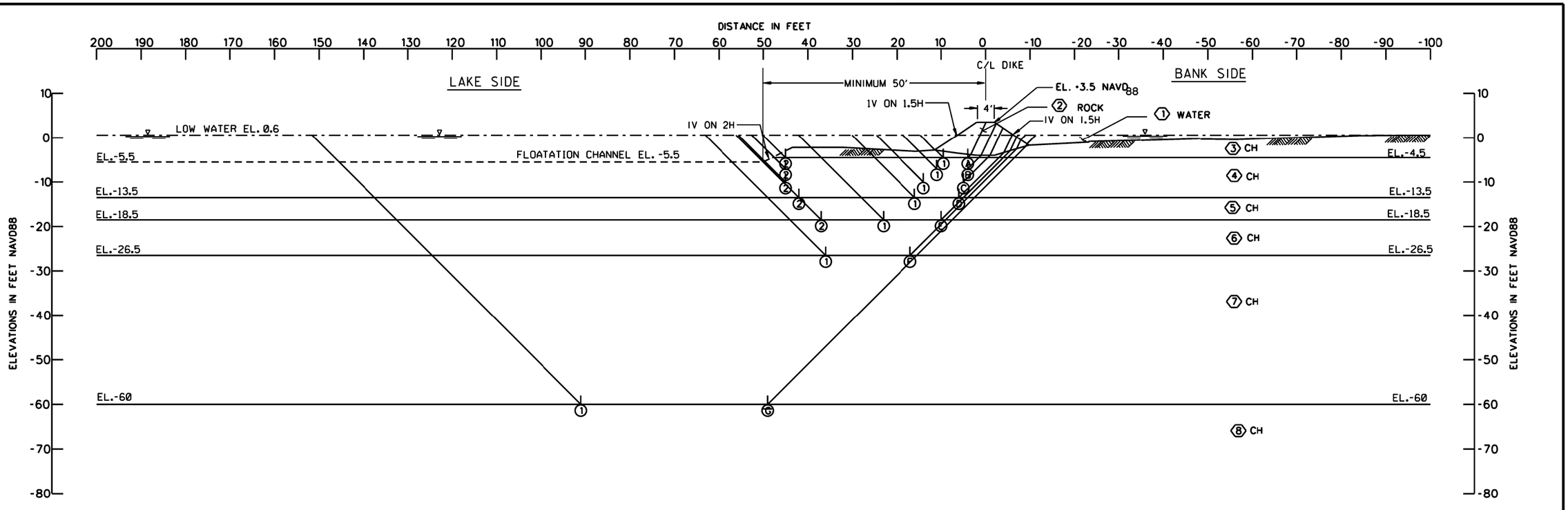
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 6
LINE 7, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R62

PLATE: 32



GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 19 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2362	825	488	3940	938	3675	3002	1.22
Ⓐ ②	-4.5	2362	6150	299	3940	825	881	3115	2.83
Ⓑ ①	-7.0	3273	1050	1195	6833	1955	5518	4878	1.13
Ⓑ ②	-7.0	3273	6150	799	6833	1896	10222	4937	2.07
Ⓒ ①	-10.0	3836	1350	2165	10214	3943	7351	6271	1.17
Ⓒ ②	-10.0	3836	6000	1400	10214	3793	11236	6421	1.75
Ⓓ ①	-13.5	3826	1500	3304	14529	7621	8630	6908	1.25
Ⓓ ②	-13.5	3826	5400	2400	14529	7428	11626	7101	1.64
Ⓔ ①	-18.5	5534	2600	5388	22204	14657	13522	7547	1.79
Ⓔ ②	-18.5	5534	5400	4400	22204	14396	15334	7808	1.96
Ⓕ ①	-26.5	8642	3800	7600	38547	30229	20042	8318	2.41
Ⓖ ①	-60.0	52233	27300	51150	187498	176333	130683	11165	11.70

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
⟨1⟩	WATER	62	0	0	0
⟨2⟩	ROCK	132	0	0	40
⟨3⟩	CH	80	150	150	0
⟨4⟩	CH	90	150	150	0
⟨5⟩	CH	90	200	200	0
⟨6⟩	CH	105	200	200	0
⟨7⟩	CH	119	650	650	0
⟨8⟩	CH	119	650	650	0

NOTES

⟨⟩ -- STRATUM NUMBER
○ -- WEDGE NUMBER
ᔕ -- CROSSOVER POINT
ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY = $\dfrac{R_A + R_B + R_P}{D_A - D_P}$

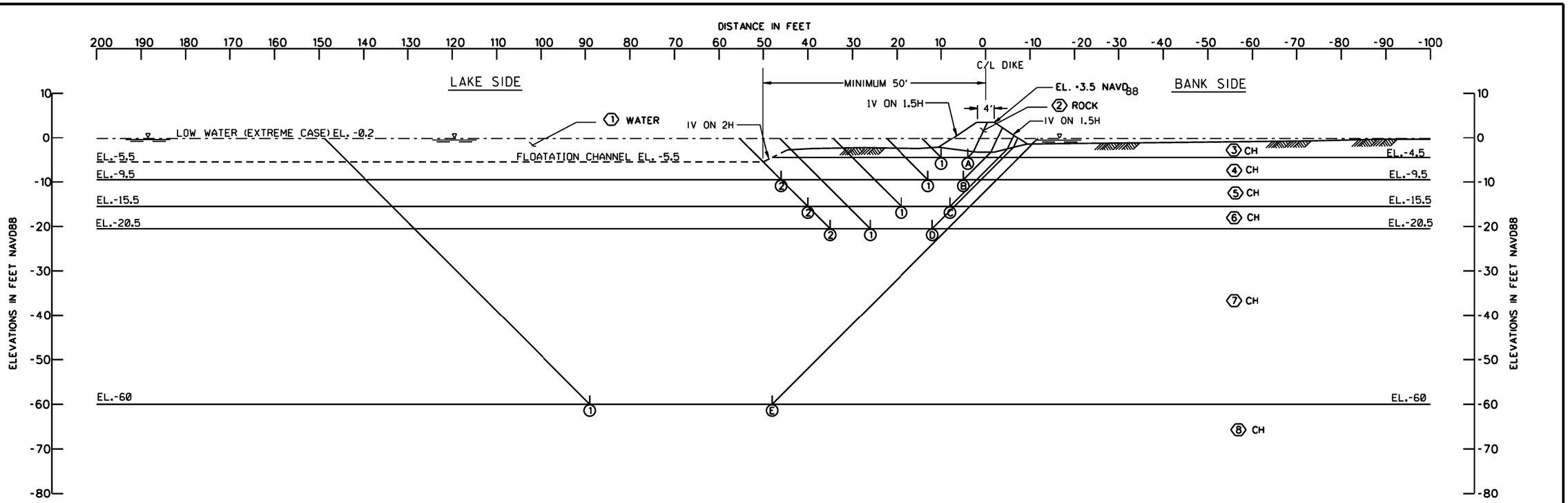
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 6
LINE 7, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004
DRAWN BY: A.G.		CADD FILE:
CHECKED BY: B.P.B.	DATE:	FILE NO.

INPUT DATA FILENAME: R66

PLATE: 33



NOTES

- ⬡ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ∽ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \dfrac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 20 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	245	900	653	3969	630	4004	3339	1.20
Ⓑ ①	-9.5	4196	1600	2624	9469	3285	8420	6184	1.36
Ⓑ ②	-9.5	4196	8200	1600	9469	3041	13996	6428	2.18
Ⓒ ①	-15.5	5508	2200	5042	17027	9605	12750	7422	1.72
Ⓒ ②	-15.5	5508	6400	4000	17027	9303	15908	7724	2.06
Ⓓ ①	-20.5	7306	2800	6922	25126	17446	17028	7680	2.22
Ⓓ ②	-20.5	7306	4600	6000	25126	17162	17906	7964	2.25
Ⓔ ①	-60.0	58664	26650	57350	189471	178074	142664	11397	12.52

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
⬡1	WATER	62	0	0	0
⬡2	ROCK	132	0	0	40
⬡3	CH	80	150	150	0
⬡4	CH	92	200	200	0
⬡5	CH	95	200	200	0
⬡6	CH	95	200	200	0
⬡7	CH	119	650	650	0
⬡8	CH	119	650	650	0

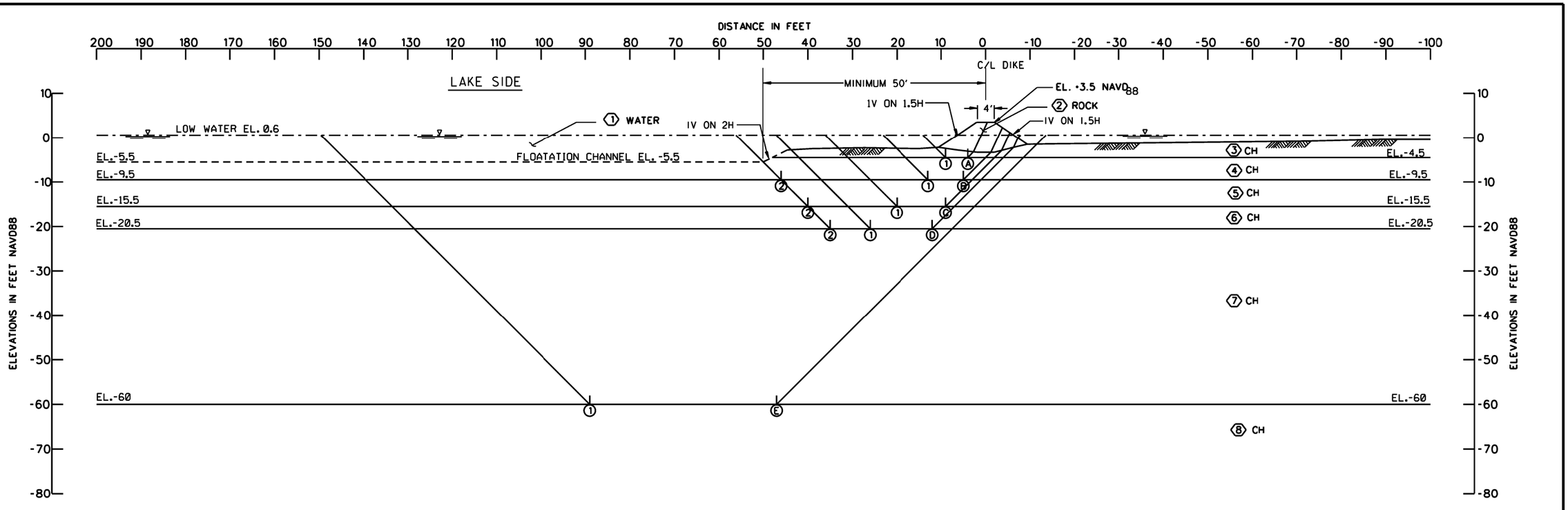
CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 7
LINE 2, EXTREME LOW WATER EL. -0.2
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.C.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.C.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R72

PLATE: 34



NOTES

- ◇ -- STRATUM NUMBER
- ○ -- WEDGE NUMBER
- ∫ -- CROSSOVER POINT
- ϕ -- ANGLE OF INTERNAL FRICTION, DEGREES
- C -- UNIT COHESION, P.S.F.
- ▽ -- STATIC WATER SURFACE
- D -- HORIZONTAL DRIVING FORCE IN POUNDS
- R -- HORIZONTAL RESISTING FORCE IN POUNDS
- A -- AS A SUBSCRIPT,REFERS TO ACTIVE WEDGE
- B -- AS A SUBSCRIPT REFERS TO CENTRAL BLOCK
- P -- AS A SUBSCRIPT REFERS TO PASSIVE WEDGE

FACTOR OF SAFETY $= \frac{R_A + R_B + R_P}{D_A - D_P}$

GENERAL NOTES

CLASSIFICATION STRATIFICATION SHEAR STRENGTHS AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE GENERAL AND UNDISTURBED BORINGS. SEE PLATES 20 AND 21 FOR DESIGN PARAMETERS.

ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	-4.5	2318	750	672	3969	924	3740	3045	1.23
Ⓑ ①	-9.5	4059	1600	2624	9469	3769	8283	5700	1.45
Ⓑ ②	-9.5	4059	8200	1600	9469	3526	13859	5943	2.33
Ⓒ ①	-15.5	5701	2200	5038	1716	10390	12939	6771	1.91
Ⓒ ②	-15.5	5701	6200	4000	1716	10086	1590	7075	2.25
Ⓓ ①	-20.5	7252	2800	6922	25436	18479	16974	6957	2.44
Ⓓ ②	-20.5	7252	4600	6000	25436	18196	17852	7240	2.47
Ⓔ ①	-60.0	58666	27300	57350	191838	181079	143316	10759	13.32

STRATUM NO.	SOIL TYPE	TOTAL UNIT WEIGHT P.C.F.	C - UNIT COHESION - P.S.F.		FRICTION ANGLE
			CENTER OF STRATUM	BOTTOM OF STRATUM	
		VERT. 1	VERT. 1	VERT. 1	DEGREES
①	WATER	62	0	0	0
②	ROCK	132	0	0	40
③	CH	80	150	150	0
④	CH	92	200	200	0
⑤	CH	95	200	200	0
⑥	CH	95	200	200	0
⑦	CH	119	650	650	0
⑧	CH	119	650	650	0

CWPPRA, SOUTH WHITE LAKE
SHORELINE PROTECTION PROJECT
REACH 7
LINE 2, LOW WATER EL. 0.6
DIKE STABILITY ANALYSIS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: A.G.	PLOT SCALE: AS SHOWN	PLOT DATE: MAR 2004	CADD FILE:
DRAWN BY: A.G.			FILE NO.
CHECKED BY: B.P.B.	DATE:		

INPUT DATA FILENAME: R76

PLATE: 35

UNIFIED SOIL CLASSIFICATION

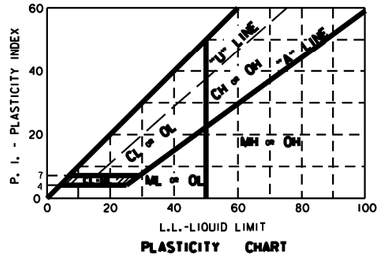
MAJOR DIVISION		TYPE	LETTER SYMBOL	SYMBOL	TYPICAL NAMES
COARSE - GRAINED SOILS (More than half of material is larger than No. 200 sieve size.)	GRAVELS (More than half of coarse fraction is larger than No. 4 sieve size.)		GW		GRAVEL, Well Graded, gravel-sand mixtures, little or no fines
			GP		GRAVEL, Poorly Graded, gravel-sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM		SILTY GRAVEL, gravel-sand-silt mixtures
			GC		CLAYEY GRAVEL, gravel-sand-clay mixtures
	SANDS (More than half of coarse fraction is smaller than No. 4 sieve size.)	CLEAN SAND (Little or No Fines)	SW		SAND, Well-Graded, gravelly sands
			SP		SAND, Poorly-Graded, gravelly sands
		SANDS WITH FINES (Appreciable Amount of Fines)	SM		SILTY SAND, sand-silt mixtures
			SC		CLAYEY SAND, sand-clay mixtures
FINE - GRAINED SOILS (More than half the material is smaller than No. 200 sieve size.)		SILTS AND CLAYS (Liquid Limit < 50)	ML		SILT & very fine sand, silty or clayey fine sand or clayey silt with slight plasticity
			CL		LEAN CLAY, Sandy Clay, Silty Clay, of low to medium plasticity
			OL		ORGANIC SILTS, and organic silty clays of low plasticity
		SILTS AND CLAYS (Liquid Limit > 50)	MH		SILT, fine sandy or silty soil with high plasticity
			CH		FAT CLAY, inorganic clay of high plasticity
			OH		ORGANIC CLAYS of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		PEAT, and other highly organic soil
WOOD			Wd		WOOD
SHELLS			Sl		SHELLS
NO SAMPLE			NS		No Sample Retrieved

NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols.

DESCRIPTIVE SYMBOLS

COLOR	
COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	Gr
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH-GRAY	brGr
GRAYISH-BROWN	gyBr
GREENISH-GRAY	gnGr
GRAYISH-GREEN	gyGn
GREEN	Gn
BLUE	Bl
BLUE-GREEN	BlGn
WHITE	Wh
MOTTLED	Mot

CONSISTENCY FOR COHESIVE SOILS		
CONSISTENCY	COHESION IN LBS./SQ.FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250-500	So
MEDIUM	500-1000	M
STIFF	1000-2000	St
VERY STIFF	2000-4000	vSt
HARD	> 4000	H



PLASTICITY CHART

For classification of fine-grained soils in accordance with ASTM D 2487

MODIFICATIONS	
MODIFICATION	SYMBOL
Traces	Tr
Fine	F
Medium	M
Coarse	C
Concretions	cc
Rootlets	rt
Lignite fragments	lg
Shale fragments	sh
Sandstone fragments	sds
Shell fragments	slf
Organic matter	O
Clay strata or lenses	CS
Silt strata or lenses	SIS
Sand strata or lenses	SS
Sandy	S
Gravelly	G
Boulders	B
Slickensides	SL
Wood	Wd
Oxidized	Ox

NOTES:

FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}"

Are natural water contents in percent dry weight

When underlined denotes D_{10} size in mm*

FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"

Are liquid and plastic limits, respectively

SYMBOLS TO LEFT OF BORING

▽	Ground-water surface and date observed
C	Denotes location of consolidation test**
S	Denotes location of consolidated-drained direct shear test**
R	Denotes location of consolidated-undrained triaxial compression test**
U	Denotes location of unconsolidated-undrained triaxial compression test**
T	Denotes location of sample subjected to consolidation test and each of the above three types of shear test**
FW	Denotes free water encountered in boring or sample

FIGURES TO RIGHT OF BORING

Are values of cohesion in lbs./sq.ft. from unconfined compression tests

In parenthesis are driving resistances in blows per foot determined with a standard split spoon sampler (1 3/8" I.D., 2" O.D.) and a 140 lb. driving hammer with a 30" drop

Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample

Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remolded to the estimated natural void ratio

*The D_{10} size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than D_{10}.

**Results of these tests are available for inspection in the U.S. Army Engineer District Office, if these symbols appear beside the boring logs on the drawings.

Safety is a Part of Your Contract

TYPICAL NOTES:

1. While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of the contract clause entitled "Differing Site Conditions".
2. Ground-water elevations shown on the boring logs represent ground-water surfaces encountered in such borings on the dates shown. Absence of water surface data on certain borings indicates that no ground-water data are available from the boring but does not necessarily mean that ground-water will not be encountered at the locations or within the vertical reaches of such borings.
3. Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression tests are shown.
4. Unless otherwise noted:
   a. Undisturbed borings, indicated by the letter "U", are taken with a 5" I.D. Piston Type Sampler.
   b. General type borings are taken with a 1 7/8" I.D. Tube Sampler and/or a 1 3/8" I.D. Split Spoon Sampler.

REVISED 25 JUNE 92

SOIL BORING LEGEND

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: VOJKOVICH	DATE: APRIL 1993	CADD FILE: BORLEGA1.DGN
DRAWN BY: WOODS	PLOT DATE: 30 MAR 93	FILE NO. H-2-30962
CHECKED BY: RICHARDSON	SCALE: 20:1	

PLATE 36