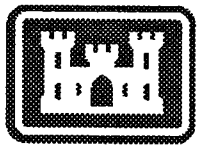

US ARMY CORPS
OF ENGINEERS
NEW ORLEANS DISTRICT

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION

SOIL REPORT
HERO CANAL

SEPTEMBER 1996

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION

SOIL REPORT - HERO CANAL

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WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
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GENERAL

1. General. This report presents additional foundation investigations for preparation of plans and specifications for the Hero Canal hurricane protection levee subsequent to "West Bank of the Mississippi River in the Vicinity of New Orleans, LA (East of the Harvey Canal)" Feasibility Report dated August 94.

2. Project Description. The Hero Canal levee is shown on plates 2 thru 10. The protection begins at Hwy 23 near the community of Oakville. The existing Plaquemines Parish levee between Hwy 23 and Station 29+01.00 will be enlarged. A new levee will tie the existing levee to the landfill. The levee will continue on the opposite side of the landfill and extend to the south bank of Hero Canal. The levee will run along the south bank of the canal, around the head of the canal, along the north bank of the canal and to Station 318+07.16 along the Intracoastal Waterway.

GEOLOGY

3. Geology. The study area is on the west bank of the Mississippi River approximately 2.5 miles downstream from the U.S. Naval Air Station near Mississippi River Mile 70 at Oakville in Plaquemines Parish, Louisiana. The levee area is perpendicular to the river, adjacent to Hero Canal and the Intracoastal Waterway. This is an area of low relief ranging in elevation from 0.0 feet up to a maximum of 5 feet on the crest of the natural levee adjacent to the river.

Natural levee deposits overlie the entire study area and consist of interbedded very soft to stiff clays with occasional lenses of silt, silty sand and sand. Natural levee deposits average 8 feet thick and range in elevation from +1 to -9 feet. Swamp deposits underlie natural levee deposits from distance 0 to 3350 and consist of interbedded very soft to soft clays and silt with occasional lenses of silty sand and sand. Interdistributary deposits average 23 feet thick and range in elevation from -8 to -36 feet. A lens of swamp deposits occurs in interdistributary deposits in boring EHC-4 and consists of organic clay. This lens is 2.5 feet thick and ranges in elevation from -18 to -20.5 feet. Prodelta deposits underlie interdistributary deposits and

consist of interbedded very soft to medium clays. Where borings penetrate the entire thickness of prodelta deposits, these deposits average 34 feet thick and range in elevation from -30 to -76 feet. Nearshore gulf deposits underlie prodelta deposits from distance 0 to 9700 and consist of interbedded clays, silt and silty sand with occasional lenses of clayey sand. The surface of nearshore gulf deposits averages -67 feet in elevation and these deposits extend to an unknown depth. The surface of the Pleistocene is not penetrated by any of the borings; however, estimates of the Pleistocene surface in the area are -85 to -95 feet in elevation.

FOUNDATIONS

4. General. The following paragraphs address design assumptions and parameters for the Hero Canal levee. The project consists of three design reaches for approximately 33,200 feet of levee.

5. Foundation Conditions. The foundation soils are predominantly fat clays (CH) varying in consistency from very soft to medium. There are occasional layers of silt (ML), silty sand (SM), and lean clays (CL). Layers of organic clays, which typically display high moisture contents, exist in the area near the Intracoastal Waterway form the original ground surface down to approximately elevation -20.

6. Field Exploration and Laboratory Investigation.

a. Soil Borings. Four undisturbed borings and four general type borings were taken along parts of the proposed alignment in Jan 1995. Location of these borings can be found on plates 2 thru 10 and the boring logs are presented as plates thru 17 thru 21.

b. Laboratory Tests. Visual classifications were made on all boring samples and water content determinations were performed on all cohesive samples. Unconfined compression shear tests (UCT's) were made on selected samples of cohesive soils.

Unconsolidated-undrained (Q) triaxial compression shear tests and consolidation (C) tests were performed on selected undisturbed samples and included Atterberg limits.

c. Design Parameters. The shear strength and soil density results were determined from undisturbed borings EHCH-1U, EHCH-2U, EHCH-3U and EHCH-4U. These were used to determine the design parameters for all three reaches.

7. Design Reaches. The job was divided into three design reaches based on hydraulic considerations. The reaches could be divided as follows:

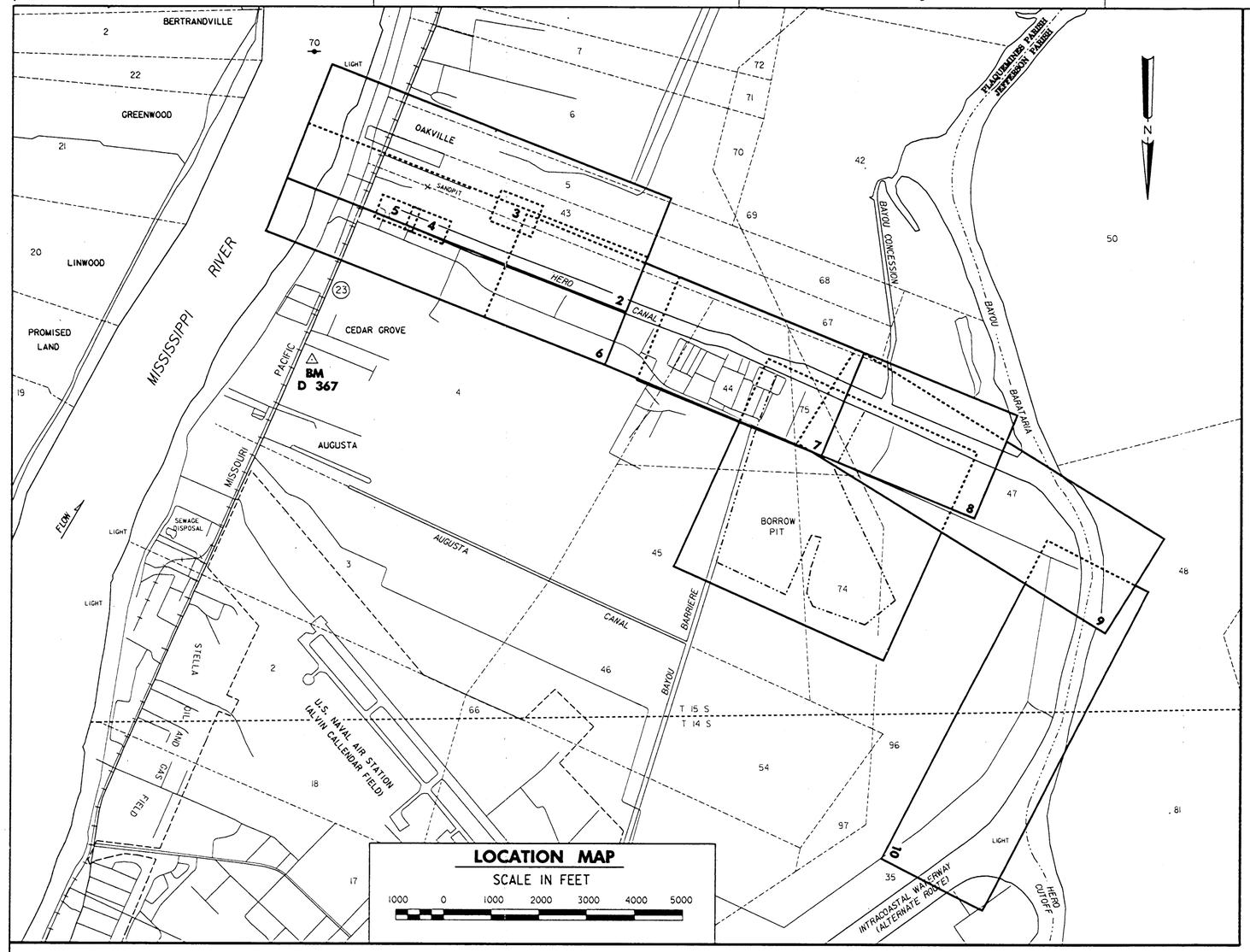
Reach I - Oakville Levee - Sta. 0+00 to 140+00
Reach II - Hero Canal Levee - Sta. 140+00 to 237+00
Reach III - Algiers Levee - Sta 237+00 to 332+38.79

The still water level (SWL) used for Reaches II and III was 7.5 and 7.0 for Reach I. The low water level used for the canals in all three reaches was -2.0.

8. Stability of Levees. Existing conditions along the proposed alignment were determined from surveys taken in Jan 1995. The slopes and berm distances for the proposed levee were designed for the (Q) construction case. A "Factor of Safety" of 1.3 is required for the levee stability. Typical levee and floodwall sections are presented on Plates 11 thru 14.

9. Borrow Material. Borrow material will be hauled from a nearby pit where the limits have been preliminarily established.

10. Settlement. Based on historical data, shrinkage and settlement of levee fill should be in the range of 10 to 20 percent over the 3 or 4 years after the enlargement. The enlargement should fall within this range of settlement since the centerline of the levee will straddle the existing levee base with approximately three feet of fill being added to the existing levee. A future enlargement will be required to restore the levee to design grade.



WEST BANK HURRICANE PROTECTION PROJECT
EAST OF THE HARVEY CANAL

HERO CANAL REACH
FIRST ENLARGEMENT

PLAQUEMINES PARISH, LOUISIANA

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
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HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL

LOCATION MAP

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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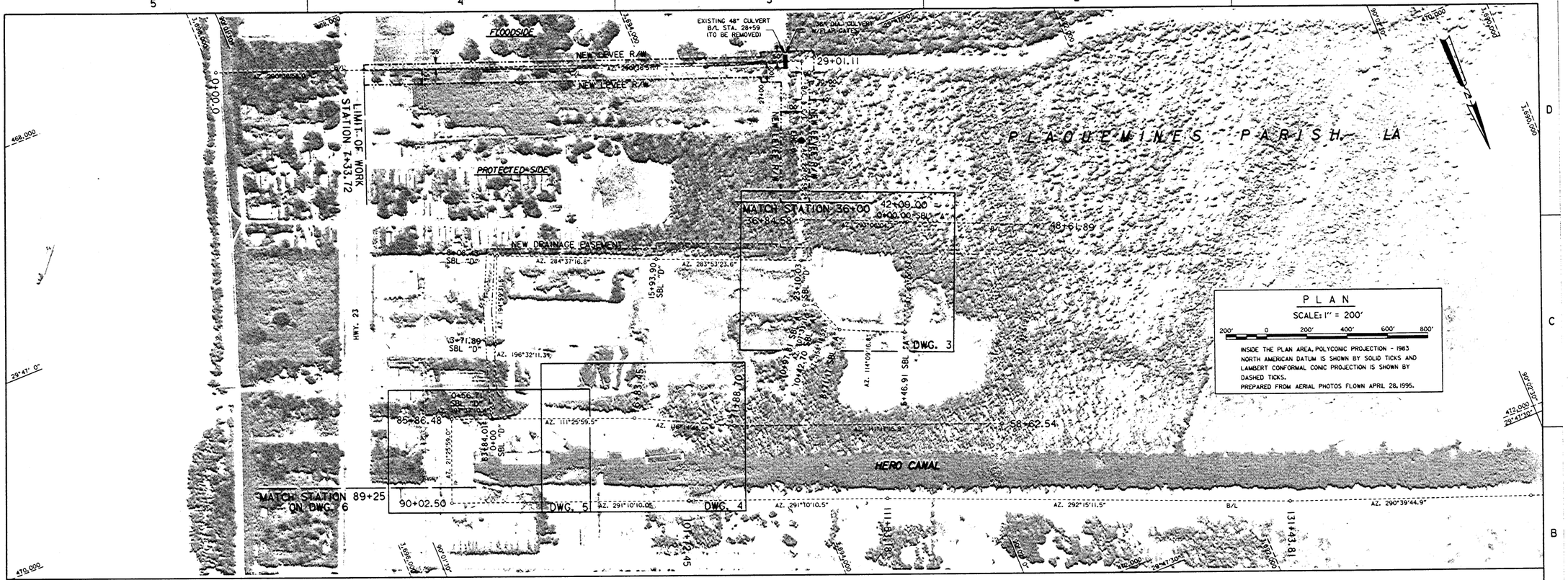
PLATE 1



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PLAN

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NEW ORLEANS, LOUISIANA

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PLATE 2

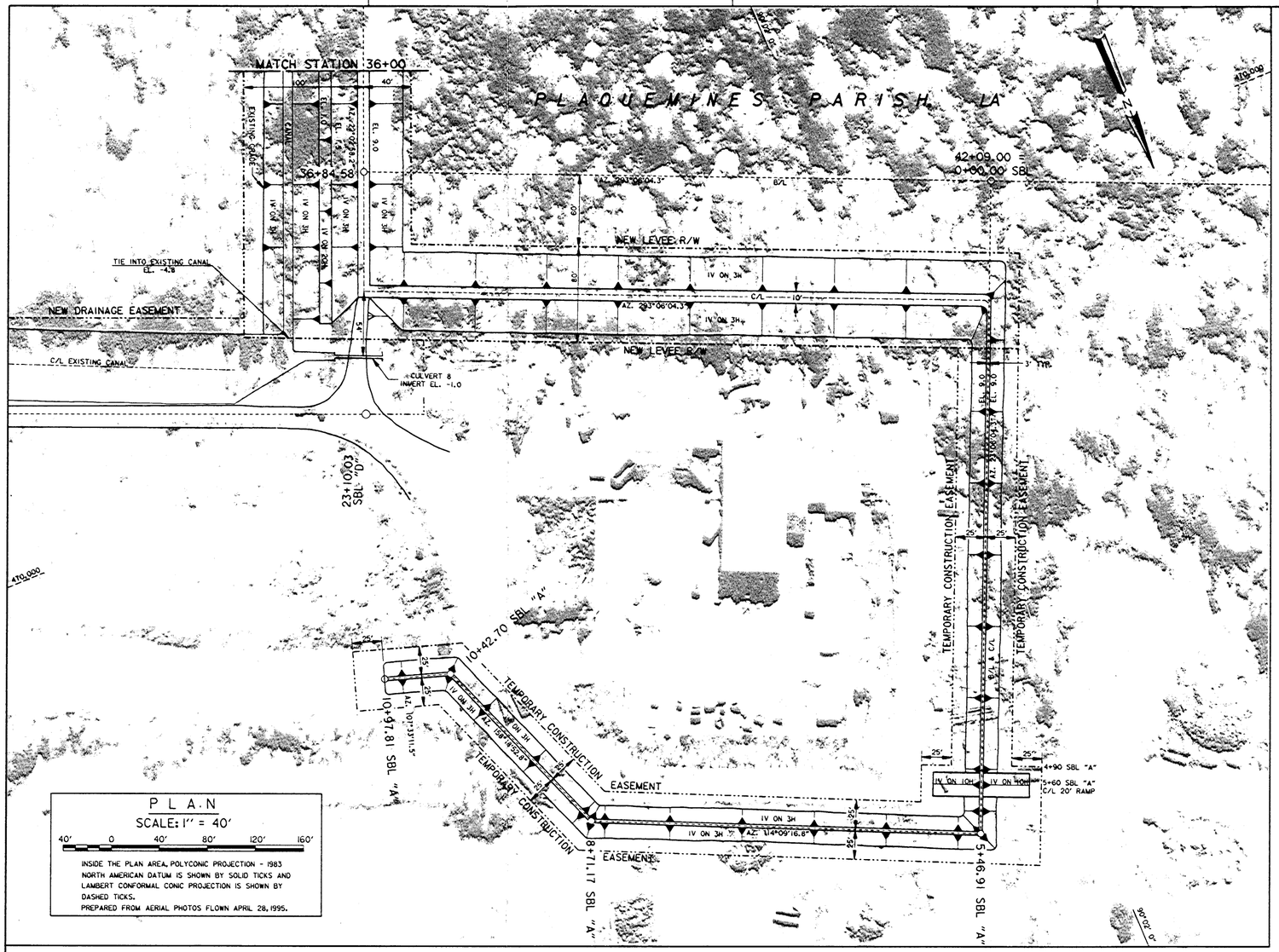

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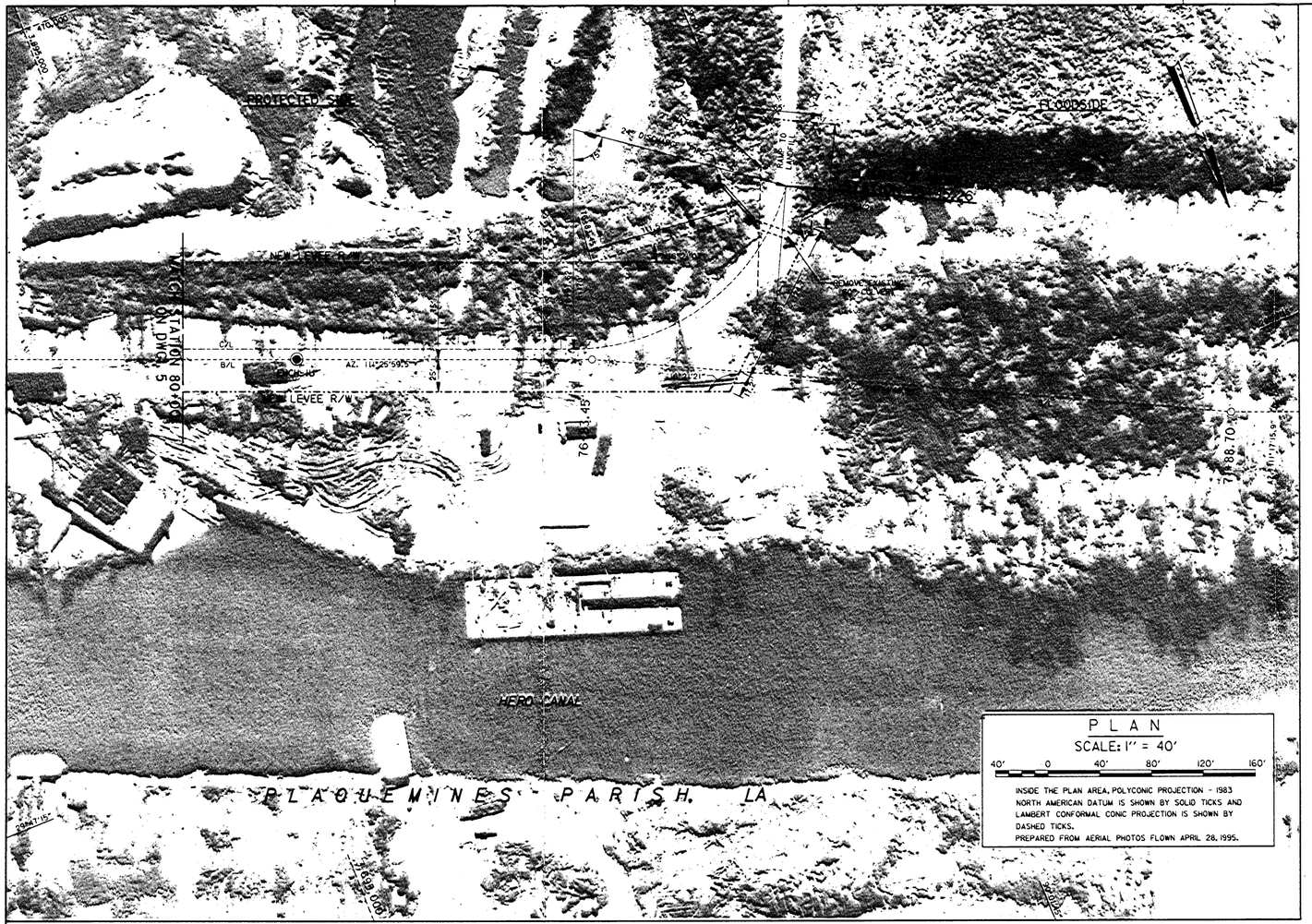
PLATE 3



WEST BANK OF THE MISSISSIPPI RIVER
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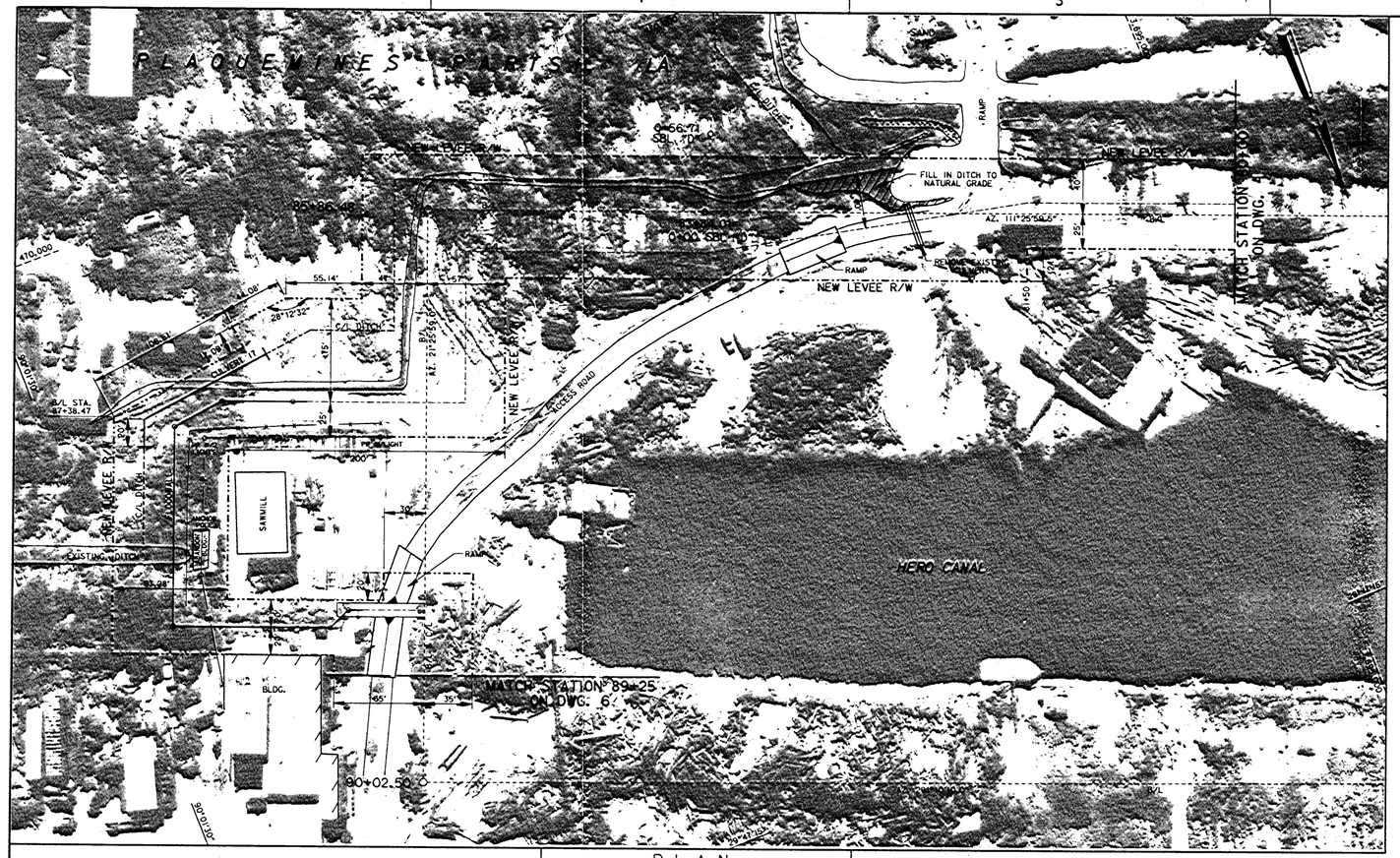
PLATE 4



PLAN

SCALE: 1" = 40'

40' 0 40' 80' 120' 160'

INSIDE THE PLAN AREA, POLYCONIC PROJECTION - 1983 NORTH AMERICAN DATUM IS SHOWN BY SOLID TICKS AND LAMBERT CONFORMAL CONIC PROJECTION IS SHOWN BY DASHED TICKS.
PREPARED FROM AERIAL PHOTOS FLOWN APRIL 28, 1995.

WEST BANK OF THE MISSISSIPPI RIVER
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PLAN

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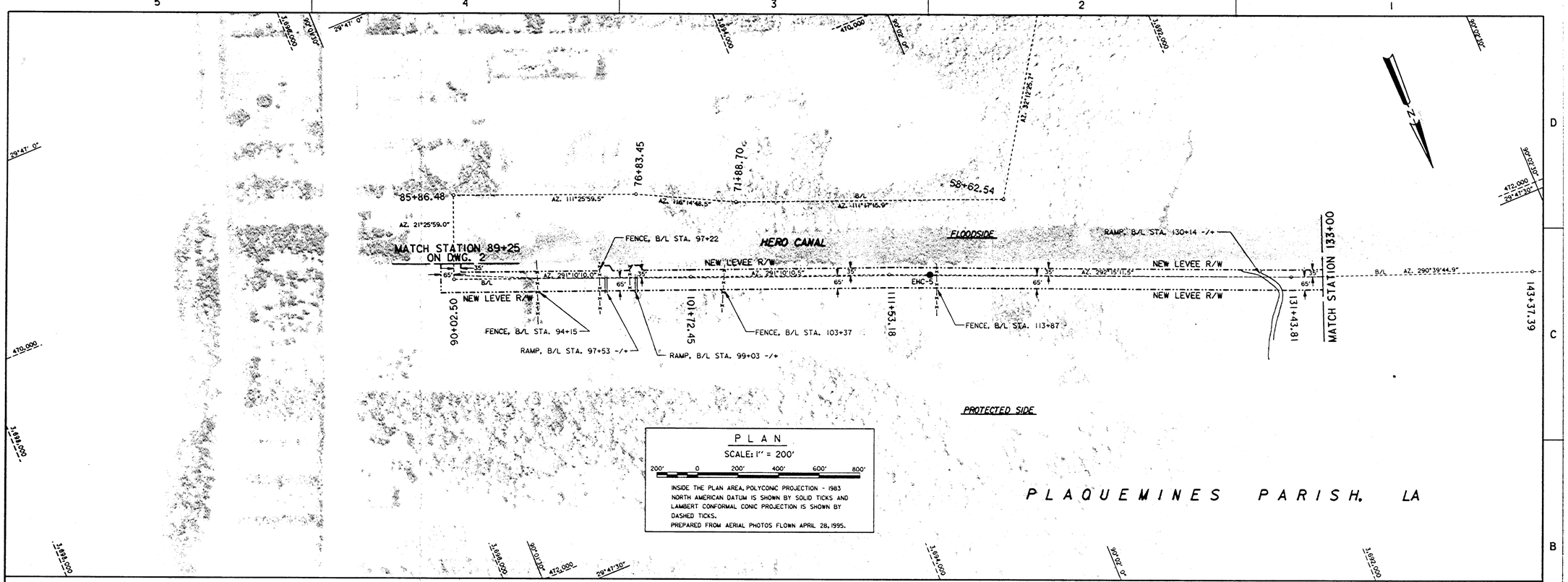
PLATE 5



PLAN

SCALE: 1" = 200'

200' 0 200' 400' 600' 800'

INSIDE THE PLAN AREA, POLYCONIC PROJECTION - 1983 NORTH AMERICAN DATUM IS SHOWN BY SOLID TICKS AND LAMBERT CONFORMAL CONIC PROJECTION IS SHOWN BY DASHED TICKS.
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PLAQUEMINES PARISH, LA

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
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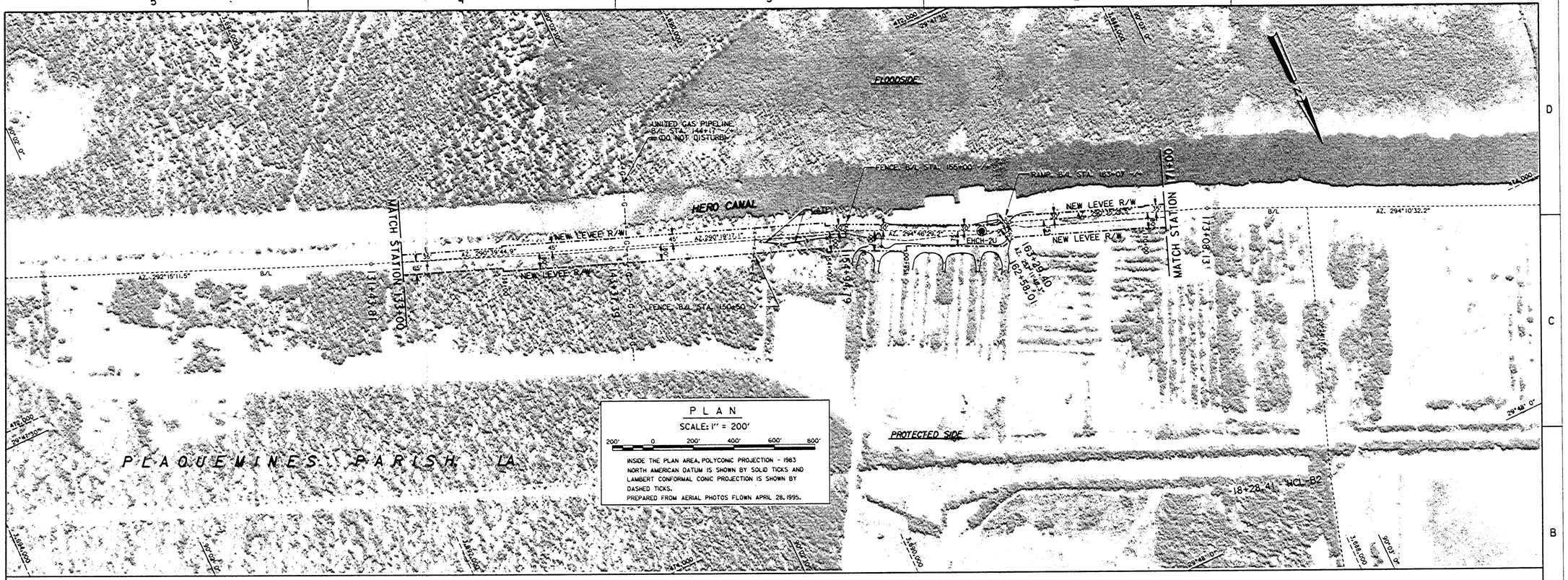
PLATE 6



PLAN

SCALE: 1" = 200'

200' 0 200' 400' 600' 800'

INSIDE THE PLAN AREA, POLYCONIC PROJECTION - 1983 NORTH AMERICAN DATUM IS SHOWN BY SOLID TICKS AND LAMBERT CONFORMAL CONIC PROJECTION IS SHOWN BY DASHED TICKS.
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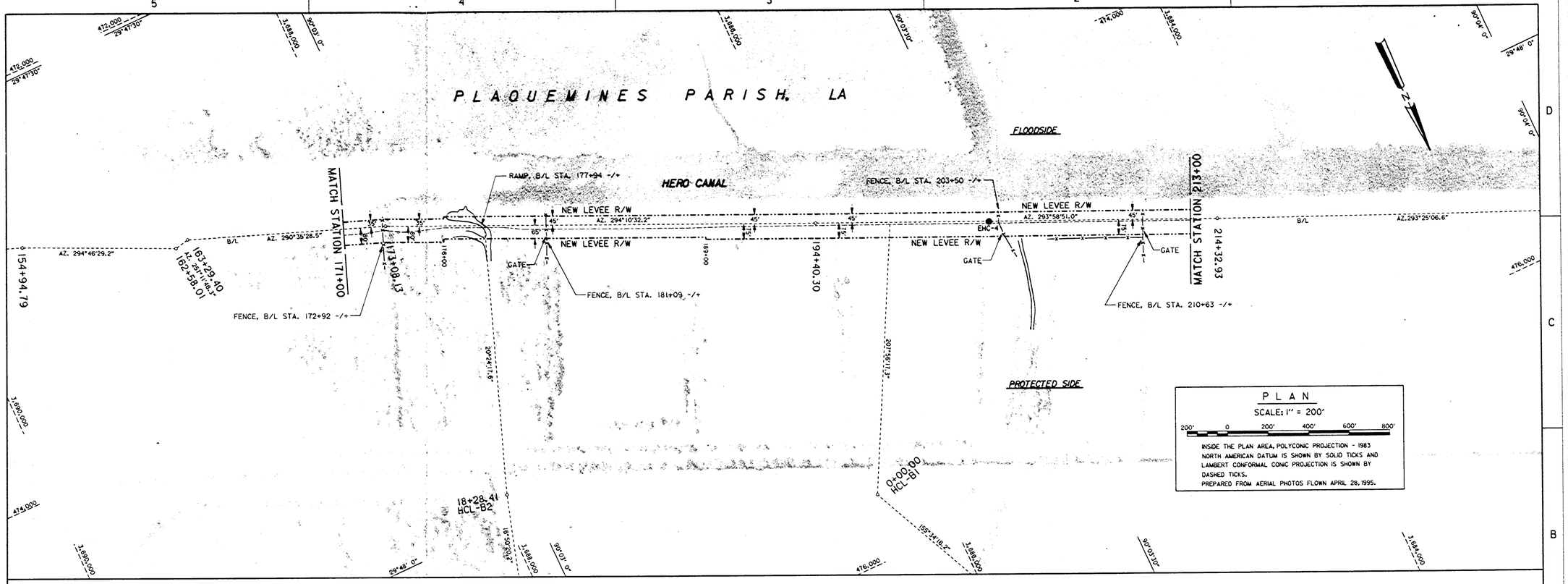
PLATE 7



PLAN

SCALE: 1" = 200'

200' 0 200' 400' 600' 800'

INSIDE THE PLAN AREA, POLYCONIC PROJECTION - 1983 NORTH AMERICAN DATUM IS SHOWN BY SOLID TICKS AND LAMBERT CONFORMAL CONIC PROJECTION IS SHOWN BY DASHED TICKS.
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PLATE 8

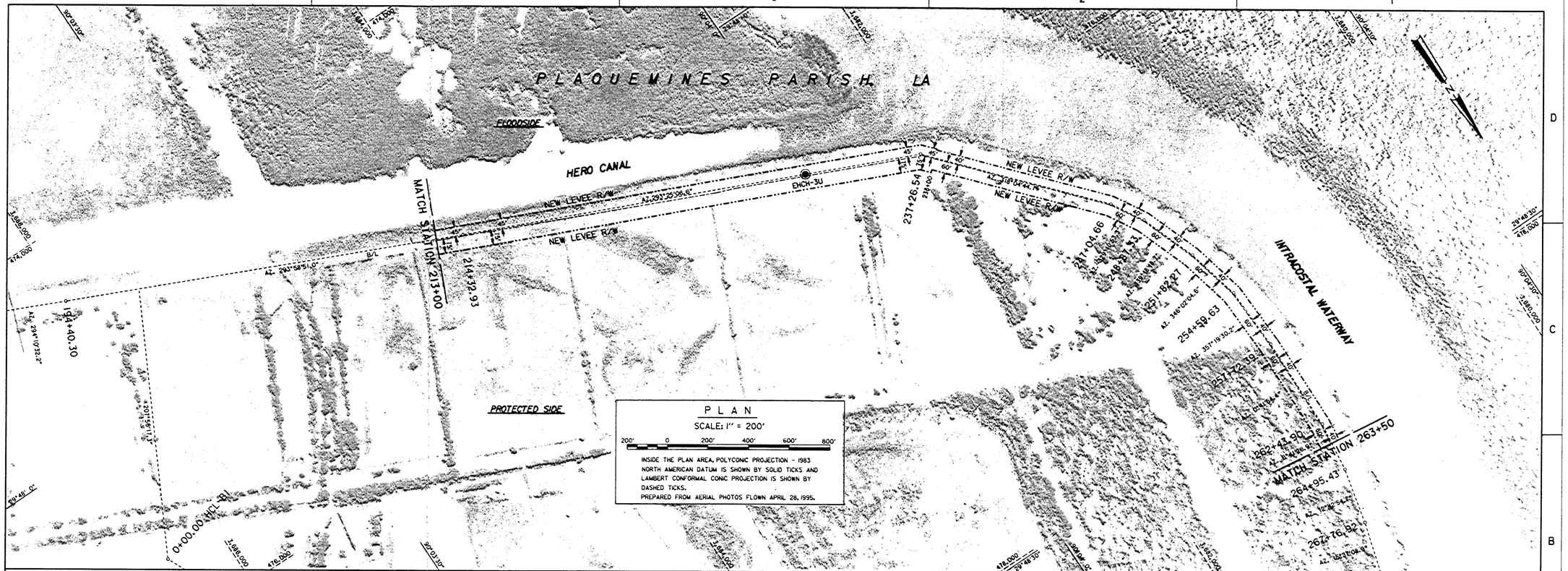

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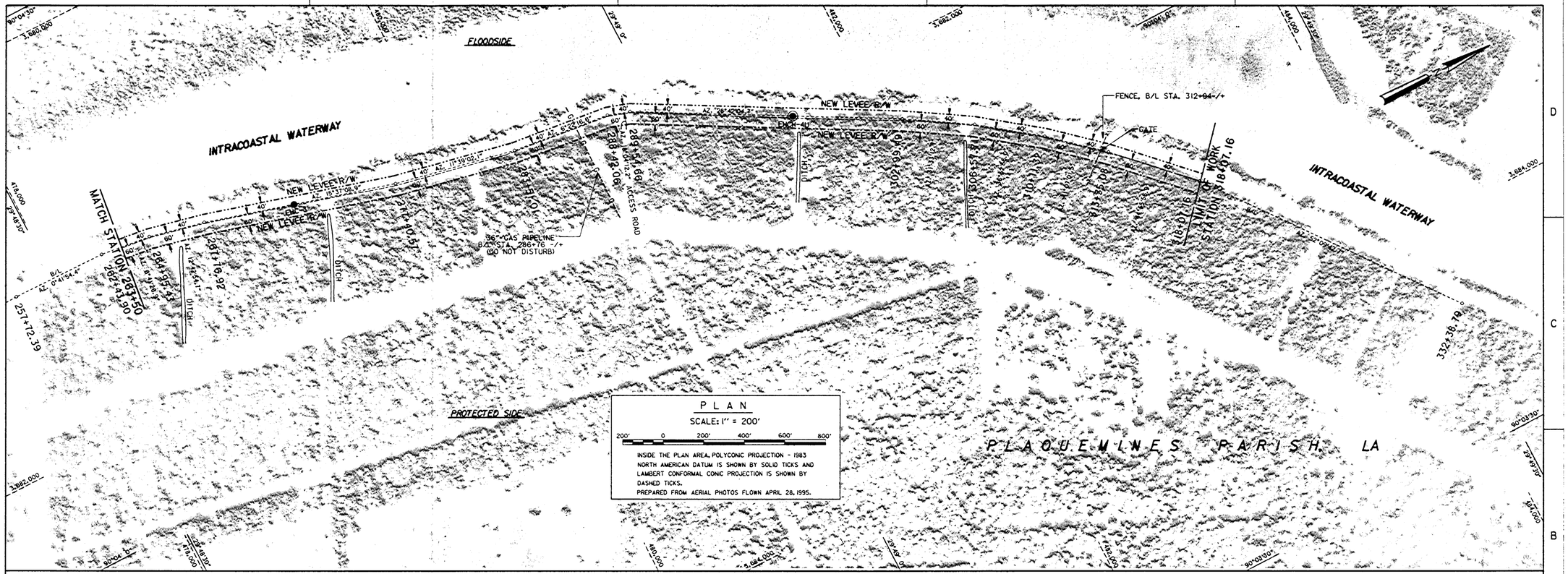
PLATE 9



WEST BANK OF THE MISSISSIPPI RIVER
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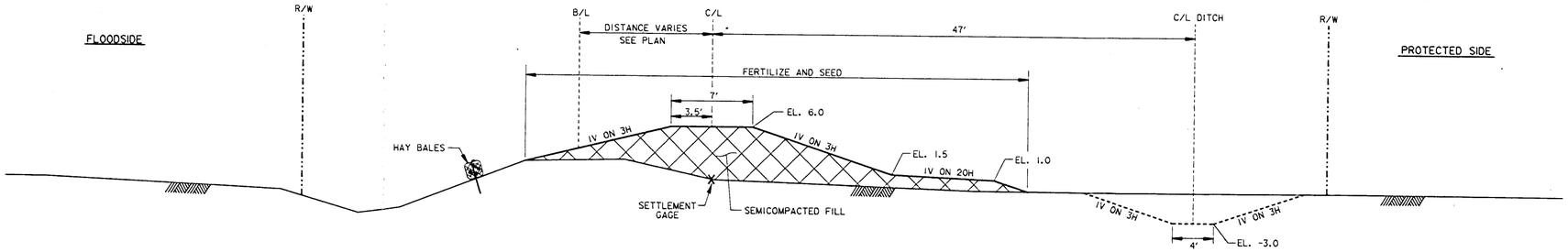
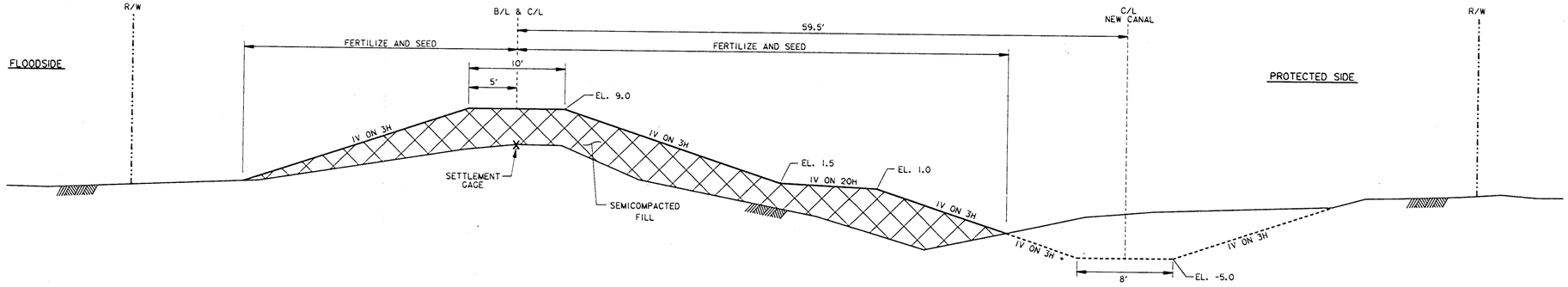
PLATE 10



TYPICAL SECTION 1

N.T.S.

B/L STA. 0+33.72 TO 29+01.11



TYPICAL SECTION 2

N.T.S.

B/L STA. 29+01.11 TO 36+84.58

WEST BANK OF THE MISSISSIPPI RIVER
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TYPICAL SECTIONS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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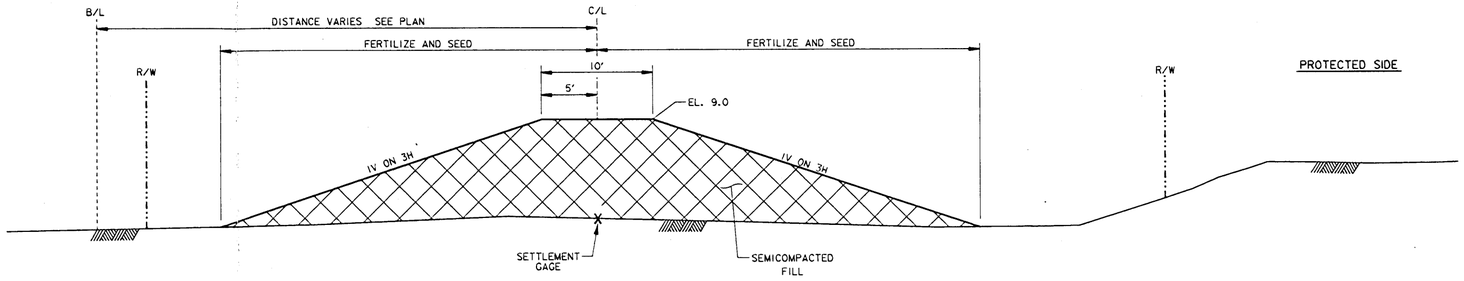
CHECKED BY:	S.E.C.	DATE: 15 DEC 95		H-2-44312

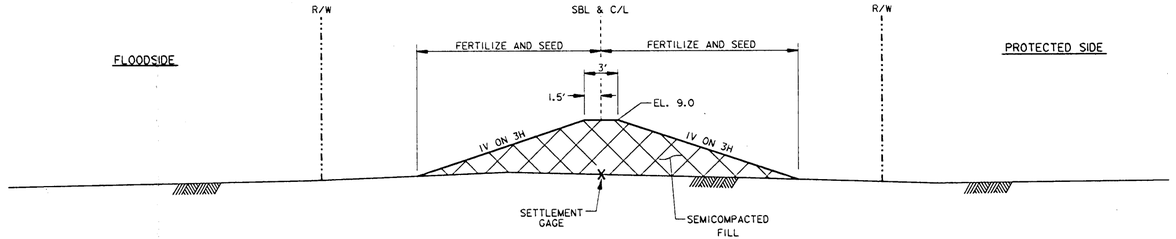
PLATE 11



TYPICAL SECTION 3

N.T.S.

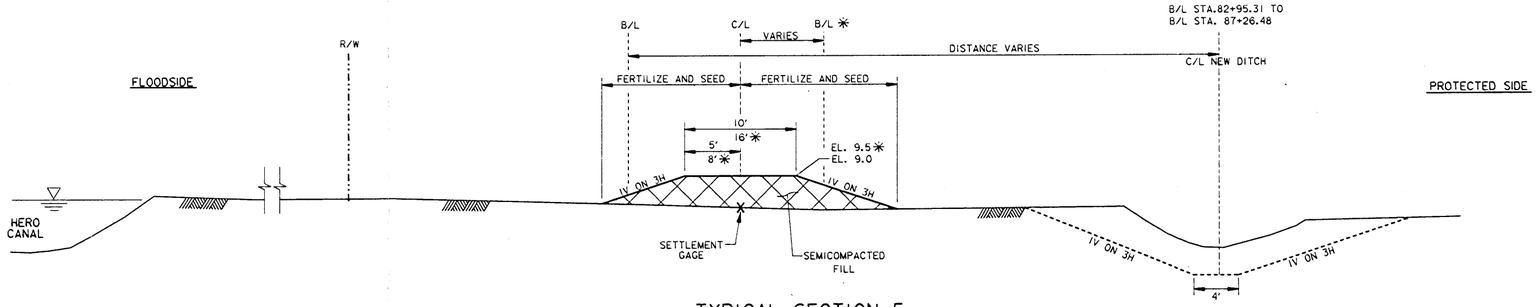
B/L STA. 36+00 TO 40+00



TYPICAL SECTION 4

N.T.S.

SBL "D" STA. 0+00 TO SBL "D" 10+97.81



TYPICAL SECTION 5

N.T.S.

✳ B/L STA. 75+45.26 TO 82+85.00
B/L STA. 82+85.00 TO 87+26.48
B/L STA. 88+75.89 TO 89+82.50

WEST BANK OF THE MISSISSIPPI RIVER
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U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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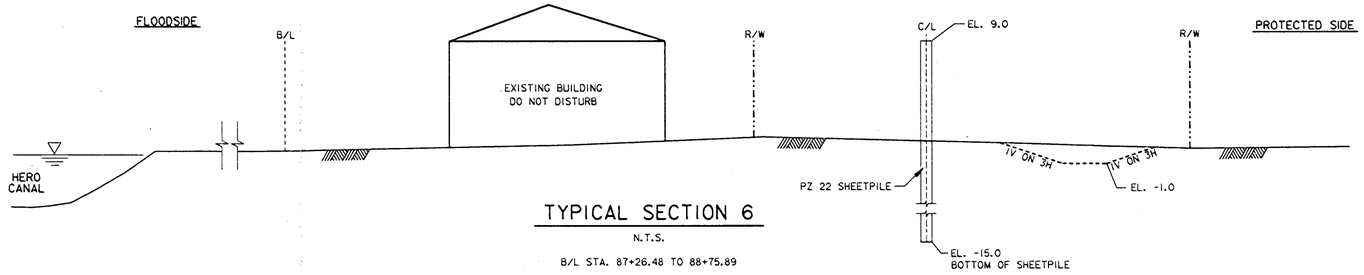
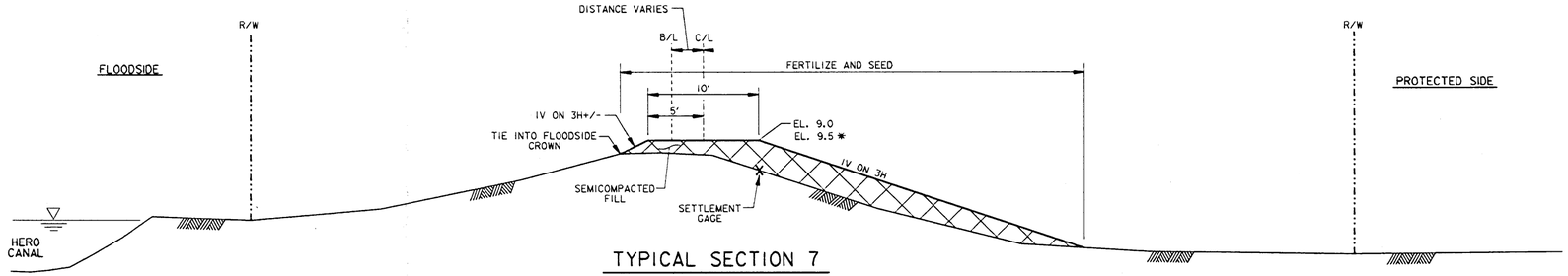
PLATE 12



TYPICAL SECTION 6

N.T.S.

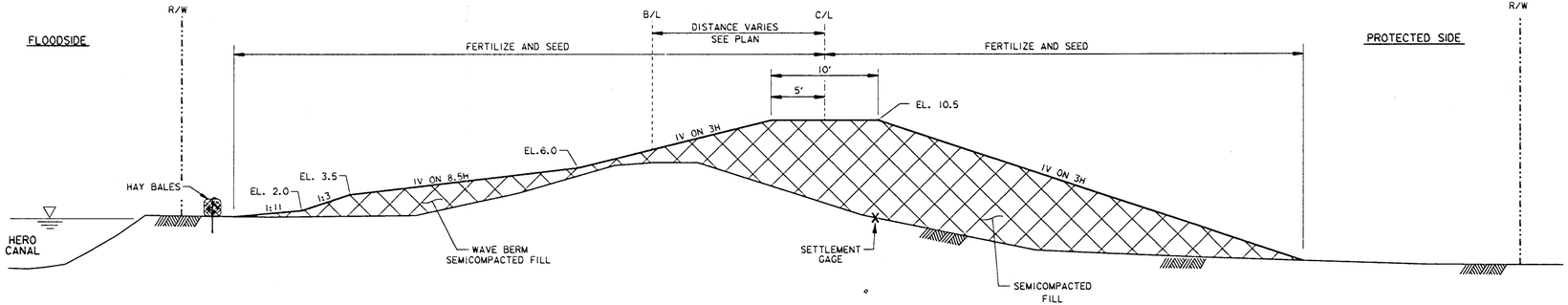
B/L STA. 87+26.48 TO 88+75.89



TYPICAL SECTION 7

N.T.S.

B/L STA. 89+82.50 TO 140+00
*B/L STA. 236+00 TO 318+07.16



TYPICAL SECTION 8

N.T.S.

B/L STA. 140+00 TO 236+00

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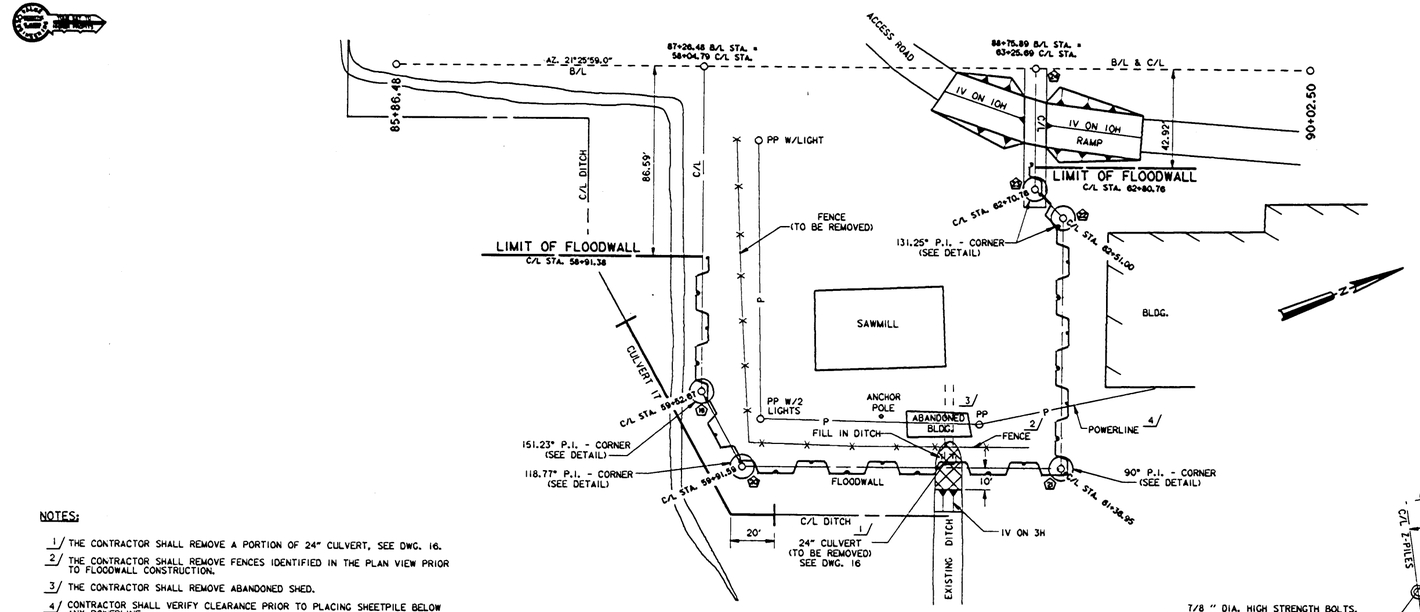


FLOODWALL PLAN 5/

NOT TO SCALE

NOTES:

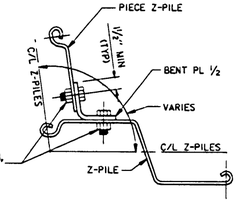
1/ THE CONTRACTOR SHALL REMOVE A PORTION OF 24" CULVERT, SEE DWG. 16.

2/ THE CONTRACTOR SHALL REMOVE FENCES IDENTIFIED IN THE PLAN VIEW PRIOR TO FLOODWALL CONSTRUCTION.

3/ THE CONTRACTOR SHALL REMOVE ABANDONED SHED.

4/ CONTRACTOR SHALL VERIFY CLEARANCE PRIOR TO PLACING SHEETPILE BELOW ANY POWERLINE.

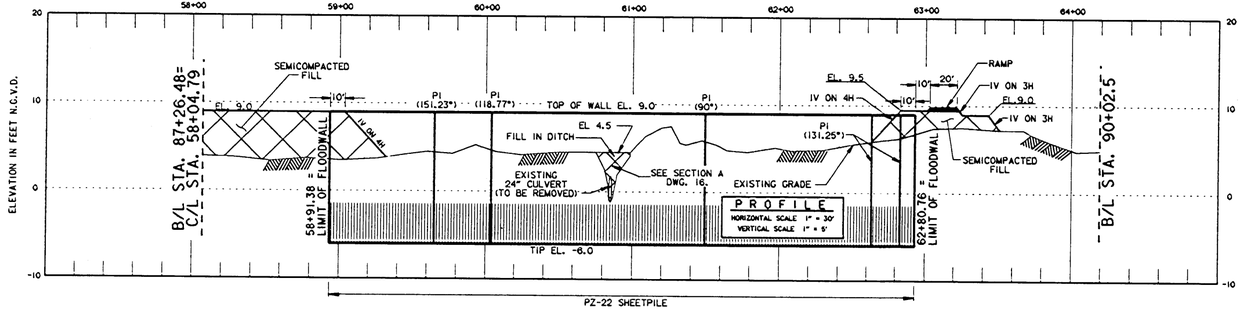
5/ CONTRACTOR MAY VARY FLOODWALL ALIGNMENT BY +/- 6" DEPENDING ON ACTUAL SHEET PILE LAYOUT.



CORNER DETAIL

TYPICAL CORNER

STATIONING ALONG CENTERLINE OF WALL



Safety is a Part of Your Contract

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL

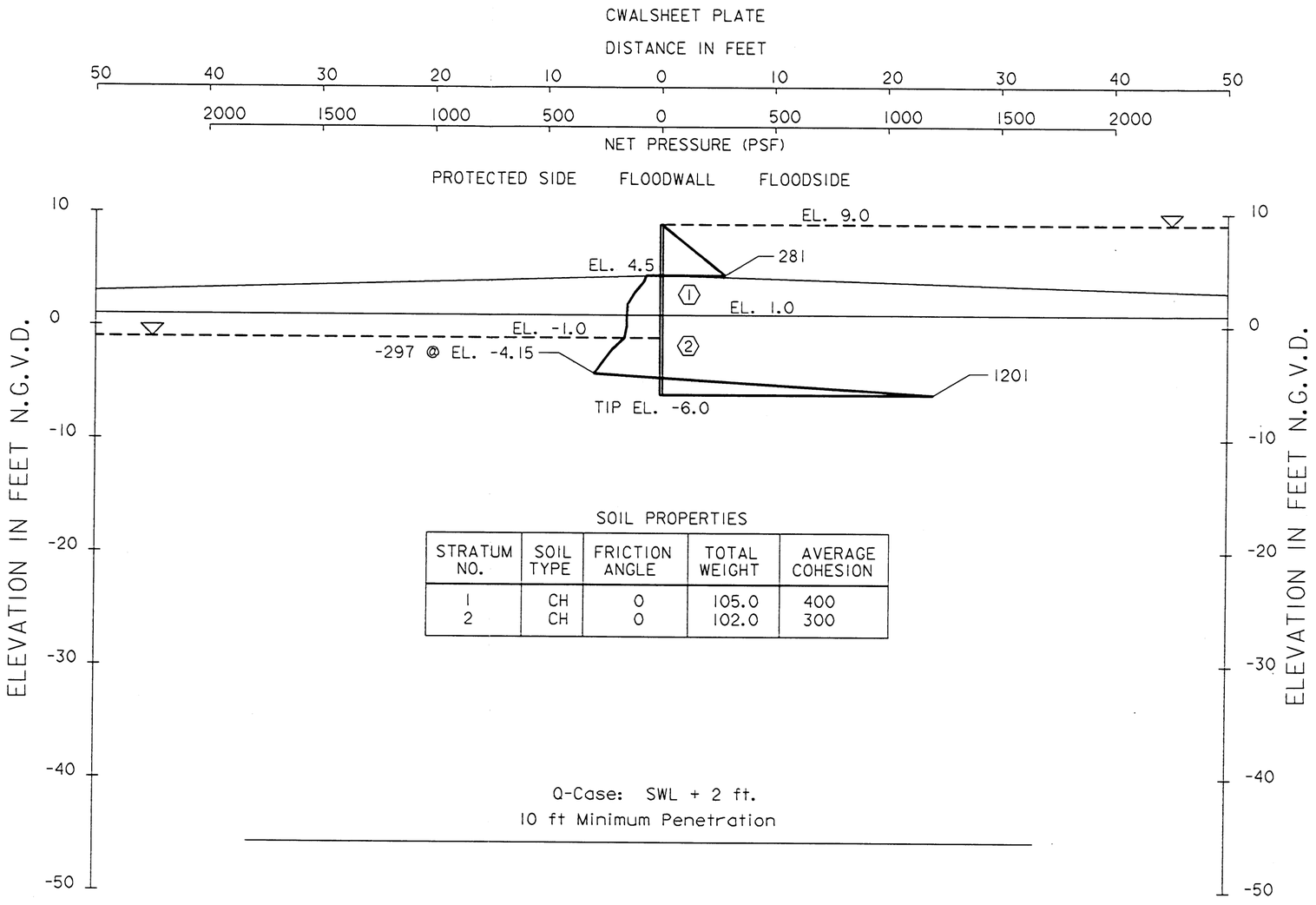
FLOODWALL PLAN, PROFILE AND DETAILS

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

DESIGNED BY:	P.M.H.	PLOT SCALE: 20	PLOT DATE: JAN 96	CADD FILE: 44312L14A.DGN
DRAWN BY:	D.M.H.			FILE NO. H-2-44312
CHECKED BY:	S.E.C.	DATE: 15 DEC 95		

PLATE 14

CWALSHEET PLATE



ELEVATION	PRESSURE
9.00	.00
4.50	281.25
4.50	-69.63
4.00	-79.13
2.00	-149.79
1.00	-153.06
.00	-154.40
-1.00	-165.15
-4.15	-297.36
-6.03	1201.44

SOIL PROPERTIES

STRATUM NO.	SOIL TYPE	FRICTION ANGLE	TOTAL WEIGHT	AVERAGE COHESION
1	CH	0	105.0	400
2	CH	0	102.0	300

Q-Case: SWL + 2 ft.
10 ft Minimum Penetration

NET DIAGRAM
(Q) CASE F.S. 2.28

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL

SHEET PILE NET PRESSURE DIAGRAM

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

DESIGNED BY: R.J.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312.15.DGN
DRAWN BY: R.J.V.			FILE NO. H-2-44312
CHECKED BY: J.B.G.	DATE: 21 AUG 1996		

PLATE: 15

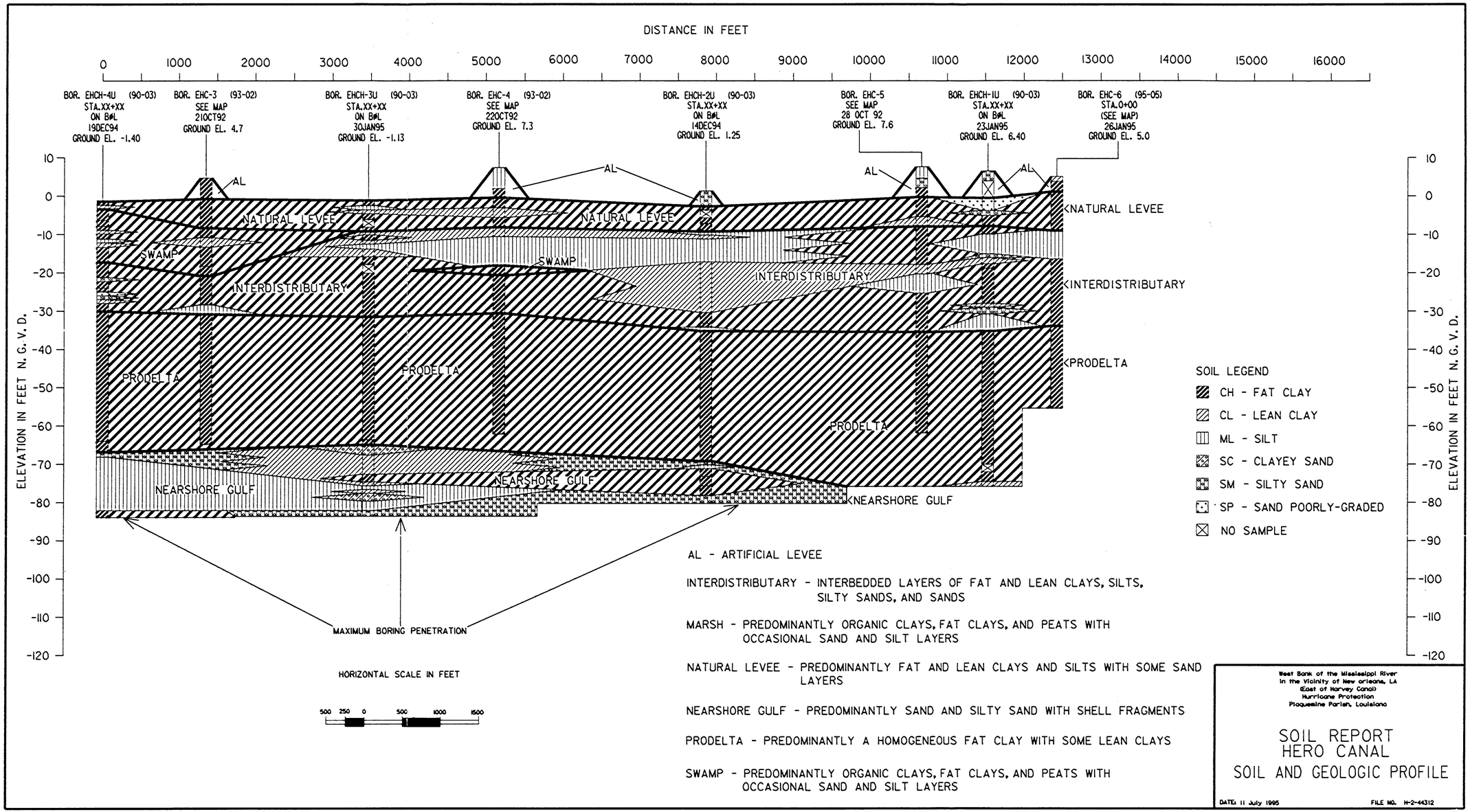
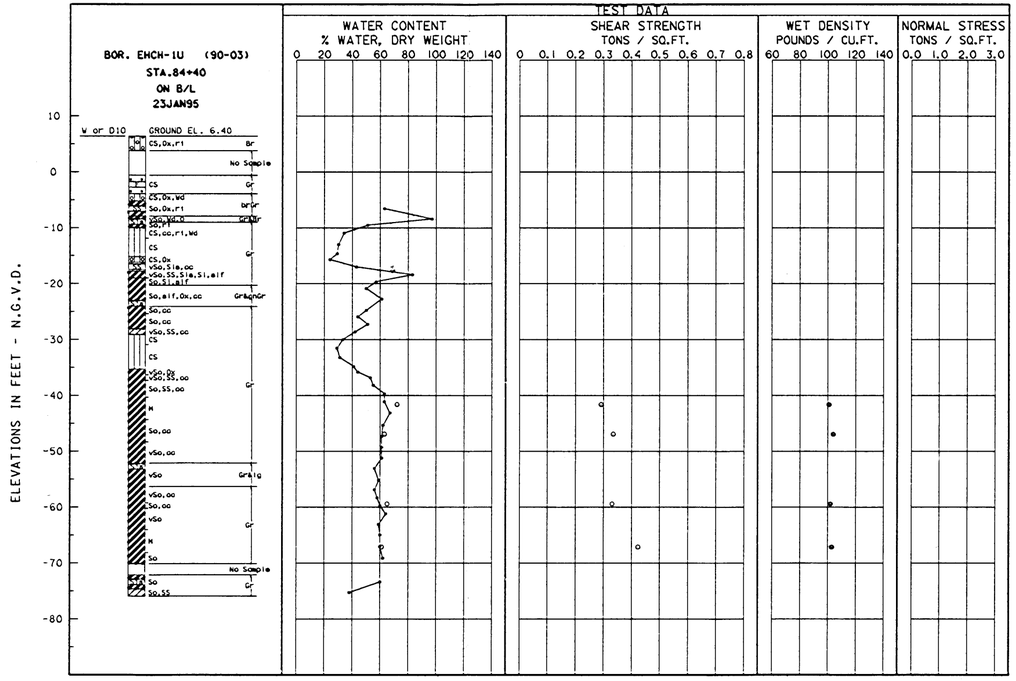

DISTANCE IN FEET
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
BOR. EHCH-4U (90-03)
STA.XX+XX
ON B&L
19DEC94
GROUND EL. -1.40
BOR. EHC-3 (93-02)
SEE MAP
21OCT92
GROUND EL. 4.7
BOR. EHCH-3U (90-03)
STA.XX+XX
ON B&L
30JAN95
GROUND EL. -1.13
BOR. EHC-4 (93-02)
SEE MAP
22OCT92
GROUND EL. 7.3
BOR. EHCH-2U (90-03)
STA.XX+XX
ON B&L
14DEC94
GROUND EL. 1.25
BOR. EHC-5
SEE MAP
28 OCT 92
GROUND EL. 7.6
BOR. EHCH-1U (90-03)
STA.XX+XX
ON B&L
23JAN95
GROUND EL. 6.40
BOR. EHC-6 (95-05)
STA.0+00
(SEE MAP)
26JAN95
GROUND EL. 5.0
AL
NATURAL LEVEE
SWAMP
INTERDISTRIBUTARY
PRODELTA
NEARSHORE GULF
ELEVATION IN FEET N. G. V. D.
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
MAXIMUM BORING PENETRATION
HORIZONTAL SCALE IN FEET
500 250 0 500 1000 1500
SOIL LEGEND
CH - FAT CLAY
CL - LEAN CLAY
ML - SILT
SC - CLAYEY SAND
SM - SILTY SAND
SP - SAND POORLY-GRADED
NO SAMPLE
AL - ARTIFICIAL LEVEE
INTERDISTRIBUTARY - INTERBEDDED LAYERS OF FAT AND LEAN CLAYS, SILTS, SILTY SANDS, AND SANDS
MARSH - PREDOMINANTLY ORGANIC CLAYS, FAT CLAYS, AND PEATS WITH OCCASIONAL SAND AND SILT LAYERS
NATURAL LEVEE - PREDOMINANTLY FAT AND LEAN CLAYS AND SILTS WITH SOME SAND LAYERS
NEARSHORE GULF - PREDOMINANTLY SAND AND SILTY SAND WITH SHELL FRAGMENTS
PRODELTA - PREDOMINANTLY A HOMOGENEOUS FAT CLAY WITH SOME LEAN CLAYS
SWAMP - PREDOMINANTLY ORGANIC CLAYS, FAT CLAYS, AND PEATS WITH OCCASIONAL SAND AND SILT LAYERS
West Bank of the Mississippi River
in the Vicinity of New Orleans, LA
(East of Harvey Canal)
Hurricane Protection
Plaquemine Parish, Louisiana
SOIL REPORT
HERO CANAL
SOIL AND GEOLOGIC PROFILE
DATE: 11 July 1995
FILE NO. H-2-44312

PLATE 16



WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

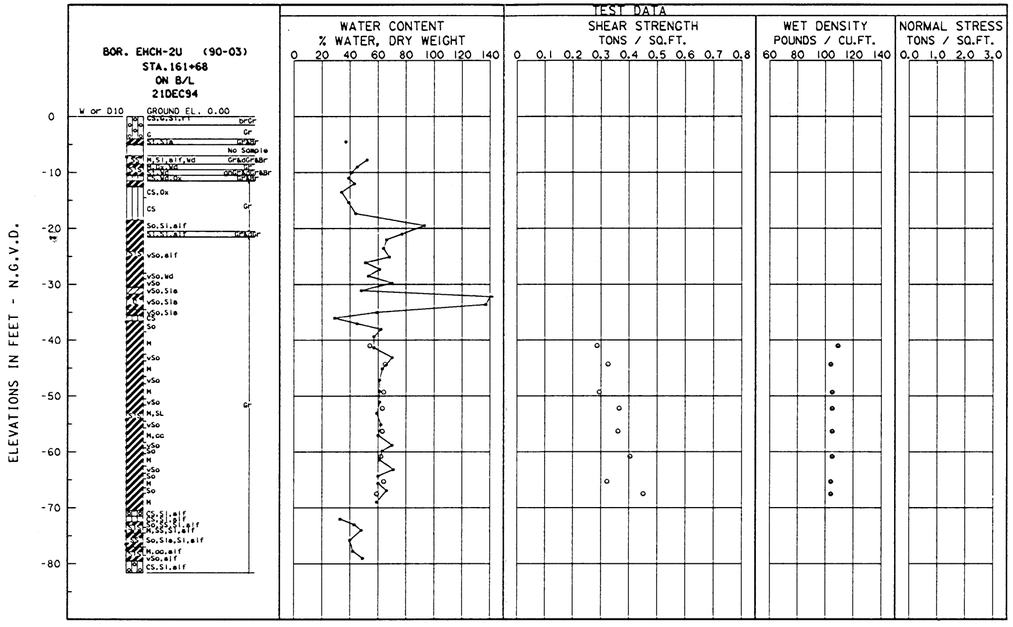
SOIL REPORT
HERO CANAL

UNDISTURBED BORING PLOT: EHCH-IU

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

DESIGNED BY: R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L17.DGN	
DRAWN BY: R.L.V.			FILE NO. H-2-44312	
CHECKED BY: J.B.G.	DATE: 21 AUG 1996			

PLATE: 17



WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

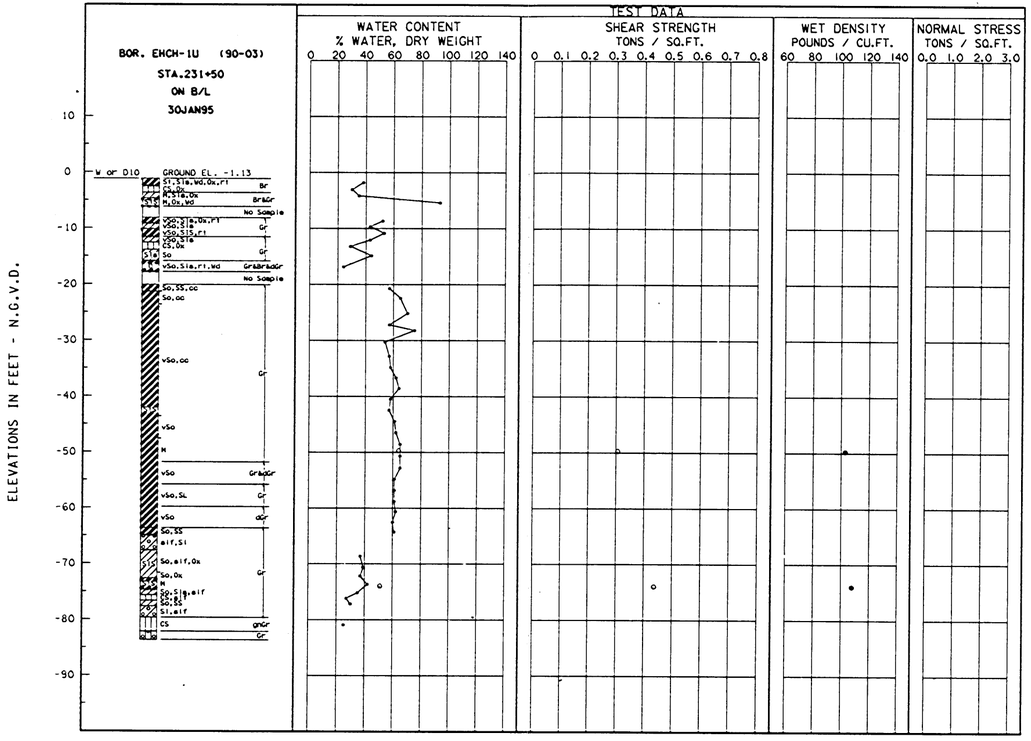
SOIL REPORT
HERO CANAL

UNDISTURBED BORING PLOT: EHCH-2U

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

DESIGNED BY: R.J.V.	PLOT SCALE: 2:1	PLOT DATE: AUG 96	CADD FILE: 44312L1B.DGN	
DRAWN BY: R.J.V.			FILE NO. H-2-44312	
CHECKED BY: J.B.C.	DATE: 21 AUG 1996			

PLATE: 18



WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

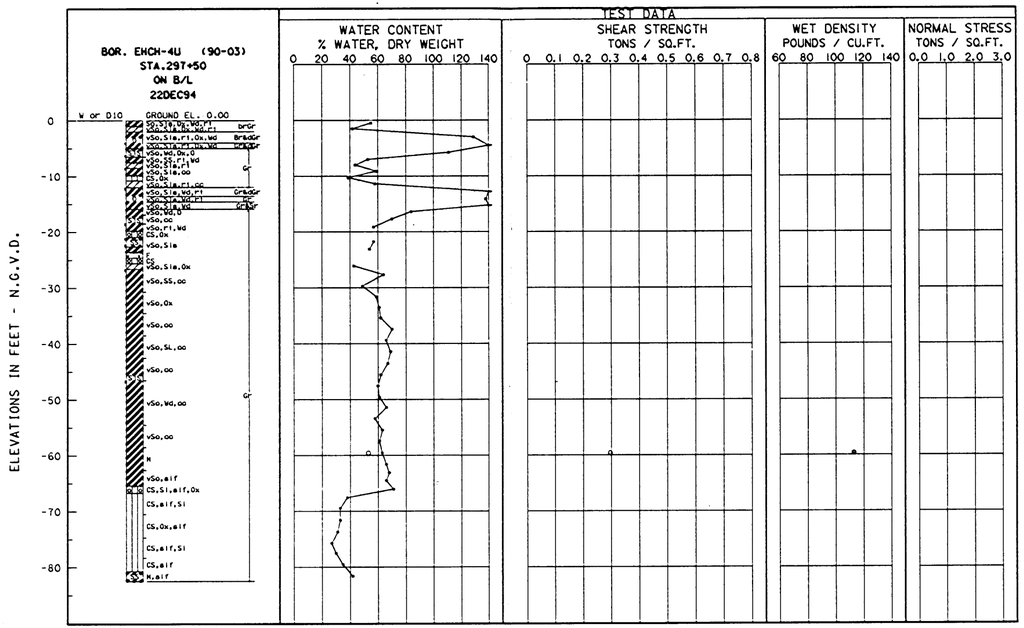
SOIL REPORT
HERO CANAL

UNDISTURBED BORING PLOT: EHCH-3U

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

DESIGNED BY: R.J.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 443121.19.DGN	
DRAWN BY: R.J.V.			FILE NO. H-2-44312	
CHECKED BY: J.B.G.	DATE: 21 AUG 1996			

PLATE: 19



WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

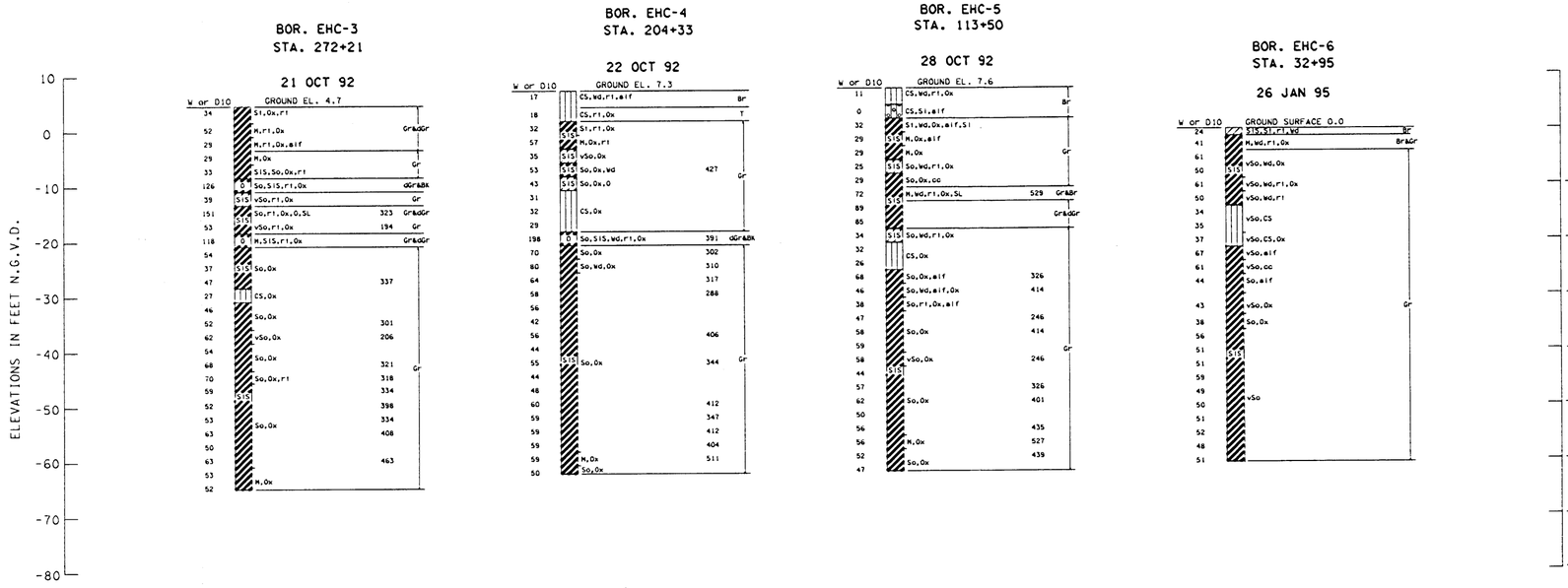
SOIL REPORT
HERO CANAL

UNDISTURBED BORING PLOT: EHCH-4U

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

DESIGNED BY:	R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L20.DGN
DRAWN BY:	R.L.V.			FILE NO. H-2-44312
CHECKED BY:	J.B.C.	DATE: 21 AUG 1996		

PLATE: 20



NOTES

- BORROW BORINGS (BB) WERE TAKEN WITH A HAND AUGER AND ARE DISCONTINUOUS.
- GENERAL TYPE BORINGS WERE TAKEN WITH A 1⅞" I.D. TUBE SAMPLER AND/OR A 1⅜" I.D. SPLIT SPOON SAMPLER.
- FOR SOIL BORING LEGEND SEE PLATE A
- FOR LOCATION OF BORINGS SEE DWGS.

CH - Fat Clay
CL - Lean Clay
ML - Silt, Low Plasticity
SM - Silty Sand

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

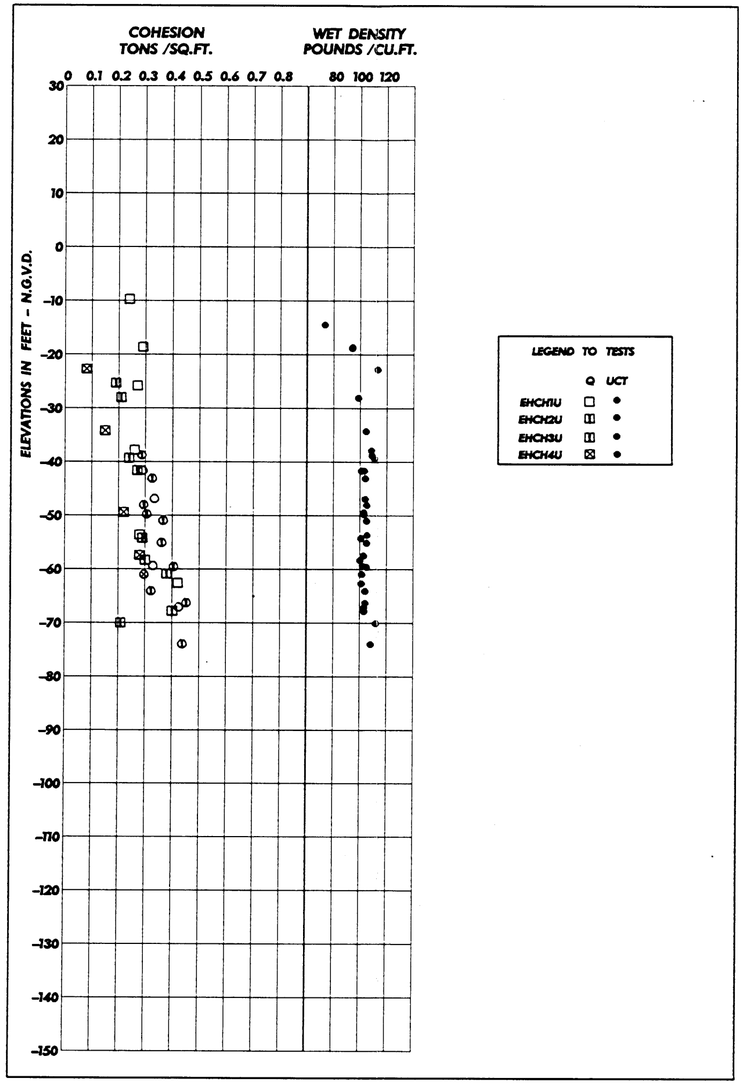
SOIL REPORT
HERO CANAL

GENERAL BORING PLOTS

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

DESIGNED BY: R.J.V.	PLOT SCALE: 10:1	PLOT DATE: AUG 96	CADD FILE: 44312L21.DGN	
DRAWN BY: R.J.V.			FILE NO. H-2-44312	
CHECKED BY: J.B.G.	DATE: 21 AUG 1998			

PLATE: 21



WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

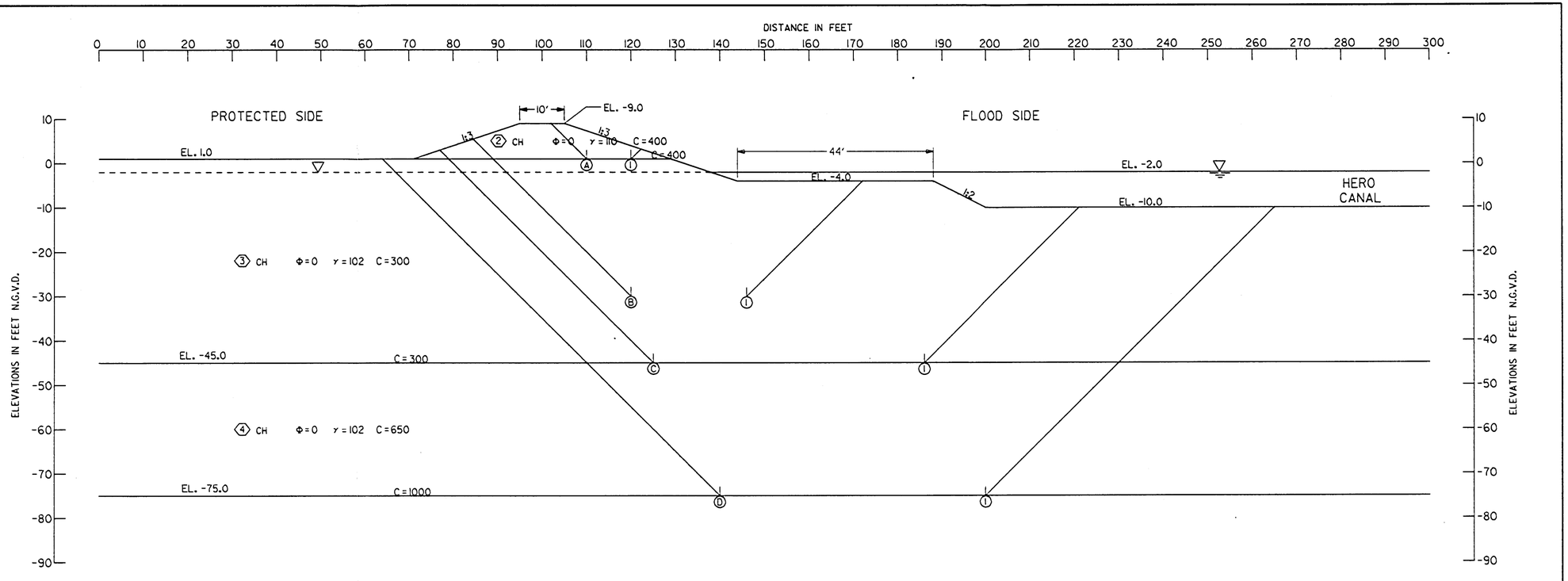
SOIL REPORT
HERO CANAL

SHEAR STRENGTH PLOTS

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

DESIGNED BY: R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L22.DGN
DRAWN BY: R.L.V.			FILE NO. H-2-44312
CHECKED BY: J.B.G.	DATE: 21 AUG 1996		

PLATE: 22



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	1.0	6399	3000	1798	3059	371	11197	2688	4.16
Ⓑ ①	-30.0	22201	7800	15598	72985	37849	45599	35136	1.30
Ⓒ ①	-45.0	29202	18300	21000	136655	83867	68502	52788	1.30
Ⓓ ①	-75.0	66602	60000	60000	322469	249967	186602	72502	2.57

NOTES

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

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

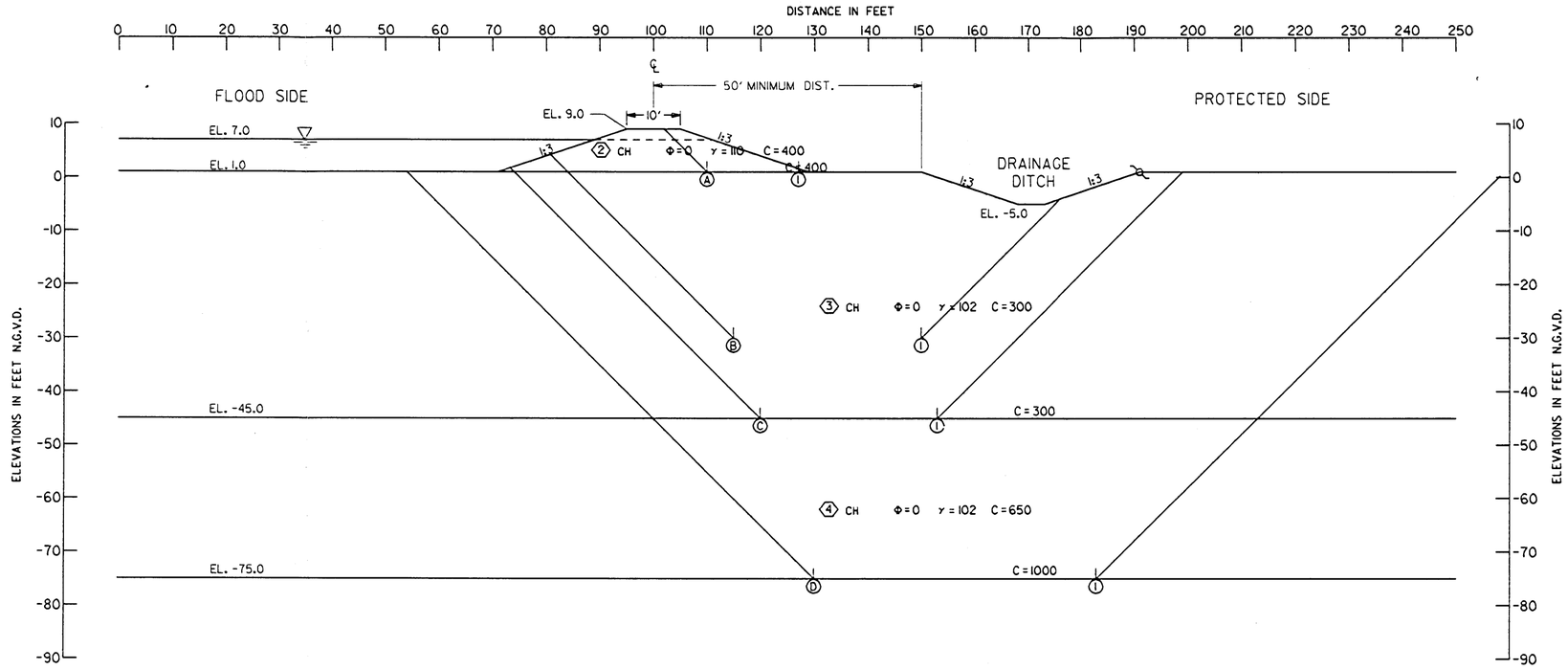
WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL
FLOOD SIDE STABILITY
STA. 0+00 TO 140+00

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

DESIGNED BY: R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L23.DGN	
DRAWN BY: R.L.V.			FILE NO.	H-2-44312
CHECKED BY: J.B.G.	DATE: 21 AUG 1996			

PLATE: 23



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	1.0	6399	5100	400	3059	18	11899	3041	3.91
Ⓑ ①	-30.0	21202	10500	15602	73957	37483	47304	36474	1.30
Ⓒ ①	-45.0	28202	9900	27600	139670	93992	65702	45678	1.44
Ⓓ ①	-75.0	66602	53000	66143	335365	293129	185745	42236	4.40

NOTES

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

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

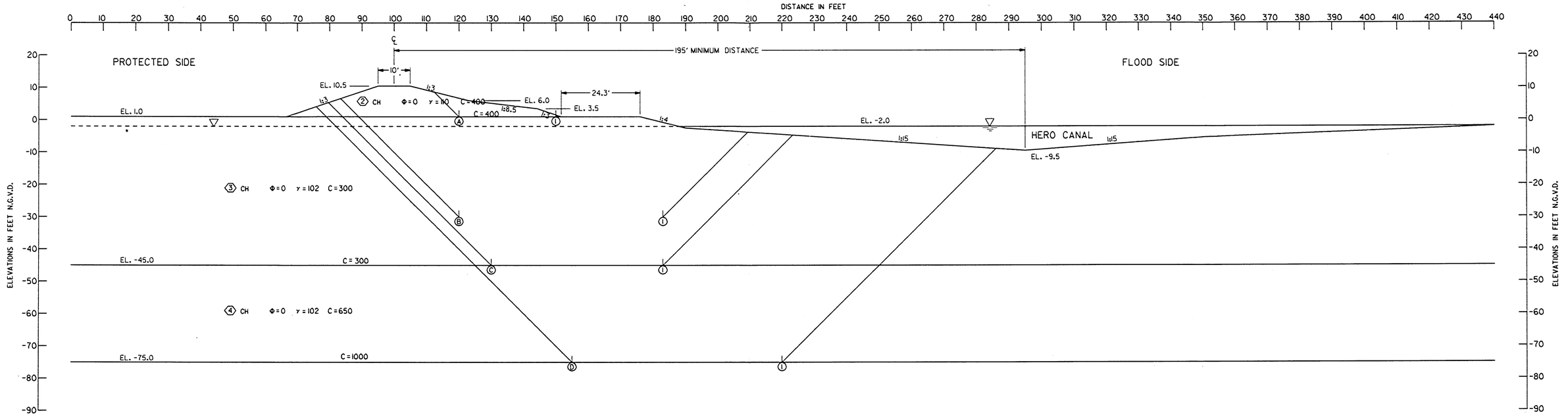
SOIL REPORT
HERO CANAL

PROTECTED SIDE STABILITY
STA. 0+00 TO 140+00

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

DESIGNED BY: R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 443123_24.DGN	
DRAWN BY: R.L.V.			FILE NO.	H-2-44312
CHECKED BY: J.B.G.	DATE: 21 AUG 1996			

PLATE: 24



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	1.0	6131	9000	350	2423	14	15481	2409	6.43
Ⓑ ①	-30.0	23101	18900	15731	79968	39352	57732	40616	1.42
Ⓒ ①	-45.0	31101	15900	24169	146928	92333	71170	54595	1.30
Ⓓ ①	-75.0	69102	65000	60657	341905	258553	194759	83352	2.34

NOTES

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

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

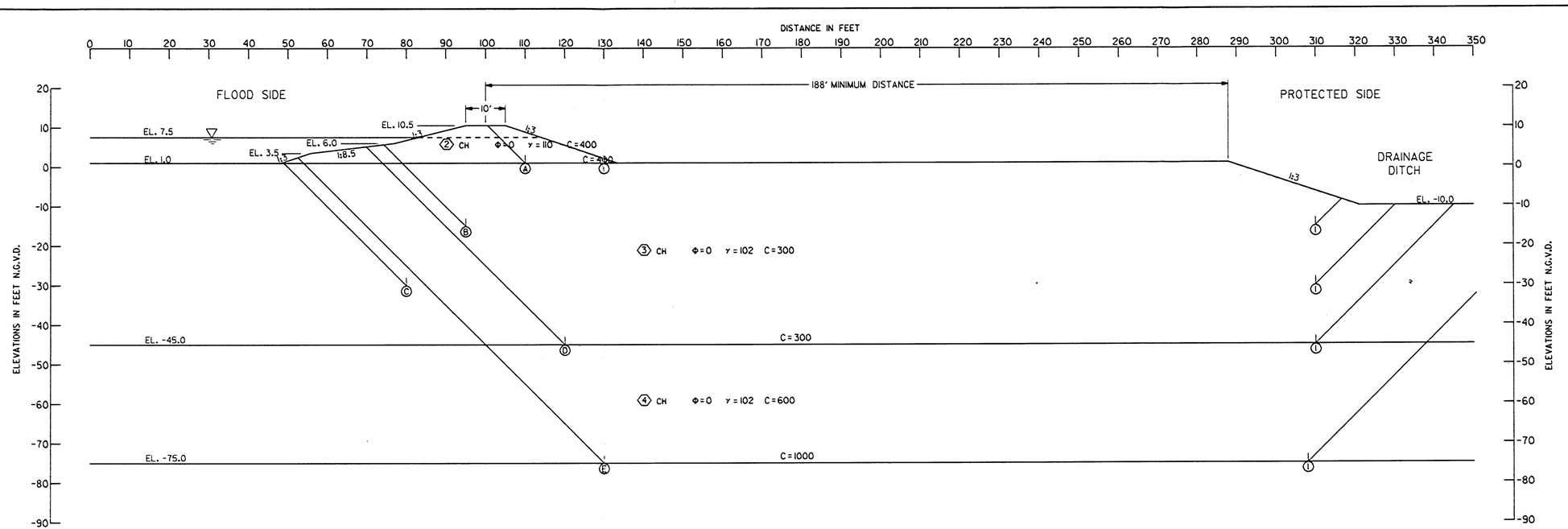
WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL
FLOOD SIDE STABILITY
STA. 140+00 TO 237+00

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

DESIGNED BY: R.J.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L26.DGN	
DRAWN BY: R.J.V.				FILE NO. H-2-44312
CHECKED BY: J.B.C.	DATE: 21 AUG 1996			

PLATE: 25



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ Ⓘ	1.0	7600	6000	700	4503	56	14300	4447	3.22
Ⓑ Ⓘ	-15.0	13349	64500	3900	28299	2872	81749	25427	3.22
Ⓒ Ⓘ	-30.0	18752	69000	12000	67919	22456	99752	45463	2.19
Ⓓ Ⓘ	-45.0	30928	57000	21000	148232	64529	108928	83703	1.30
Ⓔ Ⓘ	-75.0	64752	178000	55834	349016	216061	298586	132955	2.25

NOTES

Φ -- ANGLE OF INTERNAL FRICTION, DEGREES
C -- UNIT COHESION, P.S.F.
▽ -- STATIC WATER SURFACE
D -- HORIZONTAL DRIVING FORCE IN POUNDS
R -- HORIZONTAL RESISTING FORCE IN POUNDS
A -- AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
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P -- AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

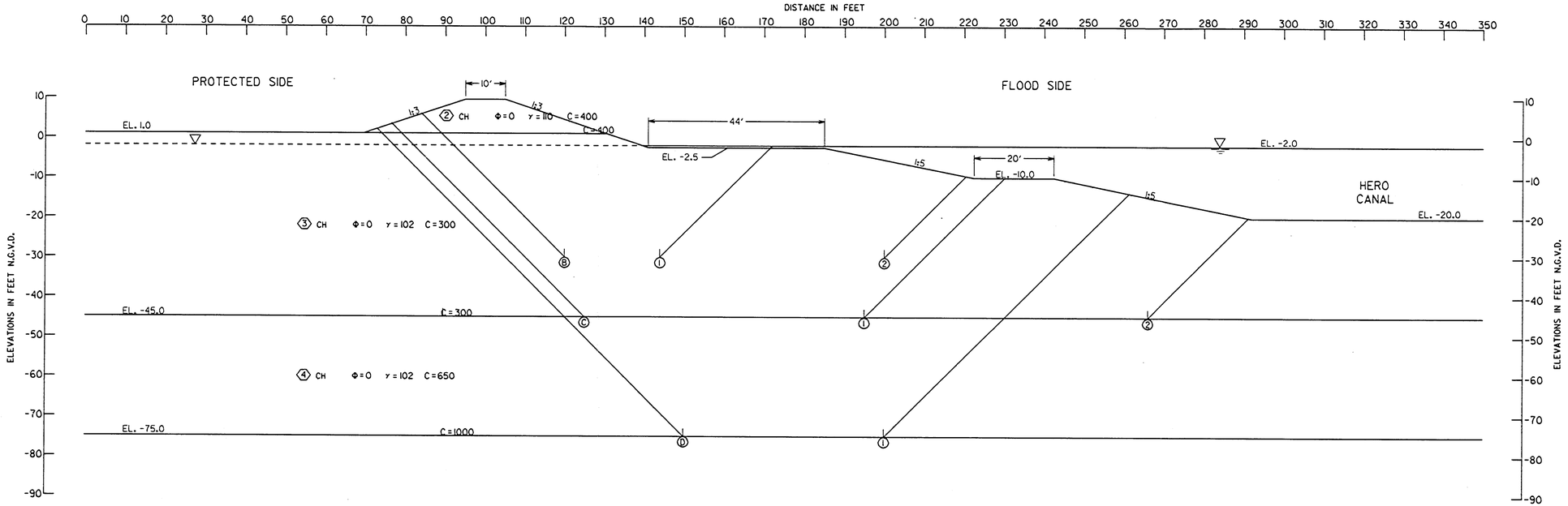
WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL
PROTECTED SIDE STABILITY
STA. 140+00 TO 237+00

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

DESIGNED BY:	R.J.V.	PLOT SCALE:	PLOT DATE:	CADD FILE: 44312L26.DGN
DRAWN BY:	R.J.V.	20:1	AUG 96	FILE NO. H-2-44312
CHECKED BY:	J.B.G.	DATE: 21 AUG 1996		

PLATE: 26



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓑ ①	-30.0	22501	7200	16499	74947	39434	46200	35513	1.30
Ⓑ ②	-30.0	22501	24000	12250	74947	34378	58751	40569	1.45
Ⓒ ①	-45.0	29502	21000	21000	139305	84959	71502	54346	1.32
Ⓒ ②	-45.0	29502	42300	15100	139305	72789	86902	66516	1.31
Ⓓ ①	-75.0	67502	50000	57702	322692	250265	175204	72427	2.42

NOTES

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

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

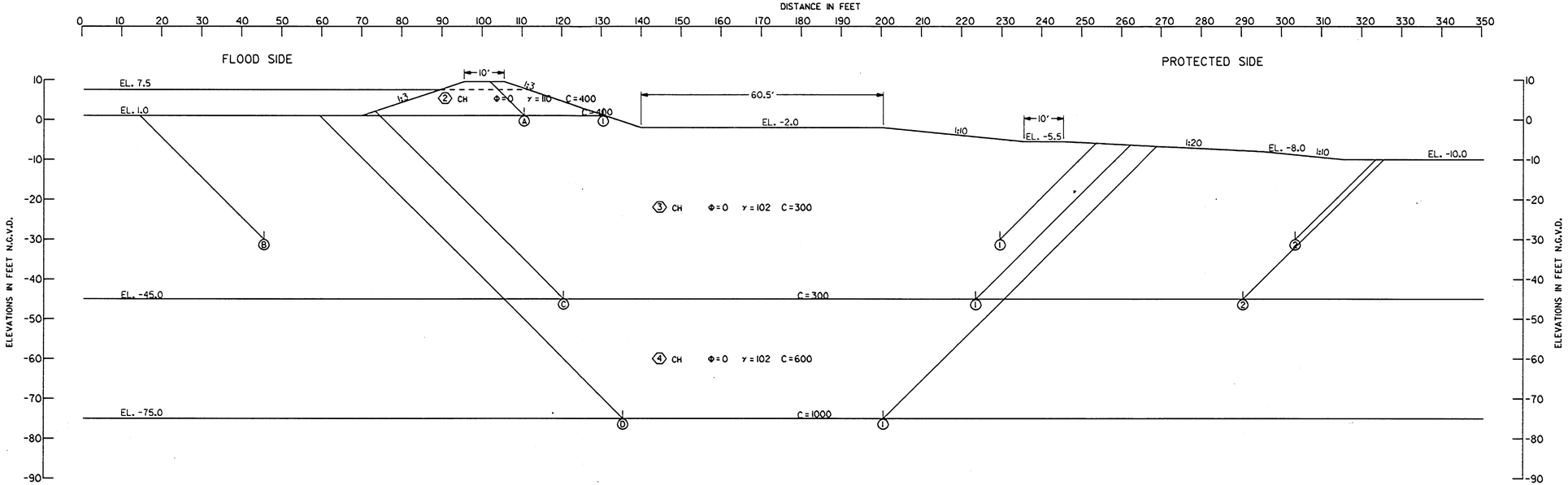
WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

SOIL REPORT
HERO CANAL
FLOOD SIDE STABILITY
STA. 237+00 TO 332+38.7

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

DESIGNED BY:	R.L.V.	PLOT SCALE:	PLOT DATE:	CADD FILE: 44312L27.DGN	
DRAWN BY:	R.L.V.	20:1	AUG 96	FILE NO.	
CHECKED BY:	A.B.C.	DATE: 21 AUG 1996		H-2-44312	

PLATE: 27



ASSUMED FAILURE SURFACE		RESISTING FORCES			DRIVING FORCES		SUMMATION OF FORCES		FACTOR OF SAFETY
NO.	ELEV.	R_A	R_B	R_P	D_A	$-D_P$	RESISTING	DRIVING	
Ⓐ ①	1.0	6799	6000	98	3513	1	12897	3512	3.67
Ⓑ ①	-30.0	18600	55200	14457	62925	30620	88257	32305	2.73
Ⓑ ②	-30.0	18600	77400	12000	62925	21133	108000	41792	2.58
Ⓒ ①	-45.0	28502	30900	23200	142416	79560	82602	62856	1.31
Ⓒ ②	-45.0	28502	51000	21000	142416	65596	100502	76820	1.31
Ⓓ ①	-75.0	63602	65000	59000	336960	251124	187602	85836	2.19

NOTES

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

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

GENERAL NOTES:

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTH, AND UNIT WEIGHT OF THE SOIL WERE BASED ON THE RESULTS OF UNDISTURBED BORINGS. SEE BORING DATA PLATES.

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA

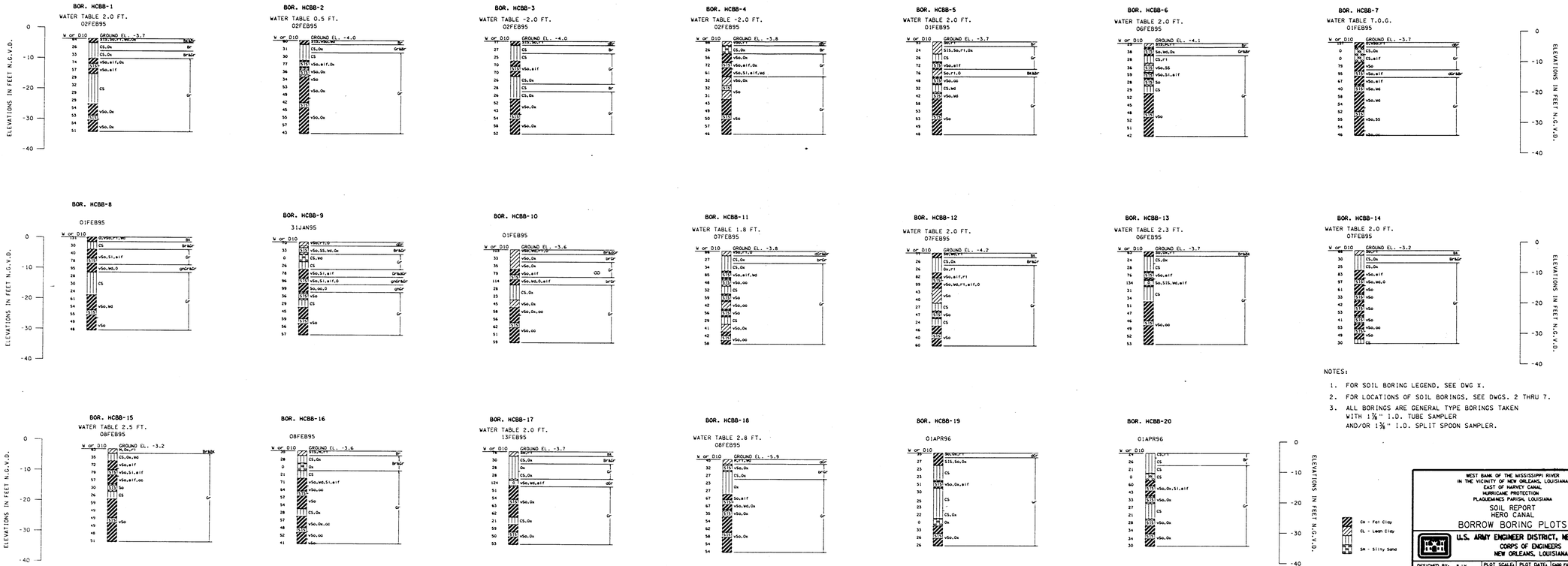
SOIL REPORT
HERO CANAL

PROTECTED SIDE STABILITY
STA. 237+00 TO 332+38.7

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

DESIGNED BY: R.L.V.	PLOT SCALE: 20:1	PLOT DATE: AUG 96	CADD FILE: 44312L36.DGN
DRAWN BY: R.L.V.			FILE NO. H-2-44312
CHECKED BY: J.B.C.	DATE: 21 AUG 1996		

PLATE: 28



NOTES:

1. FOR SOIL BORING LEGEND, SEE DWG X.
2. FOR LOCATIONS OF SOIL BORINGS, SEE DWGS. 2 THRU 7.
3. ALL BORINGS ARE GENERAL TYPE BORINGS TAKEN WITH 1⅜" I.D. TUBE SAMPLER AND/OR 1¾" I.D. SPLIT SPOON SAMPLER.

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

WEST BANK OF THE MISSISSIPPI RIVER
IN THE VICINITY OF NEW ORLEANS, LOUISIANA
EAST OF HARVEY CANAL
HURRICANE PROTECTION
PLAQUEMINES PARISH, LOUISIANA
SOIL REPORT
HERO CANAL
BORROW BORING PLOTS

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

DESIGNED BY: R.A.V.	PLOT SCALE: 10:1	PLOT DATE: AUG 96	CADD FILE: 44312.DGN	
DRAWN BY: R.A.V.			FILE NO.	H-2-44312
CHECKED BY: A.B.C.	DATE: 21 AUG 1996			

PLATE: 29