Appendix B. Slope Stability Analysis

Stability Analyses

Stability analyses were performed on eight cross sections of the proposed Mid-Barataria Sediment Diversion (MBSD) to assess the potential for stability concerns or problems along the channel alignment from the inlet system to the western end of the conveyance channel. Stability analyses were performed using the computer program SLOPE/W, part of the geotechnical analysis software package GeoStudio 2012, developed by GEO-SLOPE International, Ltd. SLOPE/W is a two-dimensional limit equilibrium stability analysis software program that permits slope stability calculation using various limit equilibrium methods. The Spencer (1967) method was selected for all slope stability analyses because it is a rigorous formulation that satisfies both moment equilibrium and force equilibrium.

Software integration features built into GeoStudio allow the user to import pore water pressure conditions calculated using SEEP/W into SLOPE/W. The seepage results discussed herein act as "parent" analyses for subsequent slope stability analyses. Slope-stability analyses, sometimes referred to as "child" analyses, are then dependent on the results of the parent seepage analysis. This parent/child coupling allows for identifying seepage-induced stability issues, examining the sensitivity of slope stability to selection of seepage parameters, and evaluating the effect of improvements such as seepage/stability berms or cutoff walls.

Seepage analyses were performed for the sections shown in Table B-1.

Table B-1. Cross sections for stability and seepage analysis

Cross section designation and station location	Rationale for selection	Exploration(s) used to develop stratigraphy and soil properties
18+00 to 45+00	Section along project centerline across MR&T Levee, inlet system, and temporary setback levee at approximate Station 42+00; point bar deposits	B-3C, IS-8A, NL-9A
35+00	Section transverse to the project centerline across the inlet system and temporary excavation setback levees, within the point bar deposits	IS-8A, NL-9A
55+00	Section at conveyance channel and guide levee; abandoned distributary channel deposits	NL-8A
67+00	Section at conveyance channel and guide levee beneath future LA 23 bridge; natural levee deposits	NL-7C, NL-10C
82+00	Section at conveyance channel and guide levee; abandoned distributary channel deposits	NL-6A
90+00	Section at conveyance channel and guide levee; at transition from natural levee deposits to marsh deposits	NL-5C, NL-11C

Cross section designation and station location	Rationale for selection	Exploration(s) used to develop stratigraphy and soil properties
110+00	Section at conveyance channel and guide levee; marsh deposits	NL-3A, NL-3C
130+00	Section at back structure; marsh deposits	NL-1C

Notes: LA 23 = Belle Chasse Highway; MR&T = Mississippi River and Tributary

Stability Parameter Selection

Two sets of stability parameters were developed for each cross section and applied using distinct material models. The first set consisted of fully drained strength parameters for use in steady-state stability analyses. The second set consisted of a combination of drained and undrained parameters depending on soil type (that is, undrained for non-free-draining soils and drained for free-draining soils) for use in rapid-flood stability analyses. Stability parameter selection was performed based on a review of the exploration logs associated with each cross section and available lab test results.

Drained strength parameters for steady-state stability analyses were selected primarily based on the Unified Soil Classification System (USCS). No site-specific drained strength testing was available to directly estimate drained strength parameters; therefore, drained strength parameters for analysis were conservatively assumed based primarily on USCS soil classifications. The U.S. Army Corps of Engineers (USACE) New Orleans District Engineering Division developed the *Hurricane and Storm Damage Risk Reduction System Design Guidelines*, June 2012 Revision, hereafter referred to as USACE Hurricane Guidelines. Chapter 3 of the USACE Hurricane Guidelines prescribes conservative drained strength values for various soil types for use in steady-state stability analyses when site-specific data are unavailable. Effective cohesion was conservatively selected as zero for all soil types under drained conditions. Effective friction angles were selected from a range of 23 degrees for clay to 30 degrees for clean sand.

Undrained strength parameters for rapid-flood stability analyses were selected based on a combination of prescribed values and site-specific information. Sands were considered free-draining materials; therefore, drained parameters were used for rapid-flood stability analyses. Undrained strength parameters of silts were selected using the USACE Hurricane Guidelines. Undrained strength parameters in clays and clay/silt mixtures for rapid flood stability were selected based on unconsolidated undrained (UU) triaxial test results, geotechnical index testing, cone penetrometer test (CPT)-based strength correlations, estimated over-consolidation ratios (OCRs), an assumed normally consolidated undrained strength ratio (0.22), and field strength testing (field vane). Undrained strengths within normally consolidated clays were increased assuming an 8-foot-thick aerial preload fill (120 pounds per cubic foot [pcf]) left in place for one year and 50 percent pore pressure dissipation in foundation clays. A total undrained strength increase of up to 106 pounds per square foot (psf) was applied (that is, 8 foot fill × 50% consolidation × 120 pcf × 0.22 = 106 psf).

Undrained strength parameters selected using the above methods were compared for consistency with undrained strength profiles produced by GeoEngineers for each exploration as presented in its *Draft Geotechnical 30% Design Engineering Data Report*, dated November 27, 2013. Undrained strengths used in the rapid-flood stability analyses do not match the GeoEngineers strength lines exactly, but were found to be similar within the upper soil layers that are expected to most greatly influence the critical slip circles in the stability analyses. Figures presented for each section in Appendix A show side-by-side comparisons of GeoEngineers' strength lines and undrained strength lines used in the analyses.

Stability Analysis Cases and Boundary Conditions

The levee and channel configuration analyzed at each cross section location corresponds to that shown in the drawings in Volume 1, General Civil Sitework. The levee and channel configurations, as well as that of the landside ditch (or polder), are based on operational requirements and include consideration of iterative slope stability analyses to help establish slope inclinations and the extent of the stability berm.

Stability analyses for the inlet system cross sections focused on the temporary (during construction) condition of the setback levees. Both of the analysis cases described below use steady-state seepage conditions calculated in Seepage Case 2 (flooded excavation), as described in Appendix A. No stability analyses were performed within the excavation because the cofferdam has not yet been included in the excavation model. Therefore, stability analyses of the excavation would not be representative of actual construction conditions. The following stability analysis cases were evaluated at temporary setback levees for the inlet system excavation (Section 18+00 to 45+00 and Section 35+00):

- **Case 1** – Water level in the Mississippi River at elevation +12.25 feet, water level in the inlet system excavation at elevation +12.25 feet, and water level on the nonexcavation side (polder side) of the temporary setback levee at elevation –3.5 feet. This case represents the condition when the river is at flood level, the water level within the inlet system excavation matches that of the river, and the water level on the nonexcavation side of the temporary setback levee is at a relatively low groundwater level (estimated based on piezometer data recorded in piezometers PZ-13 to PZ-15). This case represents the hypothetical condition where there is a breach (such as in the MR&T Levee), causing flooding of the inlet system excavation. Analyses were performed for some time well after flooding has occurred, and assumes steady-state seepage conditions and corresponding drained conditions for soil strength. Analyses were focused on slope surfaces in the temporary setback levee in the direction away from the inlet system excavation. A 65-foot-long stability berm was added on the polder-side of the temporary setback levees so that stability criteria are met.
- **Case 2** – This stability case is subjected to the same flood water levels described above for Case 1. Analyses were performed assuming rapid flood loading conditions and corresponding undrained conditions for soil strength. Analyses were focused on slope surfaces in the temporary setback levee in the direction away from the inlet system excavation. The stability berm on the polder-side of the setback levee (described for Case 1) was included in the analysis.

Stability analyses for the conveyance channel cross sections (Section 55+00 to Section 130+00) were focused on the permanent (long-term) condition of the guide levees and channel. Stability Case 1 uses steady-state seepage conditions from Seepage Case 1. Stability Cases 2 and 3 use steady-state seepage conditions from Seepage Case 2. The seepage cases are presented in this appendix. The following stability analysis cases were evaluated for the conveyance channel cross-sections:

- **Case 1** – Water level in the channel at elevation +10 feet and water level landside of the guide levee taken as corresponding to typical low groundwater level, which ranges from about elevation –3.5 feet at Station 55+00 to elevation –6.8 feet at Station 130+00. This case represents the condition when the channel is operating at its full design capacity coupled with relatively low groundwater levels in the adjacent areas. Analyses were performed assuming steady-state seepage conditions and corresponding drained conditions for soil strength. Analyses were focused on slip surfaces toward the landside direction (toward the ditch). Both global-scale slip surfaces (from about the levee crown to the ditch) and local slip surfaces (from the stability berm toe to the ditch) were analyzed.
- **Case 2** – Water level in the channel at elevation 0 feet; water level landside of the guide levee at elevation +10 feet. This case is approximately the inverse of Case 1 and represents the condition when there is flooding outside of the guide levees (such as may occur if there is a breach in one of the other levees) while water in the channel is at a normal operating level. Analyses were performed assuming steady-state seepage conditions and corresponding drained conditions for soil strength to represent the case where water levels are sustained at flood levels for a relatively long period of time. Both global scale slip surfaces (from about the levee crown to the channel toe) and local slip surfaces (from the stability berm toe to the channel toe) were analyzed.
- **Case 3** – Water level in the channel at elevation 0 feet; water level landside of the guide levee at elevation +10 feet. This case has the same water levels as Case 2 but assumes that the water level landside of the guide levee reaches elevation +10 feet quickly, to represent the rapid-flood loading condition. Analyses were performed using undrained conditions for soil strength, but the phreatic surface within the levee and pore pressures within foundation layers were conservatively modeled using steady-state seepage conditions. Both global scale slip surfaces (from about the levee crown to the channel toe) and local slip surfaces (from the stability berm toe to the channel toe) were analyzed.

The USACE New Orleans District Section 3 Guidance Document served as a reference for developing some of the criteria used for analyses for the MBSD. Based on this document and others, the following target factors of safety (FOS) for stability were adopted for this project:

- **Steady-State Stability – FOS ≥ 1.5**
  - Case 1 for inlet system (Section 18+00 to 45+00 and Section 35+00)
  - Case 1 and 2 for conveyance channel (Section 55+00 to Section 130+00)
- **Rapid Flood Stability – FOS > 1.3**
  - Case 2 for inlet system (Section 18+00 to 45+00 and Section 35+00)
  - Case 3 for conveyance channel (Section 55+00 to Section 130+00)

General Modeling Assumptions

The following discussion outlines some general modeling assumptions that are used for all stability analyses, both steady-state (drained) and rapid-flood (undrained) conditions:

1. All stability analyses are performed using steady-state pore pressures developed from the seepage analyses described in Appendix A. We acknowledge that this may be a conservative assumption for rapid-flood stability analyses; however, we consider the assumption to be appropriate considering the limited amount of subsurface data available at this time.
2. Five-foot-deep tension cracks filled with water were applied to levee embankments and berms. This assumption is adapted from the USACE Engineering Manual that recommends applying 4-foot-deep tension cracks for clayey embankments. An extra 1 foot was added to this recommendation to account for the relatively high plasticity of the on-site clays.
3. Stability model geometry is identical to the seepage model geometry for all sections.
4. The Spencer method was selected for all stability analyses, and slip surfaces were defined using entry and exit ranges. Multiple entry and exit ranges were examined to identify different failure modes for each model. The option in SLOPE/W to optimize the critical slip surface location was not used for the analyses presented herein.

Stability Analysis Results

Results of the stability analyses are presented in the figures within this appendix. For each analysis cross section, summary figures describe soil layering, stability parameters, water level conditions, calculated critical FOS, and section-specific assumptions. Graphical SEEP/W outputs show locations of calculated critical slip surfaces and other pertinent result information. For additional discussion of stability results, refer to Sections 7.1 and 8.1.

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[3]											
					M-C Model Parameters		Current Strength Parameters			Assumed Strength Increase due to Surcharging[2]								
Layer	Top Elevation (ft)[1]	Bottom Elevation (ft)[1]	Soil Type	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface (psf)	Assumed Uniform u_e Dissipation[2]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)
1	16	3	Levee/Berm	120	0	28		600	0									
2	3	-7	CL/CH	90	0	23	0.22	325		960	50%	3	480	756	106	166	325	-33.1
3	-7	-28	CL	90	0	23	0.22	325		960	50%	3	756	1336	166	294	325	-33.1
4	-28	-61	ML/SM/CL Interbedded	110	0	25		200	8	960	50%	3	1336	2906				
5	-61	-91	SM	115	0	28		0	28	960	50%	3	2906	4484				
6	-91	-107	SP/SM	120	0	28		0	28	960	50%	3	4484	5406				
7	-107	-180	CH	110	0	23	0.22			960	50%	3	5406	8881	1189	1954		
8	3	-180	CL	90	0	23	0.22	325		960	50%	3	480	5531	106	1217	325	-33.1
9	3	-132	Soil-Cement Cutoff Wall	120	0	28		100	0	960	50%	3	8881	16657				

Layer	Geo-Studio Material Model Parameters											
	Model[4]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	M-C	0	600									
2	M-C	0	325									
3	M-C	0	325									
4	M-C	8	200									
5	M-C	28	0									
6	M-C	28	0									
7	S = f(depth)	0		1189	10.5	1954						
8	Spatial M-C, Linear Cohesion Function	0					325	3	325	-33.1	1217	-180
9	M-C	0	100									

Notes: 1. Top Elevation and Bottom Elevation for Layers 1 to 7 vary in the model. The elevations noted in the table above correspond to approximate Stations 41+00 to 45+00, which corresponds to the slope stability area of interest (the temporary setback levee at Station 42+00).
2. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
3. Refer to Figure B-1.2 for the strength profile used in rapid flood stability analyses.
4. Explanation of Models: M-C indicates a Mohr-Coulomb model using specified cohesion and friction angle; S=f(depth) indicates that undrained shear strength increases with depth; and Spatial M-C, Linear Cohesion Function indicates that the undrained shear strength profile is fully specified within the layer.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)			Remarks
		Mississippi River	Excavation Area	Setback Polder	
1	Steady-State	12.25	-50	3	Mississippi River WSE at Flood Level; Excavation area WSE at bottom of excavation; Polder WSE at Ground Surface
2	Steady-State	12.25	12.25	-3.5	Mississippi River WSE at Flood Level; Excavation area WSE at Flood Level; Polder WSE from low water observations in PZ-15

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1	2	Steady-State Stability	Drained	Polder-side	1.50	**1.54**	Global	1, 2, 3	Setback levee crown to polder	Berm was sized such that Steady-State stability criteria are met
2	2	Rapid Flood Loading	Undrained	Polder-side	1.30	**1.75**	Global	1, 2, 3, 4	Setback levee crown to polder	

NOTES

1 Excavation Cross-Section from 30% Civil Design geometry and discussions with the project team.
2 Borings IS-8A and NL-9A and CPT B-3C were considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model extends approximately 1100 feet waterside of the MR&T Levee Crown and approximately 600 feet polder-side of the Setback Levee crown.
5 A 300 foot wide clay block is modeled polder-side of the setback levee to simulate the change to more clayey geologic conditions west of the point bar deposits.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.
8 The Soil-Cement Cutoff Wall is 3 feet wide and extends from the top of Layer 2 to the bottom of Layer 6
9 The area of interest for slope stability is the temporary setback levee area (Station 41+00 to 45+00)

NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS
STATION: **41+00 to 45+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

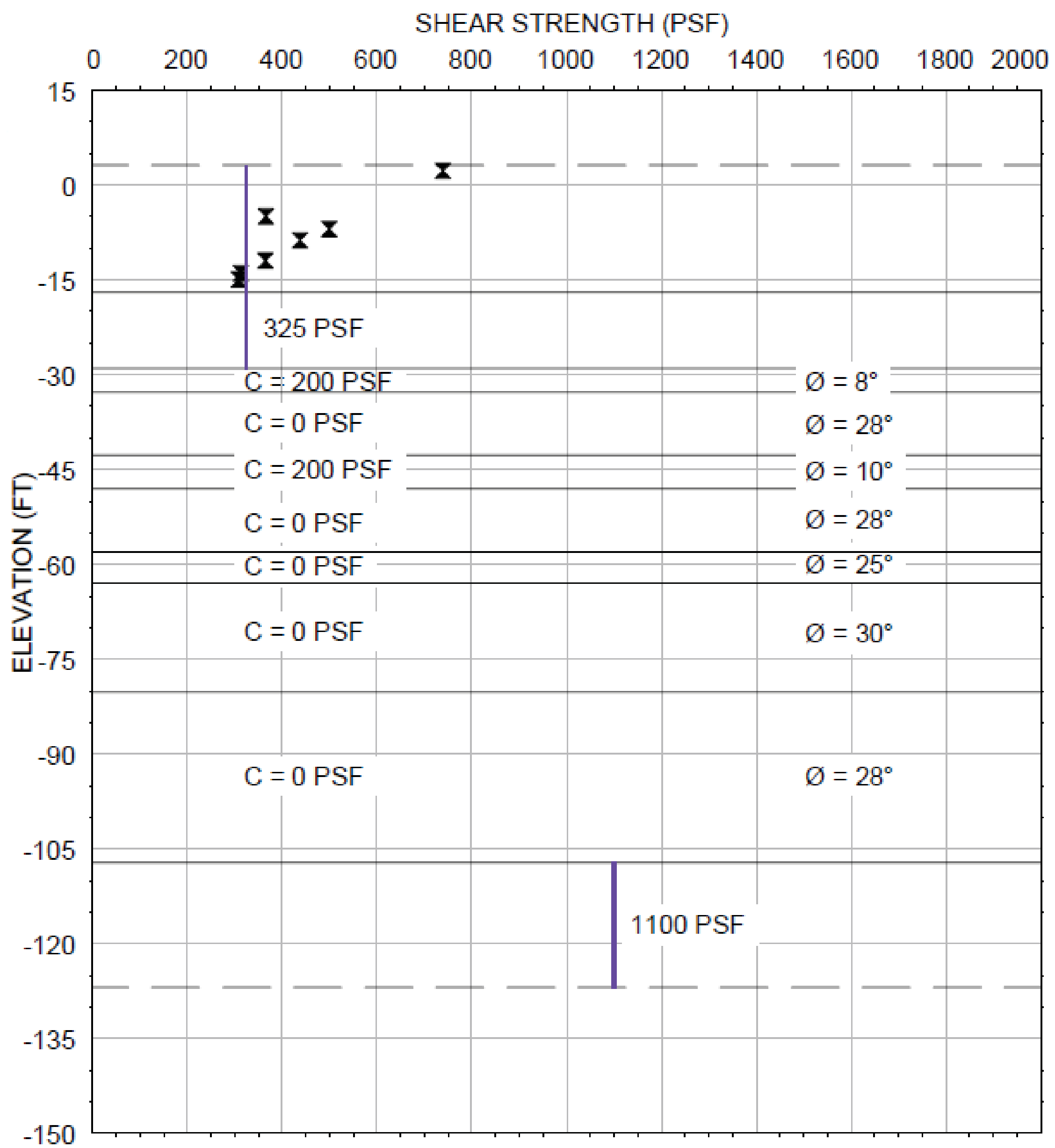
CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

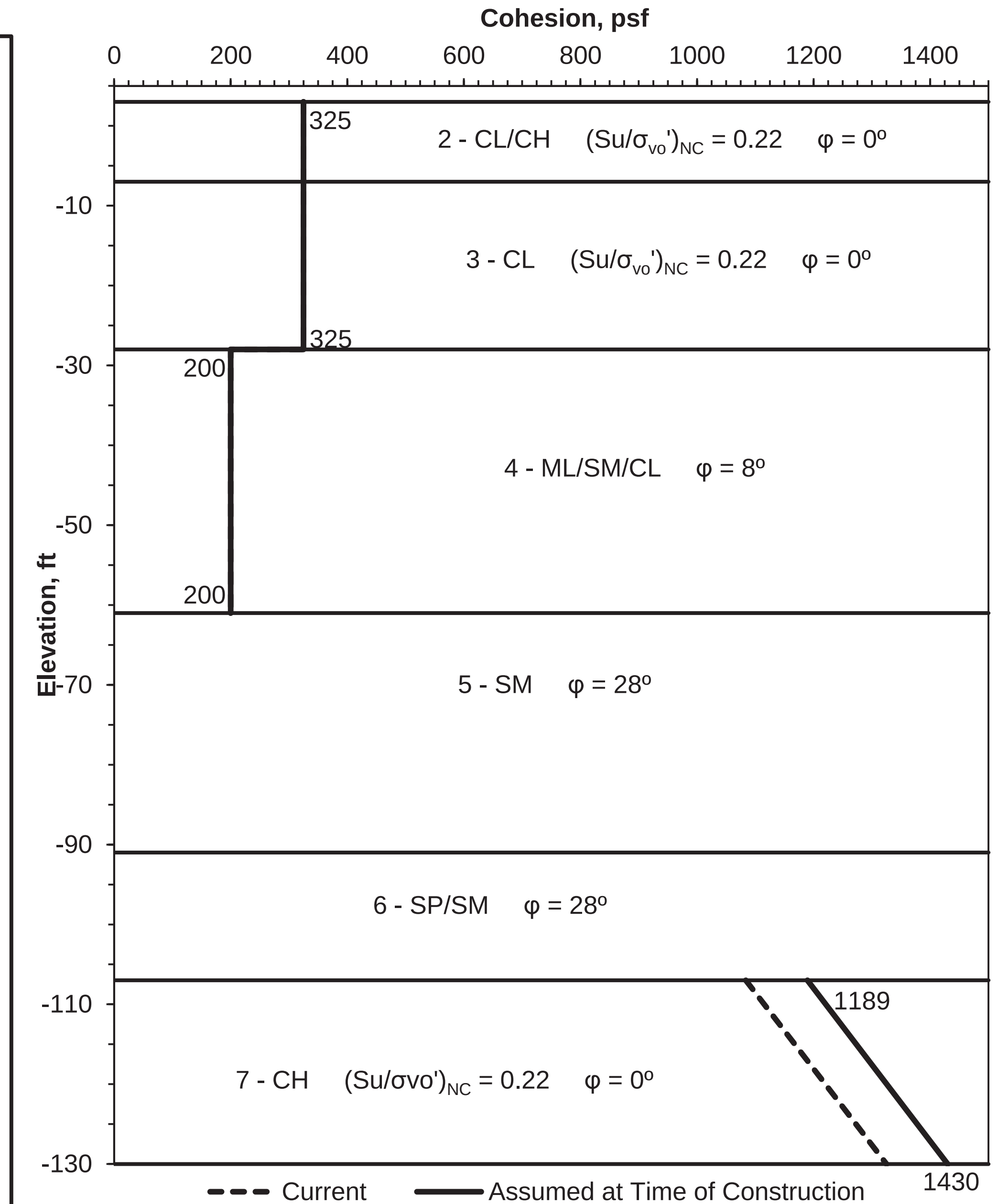
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-1.1



DESIGN CHARTS NL-9A	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2o

Figure above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS
STATION: **41+00 to 45+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

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REV.	DATE	DESCRIPTION	BY

CPRA — COASTAL PROTECTION AND RESTORATION AUTHORITY — STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

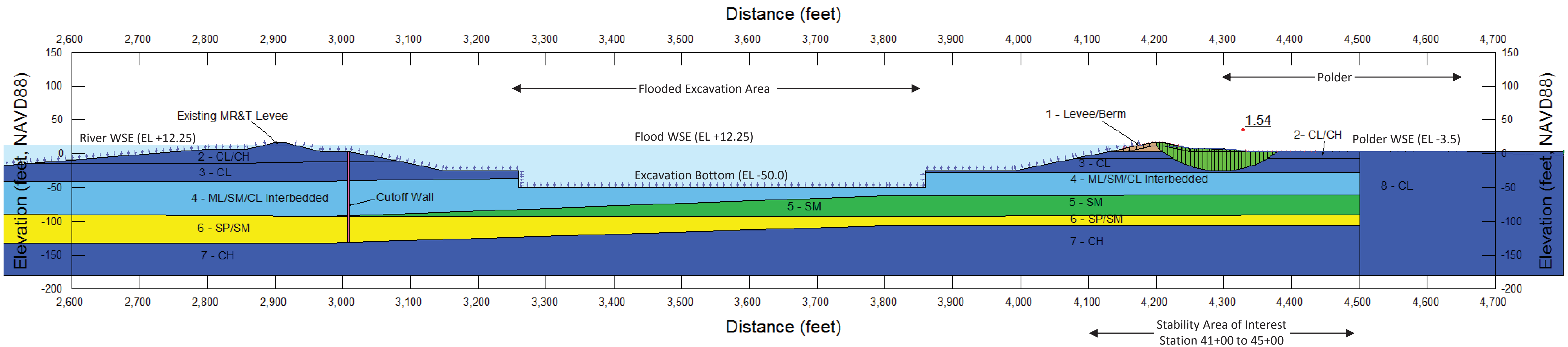
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-1.2

Created By: Crosariol, Victor
Date: 12/2/2013
File Name: 02_MR&T Levee and Excavation.gsz
Analysis: 01 - Flooded Excav w/ cutoff_Stab_Drained

MATERIALS

1 - Levee (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 0 psf Phi': 23 °
3 - CL (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 0 psf Phi': 23 °
4 - ML/SM/CL Interbedded (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
5 - SM (Kv=1.2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
6 - SP/SM (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
7 - CH (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
8 - CL (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 0 psf Phi': 23 °
9 - Soil-Cement Cutoff Wall (Kv=1x10-6 cm/sec, Kv/Kh=1.0) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS

STATION: **41+00 to 45+00**
SEEPAGE CASE: **2**
STABILITY CASE: **1 (Steady-State Stability)**
WSE In River: **+12.25 feet**
WSE In Excavation: **+12.25 feet**
WSE In Polder: **-3.5 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

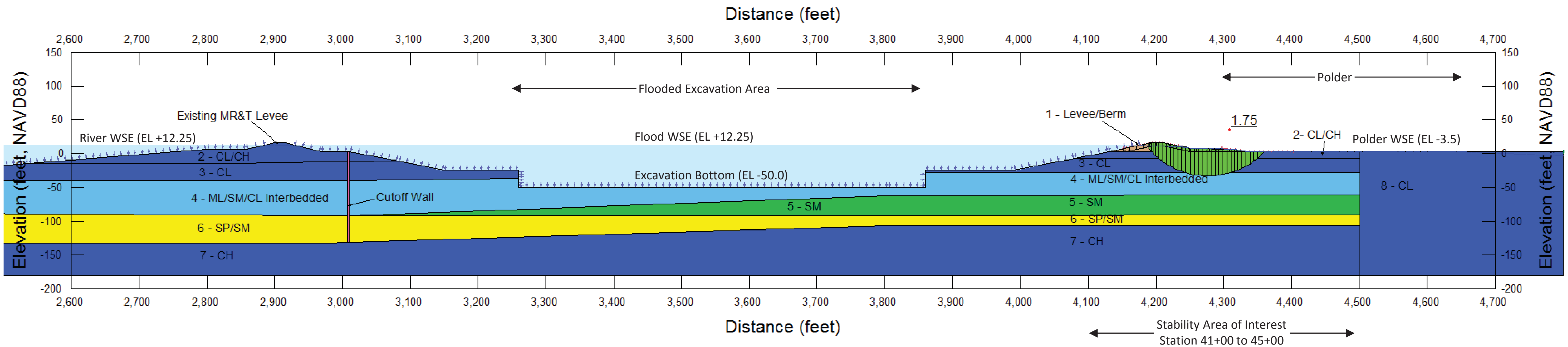
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-1.3

Created By: Crosariol, Victor
Date: 12/4/2013
File Name: 02_MR&T Levee and Excavation.gsz
Analysis: 02 - Flooded Excav w/ cutoff_Stab_Undrained

MATERIALS

RF_1 - Levee (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 325 psf Phi': 0 °
RF_3 - CL (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 325 psf Phi': 0 °
RF_4 - ML/SM/CL Interbedded (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 8 °
RF_5 - SM (Kv=1.2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
RF_6 - SP/SM (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_7 - CH (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 1,189 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,954 psf
RF_8 - CL (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 90 pcf Cohesion Fn: 8 - CL Phi': 0 °
RF_9 - Soil-Cement Cutoff Wall (Kv=1x10-6 cm/sec, Kv/Kh=1.0) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 100 psf Phi': 0 °



NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS

STATION: **41+00 to 45+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2 (Rapid Flood Stability)**
WSE In River: **+12.25 feet**
WSE In Excavation: **+12.25 feet**
WSE In Polder: **-3.5 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-1.4

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]					
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging[1]		
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)
1	16	3	Levee	120	0	28		600	0			
2	3	-8.3	CL/CH	90	0	23	0.22	325		960	50%	3
3	-8.3	-32.5	CL	90	0	23	0.22	325		960	50%	3
4	-32.5	-71	ML/SM/CL Interbedded	110	0	25		200	8	960	50%	3
5	-71	-92	SM	115	0	28		0	28	960	50%	3
6	-92	-114	SP/SM	120	0	28		0	28	960	50%	3
7	-114	-130	CH	110	0	23	0.22			960	50%	3
8	3	-114	Soil-Cement Cutoff Wall	120	0	28		100	0	960	50%	3

Layers	Rapid Loading Stability[2] (cont.)																	
	Assumed Strength Increase due to Surcharging[1]						Geo-Studio Material Model Parameters											
Layer	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1							M-C	0	600									
2	480	792	106	174	325	-33.1	M-C	0	325									
3	792	1460	174	321	325	-33.1	M-C	0	325									
4	1460	3292					M-C	8	200									
5	3292	4397					M-C	28	0									
6	4397	5664					M-C	28	0									
7	5664	6426	1246	1414			S = f(depth)	0		1246	10.5	1414						
8	6426	13165					M-C	0	100									

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-2.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; and *S=f(depth)* indicates that undrained shear strength increases with depth.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)			Remarks
		Mississippi River	Excavation Area	Setback Polder	
1	Steady-State	12.25	-50	3	Mississippi River WSE at Flood Level; Excavation area WSE at bottom of excavation; Polder WSE at Ground Surface
2	Steady-State	12.25	12.25	-3.5	Mississippi River WSE at Flood Level; Excavation area WSE at Flood Level; Polder WSE from low water observations in PZ-15

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1	2	Steady-State Stability	Drained	Polder-side	1.50	**2.47**	Global	1, 2, 3	Setback levee crown to polder	
2	2	Rapid Flood Loading	Undrained	Polder-side	1.30	**1.69**	Global	1, 2, 3	Setback levee crown to polder	

NOTES

1. Excavation Cross-Section at Station 35+00 from 30% Civil Design geometry and discussions with the project team.
2. Borings IS-8A and NL-9A were considered to develop the stratigraphy shown.
3. Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4. Symmetry was used to model only one side of the cross-section with respect to the channel centerline.
5. Model extends 1600 feet landward of approximate Channel centerline.
6. The Spencer analysis method was used to evaluate stability.
7. 5-foot tension cracks filled with water are applied in the embankment.
8. The Soil-Cement Cutoff Wall is 3 feet wide and extends from the top of Layer 2 to the bottom of Layer 6.

NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS
STATIONS: **35+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

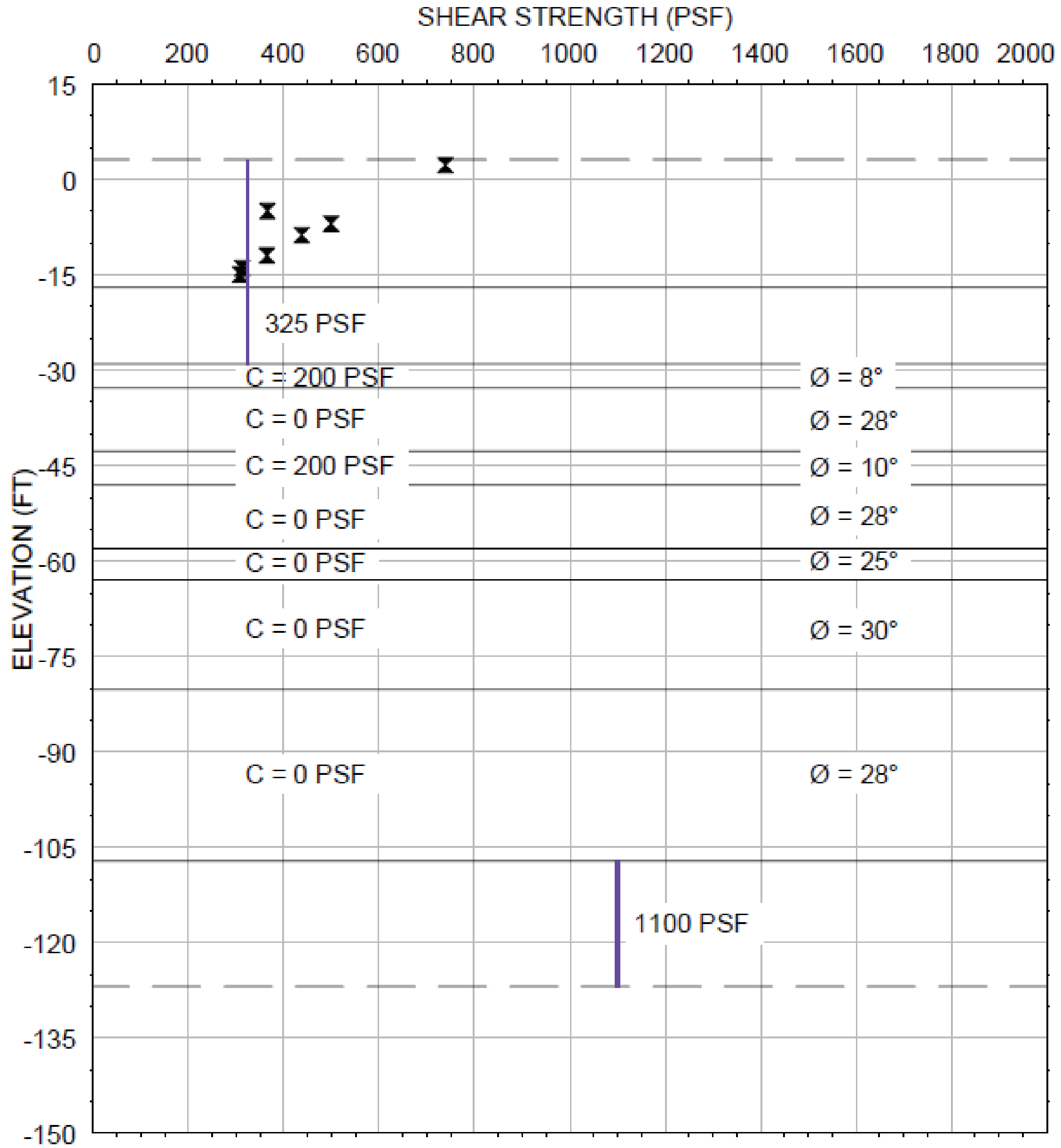
COASTAL PROTECTION AND RESTORATION AUTHORITY — CPRA
STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

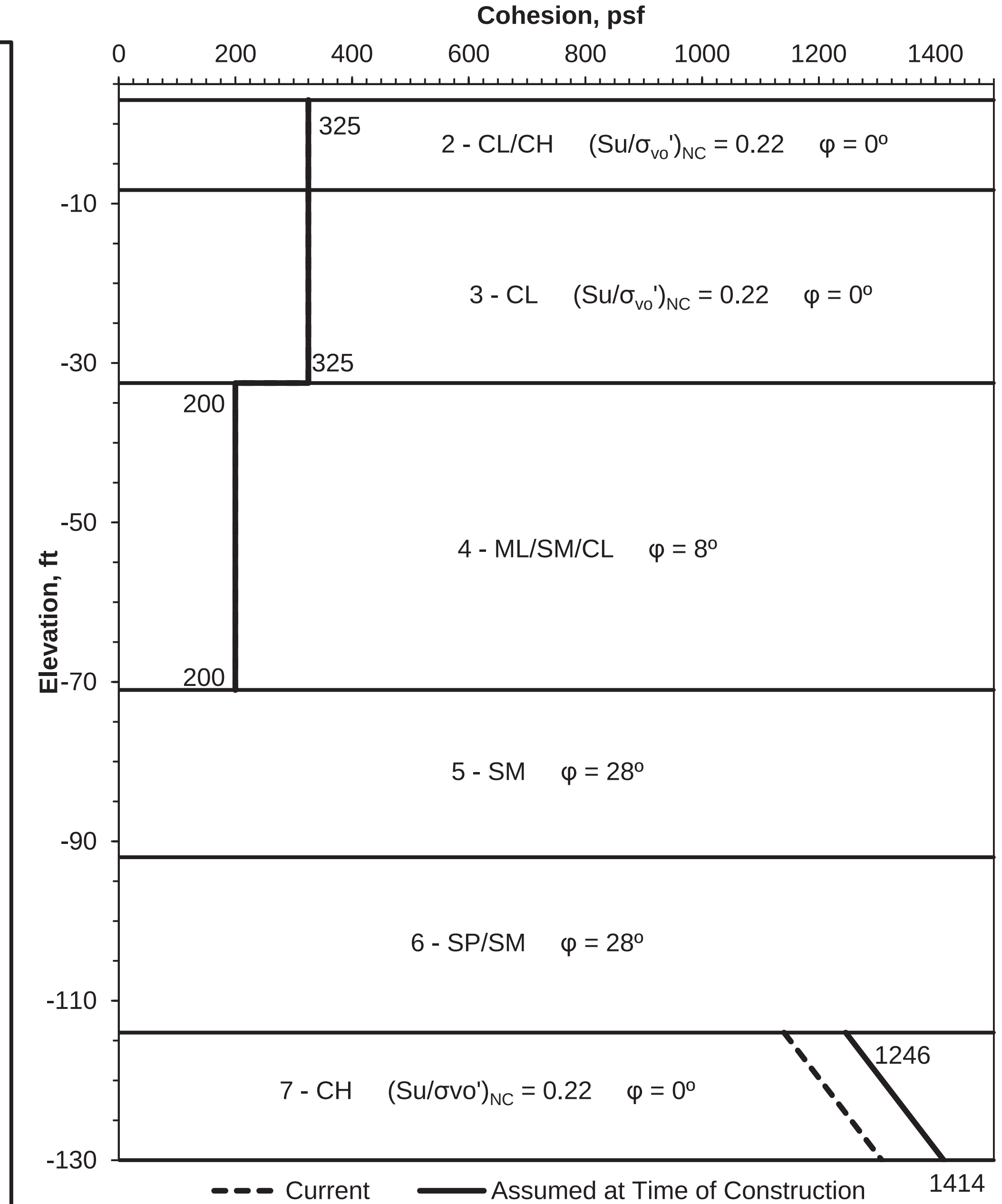
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-2.1



DESIGN CHARTS NL-9A	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2o

LEGEND

- NL-9A
- C/P = 0.22
- DESIGN STRENGTH



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

Figure above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013

INLET EXCAVATION STABILITY ANALYSIS
STATION: **35+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

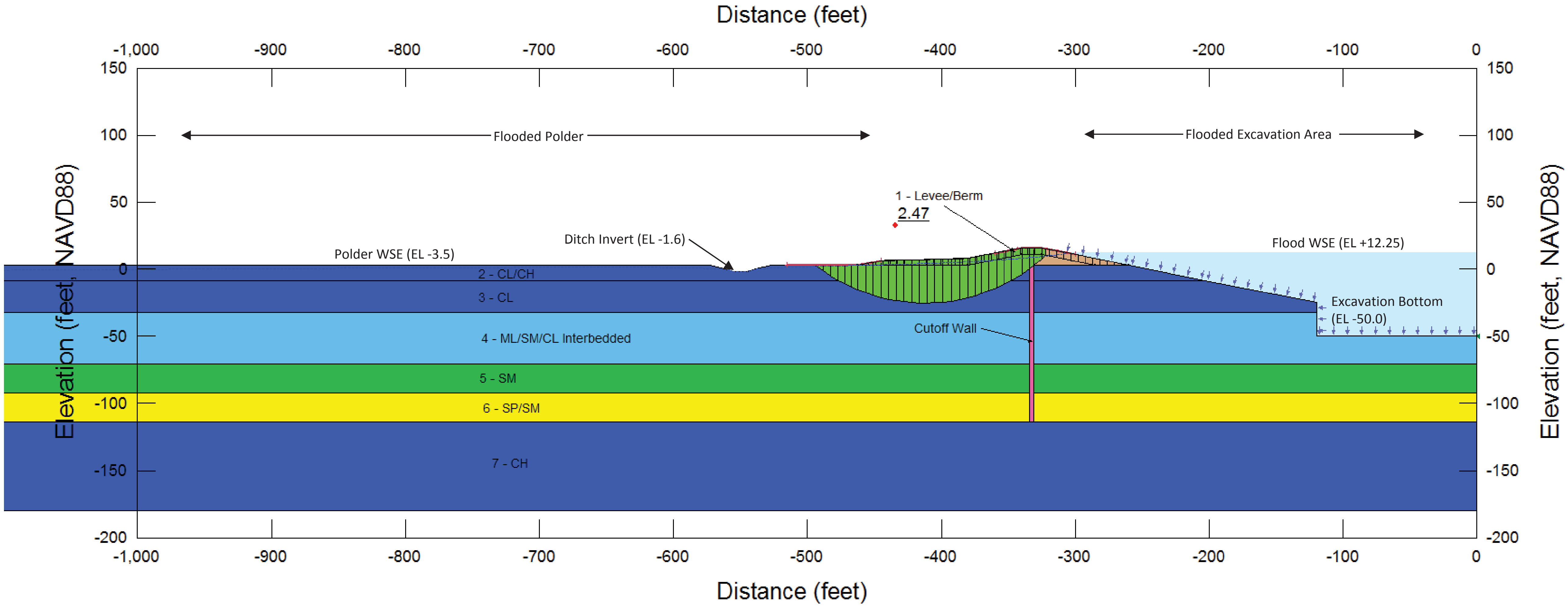
DRAWN BY:	DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION	GEOTECHNICAL ENGINEERING REPORT
STATE PROJECT NUMBER: BA-153	
FEDERAL PROJECT NUMBER: BA-153	DATE: JULY 2014
APPROVED BY:	FIGURE: B-2.2

Project: Mid-Barataria Sediment Diversion
Created By: Crosariol, Victor
Date: 12/2/2013
File Name: 03_Station 35+00_30% Levee.gsz
Analysis: 01 - Flooded Excav w/ cutoff_Stab_Drained

MATERIALS

: 1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
: 2 - CL/CH +3.0 to -8.3 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 0 psf Phi': 23 °
: 3 - CL -8.3 to -32.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 0 psf Phi': 23 °
: 4 - ML/SM/CL Interbedded -32.5 to -71.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.167) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
: 5 - SM -71.0 to -92.0 (Kv=1.2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
: 6 - SP/SM -92.0 to -114.0 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
: 7 - CH -114.0 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
: 8 - Soil-Cement Cutoff Wall (Kv=1x10-6 cm/sec, Kv/Kh=1.0) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS

STATIONS: **35+00**
SEEPAGE CASE: **2**
STABILITY CASE: **1 (Steady-State Stability)**
WSE In River: **+12.25 feet**
WSE In Excavation: **+12.25 feet**
WSE In Polder: **-3.5 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

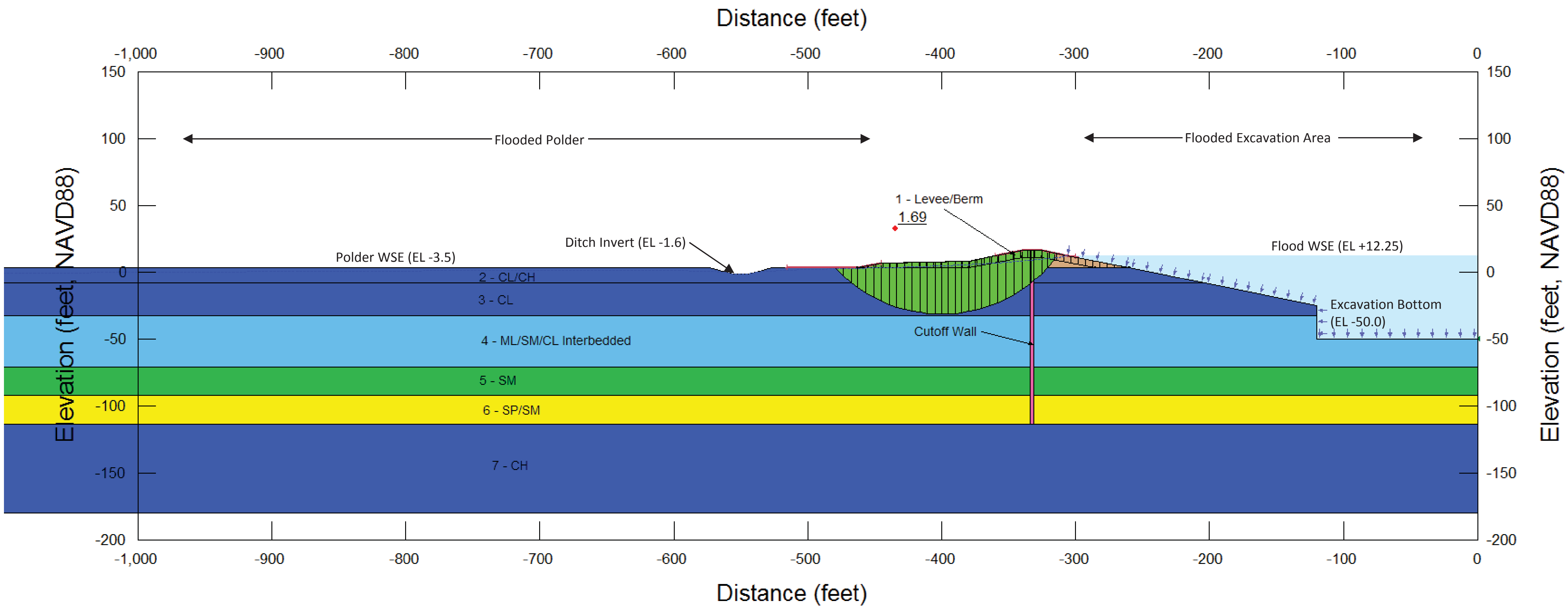
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-2.3

Project: Mid-Barataria Sediment Diversion
Created By: Crosariol, Victor
Date: 12/2/2013
File Name: 03_Station 35+00_30% Levee.gsz
Analysis: 02 - Flooded Excav w/ cutoff_Stab_Undrained

MATERIALS

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +3.0 to -8.3 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 325 psf Phi': 0 °
RF_3 - CL -8.3 to -32.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 90 pcf Cohesion': 325 psf Phi': 0 °
RF_4 - ML/SM/CL Interbedded -32.5 to -71.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.167) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 8 °
RF_5 - SM -71.0 to -92.0 (Kv=1.2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
RF_6 - SP/SM -92.0 to -114.0 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_7 - CH -114.0 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 1,246 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,414 psf
RF_8 - Soil-Cement Cutoff Wall (Kv=1x10-6 cm/sec, Kv/Kh=1.0) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 100 psf Phi': 0 °



NOT TO SCALE

INLET EXCAVATION STABILITY ANALYSIS

STATIONS: **35+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2 (Rapid Flood Stability)**
WSE In River: **+12.25 feet**
WSE In Excavation: **+12.25 feet**
WSE In Polder: **-3.5 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-2.4

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]																						
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging[1]									Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	13.5	1	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	1	-12.5	CL/CH	113	0	23	0.22	300		960	50%	1	480	1163	106	256	300	-16.5	M-C	0	300									
3	-12.5	-17.5	SM/CL Interbedded	105	0	25	0.22	300		960	50%	1	1163	1376	256	303	300	-17.2	M-C	0	300									
4	-17.5	-23.5	ML/CL Interbedded	105	0	25		200	15	960	50%	1	1376	1632					M-C	15	200									
5	-23.5	-45.5	CL/CH with Sand and Silt Seams	105	0	23	0.22	300		960	50%	1	1632	2569	359	565	300	-17.2	S = f(depth)	0		359	9.4	565						
6	-45.5	-113	CL/CH	105	0	23	0.22			960	50%	1	2569	5444	565	1198			S = f(depth)	0		565	9.4	1198						
7	-113	-117.3	SM	122	0	28		0	28	960	50%	1	5444	5701	0	0			M-C	28	0									
8	-117.3	-130	CL/CH	100	0	23	0.22			960	50%	1	5701	6178	1254	1359			S = f(depth)	0		1254	8.3	1359						

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-3.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; and *S=f(depth)* indicates that undrained shear strength increases with depth.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)		Remarks
		Channel	Polder	
1	Steady-State	10	-3.5	Polder WSE From low water observations in PZ-15
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	2.62	Global	1, 2	Levee crown to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	0.90	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	2.15	Global	1, 2, 3, 4, 5	Levee crown to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	1.16	Local	1, 2	Berm toe to channel slope	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	1.79	Global	1, 2, 3, 4, 5, 6	Polder-side levee slope to channel toe	
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	1.59	Local	1, 2, 3	Levee crown to channel-side berm	

NOTES

1 Cross Section was developed from 30 Percent Civil Design geometry.
2 Boring NL-8A was considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5 Model extends 1600 feet landward of approximate Channel centerline.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.

NOT TO SCALE

STABILITY ANALYSIS
STATION: **55+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

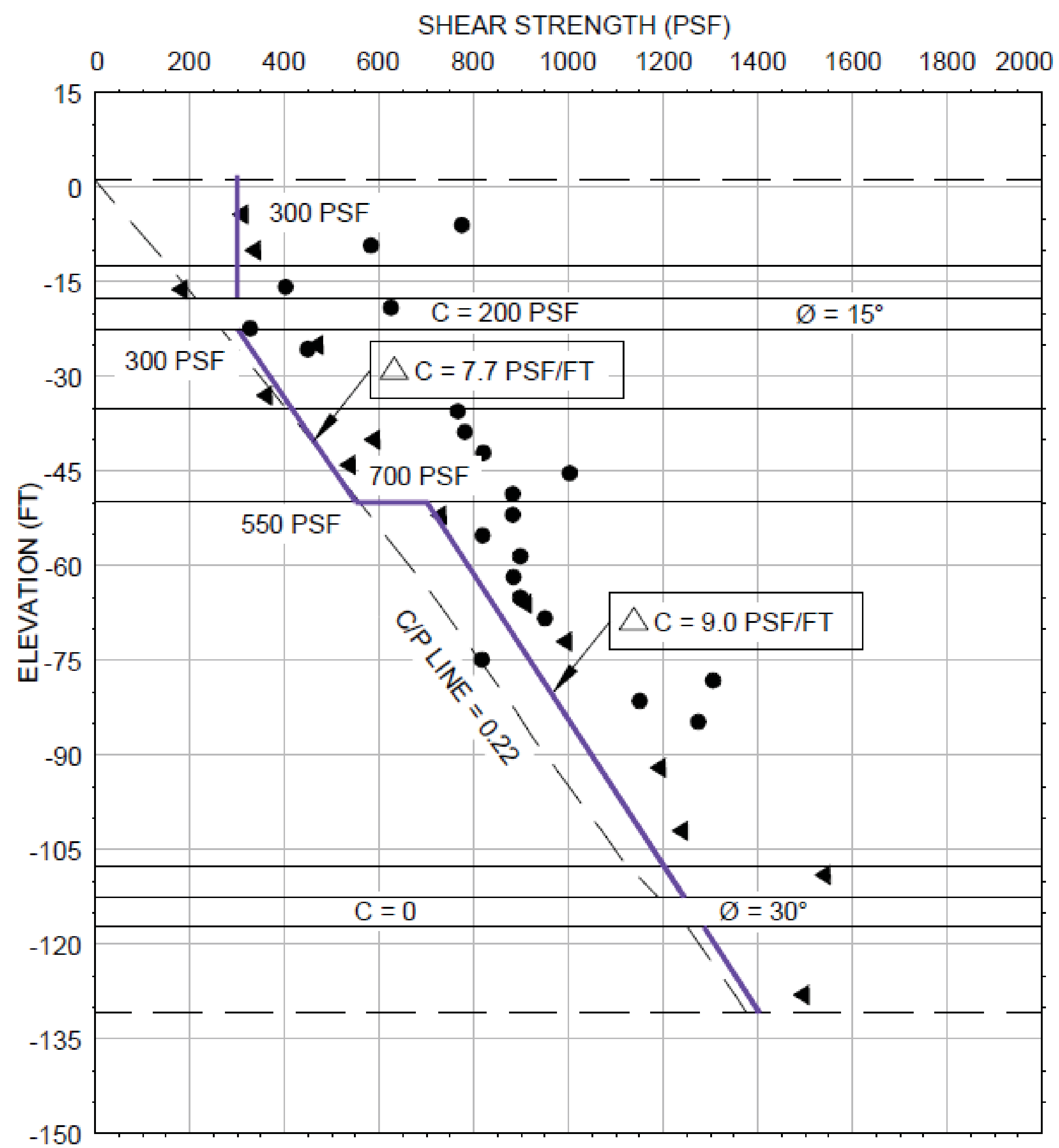
COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION

GEOTECHNICAL ENGINEERING REPORT

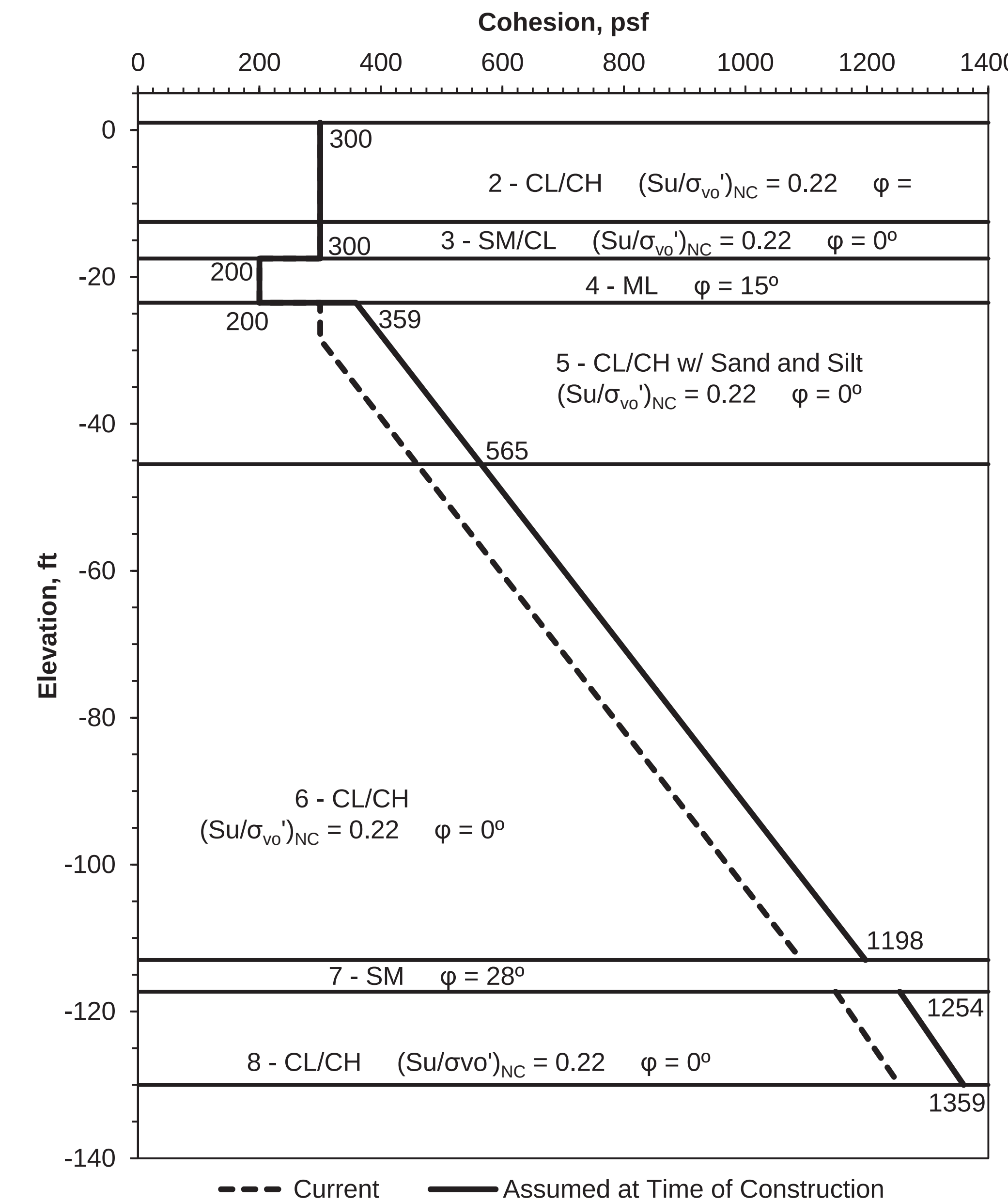
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
DATE: JULY 2014
APPROVED BY:
FIGURE: B-3.1



DESIGN CHARTS NL-8A & FV-4	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2n

LEGEND

- ◀ NL-8A
- ● FV-4
- DESIGN STRENGTH
- C/P= 0.22



Strength Parameters used in Rapid Flood Stability Analyses

Figure above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **55+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

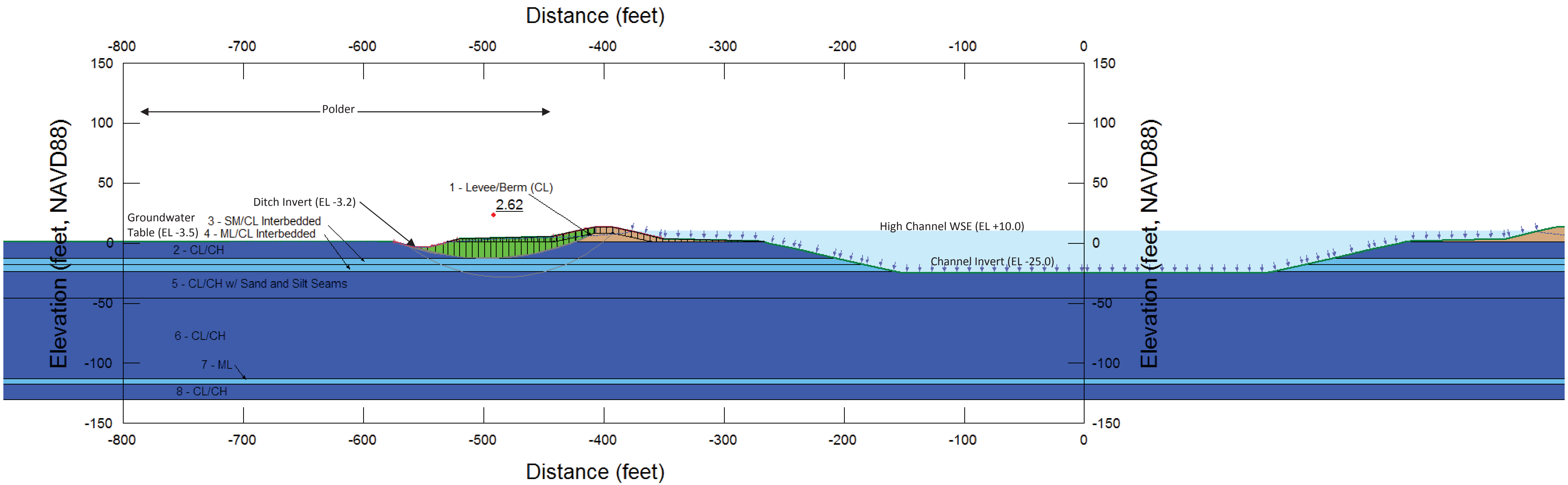
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.2

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **55+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-3.5 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

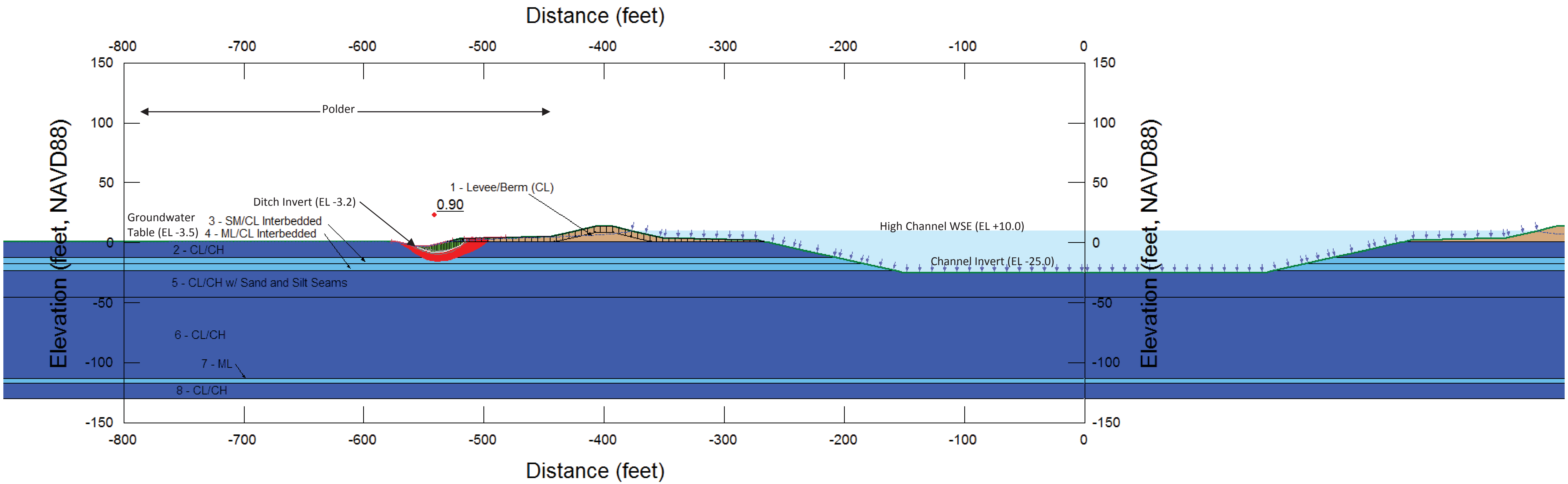
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.3

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **55+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-3.5 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

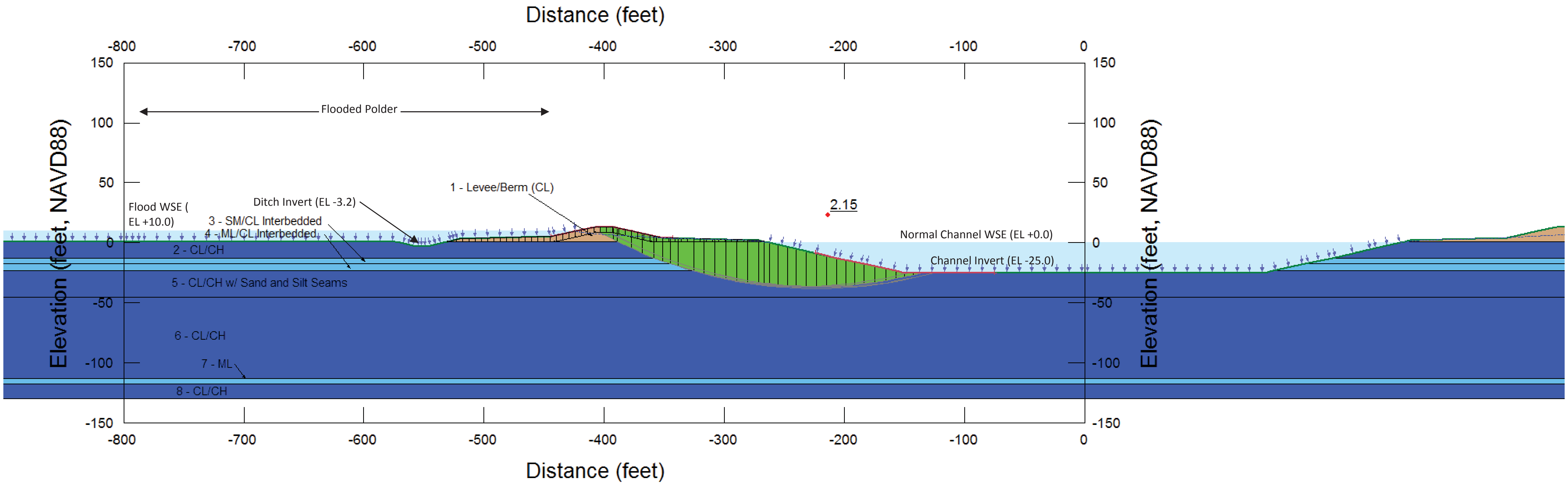
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.4

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB Case 2A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS

STATION: **55+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION

STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

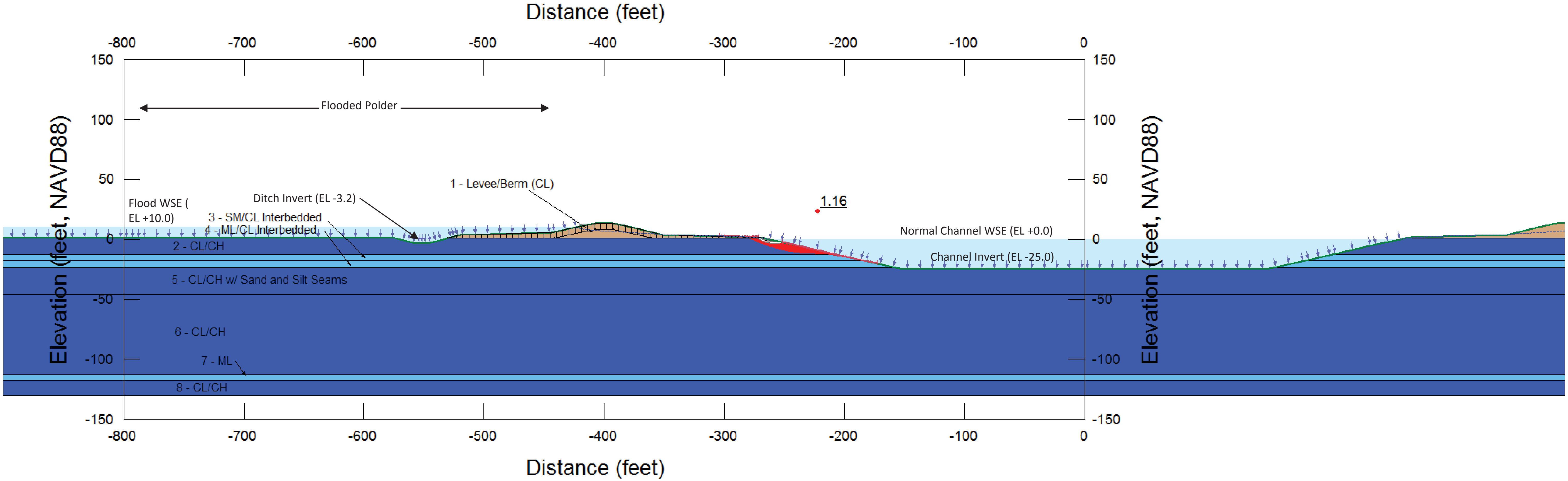
GEOTECHNICAL ENGINEERING REPORT

DATE: JULY 2014
FIGURE: B-3.5

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB Case 2B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **55+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

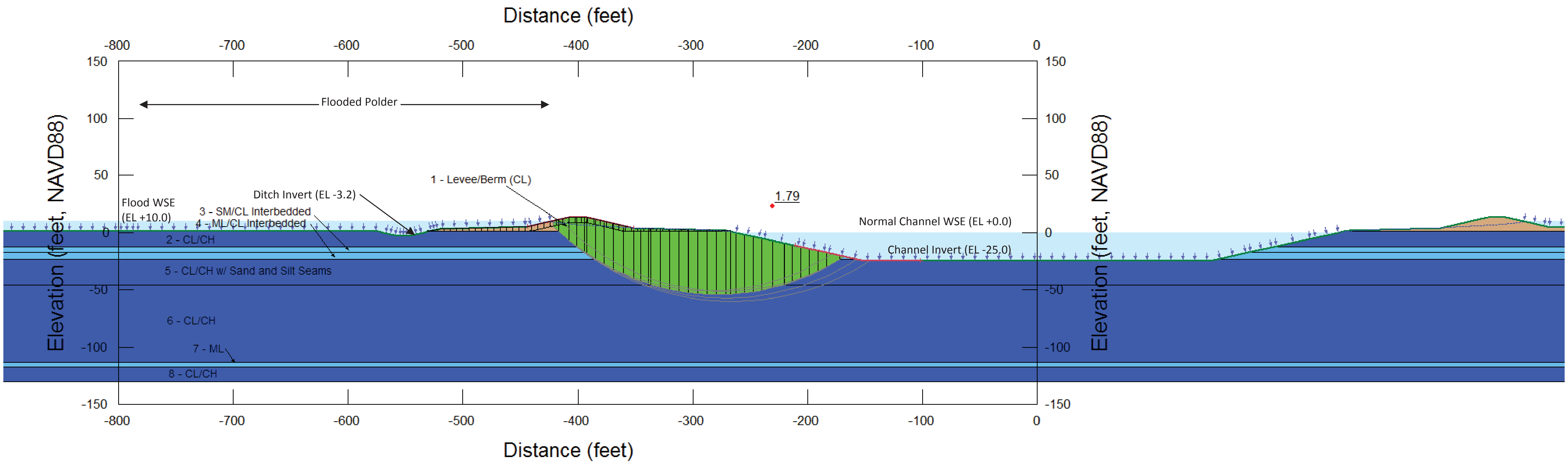
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.6

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (In: 10 ft / Out: GWT)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 359 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 565 psf
RF_6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 565 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,198 psf
RF_7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
RF_8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 1,254 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,359 psf



NOTES:
1) “RF” IN THE MATERIALS LIST INDICATES “RAPID FLOOD”

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **55+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

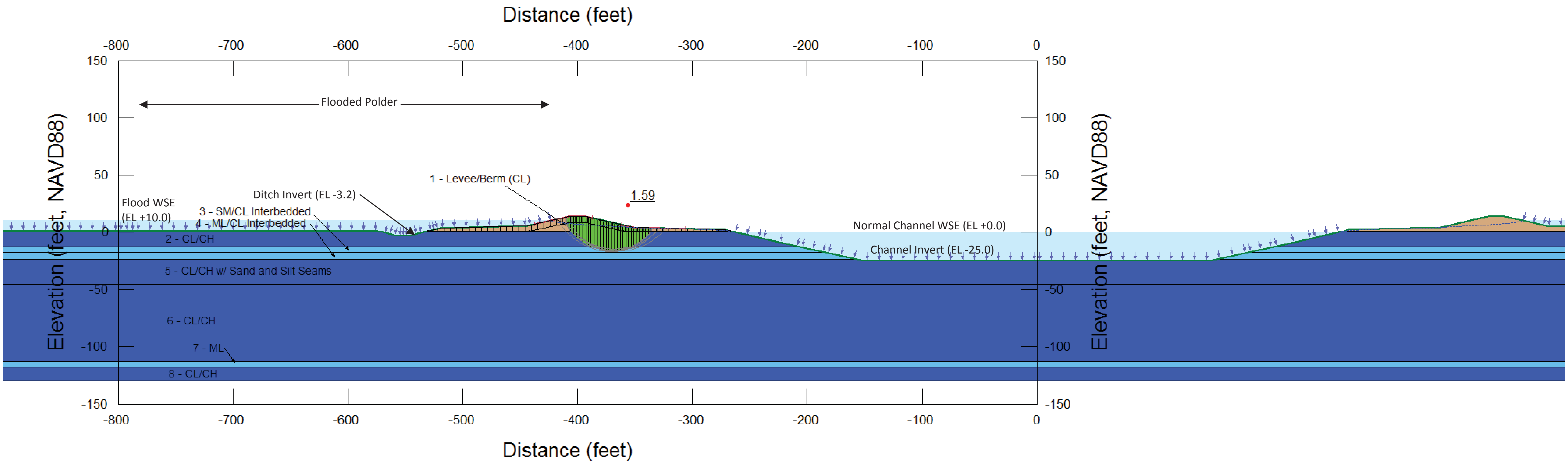
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.7

Created By: Crosariol, Victor
Date: 11/26/2013
File Name: 01_Station 55+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (In: 10 ft / Out: GWT)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) (2) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +1.0 to -12.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 113 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM/CL Interbedded -12.5 to -17.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_4 - ML/CL Interbedded -17.5 to -23.5 (Kv=5x10-6 cm/sec, Kv/Kh=0.20) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_5 - CL/CH w/Sand/Silt Seams -23.5 to -45.5 (Kv=6x10-7 cm/sec, Kv/Kh=0.20) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 359 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 565 psf
RF_6 - CL/CH -45.5 to -113.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 565 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,198 psf
RF_7 - SM -113.0 to -117.3 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 122 pcf Cohesion': 0 psf Phi': 28 °
RF_8 - CL/CH -117.3 to -130.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 1,254 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,359 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **55+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-3.8

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]																								
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging[1]									Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	13.5	0.5	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	0.5	-11	CL/CH	105	0	23	0.22	300		960	50%	0.5	480	970	106	213	300	-20.2	M-C	0	300									
3	-11	-20	SM/ML/CL Interbedded	105	0	28		200	15	960	50%	0.5	970	1353					M-C	15	200									
4	-20	-28	CL	105	0	23	0.22	300		960	50%	0.5	1353	1694	298	373	300		S = f(depth)	0		300	9.4	373						
5	-28	-50	SM/ML Interbedded	110	0	28		200	10	960	50%	0.5	1694	2741					M-C	10	200									
6	-50	-103	CL/ML	110	0	25	0.22			960	50%	0.5	2741	5264	603	1158			S = f(depth)	0		603	10.5	1158						
7	-103	-128	ML/SM	120	0	28		200	15	960	50%	0.5	5264	6704	0	0			M-C	15	200									

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-4.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; and *S=f(depth)* indicates that undrained shear strength increases with depth.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)		Remarks
		Channel	Polder	
1	Steady-State	10	-3.5	Polder WSE From low water observations in PZ-15
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	**2.40**	Global	1, 2, 3, 4	Levee crown to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	**0.58**	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	**2.01**	Global	1, 2, 3, 4	Channel-side levee slope to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	**1.24**	Local	1, 2, 3	Berm toe to channel slope	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.72**	Global	1, 2, 3, 4, 5	Polder-side levee slope to channel toe	
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**2.05**	Local	1, 2, 3, 4, 5	Channel-side berm to channel toe	
3C	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.72**	Local	1, 2	Levee-Crown to channel-side levee toe	

NOTES

1 Cross Section was developed from 30 Percent Civil Design geometry.
2 CPT's NL-7C and NL-10C were considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5 Model extends 1600 feet landward of approximate Channel centerline.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.

NOT TO SCALE

STABILITY ANALYSIS
STATION: **67+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

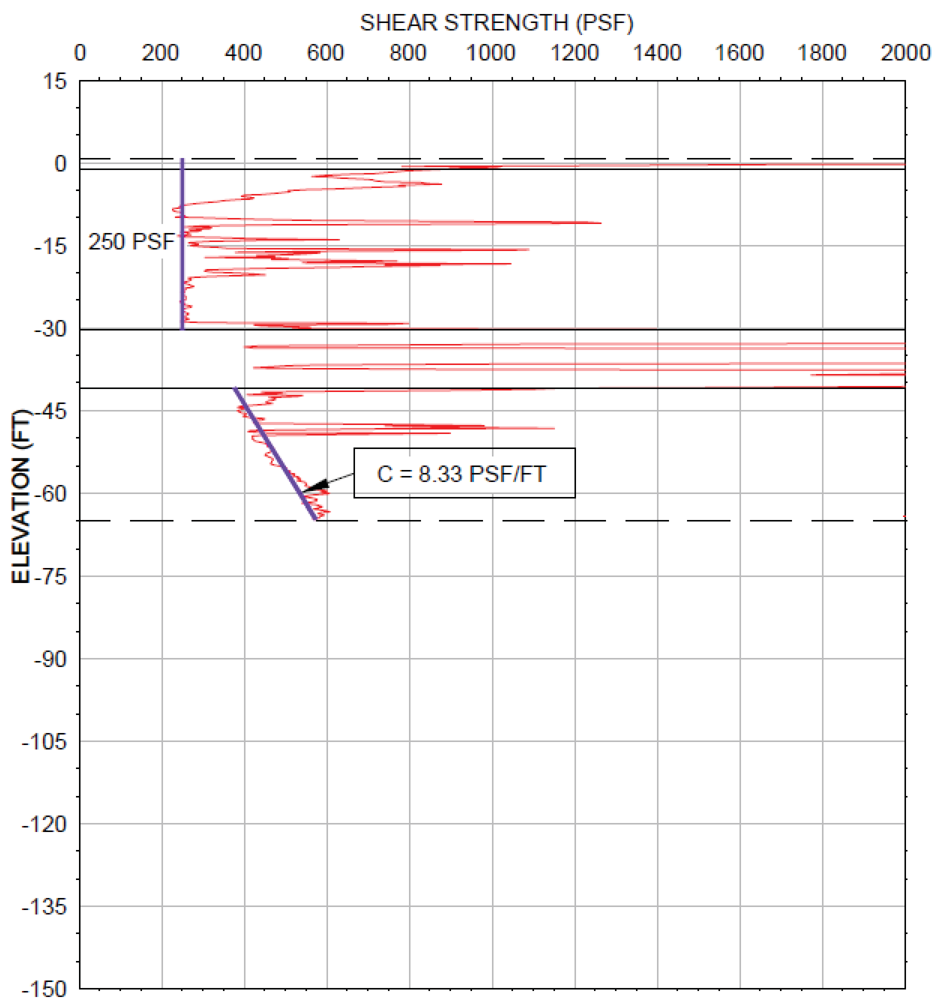
REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

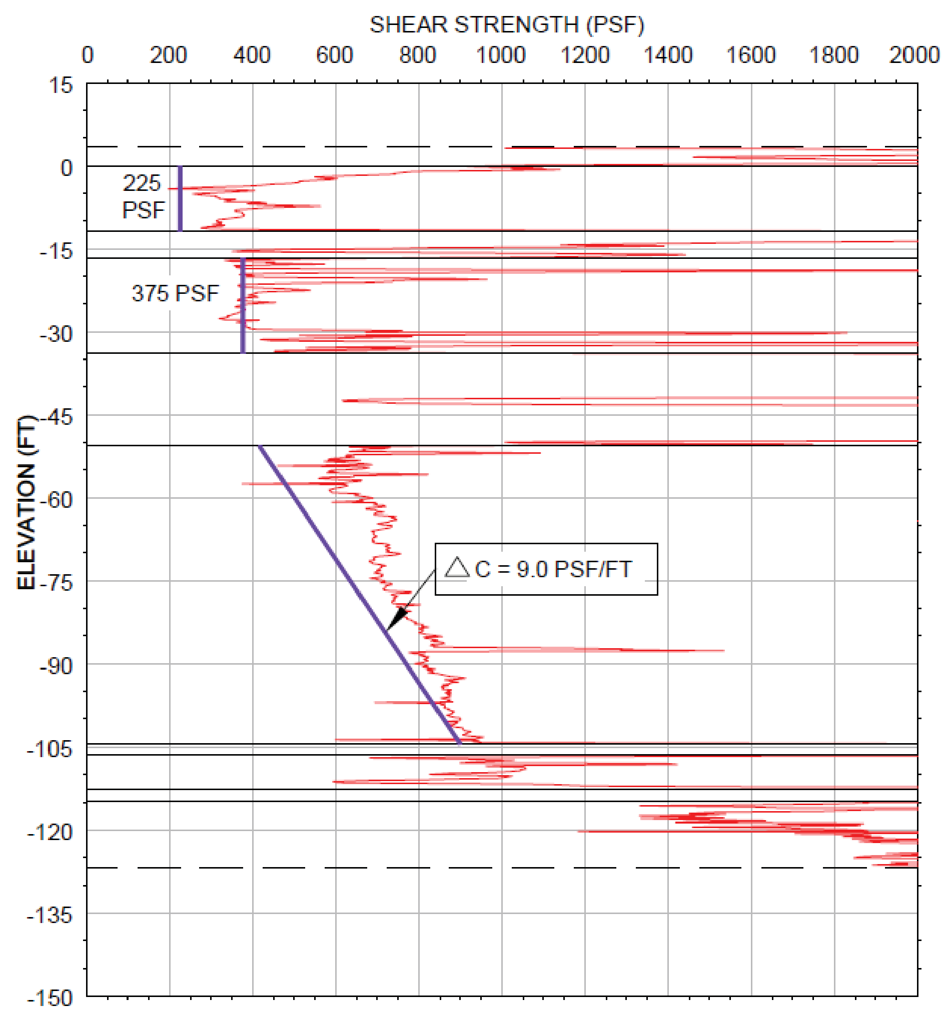
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.1



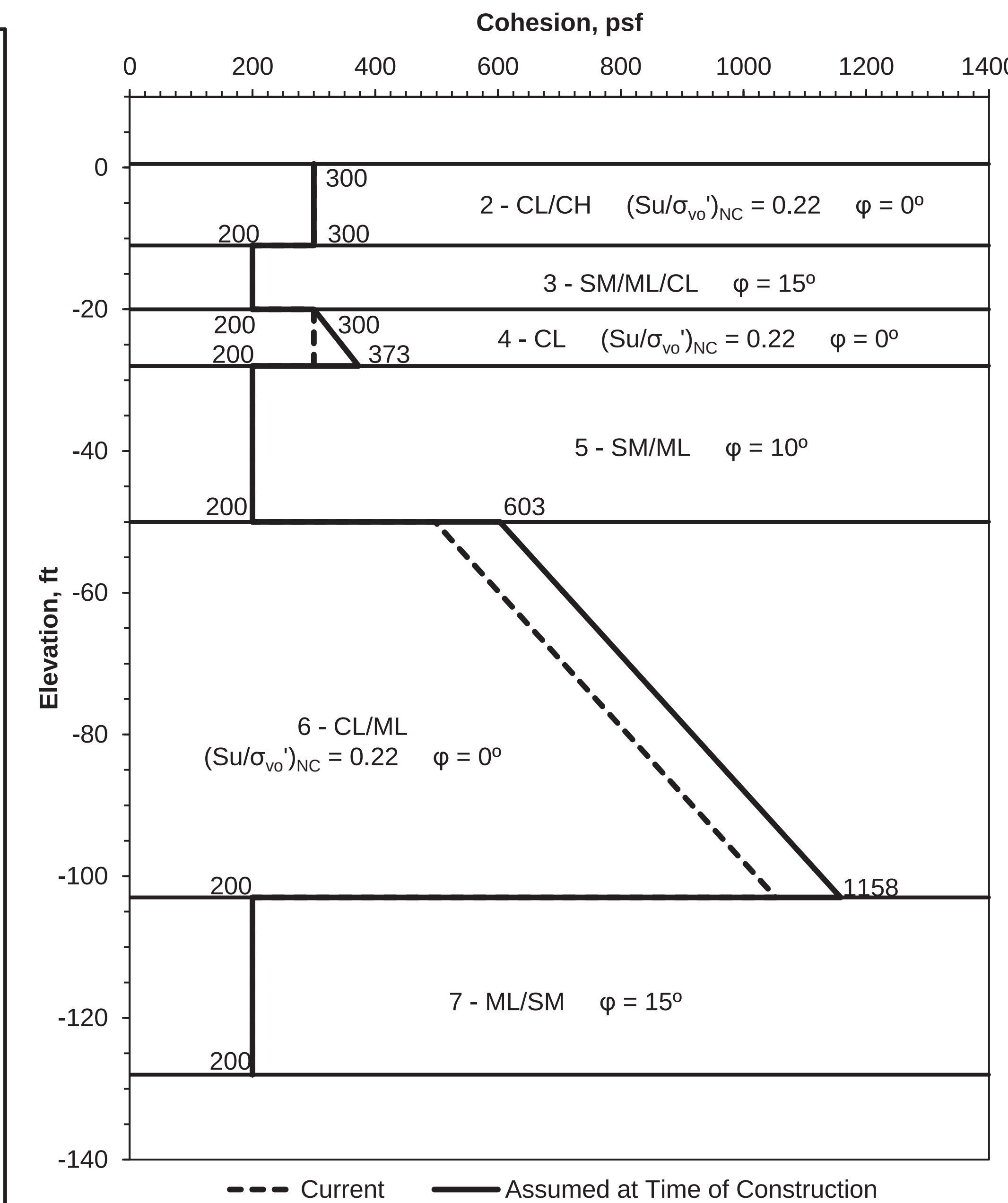
DESIGN CHARTS NL-7C	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2m

LEGEND
- NL-7C
- Design Strength



DESIGN CHARTS NL-10C	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2p

LEGEND
- NL-10C
- Design Strength



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

Figure above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013

RAPID FLOOD STABILITY ANALYSIS
STATION: **67+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: | DESIGNED BY: | APPROVED BY:

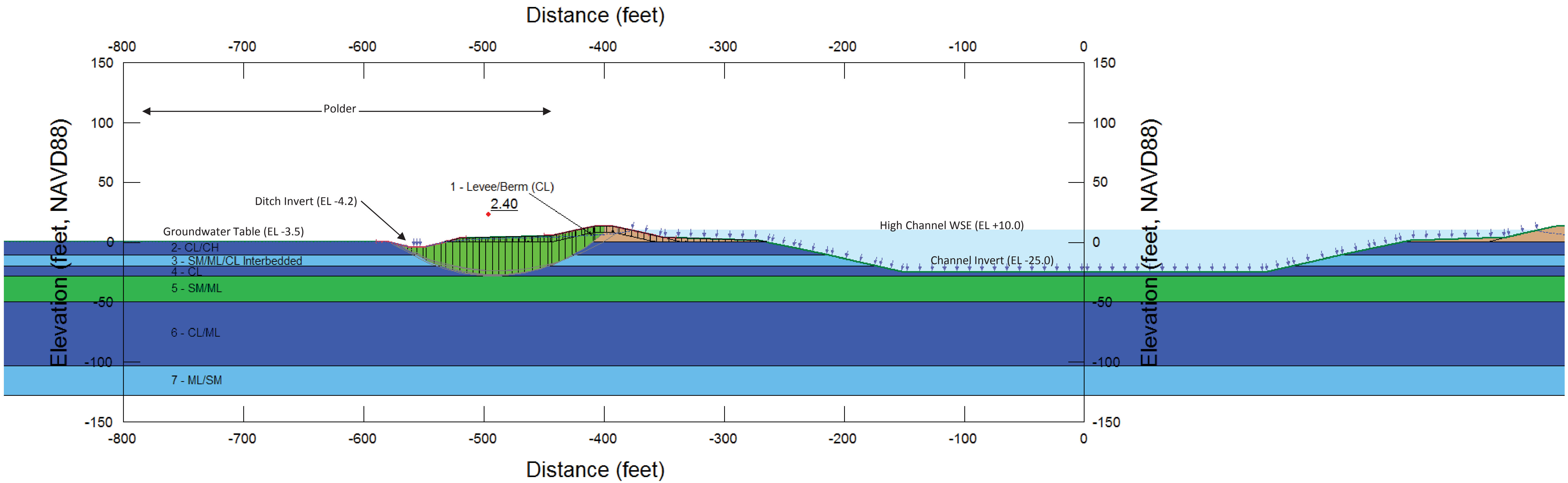
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.2

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS

STATION: **67+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-3.5 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

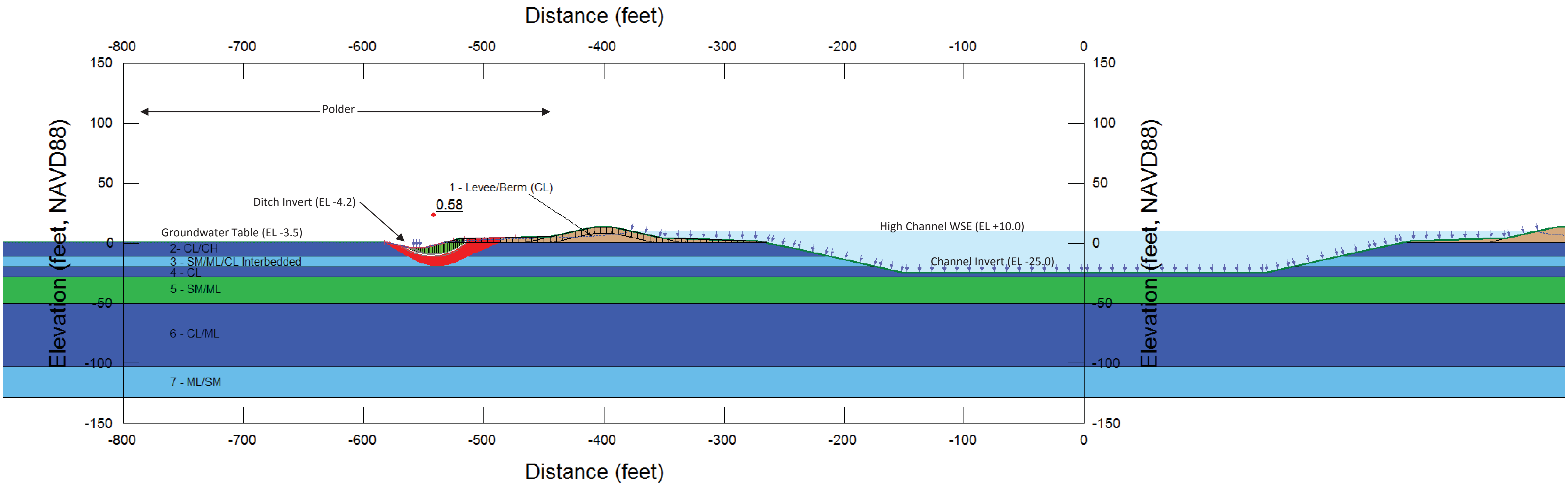
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.3

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-3.5 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

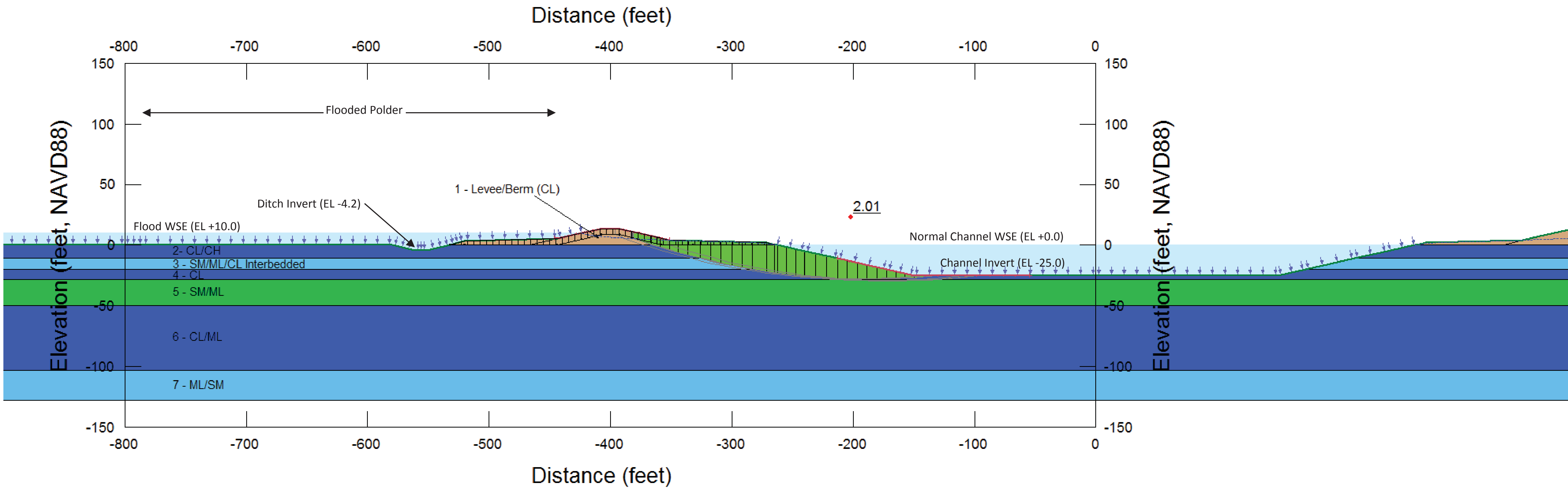
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.4

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB Case 2A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA
STATE OF LOUISIANA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

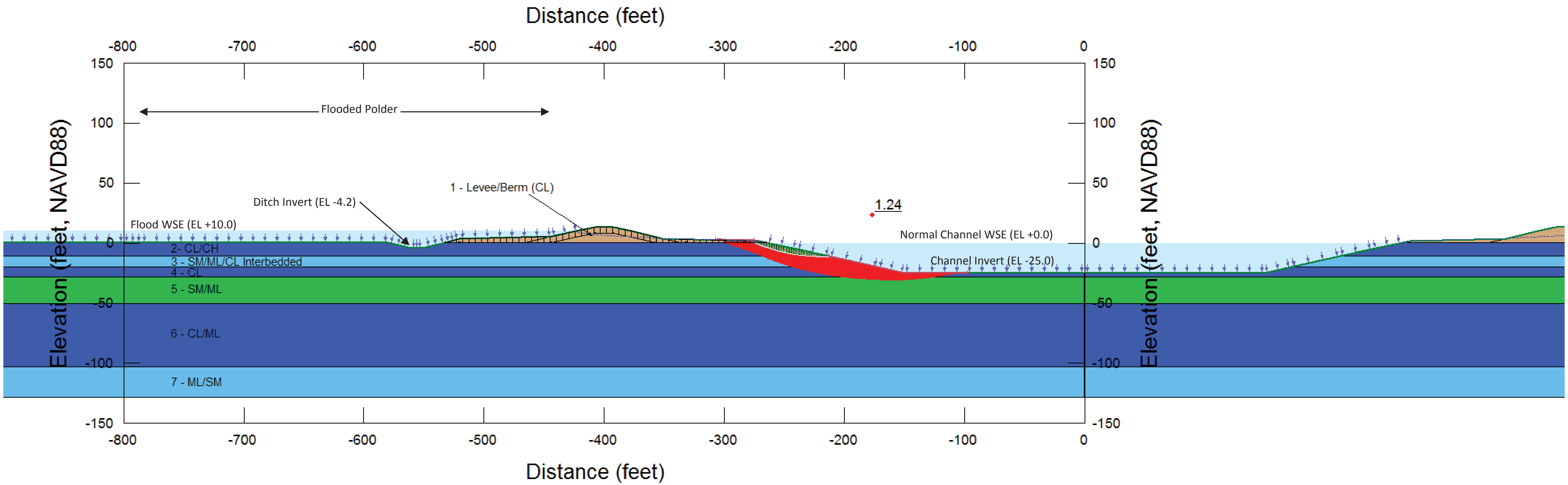
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.5

Created By: Crosariol, Victor
Date: 11/20/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB Case 2B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 28 °
6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

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REV.	DATE	DESCRIPTION	BY

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ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

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DESIGNED BY:

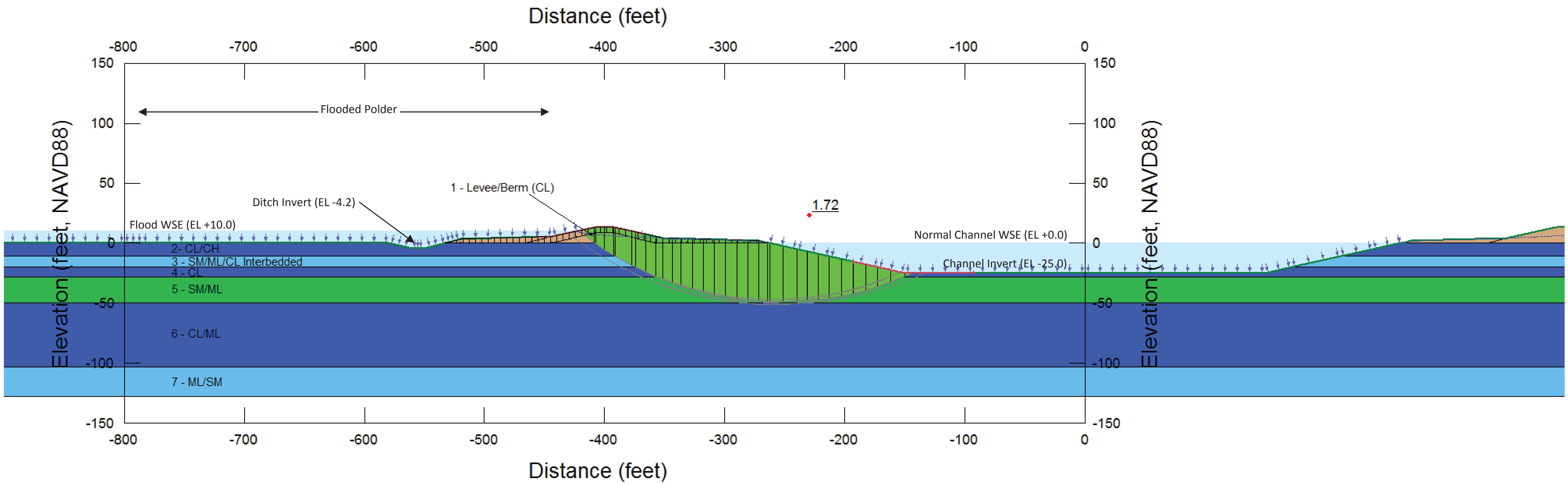
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.6

Created By: Crosariol, Victor
Date: 11/27/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (In: 10 ft / Out: GWT)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 300 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 373 psf
RF_5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 10 °
RF_6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 603 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,158 psf
RF_7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

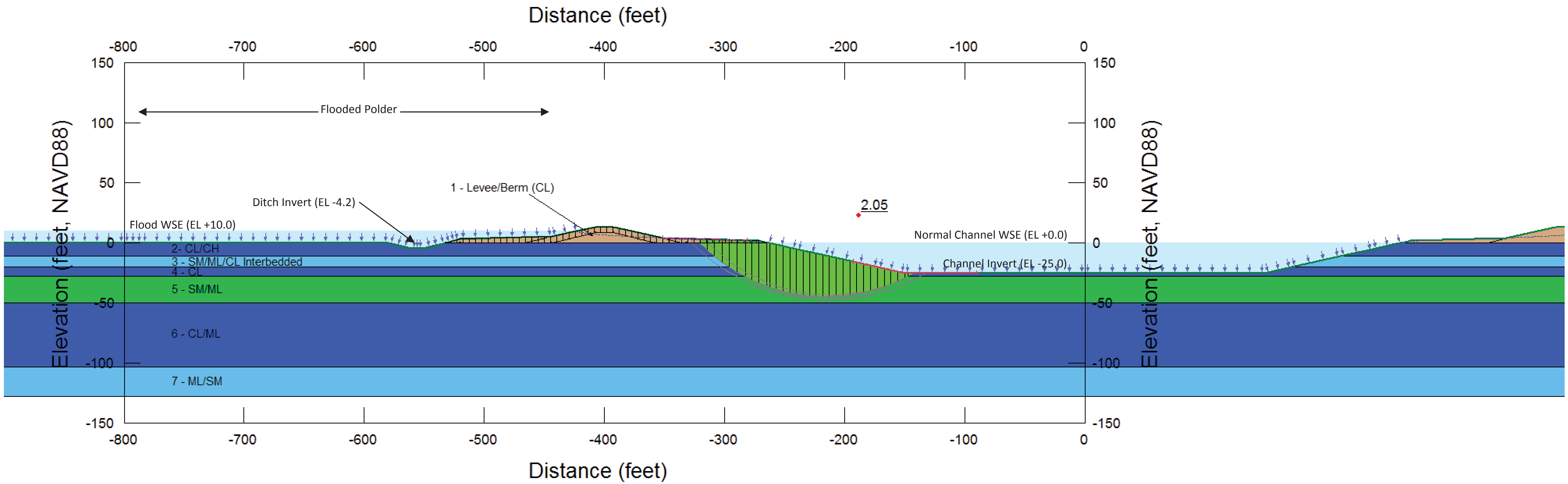
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.7

Created By: Crosariol, Victor
Date: 11/27/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (In: 10 ft / Out: GWT)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 300 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 373 psf
RF_5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 10 °
RF_6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 603 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,158 psf
RF_7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION

GEOTECHNICAL ENGINEERING REPORT

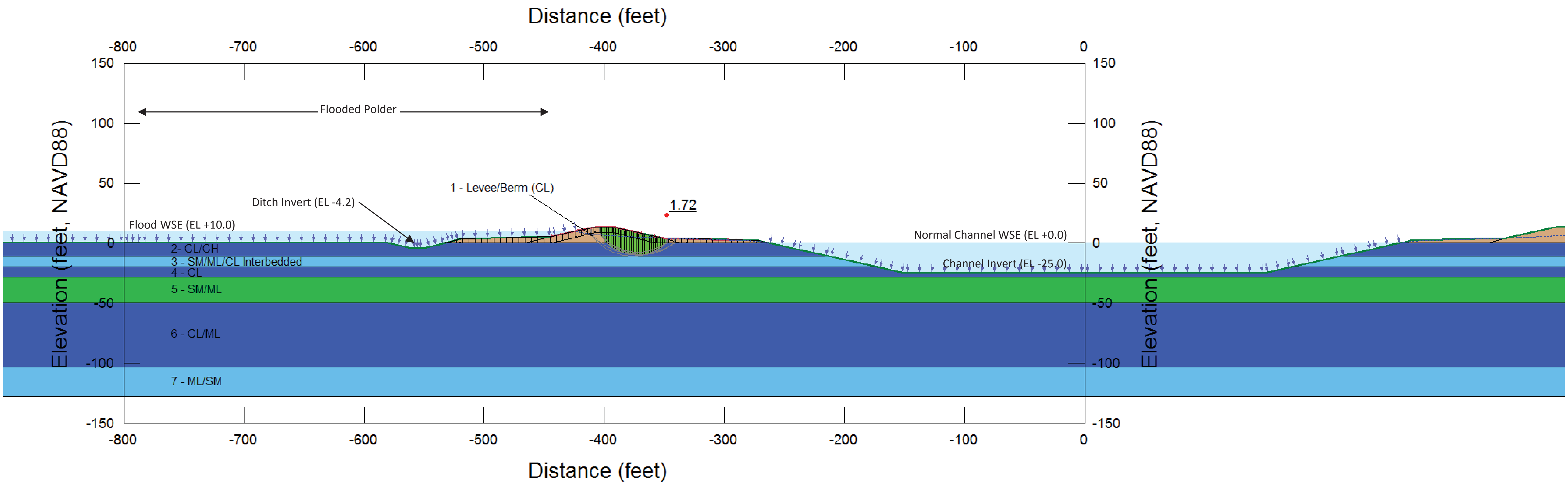
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
DATE: JULY 2014

DRAWN BY:
DESIGNED BY:
APPROVED BY:
FIGURE: B-4.8

Created By: Crosariol, Victor
Date: 11/27/2013
File Name: 01_Station 67+00_30% Levee.gsz
Analysis: STAB_RF Case 3C: (In: 10 ft / Out: GWT)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH +0.5 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM/ML/CL Interbedded -11.0 to -20.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL -20.0 to -28.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 300 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 373 psf
RF_5 - SM/ML Interbedded -28.0 to -50.0 (Kv=5x10-5 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 10 °
RF_6 - CL/ML -50.0 to -103.0 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 603 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,158 psf
RF_7 - ML/SM -103.0 to -128.0 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 200 psf Phi': 15 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **67+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3C**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: | DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-4.9

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]																							
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging									Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	13.5	0	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	0	-11	CL/CH	105	0	23	0.22	300		960	50%	0	480	949	106	209	300	-20.7	M-C	0	300									
3	-11	-14.4	SM	105	0	28		200	15	960	50%	0	949	1093					M-C	15	200									
4	-14.4	-19.2	SM/CH/ML Interbedded	105	0	28		200	15	960	50%	0	1093	1298					M-C	15	200									
5	-19.2	-23.4	ML	105	0	28		200	15	960	50%	0	1298	1477					M-C	15	200									
6	-23.4	-24.4	SP	120	0	30		0	30	960	50%	0	1477	1534					M-C	30	0									
7	-24.4	-25.4	CH	110	0	23	0.22	300		960	50%	0	1534	1582	338	348			S = f(depth)	0		338	10.5	348						
8	-25.4	-28.9	SM	120	0	28		0	28	960	50%	0	1582	1784					M-C	28	0									
9	-28.9	-33.4	CL/ML/SM Interbedded	105	0	25		200	10	960	50%	0	1784	1975					M-C	10	200									
10	-33.4	-35.4	CL	105	0	23	0.22			960	50%	0	1975	2061	435	453			S = f(depth)	0		435	9.4	453						
11	-35.4	-37.4	ML	115	0	28		200	15	960	50%	0	2061	2166					M-C	15	200									
12	-37.4	-40.7	CL	115	0	23	0.22			960	50%	0	2166	2339	476	515			S = f(depth)	0		476	11.6	515						
13	-40.7	-47.8	SC	125	0	27		0	27	960	50%	0	2339	2784					M-C	27	0									
14	-47.8	-131.4	CH	105	0	23	0.22			960	50%	0	2784	6345	612	1396			S = f(depth)	0		612	9.4	1396						

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figures B-5.2 and B-5.3 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; and *S=f(depth)* indicates that undrained shear strength increases with depth.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)		Remarks
		Channel	Polder	
1	Steady-State	10	-4.3	Polder WSE From low water observations in PZ-14 and PZ-15
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	**1.73**	Global	1, 2	Polder-side levee slope to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	**0.20**	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	**2.71**	Global	1 to 10	Levee crown to to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	**1.36**	Local	1, 2	Berm toe to channel slope	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**2.14**	Global	1 to 12	Polder-side levee slope to channel slope	
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**2.53**	Local	1 to 10	Channel-side berm to channel toe	
3C	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.68**	Local	1, 2	Levee crown to to channel-side levee toe	

NOT TO SCALE

NOTES

1 Cross Section was developed from 30 Percent Civil Design geometry.
2 Boring NL-6A was considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5 Model extends 1600 feet landward of approximate Channel centerline.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.

STABILITY ANALYSIS
STATION: **82+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

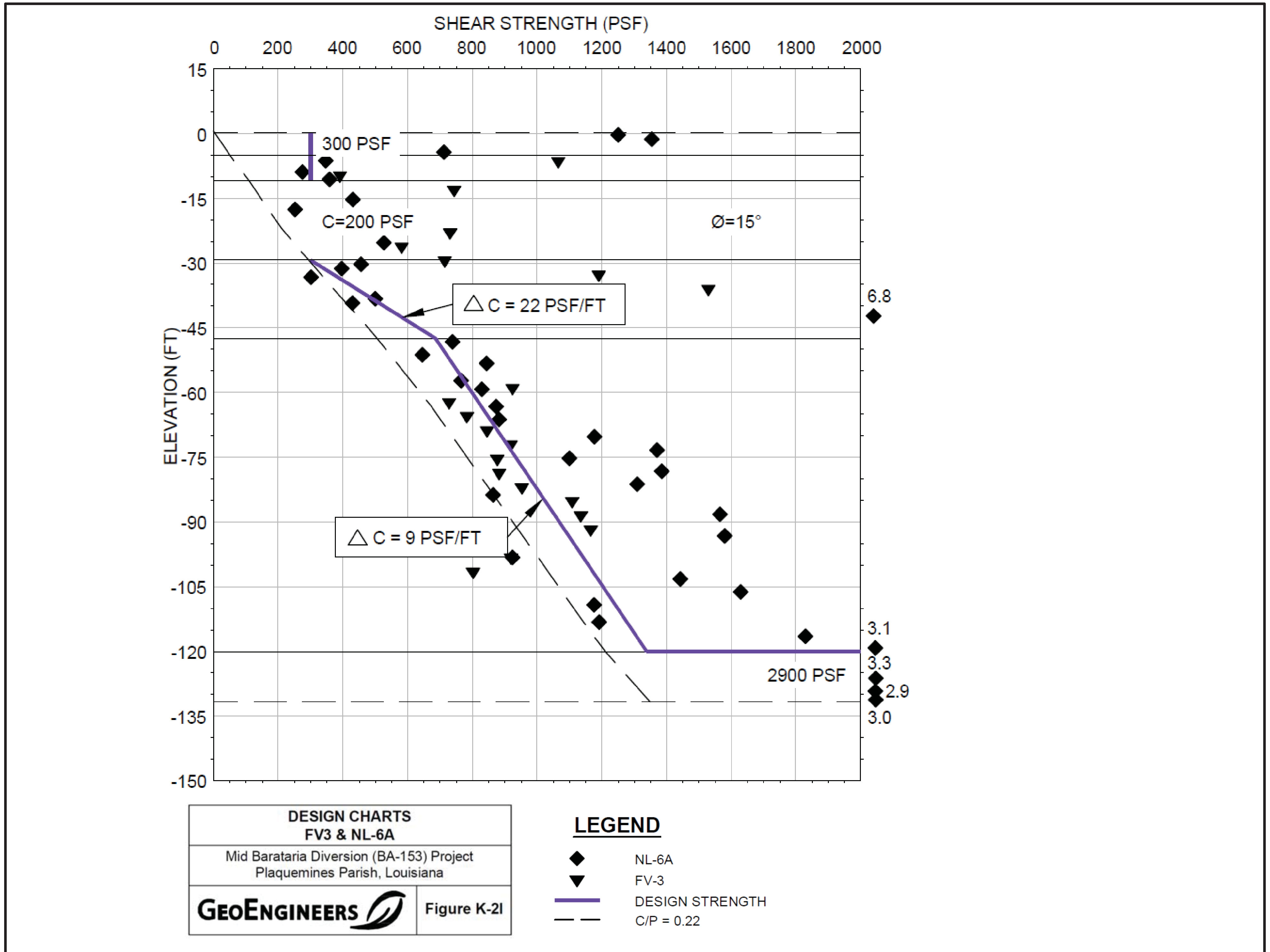
REV.	DATE	DESCRIPTION	BY

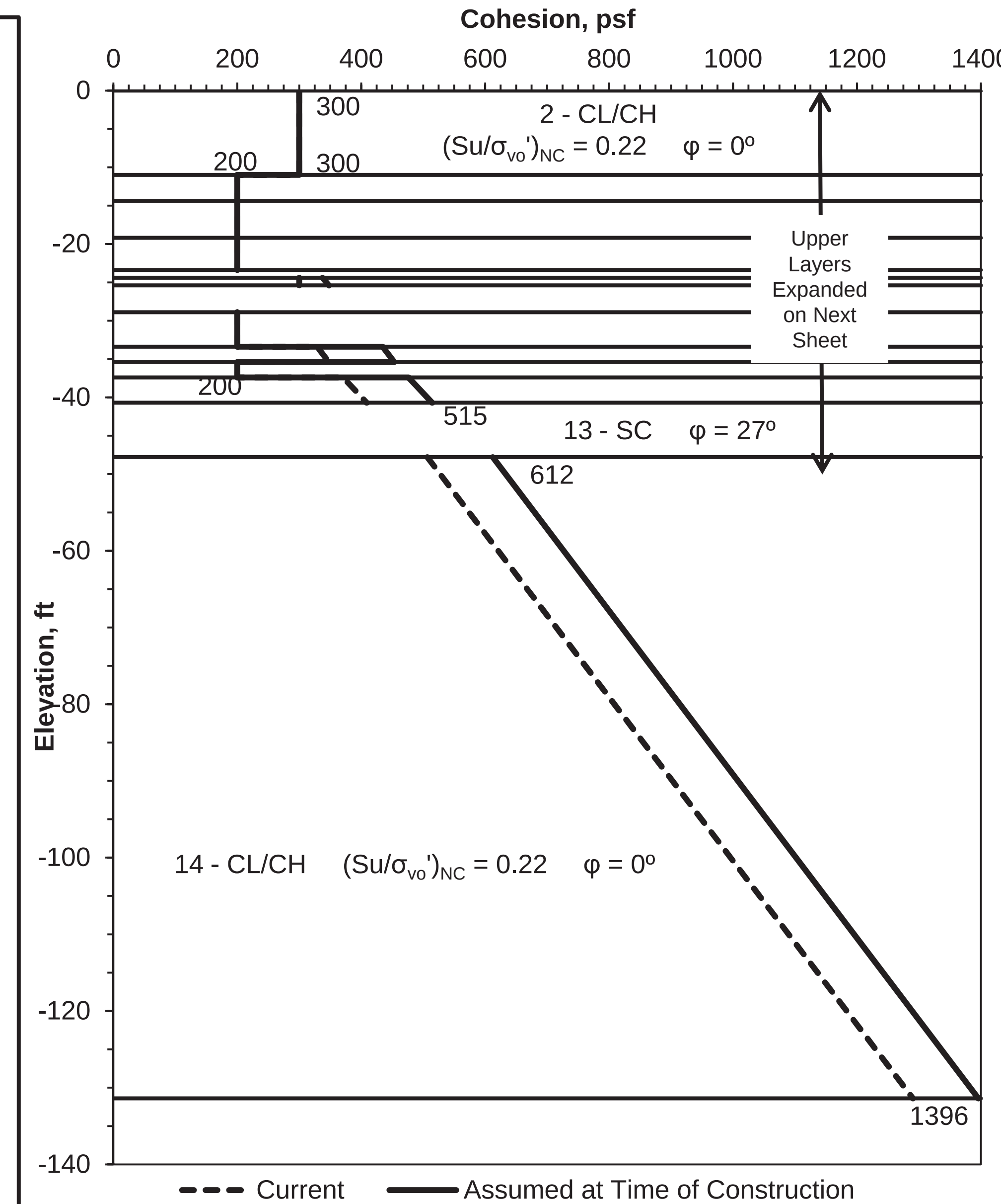
COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.1





Strength Parameters used in Rapid Flood Stability Analyses

Figure above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **82+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

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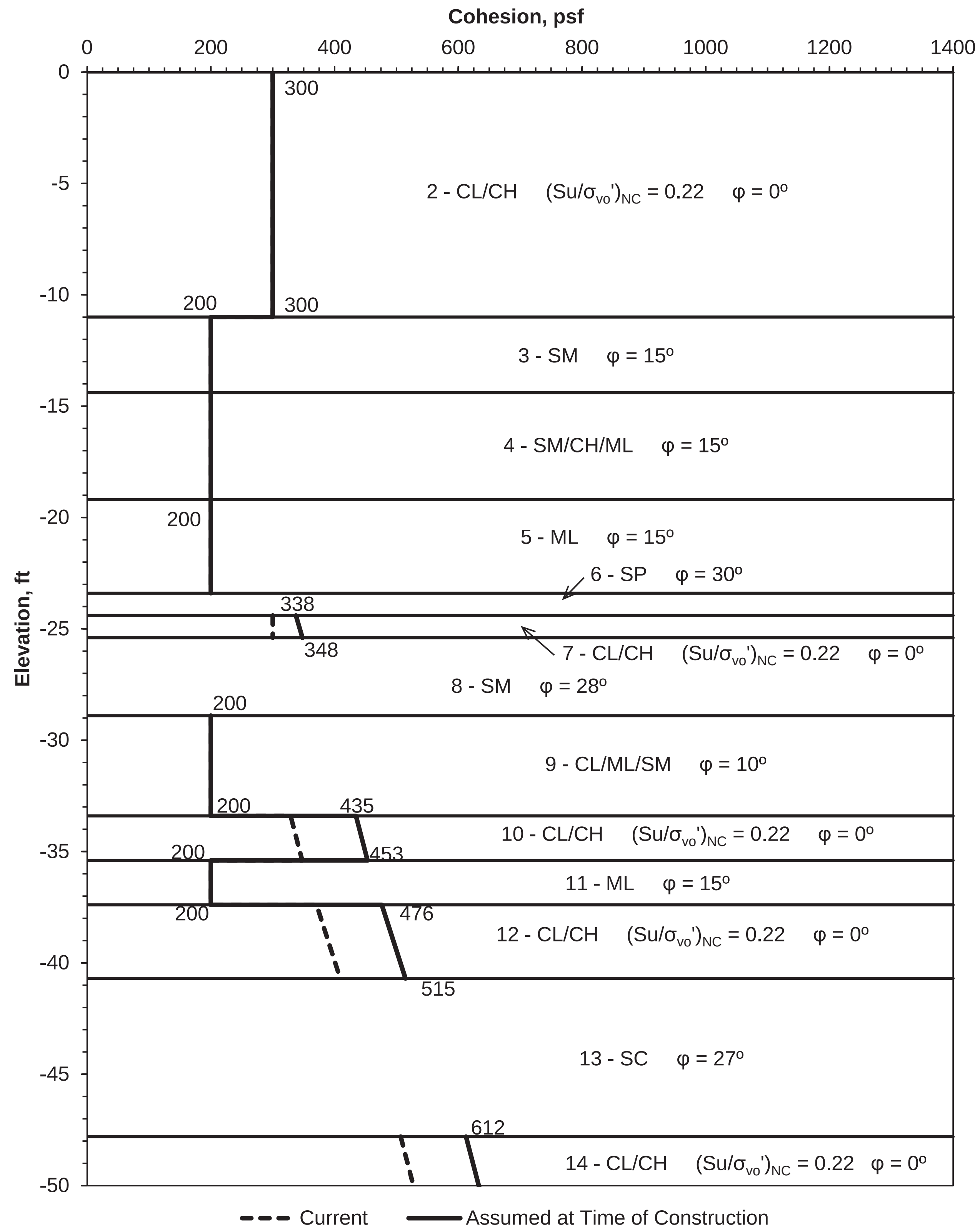
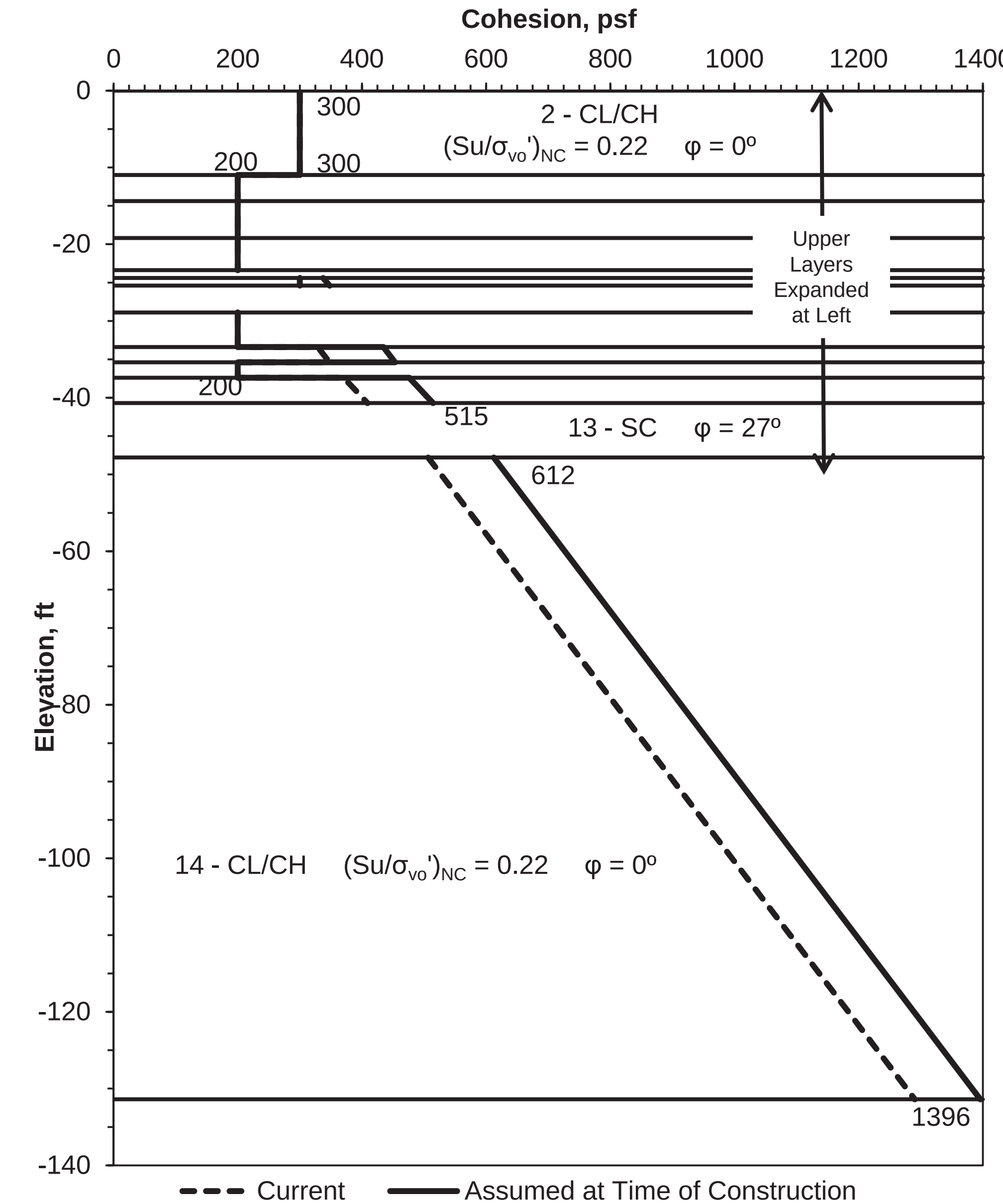
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.2



Strength Parameters used in Rapid Flood Stability Analyses (EL 0.0 to -50.0)



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **82+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

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REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: | DESIGNED BY:

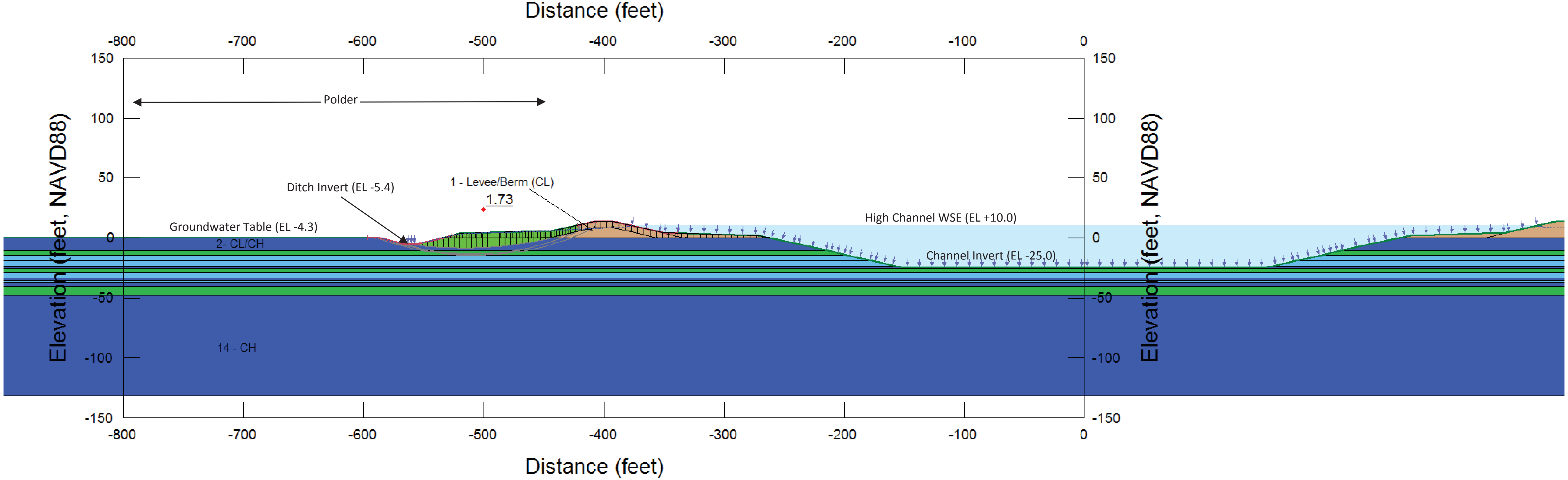
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.3

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 23 °
13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS

STATION: **82+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-4.3 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION

GEOTECHNICAL ENGINEERING REPORT

STATE PROJECT NUMBER: BA-153

FEDERAL PROJECT NUMBER: BA-153

DATE: JULY 2014

DRAWN BY:

DESIGNED BY:

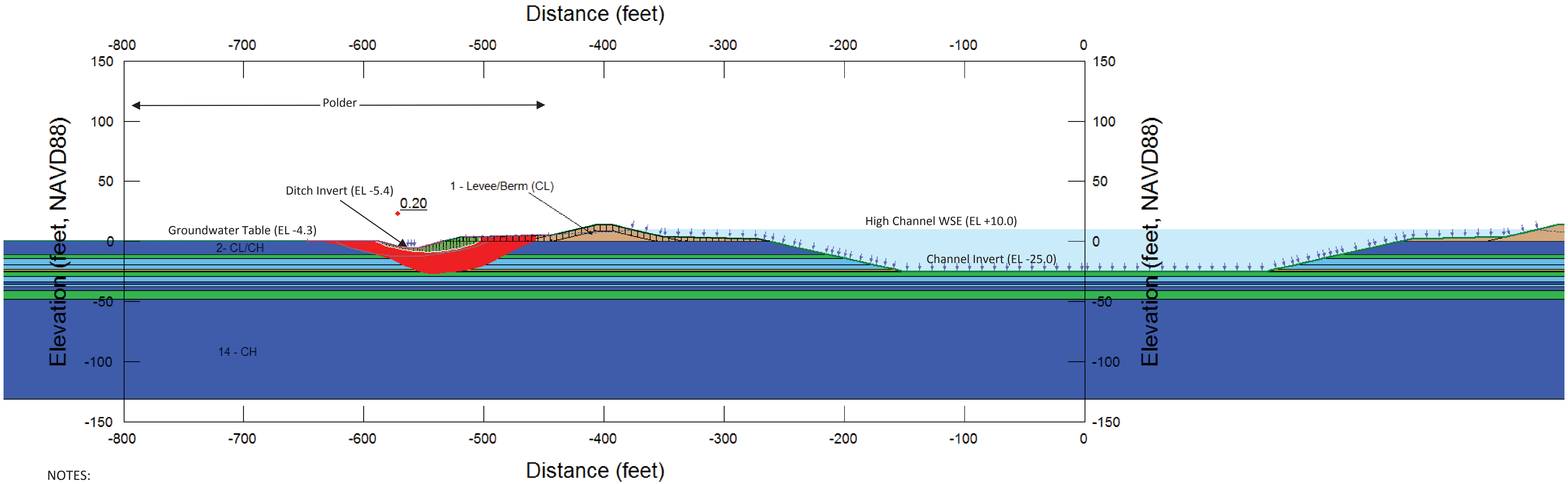
APPROVED BY:

FIGURE: B-5.4

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 23 °
13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-4.3 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

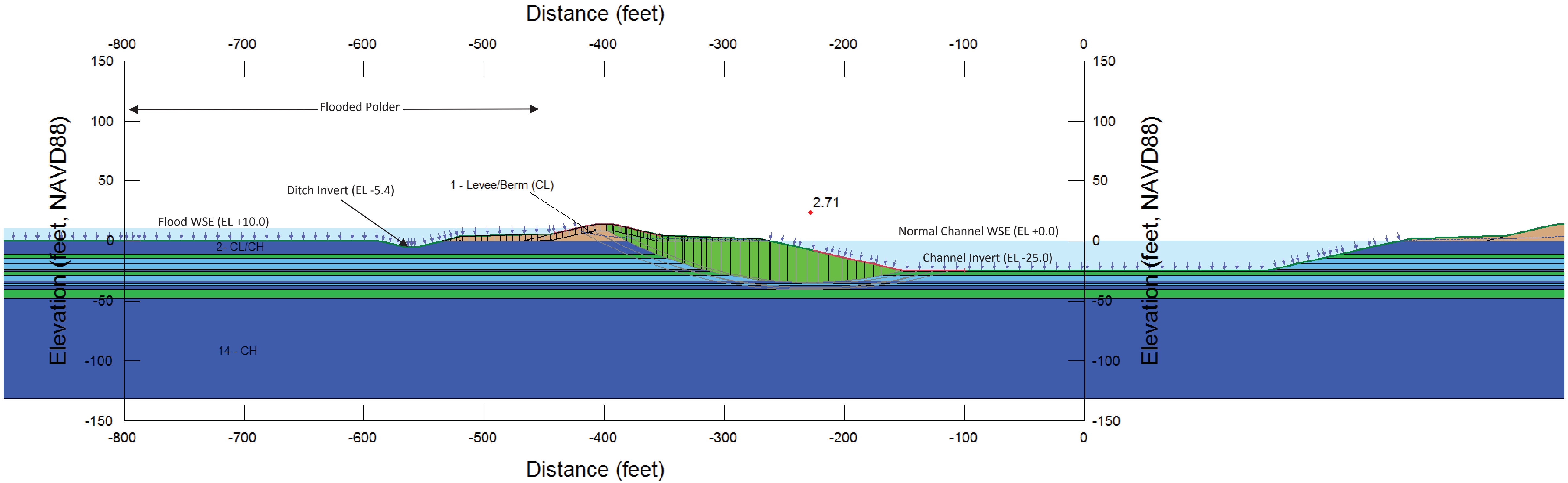
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.5

Created By: Crosariol, Victor
Date: 11/14/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB Case 2A: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 23 °
13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

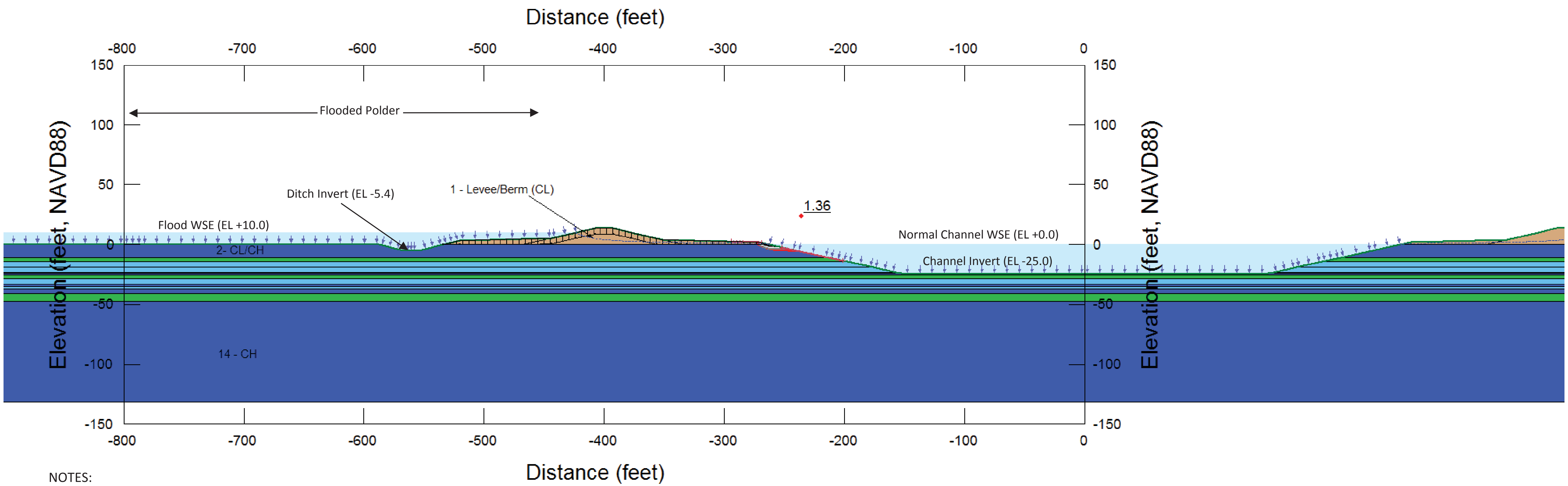
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.6

Created By: Crosariol, Victor
Date: 11/15/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB Case 2B: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 25 °
10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 28 °
12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 0 psf Phi': 23 °
13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV. | DATE | DESCRIPTION | BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

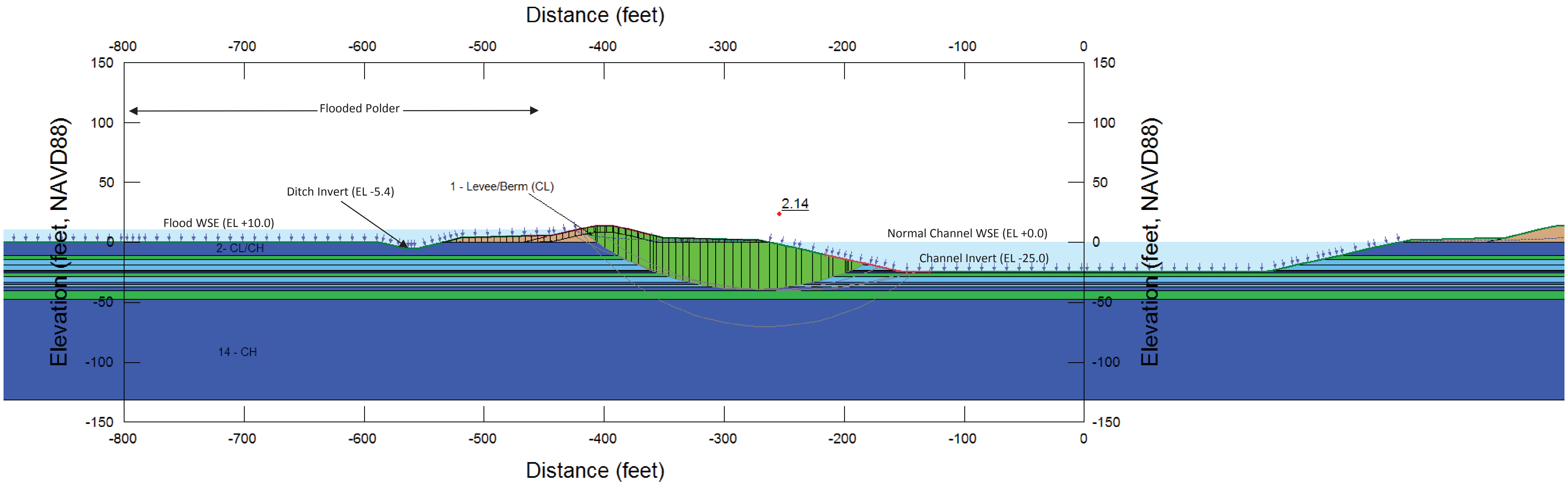
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.7

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
RF_7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 338 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 348 psf
RF_8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 10 °
RF_10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 435 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 453 psf
RF_11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 200 psf Phi': 15 °
RF_12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 476 psf C-Rate of Change: 11.6 psf/ft C-Maximum: 515 psf
RF_13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
RF_14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 612 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,396 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

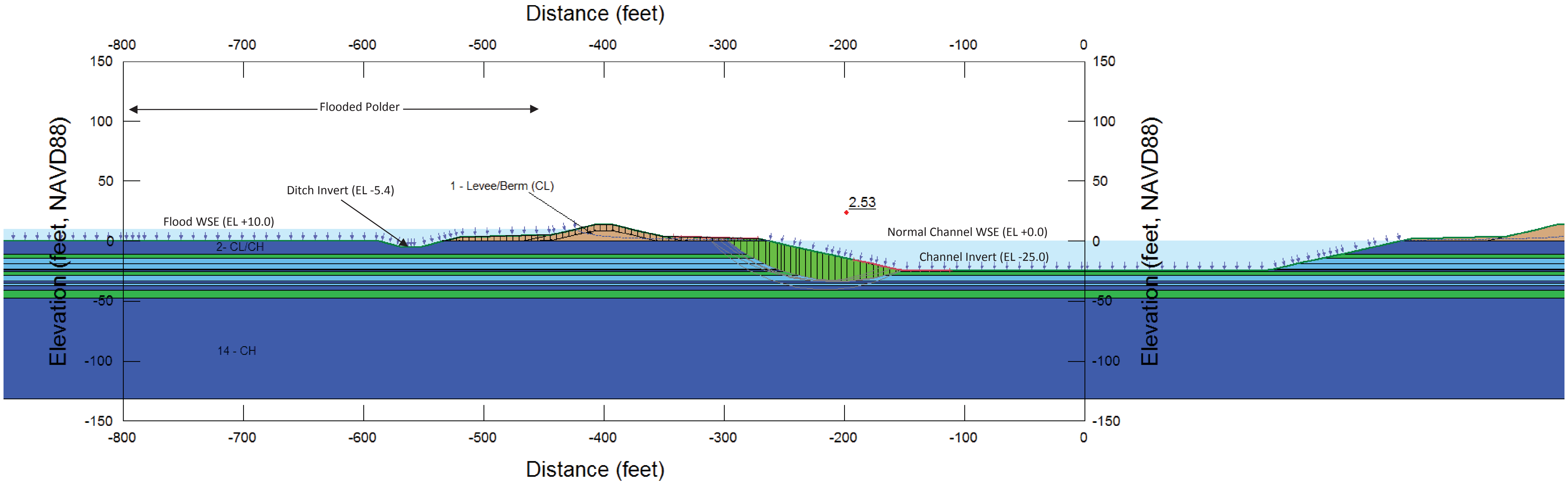
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.8

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
RF_7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 338 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 348 psf
RF_8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 10 °
RF_10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 435 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 453 psf
RF_11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 200 psf Phi': 15 °
RF_12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 476 psf C-Rate of Change: 11.6 psf/ft C-Maximum: 515 psf
RF_13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
RF_14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 612 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,396 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

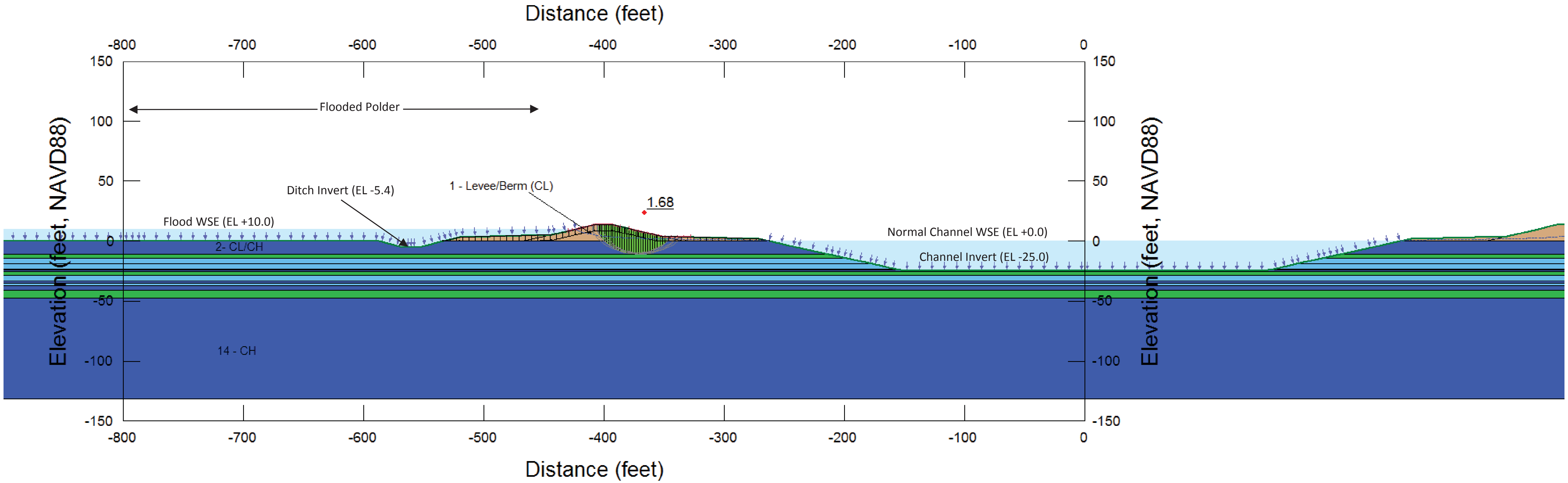
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.9

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 01_Station 82+00_30% Levee.gsz
Analysis: STAB_RF Case 3C: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CL/CH 0.0 to -11.0 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 300 psf Phi': 0 °
RF_3 - SM -11.0 to -14.4 (Kv=8x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - SM/CH/ML Interbedded -14.4 to -19.2 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_5 - ML -19.2 to -23.4 (Kv=5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_6 - SP -23.4 to -24.4 (Kv=1x10-2 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
RF_7 - CH -24.4 to -25.4 (Kv=6x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 338 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 348 psf
RF_8 - SM -25.4 to -28.9 (Kv=3x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_9 - CL/ML/SM Interbedded -28.9 to -33.4 (Kv=5x10-6 cm/sec, Kv/Kh=0.10) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 10 °
RF_10 - CL -33.4 to -35.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 435 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 453 psf
RF_11 - ML -35.4 to -37.4 (Kv=5.5x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion': 200 psf Phi': 15 °
RF_12 - CL -37.4 to -40.7 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 115 pcf C-Top of Layer: 476 psf C-Rate of Change: 11.6 psf/ft C-Maximum: 515 psf
RF_13 - SC -40.7 to -47.8 (Kv=9x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion': 0 psf Phi': 27 °
RF_14 - CH -47.8 to -131.4 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 612 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,396 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **82+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3C**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-5.10

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability M-C Model Parameters[3]		Rapid Loading Stability[2] — Current Strength Parameters			Rapid Loading Stability[2] — Assumed Strength Increase due to Surcharging									Rapid Loading Stability[2] — Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(S_u/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	14	-2	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	-2	-31.5	CH/OH/CL	100	0	23	0.22	300		960	50%	-1.5	480	1608	106	354	300	-25.0	Spatial M-C, Linear Cohesion Function	0					300	-1.5	300	-25.0	354	-31.5
3	-31.5	-38	ML	105	0	28		200	15	960	50%	-1.5	1608	1885					M-C	15	200									
4	-38	-108	CL/CH	105	0	23	0.22			960	50%	-1.5	1885	4867	415	1071			S = f(depth)	0		415	9.4	1071						
5	-108	-113	SP/SM	120	0	30		0	30	960	50%	-1.5	4867	5126					M-C	30	0									
6	-113	-126	CL	110	0	23	0.22			960	50%	-1.5	5126	5769	1128	1269			S = f(depth)	0		1128	10.5	1269						
7	-126	-135	SM	120	0	28		0	28	960	50%	-1.5	5769	6287					M-C	28	0									

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-6.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; *S=f(depth)* indicates that undrained shear strength increases with depth; and *Spatial M-C, Linear Cohesion Function* indicates that the undrained shear strength profile is fully specified within the layer.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet) — Channel	Water Surface Elevations (WSE) (feet) — Polder	Remarks
1	Steady-State	10	-4.8	Polder WSE From low water observations in PZ-14 and PZ-15
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	**2.29**	Global	1, 2, 3, 4	Levee crown to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	**1.04**	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	**2.01**	Global	1, 2, 3, 4	Levee crown to to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	**1.43**	Local	1, 2	Berm toe to channel slope	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.52**	Global	1, 2, 3, 4	Polder-side levee slope to channel slope	
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.99**	Local	1, 2	Channel-side berm to channel slope	
3C	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.20**	Local	1, 2	Polder-side levee slope to channel-side berm	Safety map encompases all slip surfaces with FOS < 1.3

NOTES

1 Cross Section was developed from 30 Percent Civil Design geometry.
2 Borings NL-5C and NL-11C was considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5 Model extends 1600 feet landward of approximate Channel centerline.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.

NOT TO SCALE

STABILITY ANALYSIS
STATION: **90+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

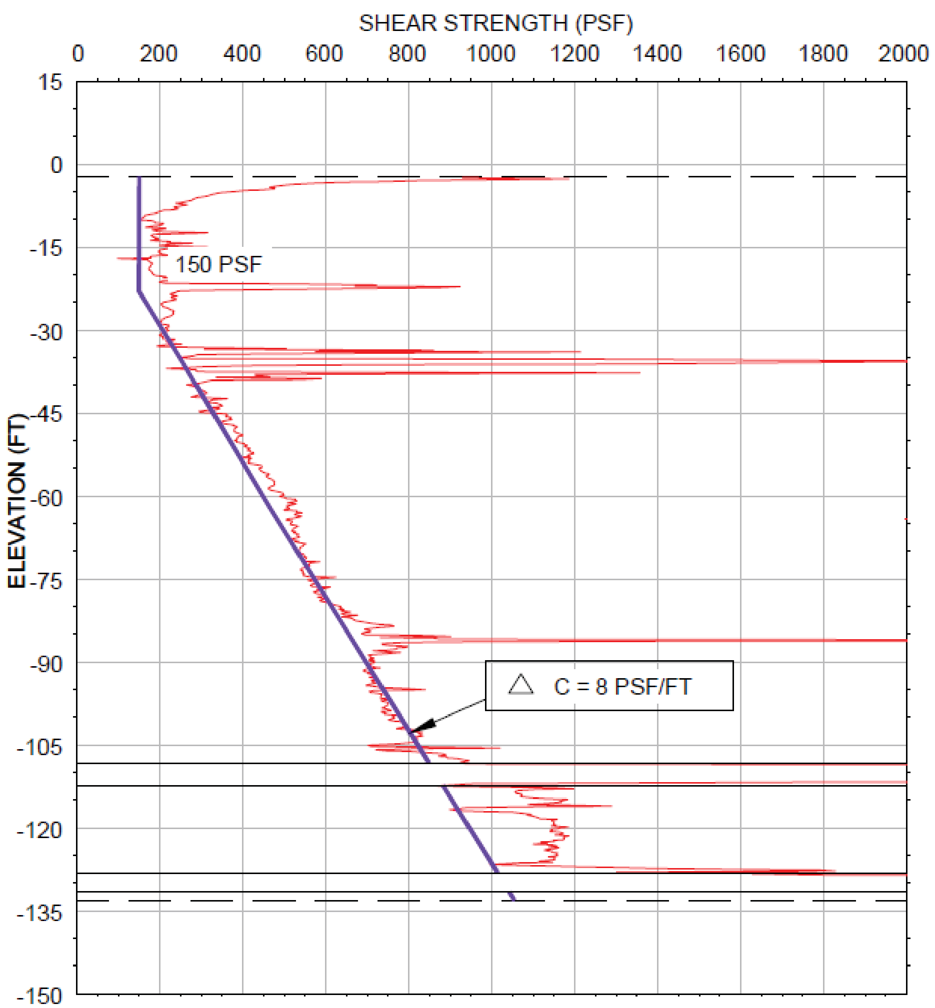
REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

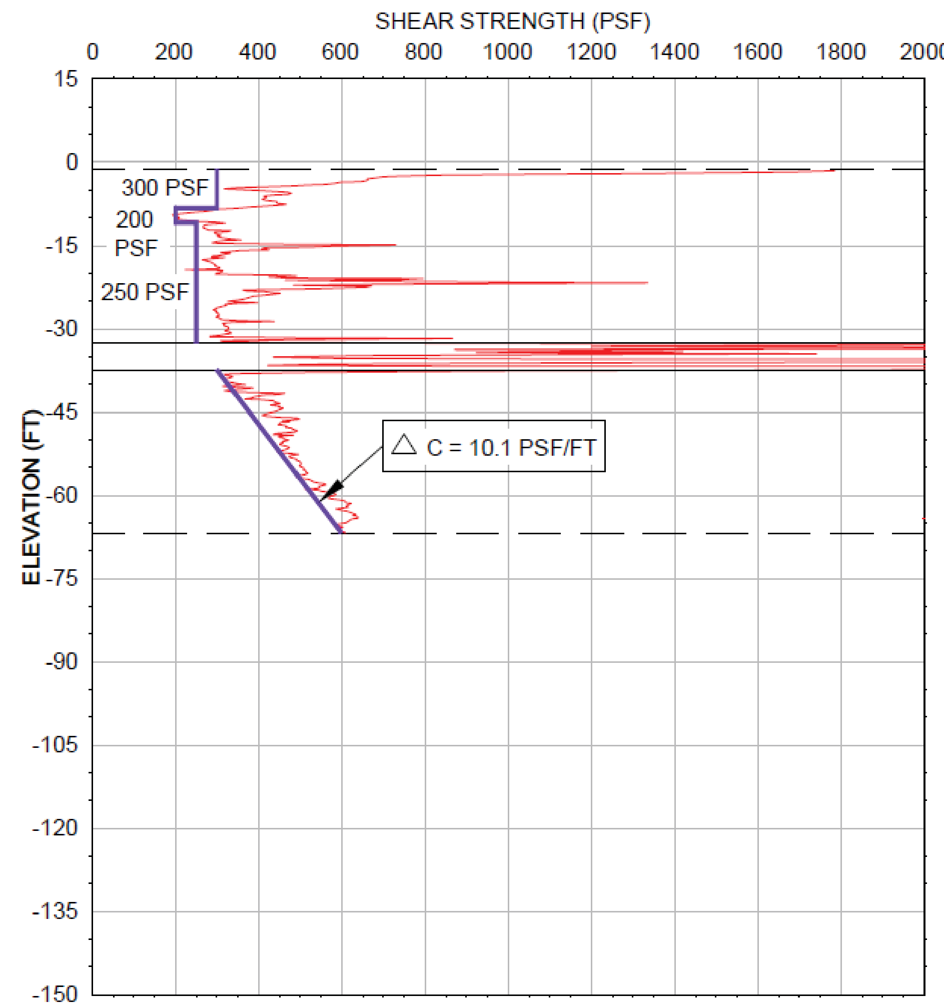
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.1



DESIGN CHARTS NL-11C	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2q

LEGEND

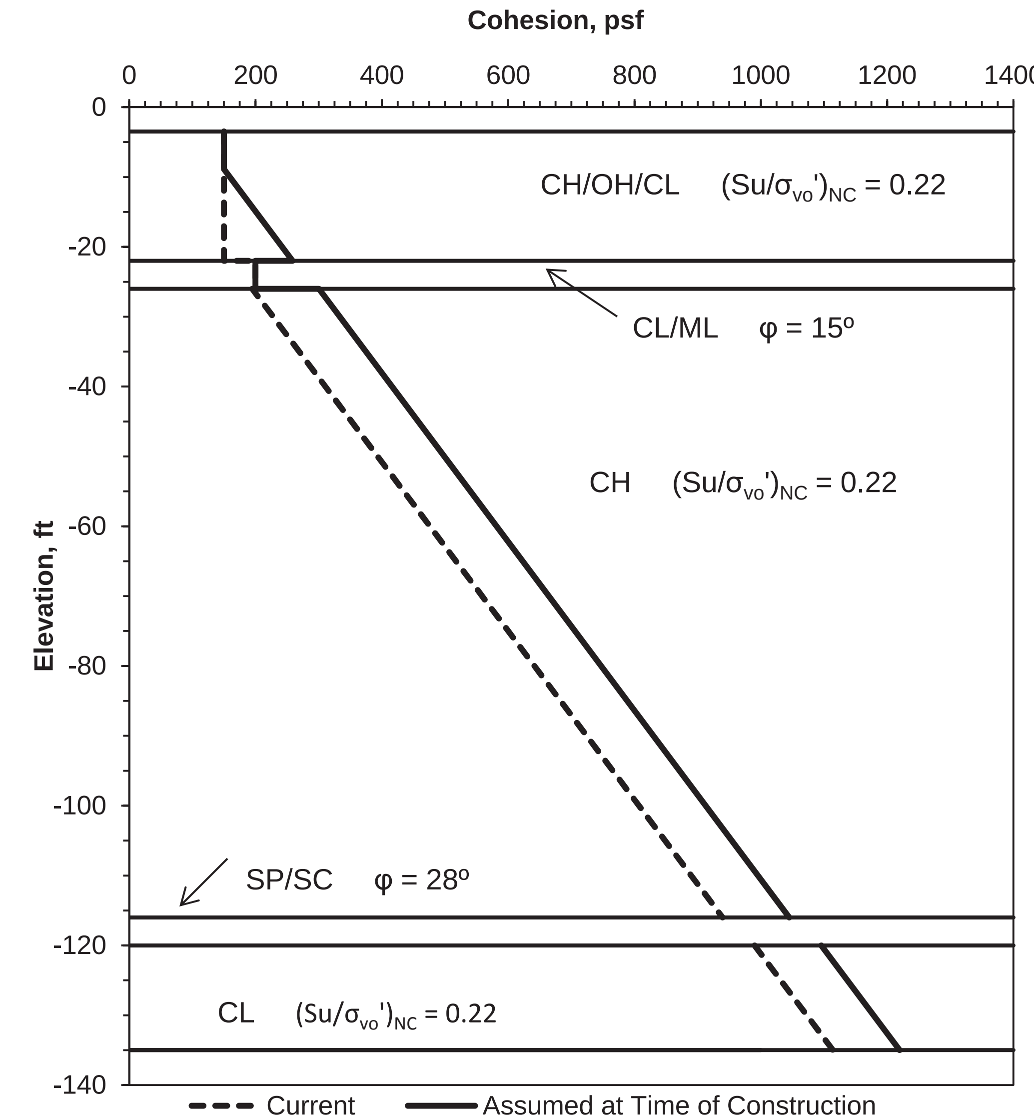
NL-11C
DESIGN STRENGTH



DESIGN CHARTS NL-5C	
Mid Barataria Diversion (BA-153) Project Plaquemines Parish, Louisiana	
GEOENGINEERS	Figure K-2k

LEGEND

NL-5C
Design Strength



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

Figures above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013

RAPID FLOOD STABILITY ANALYSIS
STATION: **90+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

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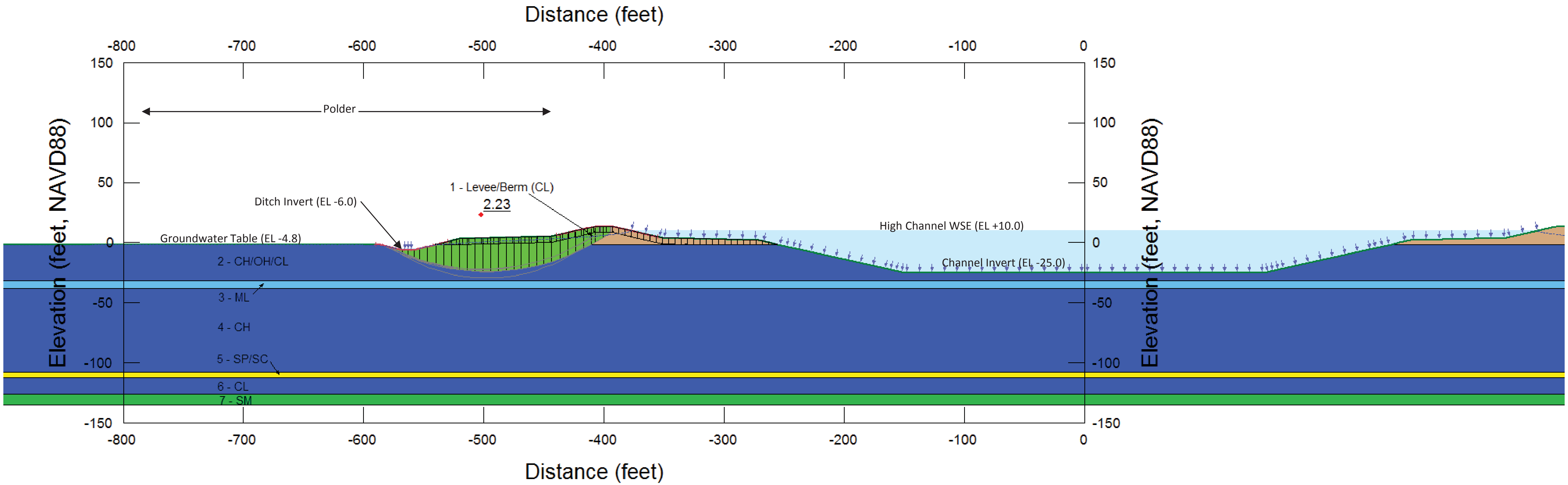
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.2

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-4.8 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

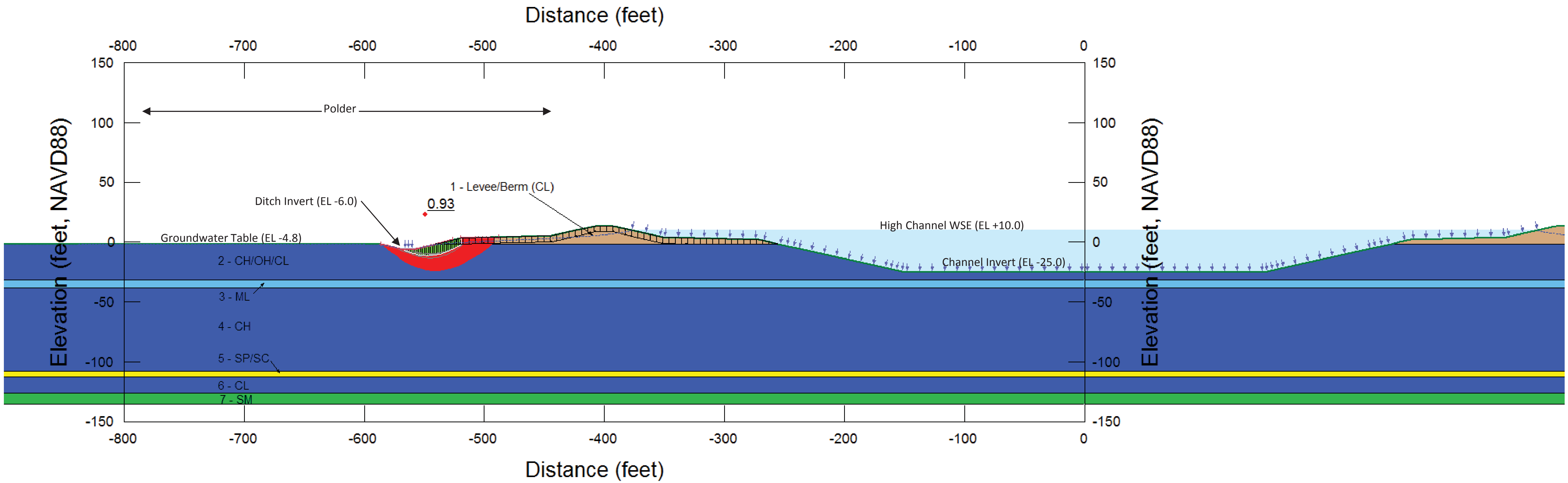
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.3

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-4.8 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION AND RESTORATION AUTHORITY — CPRA

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

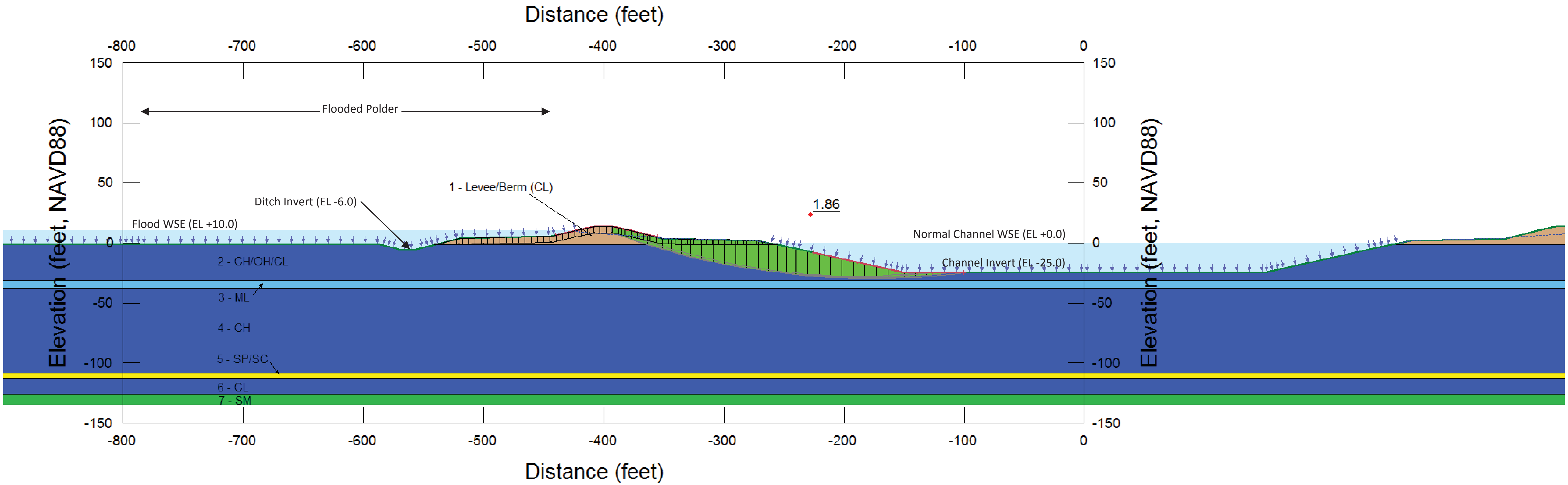
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.4

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB Case 2A: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION

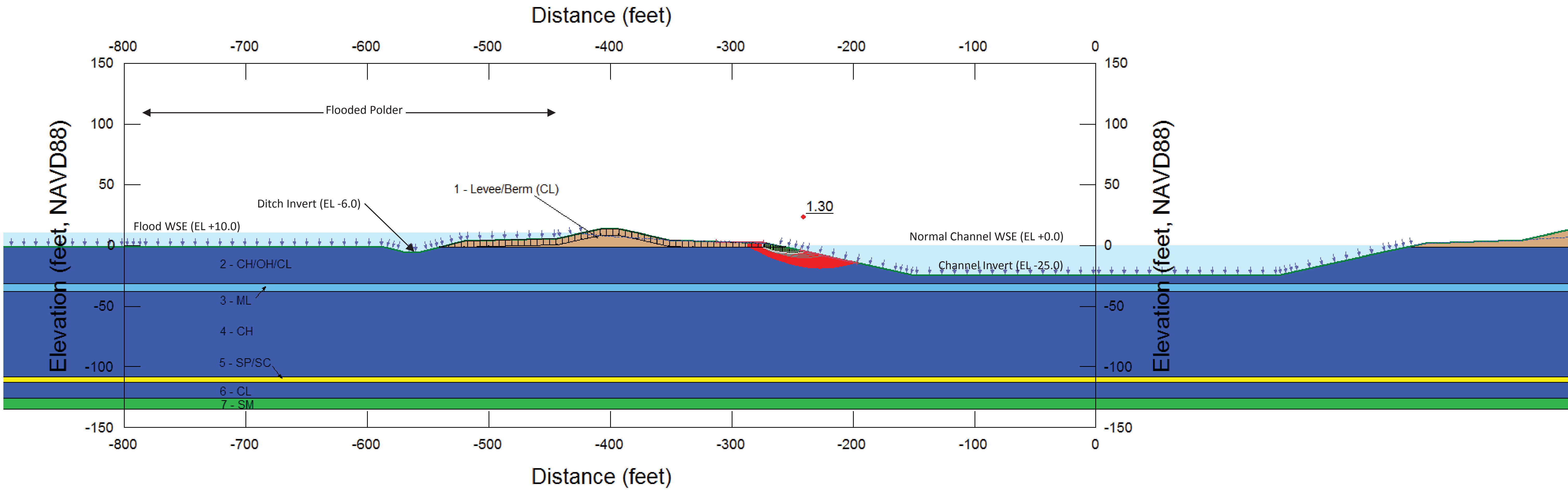
GEOTECHNICAL ENGINEERING REPORT

STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
DATE: JULY 2014
DRAWN BY:
DESIGNED BY:
APPROVED BY:
FIGURE: B-6.5

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB Case 2B: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 23 °
7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

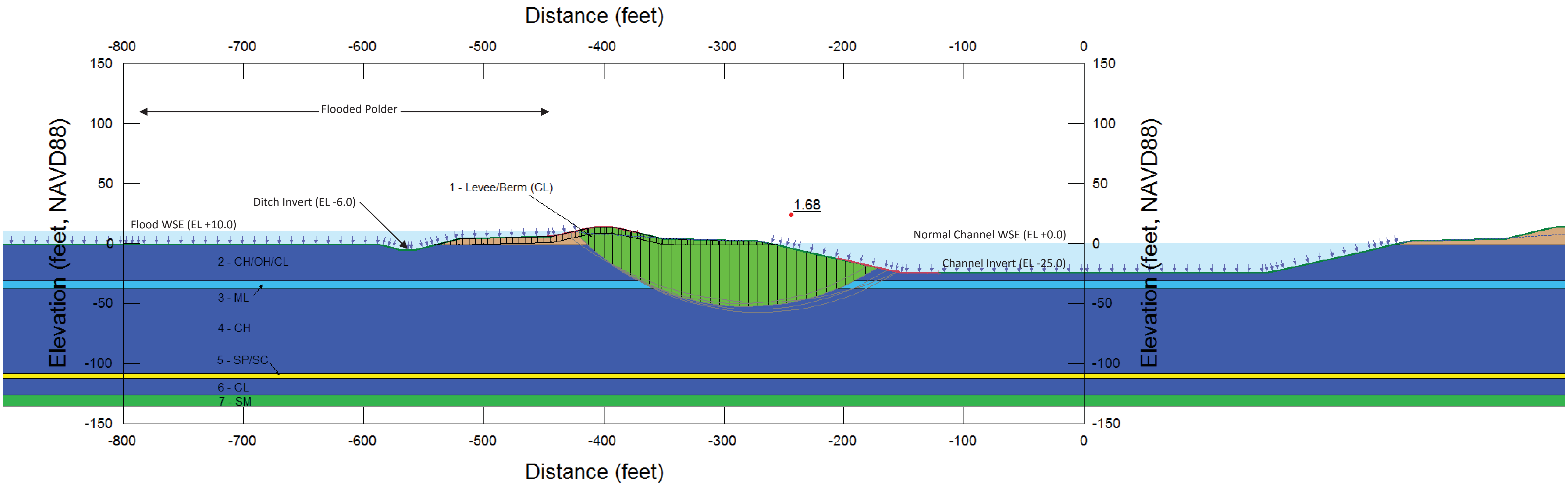
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.6

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH/CL -1.5 to -31.5 Phi': 0 °
RF_3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 415 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,071 psf
RF_5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
RF_6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 1,128 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,269 psf
RF_7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

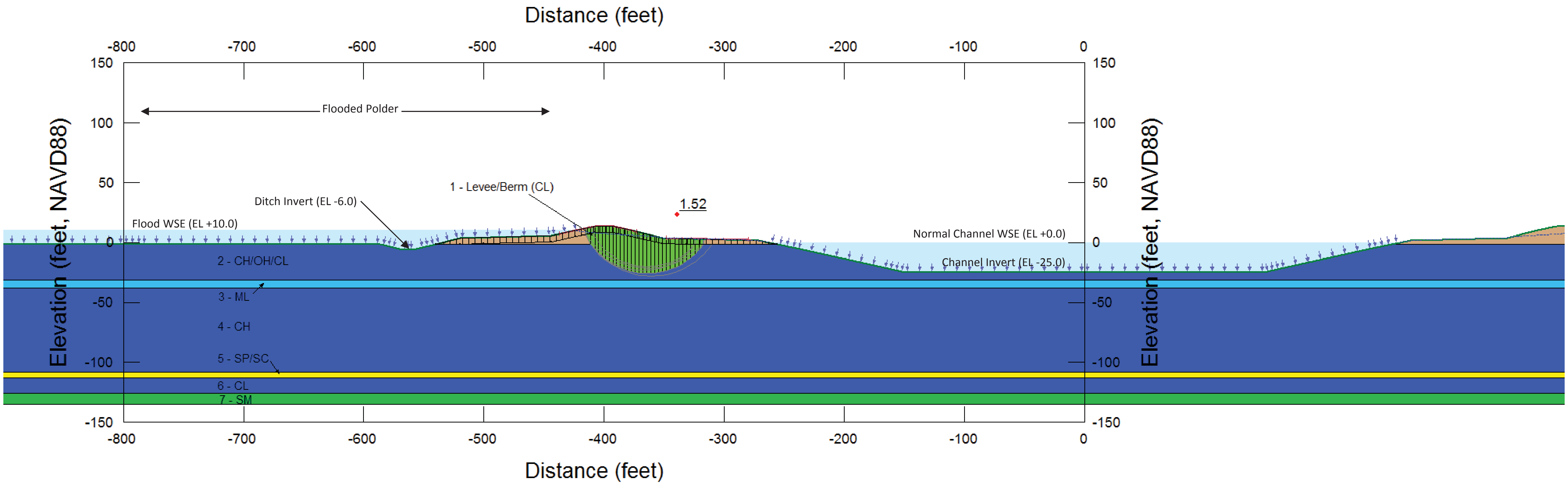
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.7

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 90+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH/CL -1.5 to -31.5 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH/CL -1.5 to -31.5 Phi': 0 °
RF_3 - ML -31.5 to -38 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL/CH -38 to -108 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 415 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 1,071 psf
RF_5 - SP/SM -108 to -112.5 (Kv=1x10-3 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 30 °
RF_6 - CL -112.5 to -126 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 110 pcf C-Top of Layer: 1,128 psf C-Rate of Change: 10.5 psf/ft C-Maximum: 1,269 psf
RF_7 - SM -126 to -135 (Kv=2x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **90+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-6.8

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]																							
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging									Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(S_u/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	13.5	-3.5	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	-3.5	-22	CH/OH/CL	100	0	23	0.22	150		960	50%	-3.5	480	1176	106	259	150	-8.9	Spatial M-C, Linear Cohesion Function	0					150	-3.5	150	-8.9	259	-22
3	-22	-26	CL/ML	110	0	25		200	15	960	50%	-3.5	1176	1366					M-C	15	200									
4	-26	-116	CH	100	0	23	0.22			960	50%	-3.5	1366	4750	301	1045			S = f(depth)	0		301	8.3	1045						
5	-116	-120	SP/SC	120	0	28		0	28	960	50%	-3.5	4750	4980					M-C	28	0									
6	-120	-135	CH	100	0	23	0.22			960	50%	-3.5	4980	5544	1096	1220			S = f(depth)	0		1096	8.3	1220						

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-7.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; *S=f(depth)* indicates that undrained shear strength increases with depth; and *Spatial M-C, Linear Cohesion Function* indicates that the undrained shear strength profile is fully specified within the layer.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)		Remarks
		Channel	Polder	
1	Steady-State	10	-6.1	Polder WSE From low water observations in PZ-13 and PZ-14
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	**2.29**	Global	1, 2, 3, 4	Levee crown to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	**1.04**	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	**2.01**	Global	1, 2, 3, 4	Levee crown to to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	**1.43**	Local	1, 2	Berm toe to channel slope	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.52**	Global	1, 2, 3, 4	Polder-side levee slope to channel slope	
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.99**	Local	1, 2	Channel-side berm to channel slope	
3C	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.20**	Local	1, 2	Polder-side levee slope to channel-side berm	Safety map encompases all slip surfaces with FOS < 1.3

NOTES

1 Cross Section was developed from 30 Percent Civil Design geometry.
2 Boring NL-3A and CPT NL-3C was considered to develop the stratigraphy shown.
3 Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4 Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5 Model extends 1600 feet landward of approximate Channel centerline.
6 The Spencer analysis method was used to evaluate stability.
7 5-foot tension cracks filled with water are applied in the embankment.

NOT TO SCALE

STABILITY ANALYSIS
STATION: **110+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

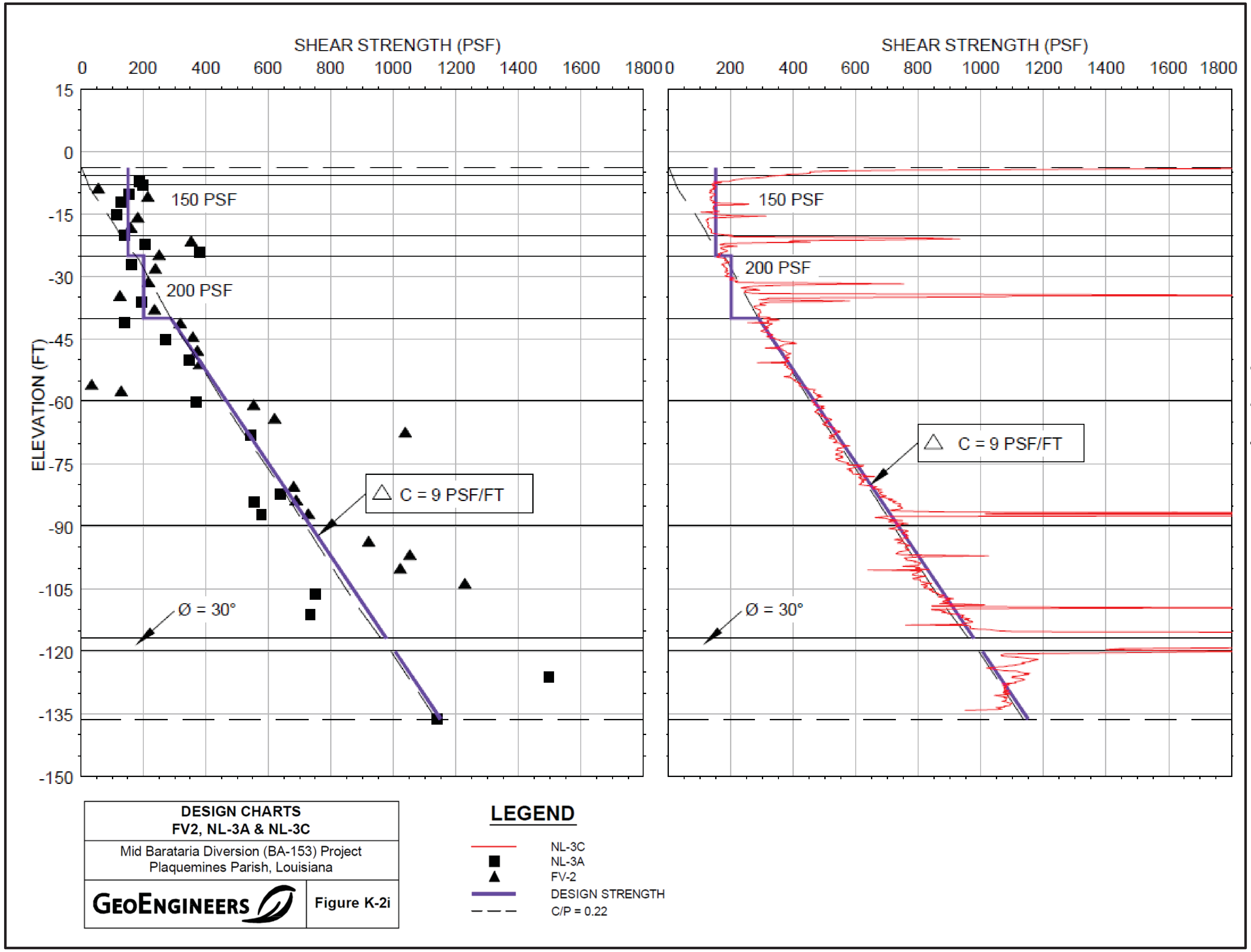
REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

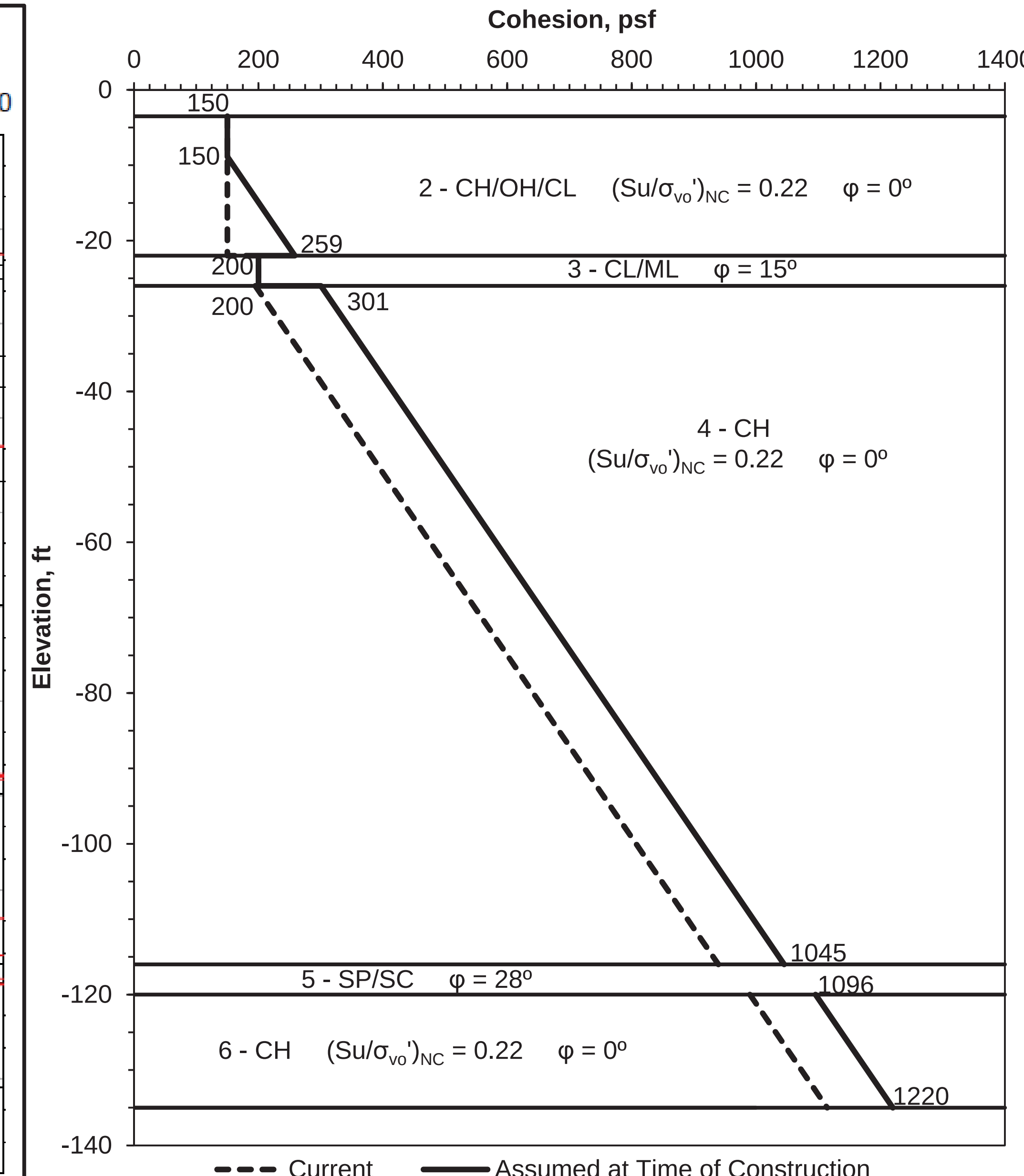
DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.1



Figures above taken from "Draft Geotechnical 30% Design Engineering Data Report" by GeoEngineers, dated November 27, 2013



Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS

STATION: **110+00**

RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

CPRA — COASTAL PROTECTION AND RESTORATION AUTHORITY

STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:

DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION

STATE PROJECT NUMBER: BA-153

FEDERAL PROJECT NUMBER: BA-153

APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT

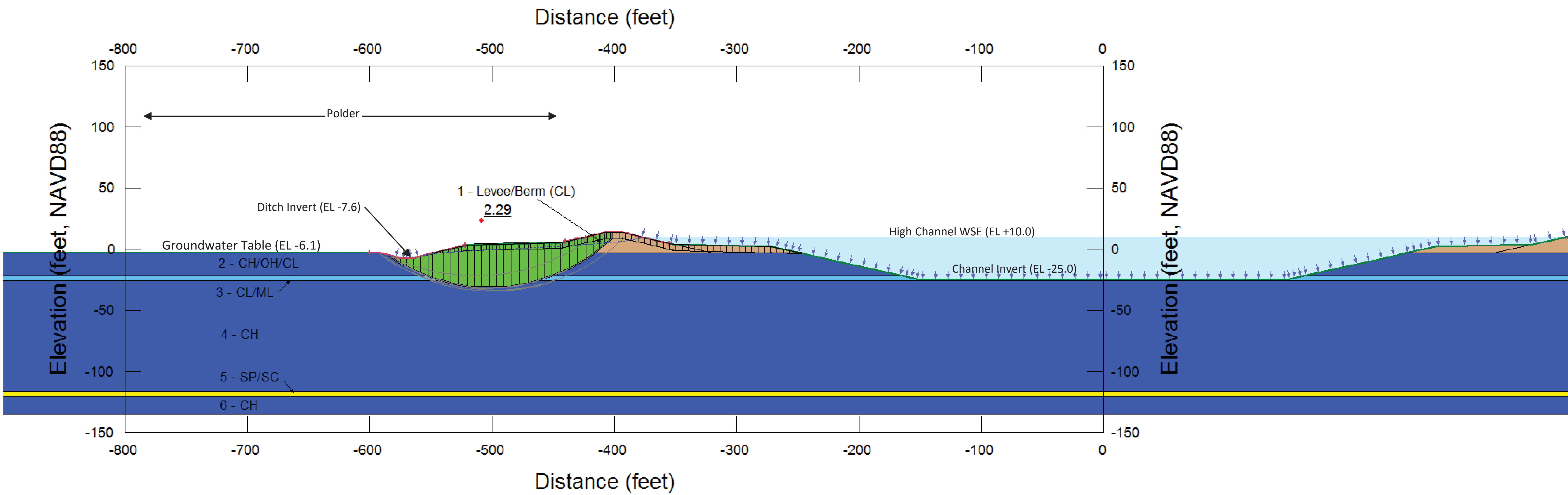
DATE: JULY 2014

FIGURE: B-7.2

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: +**10 feet**
WSE Outside Channel: **-6.1 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION AND RESTORATION AUTHORITY — CPRA
STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

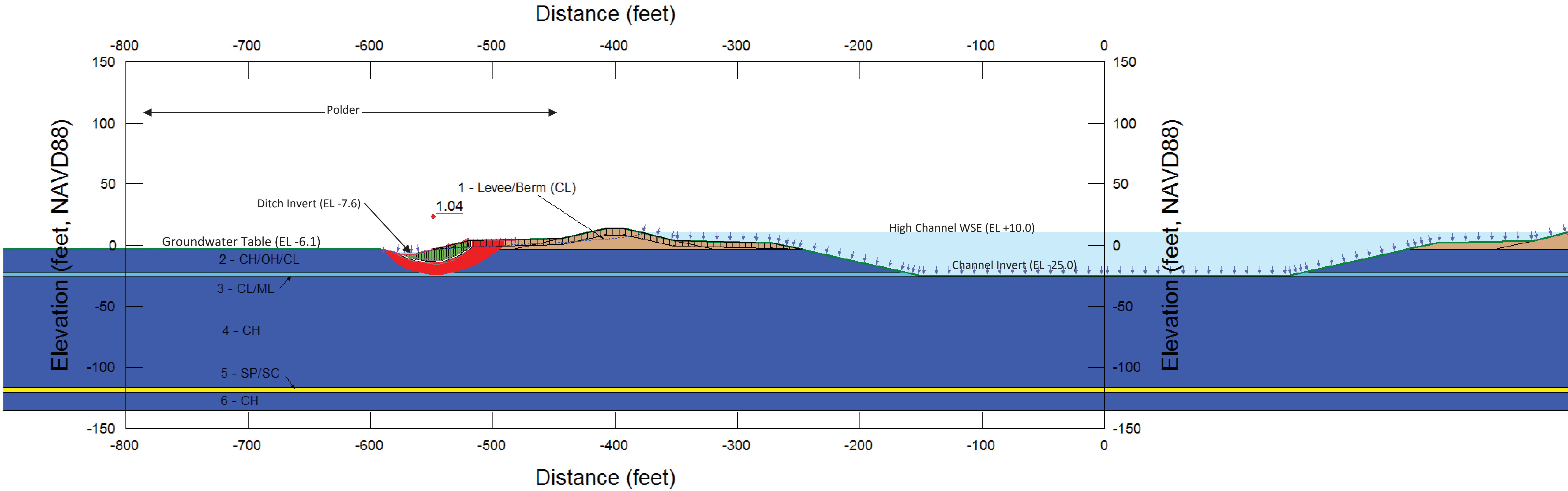
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.3

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-6.1 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

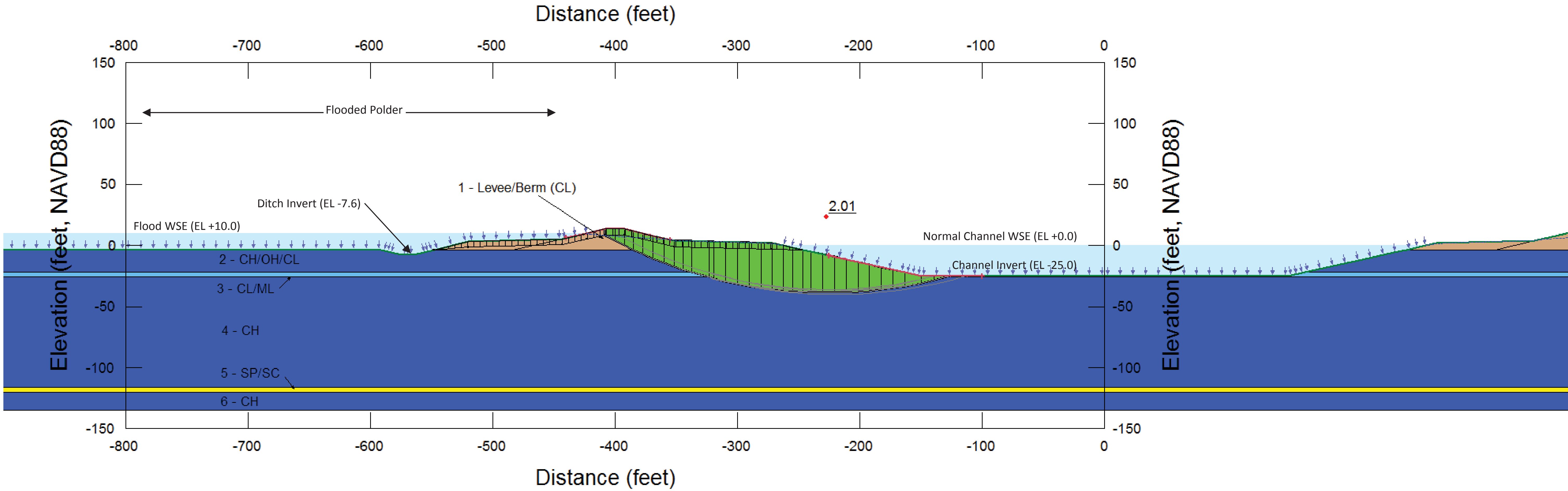
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.4

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB Case 2A: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

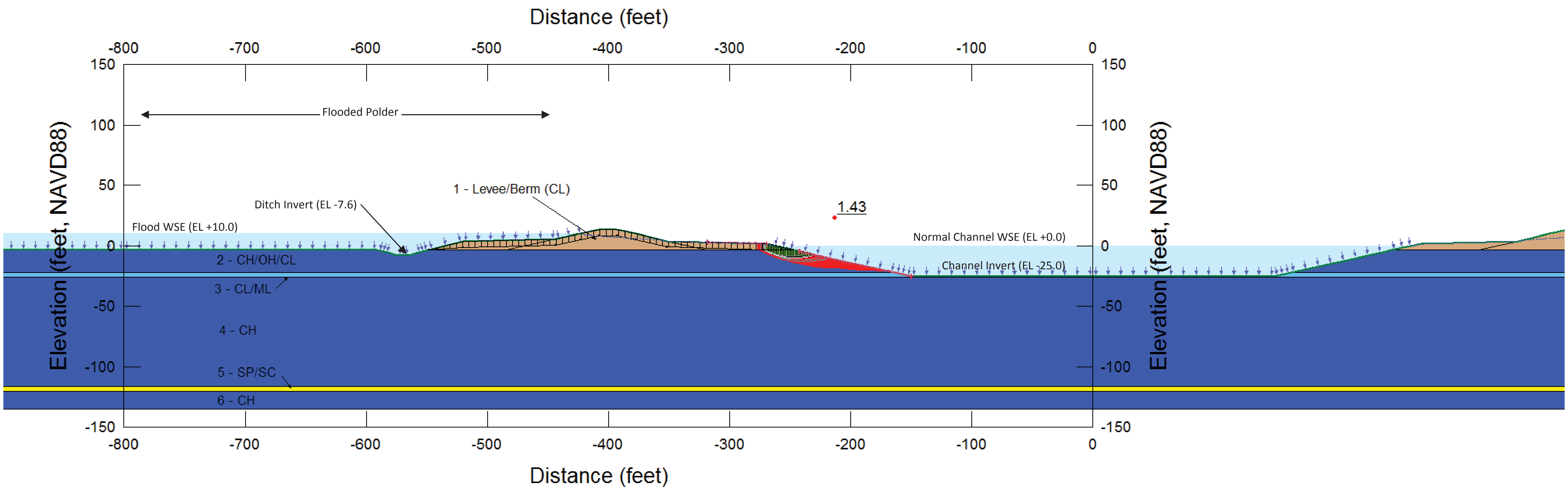
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.5

DRAWN BY:
DESIGNED BY:
APPROVED BY:

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB Case 2B: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 0 psf Phi': 25 °
4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

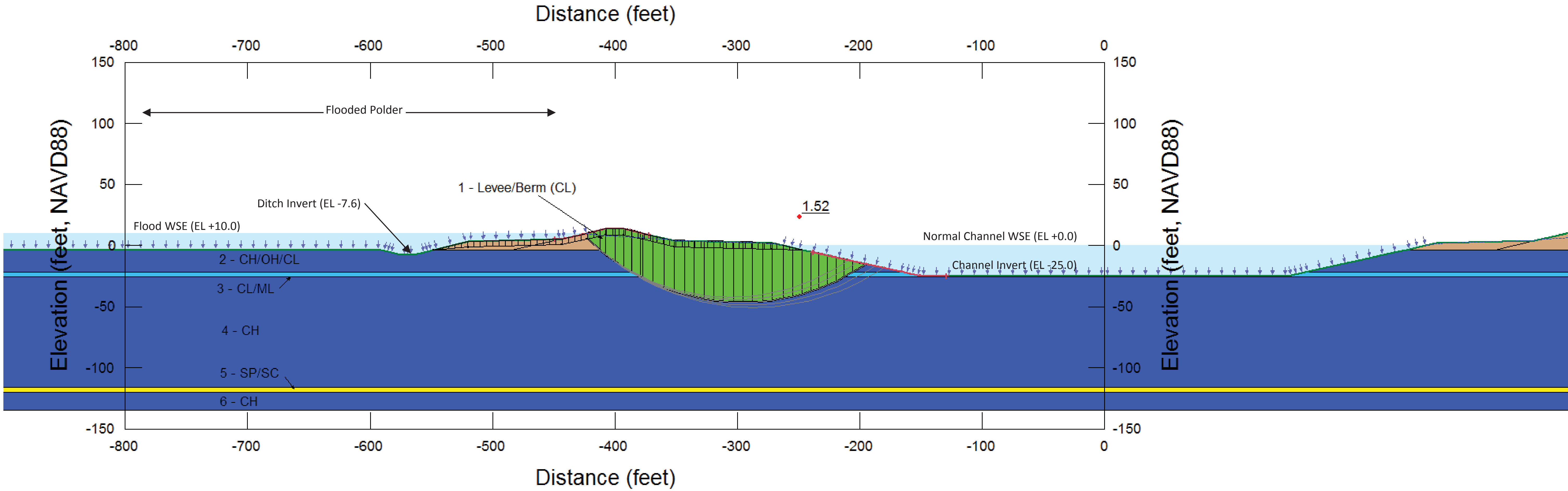
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.6

DRAWN BY:
DESIGNED BY:
APPROVED BY:

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH -3.5 to -22 Phi': 0 °
RF_3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 301 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,045 psf
RF_5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 1,096 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,220 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

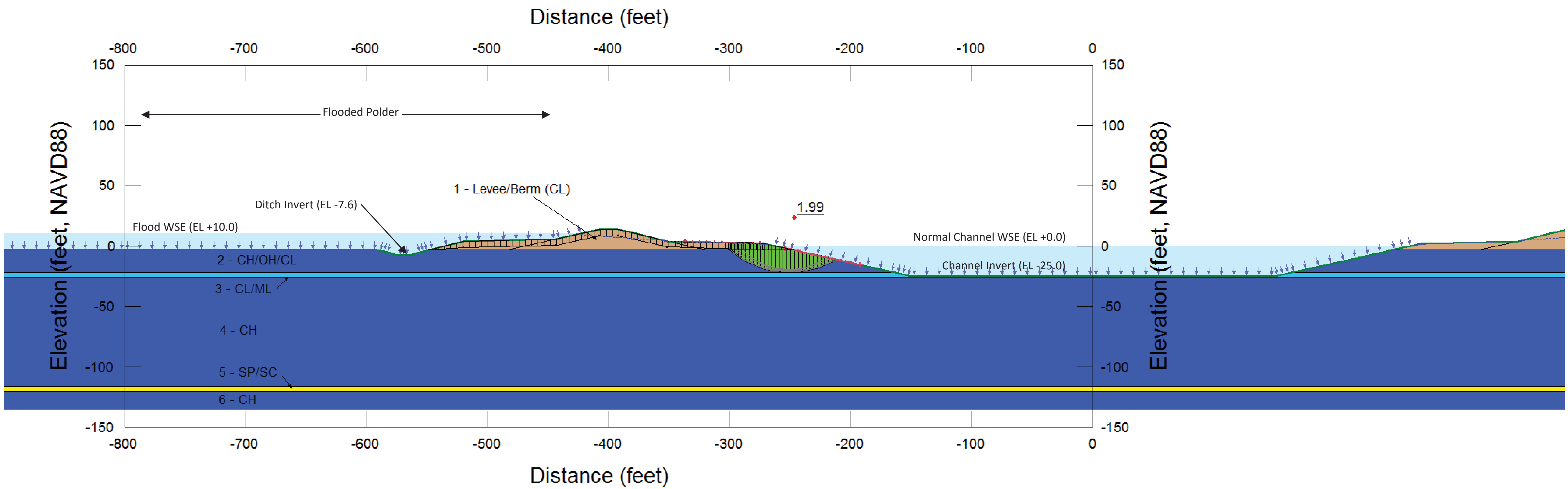
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.7

DRAWN BY:
DESIGNED BY:
APPROVED BY:

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH -3.5 to -22 Phi': 0 °
RF_3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 301 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,045 psf
RF_5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 1,096 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,220 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: +**0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

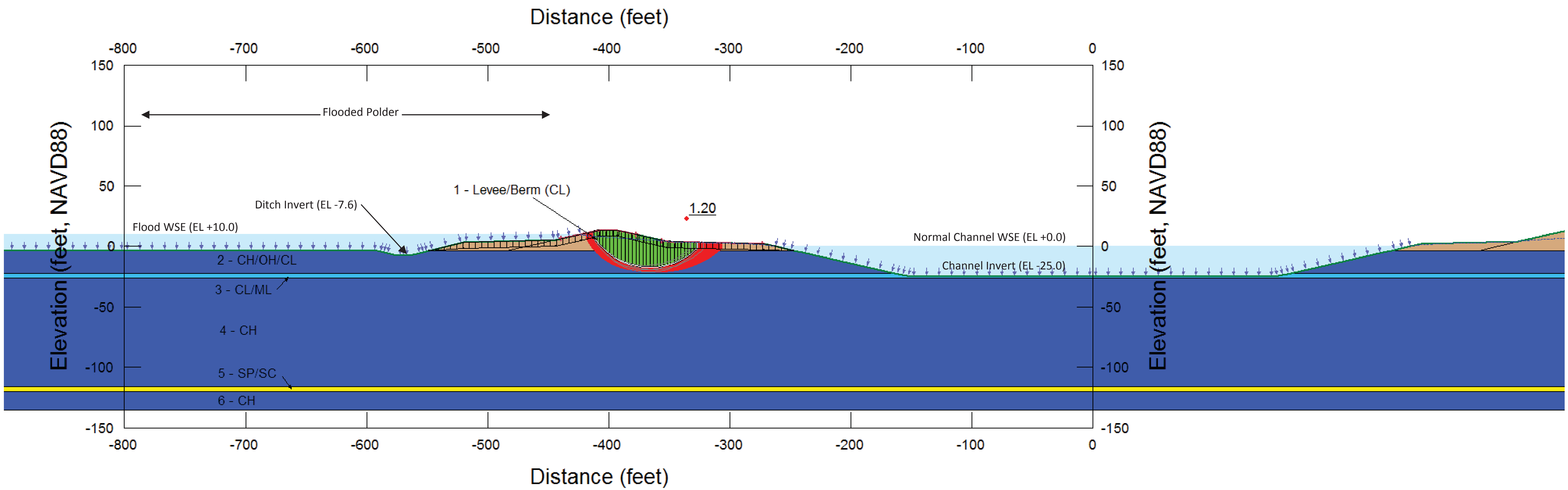
GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.8

DRAWN BY:
DESIGNED BY:
APPROVED BY:

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 110+00_30% Levee.gsz
Analysis: STAB_RF Case 3C: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH/CL -3.5 to -22 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH -3.5 to -22 Phi': 0 °
RF_3 - CL/ML -22 to -26 (Kv=5x10-6 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 110 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CH -26 to -116 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 301 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,045 psf
RF_5 - SP/SC -116 to -120 (Kv=5x10-4 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
RF_6 - CH -120 to -135 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 100 pcf C-Top of Layer: 1,096 psf C-Rate of Change: 8.3 psf/ft C-Maximum: 1,220 psf



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"
2) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.3

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **110+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3C**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-7.9

STABILITY ANALYSIS PARAMETERS

Layers					Steady-State Stability		Rapid Loading Stability[2]																							
					M-C Model Parameters[3]		Current Strength Parameters			Assumed Strength Increase due to Surcharging									Geo-Studio Material Model Parameters											
Layer	Top Elevation (ft)	Bottom Elevation (ft)	Soil Type	Total Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (deg)	$(Su/\sigma_{vo}')_{NC}$ (-)	Cohesion (psf)	Friction Angle (deg)	Surcharge Load at Surface[1] (psf)	Assumed Uniform u_e Dissipation[1]	Elevation of GWT (ft)	Top of Layer σ_v' (psf)	Bottom of Layer σ_v' (psf)	Top of Layer Su_{NC} (psf)	Bottom of Layer Su_{NC} (psf)	Su_{OC} MIN (psf)	Transition Depth (psf)	Model[3]	Phi (deg)	C (psf)	C - Top of Layer (psf)	C - Rate of Change (psf/ft)	C - Max (psf)	C_1 (psf)	Y_1 (ft)	C_2 (psf)	Y_2 (ft)	C_3 (psf)	Y_3 (ft)
1	13.5	-4.5	Levee/Berm	120	0	28		600	0										M-C	0	600									
2	-4.5	-27	CH/OH	100	0	23	0.22	150	0	960	50%	-4.5	480	1326	106	292	150	-9.9	Spatial M-C, Linear Cohesion Function	0					150	-4.5	150	-9.9	292	-27
3	-27	-33	ML	105	0	28		200	15	960	50%	-4.5	1326	1582					M-C	15	200									
4	-33	-85	CL/CH	105	0	23	0.22			960	50%	-4.5	1582	3797	348	835			S = f(depth)	0		348	9.4	835						
5	-85	-110	ML	105	0	28		200	15	960	50%	-4.5	3797	4862					M-C	15	200									
6	-110	-120	ML/SM/SP	120	0	28		100	20	960	50%	-4.5	4862	5438					M-C	20	100									
7	-120	-135	ML	105	0	28		200	15	960	50%	-4.5	5438	6077					M-C	15	200									

Notes: 1. Strength increase due to surcharging is from an assumed 8 foot soil fill with a unit weight of 120 pcf. It is also assumed that by the time of construction, approximately 1 year, a condition of 50% excess pore water dissipation will be reached in the cohesive layers.
2. Refer to Figure B-8.2 for the strength profile used in rapid flood stability analyses.
3. Explanation of Models: *M-C* indicates a Mohr-Coulomb model using specified cohesion and friction angle; *S=f(depth)* indicates that undrained shear strength increases with depth; and *Spatial M-C, Linear Cohesion Function* indicates that the undrained shear strength profile is fully specified within the layer.

SEEPAGE ANALYSIS CASES

Seepage Case	Flow Regime	Water Surface Elevations (WSE) (feet)		Remarks
		Channel	Polder	
1	Steady-State	10	-6.8	Polder WSE From low water observations in PZ-13
2	Steady-State	0	10	

STABILITY ANALYSIS CASES AND RESULTS

Stability Analysis Case	Seepage Case	Analysis Type	Soil Drainage Conditions	Slip Direction	Required Factor of Safety	Calculated Critical FOS	Failure Type	Soil Layers Impacted by Critical Slip Surface	Critical Slip Description	Additional Remarks
1A	1	Steady-State Stability	Drained	Polder-side	1.50	**2.02**	Global	1, 2	Levee crown to polder-side ditch	
1B	1	Steady-State Stability	Drained	Polder-side	1.50	**0.89**	Local	1, 2	Berm toe to polder-side ditch	Safety map encompases all slip surfaces with FOS < 1.5
2A	2	Steady-State Stability	Drained	Channel-side	1.50	**1.95**	Global	1, 2, 3, 4	Channel-side levee slope to channel toe	
2B	2	Steady-State Stability	Drained	Channel-side	1.50	**1.40**	Local	1, 2	Berm toe to levee toe	Critical slip surface consists of shallow slumping; safety map encompases all slip surfaces with FOS < 1.5
3A	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.24**	Local	1, 2	Polder-side levee slope to channel-side berm	Safety map encompases all slip surfaces with FOS < 1.3
3B	2	Rapid Flood Loading	Undrained	Channel-side	1.30	**1.91**	Local	1, 2	Polder-side berm to channel slope	

NOTES

1. Cross Section was developed from 30 Percent Civil Design geometry.
2. CPT NL-1C was considered to develop the stratigraphy shown.
3. Stability is calculated using pore pressure developed from the parent steady-state seepage model.
4. Model is symmetric with respect to channel centerline, therefore results are equal on each side of the model.
5. Model extends 1600 feet landward of approximate centerline.
6. The Spencer analysis method was used to evaluate stability.
7. 5-foot tension cracks filled with water are applied in the embankment.

NOT TO SCALE

STABILITY ANALYSIS
STATION: **130+00**
STABILITY PARAMETERS AND RESULTS

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

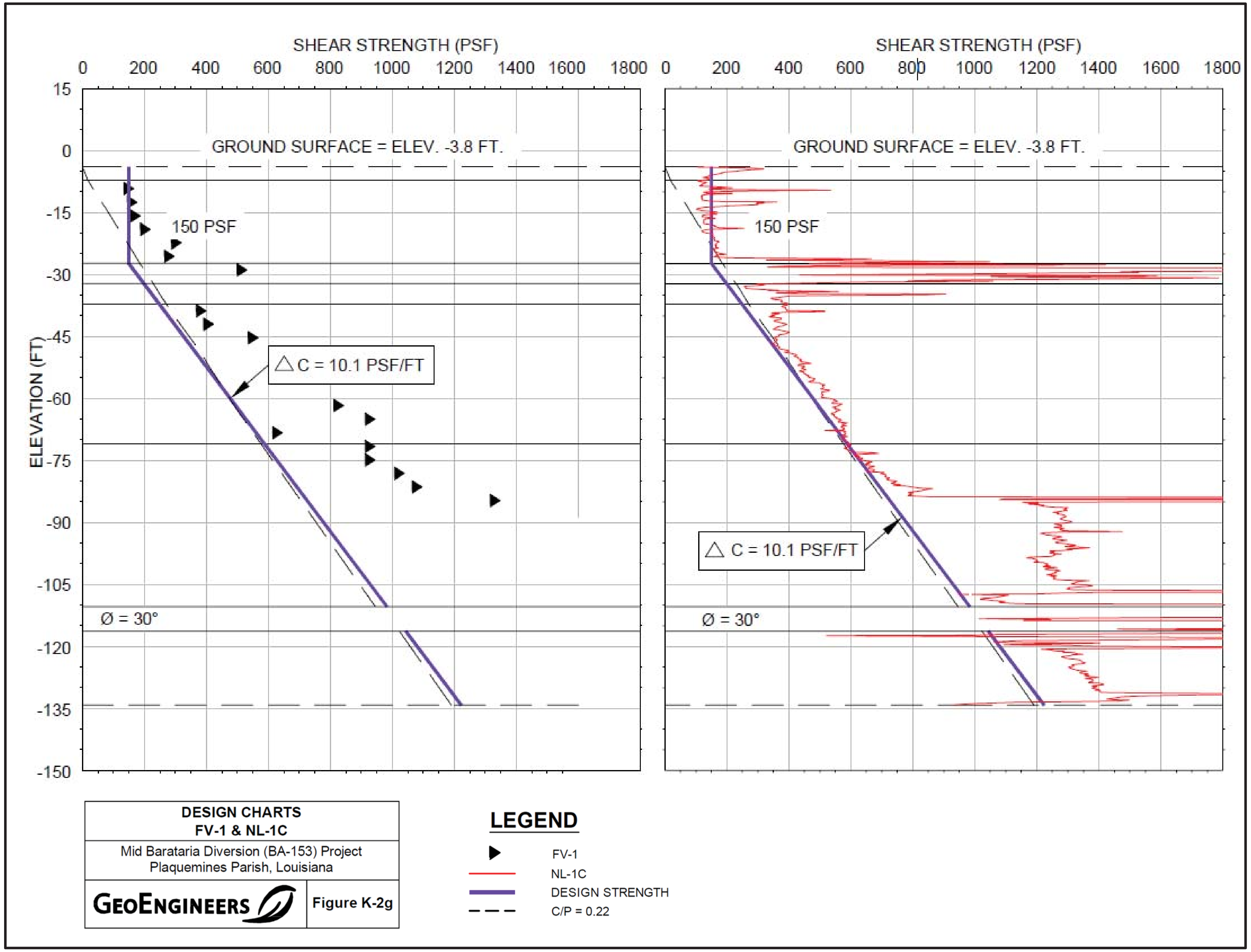
COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA
STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

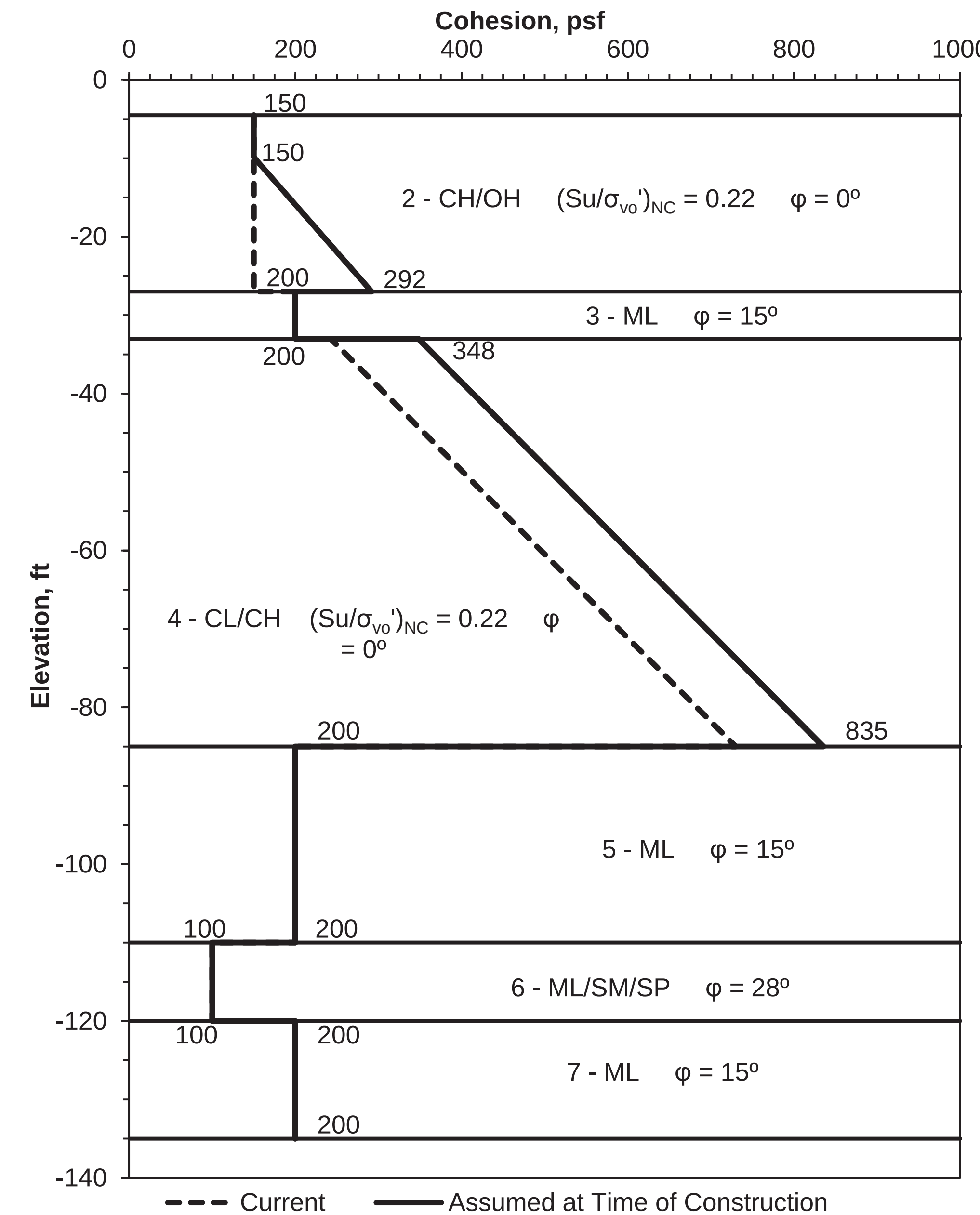
COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014

DRAWN BY: | DESIGNED BY: | APPROVED BY: | FIGURE: B-8.1





Strength Parameters used in Rapid Flood Stability Analyses

NOT TO SCALE

Figures above taken from “Draft Geotechnical 30% Design Engineering Data Report” by GeoEngineers, dated November 27, 2013

RAPID FLOOD STABILITY ANALYSIS
STATION: **130+00**
RAPID FLOOD STABILITY PARAMETERS

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
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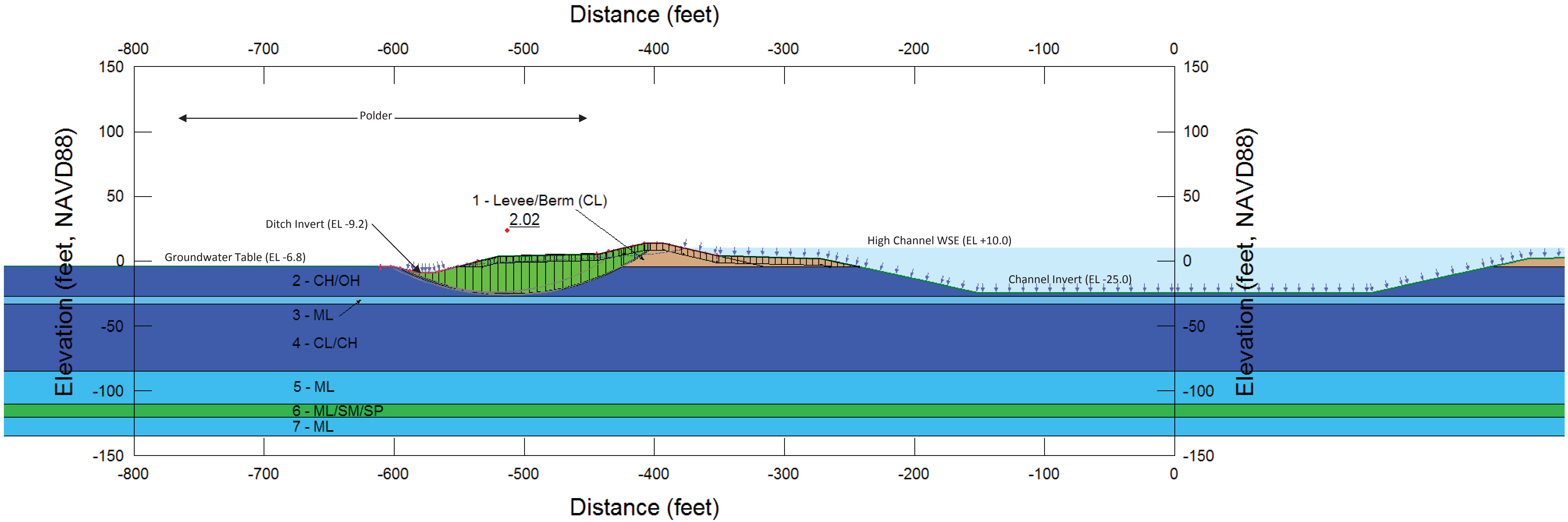
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.2

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB Case 1A: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1A**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-6.8 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

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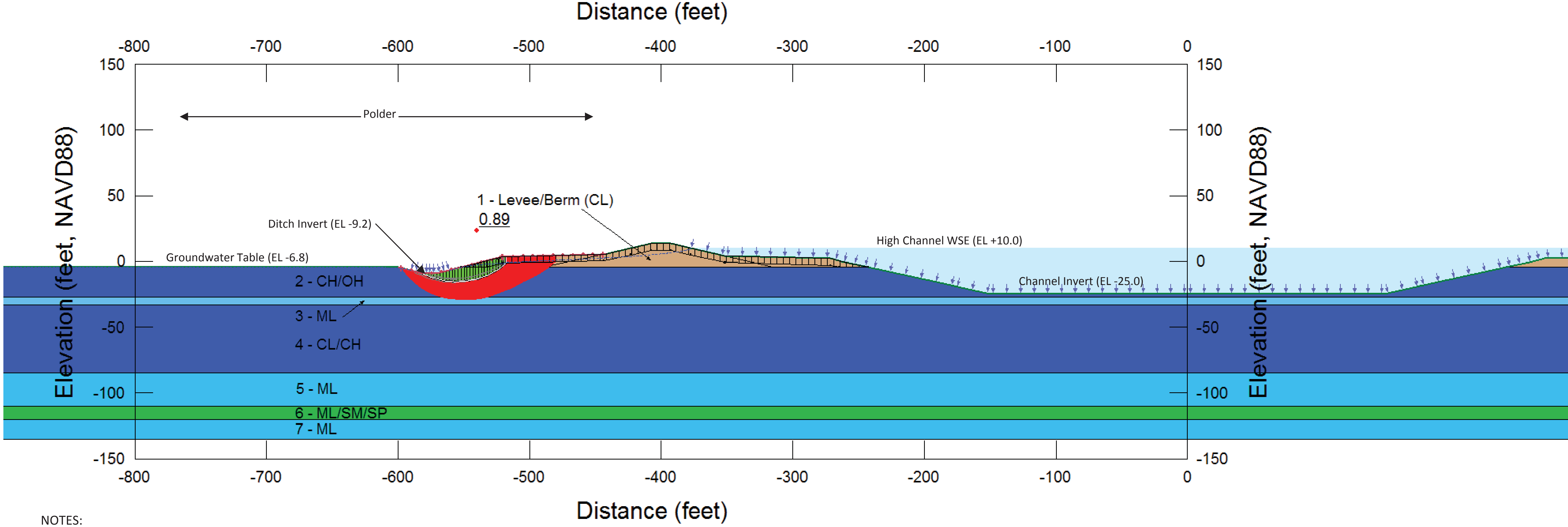
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.3

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB Case 1B: (In: 10 ft / Out: GWT)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **1**
STABILITY CASE: **1B**
WSE In Channel: **+10 feet**
WSE Outside Channel: **-6.8 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

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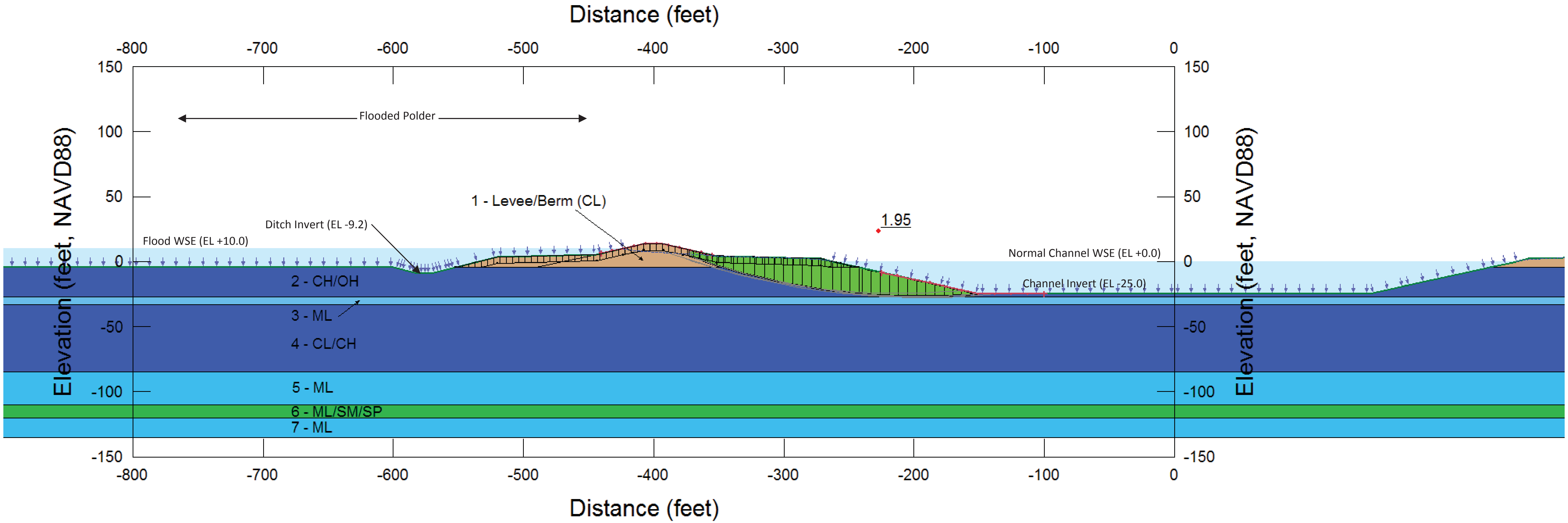
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.4

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB Case 2A: (Out: 10 ft / In: 0 ft)

MATERIALS

- 1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
- 2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
- 3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
- 4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
- 5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
- 6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
- 7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °



NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2A**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

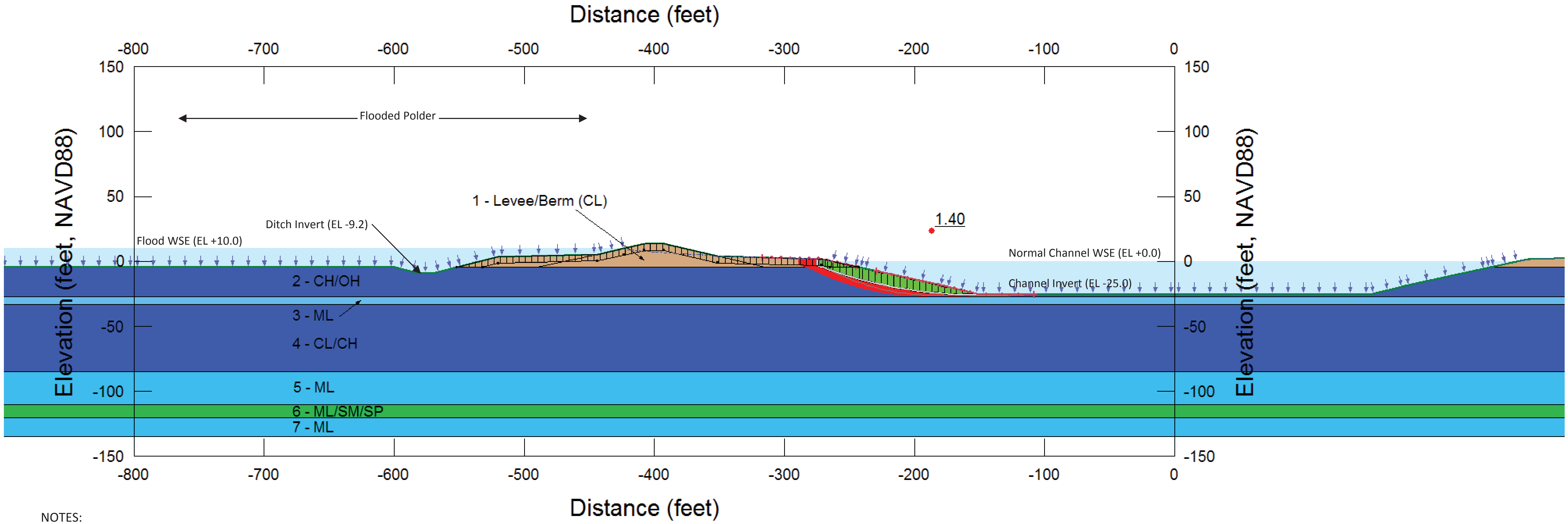
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.5

Created By: Crosariol, Victor
Date: 11/18/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB Case 2B: (Out: 10 ft / In: 0 ft)

MATERIALS

1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 100 pcf Cohesion': 0 psf Phi': 23 °
3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 23 °
5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °
6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 0 psf Phi': 28 °
7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 0 psf Phi': 28 °



NOTES:
1) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.5

NOT TO SCALE

STEADY-STATE STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **2**
STABILITY CASE: **2B**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

HDR

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION AND RESTORATION AUTHORITY — CPRA

STATE OF LOUISIANA — UNION JUSTICE CONFIDENCE

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY:
DESIGNED BY:

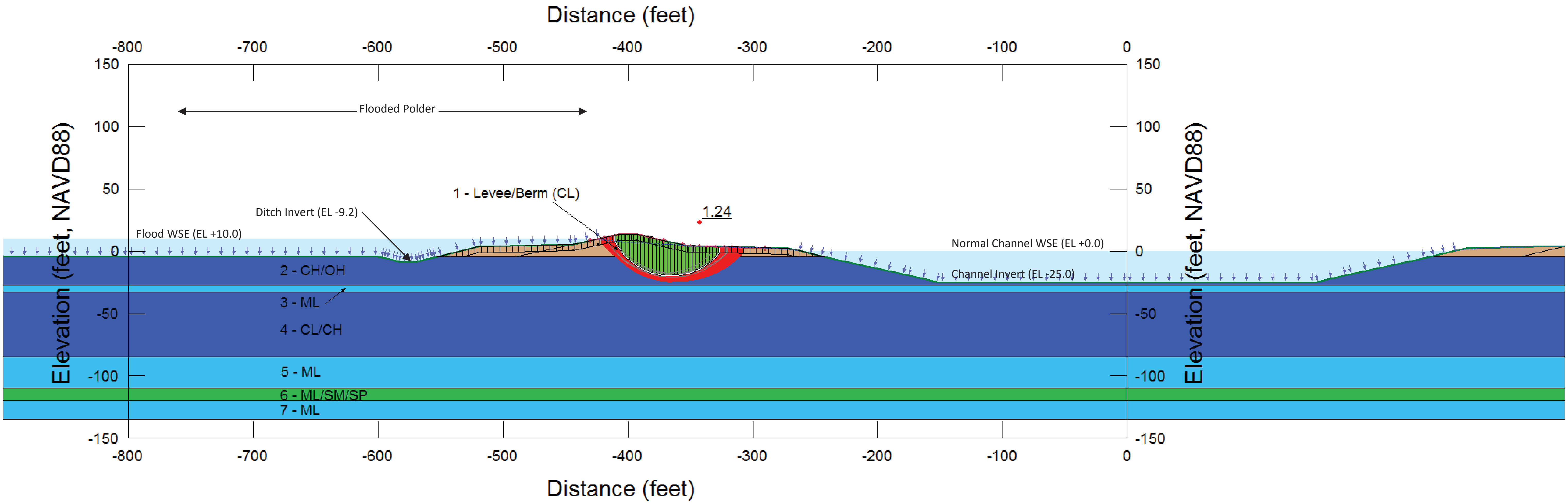
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.6

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB_RF Case 3A: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH -4.5 to -27 Phi': 0 °
RF_3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 348 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 835 psf
RF_5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 100 psf Phi': 20 °
RF_7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"
2) RED BAND INDICATES ALL SLIP SURFACES WITH FOS < 1.3

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3A**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

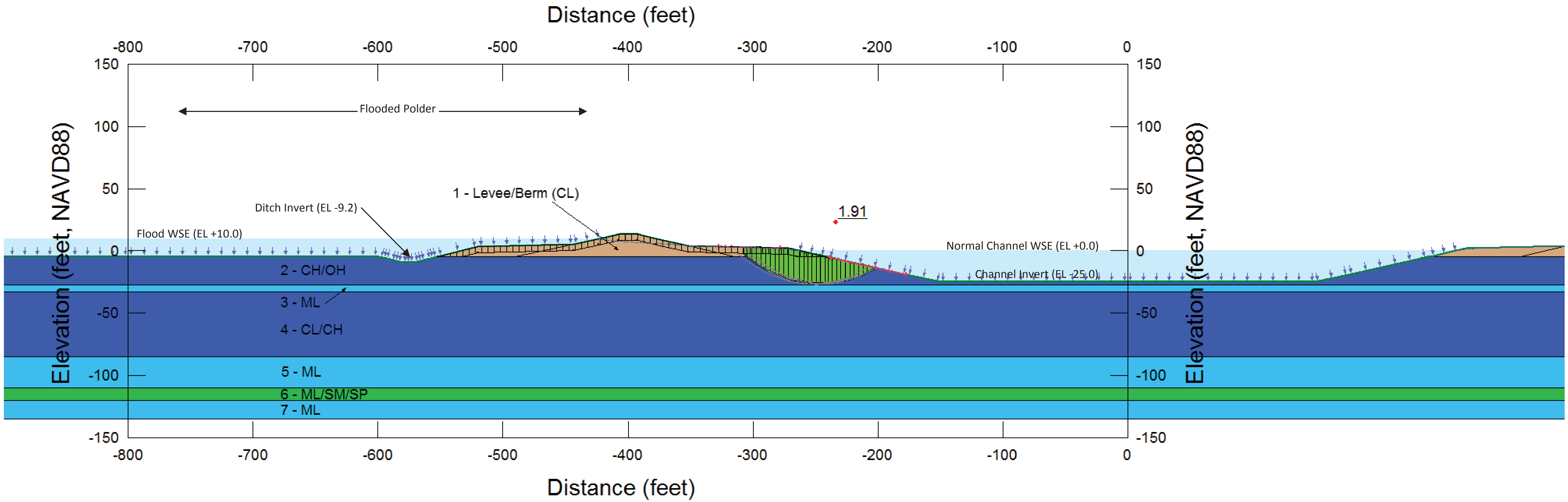
MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.7

Created By: Crosariol, Victor
Date: 11/21/2013
File Name: 02_Station 130+00_30% Levee.gsz
Analysis: STAB_RF Case 3B: (Out: 10 ft / In: 0 ft)

MATERIALS[1]

RF_1 - Levee/Berm (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 600 psf Phi': 0 °
RF_2 - CH/OH -4.5 to -27 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: Spatial Mohr-Coulomb Unit Weight: 100 pcf Cohesion Fn: RF_2 - CH/OH -4.5 to -27 Phi': 0 °
RF_3 - ML -27 to -33 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_4 - CL/CH -33 to -85 (Kv=5x10-7 cm/sec, Kv/Kh=0.25) Model: S=f(depth) Unit Weight: 105 pcf C-Top of Layer: 348 psf C-Rate of Change: 9.4 psf/ft C-Maximum: 835 psf
RF_5 - ML -85 to -110 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °
RF_6 - ML/SM/SP -110 to -120 (Kv=6x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 120 pcf Cohesion': 100 psf Phi': 20 °
RF_7 - ML -120 to -135 (Kv=4x10-5 cm/sec, Kv/Kh=0.25) Model: Mohr-Coulomb Unit Weight: 105 pcf Cohesion': 200 psf Phi': 15 °



NOTES:
1) "RF" IN THE MATERIALS LIST INDICATES "RAPID FLOOD"

NOT TO SCALE

RAPID FLOOD STABILITY ANALYSIS
STATION: **130+00**
SEEPAGE CASE: **2**
STABILITY CASE: **3B**
WSE In Channel: **+0.0 feet**
WSE Outside Channel: **+10.0 feet**

30 PERCENT DESIGN

REV.	DATE	DESCRIPTION	BY

COASTAL PROTECTION & RESTORATION AUTHORITY
ENGINEERING DIVISION
450 LAUREL STREET
BATON ROUGE, LOUISIANA 70801

DRAWN BY: DESIGNED BY:

MID-BARATARIA SEDIMENT DIVERSION
STATE PROJECT NUMBER: BA-153
FEDERAL PROJECT NUMBER: BA-153
APPROVED BY:

GEOTECHNICAL ENGINEERING REPORT
DATE: JULY 2014
FIGURE: B-8.8