1349

U. S. ARMY, CORPS OF ENGINEERS

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN

New Orleans - 83
Spanish Fort - 41

DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 8
INNER HARBOR NAVIGATION CANAL REMAINING LEVEES

1E, 2E, 3E, 4E, 6ET, 7EU, 8E, 8ET, 9E, 9EA, 10EA,
11E, 12ET, 12EA, 14E, 15E, 17E, 1W, 2WTA, 3W, 4W, 5WT
8W, 9W, 10W, 10WT, 12W, 12WT, 14W, 15WT, 1LB, 2LB, 3LB, 4LB,
5LB, 16W, 17W, 18WT, 19WT, 20WT, 21W, 22W, 23W, 24WT,
25W, 27WU, 28W, 29WT, 30W, 33WT, G1, G2, G3.

New Orleans
& Chef Menteur
& St Bernard

IHC - 18EC, 19EC, etc
1E, 1W, 2WTA, etc.

Prepared in the Office of the District Engineer
New Orleans District, Corps of Engineers
New Orleans, Louisiana

February 1968

INCL 2

April 1968

DEPARTMENT OF THE ARMY
MISSISSIPPI RIVER COMMISSION, CORPS OF ENGINEERS
Vicksburg, Mississippi 39180

COMMENTS ON SUPPLEMENT NO. 8 GDM NO. 2, IHNC, REMAINING LEVEES, LAKE PONTCHARTRAIN BARRIER PLAN.

1. Sec. III, Para 19, Page III-16. The stability of all the I-walls should be checked using the Q shear strength in addition to the S shear strength, if this has not been done. If the Q condition has been checked and found not to be critical, appropriate statements to this effect should be included.

2. Sec. III, Para 23, Page III-19. The last sentence of this paragraph indicates that approximately 4.5 and 2.0 feet of settlement will occur beneath the road ramps on the west side near Hwy 90 and at Jourdan Road on the east side, respectively. As indicated on Plate IV-7, the road ramp on the west side near Hwy 90 closely parallels the I-wall for a distance of about 500 feet. As a result of this, the new ramp fill load will also cause time-dependent settlement of the adjacent I-walls. A similar condition exists at the Jourdan Road ramp on the east side. The settlements along the walls will tend to be differential in nature, due to the varying fill height, which complicates the problem of providing a finished wall to the design grade prior to the time when consolidation of the ramp is essentially complete. It is noted in paragraph 28 of Sec. III that fill for road ramps will be placed ahead of the tie-in walls to reduce ultimate settlement of the wall. In view of the difficulties which may be encountered in the above areas, the DM should be specific as to the proposed time interval allowed between fill placement and wall completion.

3. Sec. III, Para 25, Page III-20, and Plate III-60. The details of the proposed borrow pit in Lake Pontchartrain indicate that about 5 to 10 feet of soft lake bottom deposits may have to be removed in order to obtain the desired Pleistocene material. Such an operation, combined with the distance from the project site, would be expensive. The DM should indicate what studies have been made to locate sources of suitable material and the comparative economics involved in selecting the proposed pit.

4. Plate III-11. A 16 gage corrugated metal pipe is considered too thin for use as the collector pipe. This pipe should be 14 gage.

5. Plate III-16 and Fig. 4-4. The proposed I-wall in the reach from stas 117+50 to 118+85 is retaining the Hwy 90 approach embankment to the Chef Menteur bridge over the IHNC. This wall retains about 9 feet of earth and has a computed deflection of about 4 inches. Under these conditions, the long-term adequacy of an I-type wall in this area is questionable.

It appears that a T-type wall would be more appropriate and should be considered further. Also see Comment No. 13 below.

06. Plates III-16 and III-17. In the reach from stas 115+65 to 117+50 the required tip elevation of the sheet pile is indicated to be about 15 feet deeper than the design value. This is also the case in the reach from stas 119+59 to 132+00 where the required penetration is about 9 feet deeper than the design value. Since the borings in these areas do not indicate any pervious zones which would require a cutoff below the design tip elevation, the reasons for providing the additional pile penetration should be indicated. Such reasons should also be indicated for similar conditions shown on Plates III-33 and III-34.

07. Plates III-24, III-25, III-26, and III-28. With the exception of the stability analysis from stas 148+00 to 210+10 on Plate III-26, the basis for the selection of the design shear strengths used is not apparent. In much of the area covered by these analyses no undisturbed borings are available; and where such undisturbed borings are located in the immediate vicinity, the design shear strengths do not conform to those indicated by data from these borings. For example, in the analysis at sta 211+63 on Plate III-28 the design shear strengths are higher than those at Boring 31-WUT which is about 400 feet from the section, see Plate IV-15. In view of the above, the DM should clearly indicate the basis for selecting design shear strengths for each reach or section analyzed.

08. Plate III-42. 0a. In the stability analysis from stas 130+81 to 136+07 a design shear strength of c = 500 psf is used for the levee foundation down to el -12.0. However, since the shear strength data from Boring 12-EU, shows shear strengths from unconfined tests as low as 200 to 300 psf, the basis for the selection of the design shear strength is not apparent and should be reevaluated.

b. Title block is in error. This plate contains analyses outside the reach from Lake Pontchartrain to Chef Hwy.

9. Section IV, Para 8, Page IV-4. This paragraph indicates that "I" type walls are to be used where exposed heights do not exceed 10 feet. Based on the results of the analysis of an 8-foot wall (Fig. 4-3), it appears that a 10-foot wall may result in excessive deflection.

10. Section IV, Paras 11e and 11f, Page IV-5. The difference between the water surface elevations for Cases 3 and 5 seems too small to warrant an investigation of Case 5. If Case 5 is intended to check the effect of an intermediate stage on the lateral loading of the piles, it would appear that a lower level than that indicated would be more critical.

11. Plate IV-5. The adequacy of the MA-22 piling between sta 80+98 and 81+23

to support an "I" type wall without excessive deflection is questioned. A "T" type wall will probably be required.

12. Plates IV-5 and IV-6. Refer to the wall reach from sta 81+23 to 91+00. The penetration ratio for this reach is 21/8.25 = 2.55. Figure 4-3 indicates a penetration ratio of 3 for a wall with only a 7.5-foot loaded height. The wall should be checked.

13. Plate IV-8. The profile indicates the embankment grade at highway 90 to be at least ? feet above the wall. This suggests that the wall alignment need not be offset as far as indicated on the plan to reach an embankment level adequate for the wall connection, and that a reduction in the length of the wall at both sides of the embankment is possible.

14.

DELETED

15. Plate IV-17. a. It may be more economical to cut off and salvage the existing Z-27 piling rather than driving to the deeper penetration.

b. It is not apparent why a T-wall is proposed between stas 226+60 and 235+77. The reasons for providing such a wall in this area should be presented. If it is desired to utilize the existing Z-27 sheet piling along the proposed alignment, consideration should be given to the feasibility of constructing a 3- to 4-foot high levee fill and incorporating the existing piling as an I-wall through the embankment. In addition, consideration should be given to the economics of abandoning the existing sheet piling and constructing a levee to the required grade on an alignment further away from the canal if necessary for stability of the canal and levee.

16. Plate IV-22. a. Sta 83+45.5 to 85+07. This wall is subjected to an earth loading on the flood side as well as the water loading.

b. Sta 85+44 to 85+90±. This reach should be indicated to be a "T" wall on the profile.

c. Sta 85+44 to 86+66. This wall is apparently subjected to an earth loading on the land side from the ramp fill.

d. "I" Wall Beginning at Sta 87+41. The portion of the wall in the end slope of the levee is considered too high for an "I" wall and should be checked.

17. Plate IV-23, Sta 94+19 to 94+68.75. This wall is a special design, not an "I" wall as indicated.

18. Plates IV-23 and IV-43. Driving concrete piles adjacent to existing circulating water tunnels may cause high lateral earth pressures and damage the tunnels. Consider either requiring prebored holes or steel H-piling.

19. Plate IV-25. Consider minor revision in alignment as indicated in red.

20. Plate IV-27. An alignment as indicated in red would result in a considerable savings provided a gate design for about a 46-foot clear opening can be developed.

21. Plates IV-35, IV-36, and IV-37. The ground surface adjacent to the wall should be shaped to turn surface drainage away from the wall.

22. Plate IV-38. Reference is made to the design section from stas 105+60 to 112+03 (Owens-Ill. glass building). This section is not sufficient to indicate the geometry and adequacy of the existing "floodwall," or the intended function of the new work. The DM should present a clearer picture of the existing and new work together with design assumptions.

23. Plate IV-39. The reinforcement extending from the piles into the base should be conventional reinforcement bars placed to supplement the prestressed reinforcement. Since the pile load analysis is based on the piles being pinned at the base, the amount of supplemental reinforcement should be sufficient to prevent excessive cracking of the piles assuming some moment develops. Refer to comments marked in red.

24. Plate IV-44. The need to grout beneath the existing tunnel to fill possible voids should be considered.

25. Plate IV-46. New batter piles should be spaced to clear existing piles.

26. Plate IV-47. The gate sills should be checked for torsion.

27. Fig. 4-14. The top of the levee is at elevation 4.83 at sta 87+41 and slopes up to elevation 9 in about 15 feet. The design is not conservative for the portion of the wall in the sloping fill and should be rechecked for an average lower ground surface.

28. Fig. 4-53. a. The unit weight of the rock material appears to represent an everage of the weights of drained and saturated material; however, considering the nature of other assumptions, refinement in the analysis is not warranted.

b. In view of the paved area behind the wall, a drain should be provided to prevent any build up of seepage pressure.

29. Fig. 4-54. A value of ϕ = 45° would be reasonable for broken or crushed rock. Based on this value of ϕ, Ka based on Rankines formula would vary from 0.17 for a level backfill to 0.70 for a backfill slope equal to 45°. The

wall, however, may not yield enough for the active pressure to develop if the piles are driven into a sand stratum of substantial thickness as indicated in some boring logs. For a nonyielding wall, "at rest" pressure would develop for which the coefficient would vary from about 0.5 for a level backfill, to about 0.95 for a sloping backfill. The value of 0.95 is based on the procedure set forth in para 3d of EM 1110-2-2502 for an effective $\phi' = 20°$ and assumes the backfill slope equal to ϕ'. Based on the above, the value of $k = 1.0$ assumed for design appears to represent an "at rest" value for the sloping fill and not the active condition.

30. Fig. 4-55. The indicated length of 64 feet may be excessive for a 12-in. square concrete pile and should be checked for possible difficulties in handling and driving.

31. Fig. 4-56. For the "active" condition, the earth load would be $\frac{kwh^2}{2}$ where $k = .7$. The direction of the force would be parallel to the surface of the fill. For the "at rest" condition, the value of k would be about 0.95. The direction of the force would be at an angle of 20° to correspond to the value of the effective ϕ'.

32. Fig. 4-57. a. The procedure is correct only where k is assumed equal to 1, and the direction of the force is assumed horizontal. For other values of k and where the earth force is applied at an inclined direction, the water pressure and earth pressures should be computed separately taking into account the buoyancy of the water in reducing the earth load.

b. The wall should be checked for the effect of possible variations in earth loadings as discussed above.

33. Fig. 4-77. The design should be checked assuming the vertical stems at each side, and between the tunnels, to be wide supports.

34. Fig. 4-79. Due to the width of the portion of the stem supporting the wall spanning the culverts, stresses will concentrate at each side at the base. Buttresses may be desirable to prevent high stresses at these points of concentration, and the use thereof should be considered.

35. Fig. 4-83. The weight of earth over the footing has been omitted in the moment and shear calculations. The calculations should be revised. Refer to comment marked in red.

36. Section IX. a. Page IX-3. (1) Reinforcing steel at 14¢ is from 1 to 2 cents per lb. low.

(2) Unit price for relief well riser pipe and well screen is considered too high and should be checked.

b. Page IX-4. (1) The cost of $90,000 per ramp is considered excessive and should be explained.

(2) Pile tests at $12,000 each is excessive and should be explained.

(3) S&A percentage is almost 2% below curve, and should be checked.

c. Page IX-5. The E&D percentage on page IX-3 as well as S&A on pages IX-4 and IX-5 are considered low and should be checked.

37. Refer to annotations in red on Pages III-1, III-17, IX-4, Plates III-27, IV-1, IV-25, IV-27, IV-37, IV-38, IV-39, IV-41, IV-45, IV-49, IV-52, Fig.4-4, 4-10, 4-16, and 4-83.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

LMNED-PP

22 December 1969

SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. Reference is made to LMNED-PP letter dated 28 Feb 68, subject as above, and indorsements thereto, and specifically to the following comments: paragraphs 15a and 15b of incl 2 (LMVD comments), 1st Ind; paragraph 4 of the 2d Ind; paragraph 2 of the 3d Ind; and paragraph 1a (15) of the 4th Ind.

2. By letter dated 9 Oct 68, the Board of Levee Commissioners of the Orleans Levee District [the local agency officially designated by Executive Order of the State of Louisiana to provide the required local cooperation on the Lake Pontchartrain, La. and Vicinity Hurricane Protection Project in Orleans, Jefferson, St. Charles, and St. Tammany Parishes] forwarded a request (see incl 1) by the Board of Commissioners of the Port of New Orleans for an adjustment to the alignment of the protective works on the west bank of the IHNC just north of Florida Avenue. The Board of Levee Commissioners of the Orleans Levee District indorsed this new alignment and requested that consideration be given thereto.

3. The following factors are important to the evaluation of the request by local interests:

a. The plan of protection as covered in the project document for the inner harbor area consisted of raising the existing levee "by construction of a sheet piling wall with concrete cap at elevation 13 feet in the crown of the existing levee." The requested alignment change returns the alignment to that presented in the project document, i.e., parallel to France Road and thence easterly toward the IHNC parallel to the Florida Avenue Canal. See plate E-2, Appendix E, Interim Survey Report, Lake Pontchartrain, Louisiana and Vicinity, dated 21 Nov 62.

LMNED-PP 22 December 1969

SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

b. The proposed marine terminal development in the area in question consists of containerized shipping facilities estimated to cost about $6,000,000. A contract to initiate construction of these facilities was let recently.

4. Forwarded herewith for review and approval is the supplemental design information, incl 2, for the protective works on the project document alignment. Local interests are in agreement with this alignment and, in addition, this plan of protection is the most economical means of providing the required protection. Approval of the supplemental design information is recommended.

FOR THE DISTRICT ENGINEER:

Jerome C. Baehr

JEROME C. BAEHR
Chief, Engineering Division

2 Incl
1. Ltr
2. Design info (16 cys)

LMVED-TD (NOD 22 Dec 69) 1st Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 28 January 1970

TO: Chief of Engineers, ATTN: ENGCW-E/ENGCW-V

1. Pursuant to para 20, ER 1110-2-1150, supplemental design information to subject design memorandum (describing proposed alignment change) is forwarded for review and approval. Approval is recommended subject to the following comments.

2. Para 12. a. Table 2, Page 6. A contingency factor of 25% should be used, and the Cost Estimate should identify Federal and non-Federal costs.

b. A separate "Comparison of Cost Estimate" should be furnished comparing this estimate and: (1) the latest approved PB-3; (2) Design Memorandum No. 2, General - Supplement No. 8; and (3) the project document. Each comparison should specify the increase attributed to price level separate from changes for other reasons.

This comparison will be used to substantiate the statement in para 4, basic letter, that the plan presented is the most economical means of providing the required protection.

3. Plate 9. The relatively large design sheetpile penetration in this reach suggests that deflection of the wall could be excessive. To help limit such deflection, consideration should be given to constructing the levee in the reach along Florida Avenue Drainage Canal to el +9.0 instead of +8.0 as recommended, if this does not significantly complicate the overall stability of the levee and wall section. Based on the analysis shown on Plate 12, it does not appear that this would be a problem.

4. Plates 10 through 13. a. The shear strength data presented from the four undisturbed borings do not justify the 400 psf Q shear strength used above el -5.0. The only Q test performed on material in this zone was made on a sample from Boring 2-WUC at about el 0.0, and this test indicates a shear strength of only about 120 psf. The Q shear strength of this zone is particularly critical for Q stability design of the cantilever I-wall, and should be adequately verified. Additional Q tests should be performed to verify the validity of the assumed Q shear strength above el -5.0. This may require additional shallow undisturbed borings.

LMVED-TD (NOD 22 Dec 69) 1st Ind 28 Jan 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

b. The section shown on Plate 10 from sta 223+73.08 to sta 237+42.51 indicates el 3 for the toe of the recommended levee on the protected side. Plates 12 and IV-36A indicate elevation 4.0 for the toe. This discrepancy should be resolved.

5. Plate 13. The piling arrangement shown on Plates IV-36A and IV-47 result in a wall which depends on the lateral resistance of the piling to resist the moment of resultant wall loads eccentric about the elastic center of the piling. The strata of weak soil indicated on Plate 13 may result in a very low lateral pile resistance. In fact the net load diagram for the "Q" case for Station 219+06.29 to 220+70.54 indicates that the earth rather than laterally supporting the piling may actually be supported by the sheet piling and bearing piling acting together. Such loading will tend to rotate the wall in a counterclockwise direction and may produce high bending stresses in the bearing piling. A pile arrangement in which the moment due to eccentric loads is resisted by axial pile loads may be desirable.

6. Plate IV-17A. The proposed levee crown elevation shown on the profile should be 8 instead of 9.

7. Plate IV-36A. The existing ground surface shown on the design section from sta 223+73.08 to sta 237+42.51 differs from that shown on Plates 10 and 12 for this reach. In the sections on Plates 10 and 12, the wall appears to be located at the south edge of the existing levee, whereas, on Plate IV-36A the wall is located on the north side of the existing levee. This apparent discrepancy in typical section should be clarified. If the section shown on Plate IV-36A between the above stations is typical, consider locating the new levee ℄ and wall farther south to take better advantage of the existing levee.

FOR THE DIVISION ENGINEER:

A. J. DAVIS
Chief, Engineering Division

2 Incl
wd 2 cy incl 2

CF:
NOD-LMNED-PP

ENGCW-EZ (LMNED-PP, 22 Dec 69) 2nd Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, Office of the Chief of Engineers, Washington, D.C. 20314 11 March 1970

TO: Division Engineer, Lower Mississippi Valley

The supplemental design information to the subject design memorandum is approved, subject to the comments of the Division Engineer in the 1st indorsement.

FOR THE CHIEF OF ENGINEERS:

wd all incls

WENDELL E. JOHNSON
Chief, Engineering Division
Civil Works

LMVED-TD (NOD 22 Dec 69) 3d Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 18 Mar 70

TO: District Engineer, New Orleans, ATTN: LMNED-PP

Referred to note approval.

FOR THE DIVISION ENGINEER:

A. J. DAVIS
Chief, Engineering Division

LMNED-PP (NOD 22 Dec 69) 4th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La. 70160 14 May 70

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. The proposed disposition of comments in the 1st Ind of this chain of correspondence is as follows (paragraph numbers refer to like-numbered paragraphs of the 1st Ind):

2. Par 2a.

a. As stated in the current PB-3, a 20 percent contingency factor is allocated for all construction in the Lake Pontchartrain, La. and Vicinity project, and we feel that construction of this reach will pose no unique problems upon which an increased contingency factor would be justified.

b. This reach comprises an inseparable portion of the IHNC Remaining Levees feature of the Lake Pontchartrain hurricane protection project; consequently, a Federal--Non-Federal apportionment of costs is not appropriate. However, the following breakdown for this reach is presented in response to your request:

Federal cost (70%)		Non-Federal cost (30%)
$648,000.00		$278,000.00
-	Lands, damages, & relocations	-142,000.00
$648,000.00	Cash contribution	$136,000.00

3. Par 2b. The cost in the latest approved PB-3 is based on the alignment and type of construction presented in GDM No. 2, Supp. No. 8. Additionally, the protective works and alignment presented herein as the recommended plan are the same as described in the project document plan, with the exception that I-wall is used in lieu of concrete capping of the steel sheet pile for reasons stated in GDM No. 2, Supp. No. 8. Recent studies performed by NOD have disclosed that an earthen levee cannot be constructed along the project document alignment (recommended alignment) because of rail, wharf, and structural facilities of the containerization complex now under construction. Therefore, the plan recommended is considered to be the most practical plan for the reach. A comparison of cost for the plan presented in GDM No. 2, Supp. No. 8 (same as PB-3), and for the plan recommended (same as project document plan except I-wall is used in lieu of concrete capping) herein follows (prices shown are to January 1970 price levels):

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

COMPARISON OF COSTS
IHNC REMAINING LEVEES
Sta. 210+75 to Sta. 237+44.51

	Feature	GDM No. 2 Supp.No. 8	Recommended Plan	Recommended Plan - GDM No. 2 Supp.No. 8
		$	$	$
11	Levees & floodwalls	641,000	642,000	+1,000
30	Engineering & design	73,000	73,000	0
31	Supervision & administration	69,000	69,000	0
01	Lands & damages	320,000	110,000	-210,000
02	Relocations	69,000	32,000	-37,300
	Total	1,172,000	926,000	-246,300

4. Par 3. The sheet piling from station 223+73.08 to station 237+42.51 extends to elevation -20.0 to cut off the organic clay layer from elevation -5.0 to elevation -17.0 (see plate 9). Being adjacent to the canal, this stratum presents a potential drainage path beneath the proposed levee if not cut off. Sheet pile design on the opposite side of the canal (refer to Lake Pontchartrain, La. and Vicinity, GDM No. 2, Advance Supplement, Inner Harbor Navigation Canal West Levee, Florida Avenue to IHNC Lock, approved 31 May 1967), which is nearly identical to this design, indicates that predicted deflection of the piling is not excessive.

5. Par 4a. Two additional (Q) tests were performed on the soil above elevation -5.0 with the following results:

Boring	Elevation	Cohesion	Ø Angle
1-WUC	3.2 m.s.l.	0.65 TSF = 1300 p.s.f.	0°
2-WUC	5.2 m.s.l.	0.38 TSF = 760 p.s.f.	0°

Based on these strengths, the design strength of 400 p.s.f. is acceptable.

6. Par 4b. Plate 10 is in error. The toe elevation on the protected side should be 4.0 as shown on plates 4 and 12.

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

7. Par 5. Based on guidance from LMVD personnel, the net pressure diagram for the sheet pile cutoff was modified in accordance with the following procedure:

Hypothesis. The horizontal resistance due to shear (R_B) should be distributed along the length of the sheet pile cutoff, rather than applying it as a line force at the tip of the sheet pile. Accordingly, the net pressure diagram along the sheet pile cutoff utilizing the distribution of R_B was determined as follows:

a. Conventional stability analysis by the method of planes, utilizing a factor of safety of 1.3 incorporated in the soil strength parameters, was performed to determine the stability against rotational failure. The use of a factor of safety of 1.3 is also recommended by Mr. Gregory P. Tschebotarioff in Chapter 5 of Foundation Engineering, edited by G. A. Leonards and dated 1962. The analysis was performed at 1-foot intervals with the active wedge located at the flood side edge of the structure and the passive wedge located at the protected side edge of the structure.

b. The assumption was made that the value of (R_B) at the bottom of the base of the structure was zero.

c. For each analysis the net driving force, i.e., $(D_A - D_P) - (R_A + R_B + R_P)$ was determined. The value of D_A included the weight of water between the tailwater elevation and the stillwater elevation located above the active wedge.

d. The assumption was made that the net driving force above the bottom of the base of the structure was carried by the structure.

e. Considering the driving force (D_A) positive and all resisting forces (D_P, R_P, R_B, & R_A) negative, in the expression $\Sigma D = D_A - D_P - R_P - R_B - R_A$, using the method of planes stability analyses, the ΣD was determined by assuming failure at the bottom of the base of the structure and at each foot in depth thereafter. The value of the algebraic difference in ΣD, between 1-foot intervals, was used to develop the pressure diagram. If the incremental difference is negative, the pressure diagram indicates an available horizontal resistance in excess of that required; and if the incremental difference is positive, the pressure diagram indicates an unbalanced horizontal pressure in excess of the available soil resistance. It is considered that such an excess must be carried by the sheet pile cutoff. The shear in the sheet pile at the base of the structure should be considered as

LMNED-PP (NOD 22 Dec 69) 4th Ind 14 May 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

an additional lateral load to be carried by the bearing piles. Inclosure 3 is the modified sheet pile pressure diagram for this reach and indicates that there are no unbalanced forces acting on the sheet pile cutoff. Therefore, the pile arrangement originally submitted is adequate.

8. Par 6. Concur.

9. Par 7. The existing levee runs parallel to and slightly north of the floodwall centerline from station 223+73 to approximately station 232+00. At station 232+00 it veers slightly to the south. The section shown on plate IV-36A was cut beyond station 232+00 and reflects the levee and an existing roadbed adjacent to the levee. The sections on plates 10 and 12 reflect ground conditions along the alignment west of station 232+00. The variation in cross sections through the area will be clearly illustrated on the contract plans by showing ground surface elevations on the plan view and plotted cross sections at 200-foot intervals.

10. Approval of the proposed disposition of comments presented herein is recommended.

FOR THE DISTRICT ENGINEER:

1 Incl
Added incl 3
3. Diagram (16 cys)

Walter S Marks
for RAYMOND J. FRANKLIN
Acting Chief, Engineering Division

LMVED-TD (NOD 22 Dec 69) 5th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 16 Jun 70

TO: District Engineer, New Orleans, ATTN: LMNED-PP

1. The explanations offered and actions proposed in the 4th Ind to satisfy comments in previous indorsements are satisfactory, except as indicated below.

2. Para 3. A comparison of the cost estimate prepared in GDM 2, Supplement No. 8, with the latest approved PB-3 (effective 1 Jul 69), and with the project document should be furnished in accordance with ER 1110-2-1150, Appendix I, para 1u.

3. Para 4. We have no objection to extending the tip of the sheetpile to el -20.0 from sta 223+73.08 to sta 237+42.5 in order to cut off the organic clay layer as indicated. However, the sheetpile design presented on Plate 9 of the supplemental design information submitted with the basic letter indicates that the design tip elevation of the sheetpile in this reach is -20.04 to provide the design factor of safety of 1.50. This indicates that the pile tip elevation of -20.0 is required for stability, and not merely extended to this elevation to cut off the organic clay layer as is indicated. With this the case, the deflection of the wall in this reach would probably be approaching an excessive value, as we previously indicated in para 3, 1st Ind. In regard to the sheet pile design on the opposite side of the Florida Avenue Canal, it is not apparent which design is considered "nearly identical" to the design in question. If the reference is to the I-wall design for that portion of the protection south of and parallel to the Florida Avenue Canal, the two designs are not identical. The I-wall south of the canal is designed for a levee grade of +9.0 instead of +8.0 and has a design tip elevation of -8.5 in lieu of -20.0. The predicted deflection of the wall with the tip at el -8.5 would be much less than the wall with a tip at -20.0. In our comments on the I-wall designs in other areas of the protection south of Florida Avenue Canal, the possibility of excess deflection was pointed out for designs requiring pile tip elevations of -20 or lower. In view of the above, the reply to our comment in the 1st Ind is not considered adequate. The levee along the Florida Avenue Canal should be constructed to el +9.0 as was the levee on the south side of the canal to help limit deflections.

4. Para 5. The two additional Q tests performed on the soil above el -5.0 are not representative of most of the material in this zone based on water content and consistencies shown on the borings and consequently do not furnish verification of the 400 psf Q strength used. The tests from both borings

LMVED-TD (NOD 22 Dec 69) 5th Ind 16 Jun 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

1-WUC and 2-WUC were performed on stiff and medium consistency clays in the dried crust zone very near the ground surface. However, the borings indicate that most of the material above el -5.0 is soft and very soft. With a design Q shear strength of only 200 psf from el -5.0 to about el -20, it is most important that the Q shear strength of the material above el -5.0 be adequately determined. If the actual Q shear strength of the material above el -5.0 is in the order of 200-250 psf, an I-type floodwall may not be feasible. Therefore, efforts to obtain and justify the Q shear strength of the material above el -5.0, even if this requires additional shallow undisturbed borings, should be continued.

FOR THE DIVISION ENGINEER:

wd incl

George B. Davis
GEORGE B. DAVIS
Acting Chief, Engineering Division

LMNED-PP (NOD 22 Dec 69) 6th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La. 70160 30 Sept 70

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. The proposed disposition of comments in the 5th Ind of this chain of correspondence is as follows (referenced paragraphs refer to those of the 5th Ind):

a. Par 2. A comparison of the GDM, PB-3, and project document cost estimates for that portion of the subject levee alignment located in the vicinity of the proposed containerized shipping facility is shown on inclosure 4.

b. Par 3. The stability of the cantilever sheet pile floodwall between stations 223+73.08 and 237+42.50 was reanalyzed based on the levee crown at elevation 9.0 and the revised stratification and shear strengths shown on inclosures 5 and 6. The revised analyses for the (Q) and (S) cases are shown on inclosures 7 and 8, respectively. The computed deflection of the wall, based on the (S) case pressure diagram with the pile tip located at elevation -9.71, is 0.65 inches. However, the sheet pile will extend to elevation -20.0 in order to cut off the organic clay layer.

c. Par 4. Two additional (Q) tests were performed on the soil above elevation -5.0 with the following results:

Boring	Elevation	Cohesion	Ø Angle
1-WUC	0.2	200 p.s.f.	0°
2-WUC	-2.6	240 p.s.f.	0°

Based on these test results, the stratification and design shear strengths were revised as shown on inclosures 5 and 6. The revised (Q) stability analysis of the levee, based on the levee crown at elevation 9.0 and the revised design shear strengths, is shown on inclosure 9.

LMNED-PP (NOD 22 Dec 69) 6th Ind 30 Sept 70
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 IHNC Remaining Levees

2. As a result of the aforementioned analyses, plates IV-16A, IV-17A, and IV-36A of the supplemental design were also revised and the revised plates are inclosed herewith (incl 10, 11, & 12, respectively).

FOR THE DISTRICT ENGINEER:

Jerome C. Baehr

JEROME C. BAEHR
Chief, Engineering Division

9 Incl (16 cys)
4. Comparison of estimates
5. Revised plate 3
6. Revised plate 4
7. Revised (Q) case floodwall stability analysis
8. " (S) " " " "
9. " (Q) " levee stability analysis
10-12 Revised plates IV-16A, IV-17A, IV-36A

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TC202 N4623P6 no.2 Suppl.8 1968

LMVED-TD (NOD 22 Dec 69) 7th Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Momorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 6 Nov 70

TO: District Engineer, New Orleans, ATTN: LMNED-PP

The disposition of comments presented in 6th Ind is considered satisfactory.

FOR THE DIVISION ENGINEER:

wd all incl

A. J. DAVIS
Chief, Engineering Division

LMVED-TD (NOD 28 Feb 68) 1st Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 4 Apr 68

TO: Chief of Engineers, ATTN: ENGCW-V/ENGCW-E

Subject supplement is forwarded for review and approval pursuant to para 17a ER 1110-2-1150. Approval is recommended subject to the attached comments.

FOR THE DIVISION ENGINEER:

A. J. Davis

A. J. DAVIS
Chief, Engineering Division

2 Incl
1. wd 2 cy
Added 1 incl
2. Comments
CF: w Comments
NOD-LMNED-PP

ENGCW-EZ (LMNED-PP, 28 Feb 68) 2nd Ind
SUBJECT: Lake Pontchartrain, La, & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Supplement No. 8 - IHNC Remaining Levees

DA, Office of the Chief of Engineers, Washington, D.C. 20315 6 June 1968

TO: Division Engineer, Lower Mississippi Valley

1. Approved, subject to the comments of the Division Engineer and the following comments.

2. Plates III-13 and III-15. In those cases where the distance between required pile tip and the top of sand is only 1 to 3 feet (such as between Station 61 + 00 and 69 + 90), piles should be founded on sand.

3. Results of the studies outlined in paragraphs 2, 3, 6, 7, 8a, and 15b of the Mississippi River Commission review comments should be sent to this office before completion of plans and specifications.

4. Paragraph 15b, Mississippi River Commission comments. If the T-wall was proposed by local interests, the proposed change from the project document plan should be judged by the criterion of total over-all cost, Federal and non-Federal, for the proposal, and the costs allocated to local interests should be maintained on the basis of the authorized items of local cooperation. This is a general statement of the policy that has been followed by this office for many years. It is necessary to carefully consider all requested changes to be sure that such changes result in the smallest over-all cost and are not based on reservation of land for other purposes at the expense of Federal construction costs. In all cases, the District Engineer should be certain that the values assigned to the rights-of-way and the estimated construction costs are realistic. Appropriate amounts should be included in the estimates for engineering and supervision and administration on the Federal side, and for acquisition costs of the local side. If the modification proposed by local interests does not result in the smallest total over-all cost, Federal and non-Federal, all costs of the requested modification in excess of the Federal cost of the comparable plan having the smallest total over-all cost will be charged to local interests.

FOR THE CHIEF OF ENGINEERS

wd all incls

WENDELL E. JOHNSON
Chief, Engineering Division
Civil Works

LMVED-TD (NOD 28 Feb 68) 3d Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 11 Jun 68

TO: District Engineer, New Orleans, ATTN: LMNED-PP

1. Referred for necessary action.

2. Refer to the last sentence of para 4, 2d Indorsement. When a modification is desired by local interests that results in a more expensive plan being adopted, the Federal cost will be limited to the estimated Federal share of the least costly plan, and all other costs should be borne by local interests. Only the estimated local interests costs of the least costly plan should be credited to the required local contribution for the project.

FOR THE DIVISION ENGINEER:

A. J. DAVIS
Chief, Engineering Division

LMNED-PP (NOD 28 Feb 68) 4th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La. 70160 6 Nov 68

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. Proposed disposition of comments in the 1st, 2d, and 3d indorsements of this chain of correspondence is as follows:

a. 1st Ind, incl 2.

(1) Par. 1. Sufficient (Q) stability analyses were performed to confirm that the (S) case governed for design; however, these analyses using the (Q) shear strengths were not presented in the report.

(2) Par. 2. A minimum of 1 year will be required between completion of the France Road ramp on the west side of the IHNC near Highway 90 (to include driving of the sheet piling on each side of the ramp) and commencing construction of the concrete wall between stations 102+46 and 109+81.5 (refer to plate IV-7 of the GDM). A minimum of 1 year will also be required between completion of the Jourdan Road ramp on the east side of the IHNC (to include the T-wall and driving of sheet piling on each side of the ramp) and commencing construction of the concrete wall between stations 82+96 and 86+66 (refer to plate IV-22 of the GDM). These time intervals will reduce ultimate settlement of the adjacent concrete walls.

(3) Par. 3. A study of the availability of suitable borrow for this work disclosed that the only sources of suitable material are the Mississippi River batture, the Bonnet Carre' Spillway, and the bottom of Lake Pontchartrain. Comparable cost estimates revealed that the Lake Pontchartrain source would be the most economical if the quantities of borrow to be excavated and hauled were large. The studies also revealed that if the quantities to be hauled were relatively small, as is the case for this project, the Bonnet Carre' Spillway would be the most advantageous source, and consequently the Bonnet Carre' is recommended as the borrow source. Data relative to this pit are shown on inclosure 3 (drawing file H-4-24530).

(4) Par. 4. The required thickness of the corrugated metal collector pipe will be increased from 16 gage to 14 gage.

(5) Par. 5. The I-wall stability between stations 113+00 and 118+85 has been reanalyzed for degraded ramp backfill conditions and the results are shown on inclosure 4.

w/o Incl 5

(6) Par. 6.

(a) Plates III-16 & III-17, sta. 115+65 to 117+50. This reach of wall has been reanalyzed in conjunction with the reach cited in comment relative to paragraph 5 above.

Sta. 119+59 to 132+00. As shown in plan on plates IV-8 and IV-9 of the GDM, a railroad spur track closely parallels the proposed wall, and as shown by note on plate III-17 of the GDM, the wall is also subject to acting as a retaining wall for the shell stockpile on the flood side. The factor of safety cited by notation on plate III-17 of the GDM was for a condition with the top of the shell stockpile level with the top of the wall, under hurricane head conditions, with the sheet pile to the required penetration as shown on the stability section. In view of the foregoing and the indeterminate loading conditions the wall may be subjected to in its useful life, the design tip elevation was extended to that shown on plate III-17 of the GDM.

(b) Plates III-33 & III-34. The sheet pile tips in these reaches were extended to the elevations shown to provide positive cutoff in the silty and sandy strata and the organic layer in the area.

(7) Par. 7.

(a) Plate III-24. For the levee reach between stations 91+00 and 106+01, the sheet piling was installed under a previous contract. The strengths shown on the section were based on the test data shown for boring 13-WUT, plate III-46 of the GDM.

(b) Plate III-25. The strengths shown for the levee reach between stations 137+72 and 143+76 were conservatively assigned from test data for the 3-inch diameter Shelby tube boring No. G-6 shown on plate IV-33 of the GDM.

(c) Plate III-26. The strengths shown for this levee reach were assigned from the shear test and consistency data shown for borings 20-WT and 21-WT on plate IV-33 of the GDM.

(d) Plate III-28, sta. 106+40.5. The strengths shown on this section were assigned from test data for boring 14-W shown on plate IV-32 of the GDM.

Sta. 145+57. Refer to above comment relative to plate III-26.

Sta. 211+63. The strengths shown on this section were assigned from the test data for borings 31-WU and 31-WUT as shown on plate III-50 of the GDM. This ramp was constructed with compacted shell by the Orleans Levee District, as shown on plate IV-42.

(8) Par. 8a. The foundation strength used in this predominantly lean clay material was assigned from the (Q) test data for boring 12-EU, as shown on plate III-55 of the GDM. It was concluded that, under stage construction conditions, the (Q) strength data were more indicative of the strength conditions.

(9) Par. 8b. This comment is concurred in. The title block should read "Lake Pontchartrain to Citrus Back Levee."

(10) Par. 9. The exposed height will be limited to 8 feet.

(11) Par. 10. This comment is concurred in. A test case was run with no waterload and was found to be critical. The test indicated a 6.98% overstress in certain compression piling due to transverse loading. There was no overstressing of the tension piling. However, it is not considered necessary to rearrange the piling.

(12) Par. 11. Reference is made to LMVD 1st Ind, dated 7 May 1968, for Lake Pontchartrain, La. and Vicinity (Hurricane Protection) Inner Harbor Navigation Canal West Levee Floodwall P&S (Hayne Blvd. to U.S. Hwy. 90 and Almonaster Ave. to Florida Ave.) comment h. Z-27 steel sheet piling will be driven beside the existing MA-22 steel sheet piling and the base of the concrete wall modified to include both sheet pile walls. Also on plate IV-22 of the GDM between stations 85+44 and 86+20 additional Z-27 steel sheet piling will be driven in the same manner and the concrete wall base modified.

(13) Par. 12. As shown on the net pressure diagram for stations 80+98 to 91+00 on plate III-15 of the GDM, there is a sand layer above elevation 0.0, while the net pressure diagram for stations 106+84.5 to 115+65 shown on plate III-16 of the GDM indicates that the foundation consists of clay. Therefore, the greater resistance to induced stress afforded by the sand over that afforded by the clay reduces the ratio of penetration of sheet pile to headwater.

(14) Par. 13. Refer to above comments relative to paragraph 5.

(15) Par. 15a & b. In view of current problems with local interests concerning the levee alignment in the vicinity of a proposed containerized shipping facility on the west side of the IHNC just north of Florida Avenue, the disposition of these comments will be forwarded at the earliest practicable date. Local interests have been advised that any alignment other than that presented in the project document would require approval by higher authority and further, all costs of a modification proposed by local interests in excess of the Federal cost for the levee alignment presented in the project document will be borne by the local interests.

(16) Par. 16a. This comment is concurred in. This is shown on plate IV-37.

(17) Par. 16b. On the west side of Jourdan Road, the wall is an I-wall. On the east side of Jourdan Road, the wall continues as a T-wall (refer to plate IV-37).

(18) Par. 16c. This I-wall has earth loading on both sides as shown on plate IV-37.

(19) Par. 16d. This comment is concurred in. The T-wall ending at station 87+00 B/L (87+41 C/L wall) will be constructed farther into the levee.

(20) Par. 17. This comment is concurred in. The P&S drawings will indicate special designs.

(21) Par. 18. Steel H-piles will be used adjacent to existing water tunnels.

(22) Par. 19. Relocating the floodwall, as indicated in red on plate IV-25, would allow the soil on the flood side of the wall to be washed away. This would cause the floodwall to support the embankment and consequently produce excessive deflection in the floodwall. It is recommended that the floodwall be allowed to remain on its present alignment.

(23) Par. 20. In a conference including representatives of the Orleans Levee District and the Corps of Engineers, it was pointed out that local interests had requested large gates in several areas and that these requests had been refused on the basis that the gates exceeded the size considered functional and economical for the project. Persons at the conference gave consideration to the effect that a large gate at L&N RR crossing would have on these local interests. In subsequent action, plans and estimates of

cost were prepared for an alternate alignment including a gate with a 48-foot clear opening at the L&N RR, and it was determined that this new alignment would cost $3,680.00 more than the configuration originally proposed (see inclosures 5, 6, & 7). It is therefore recommended that the plan, as presented in the GDM, be approved.

(24) Par. 21. This comment is concurred in. The ground surface will be sloped away from the wall.

(25) Par. 22. The design section detailing the intersection of the new floodwall with the existing floodwall at Owens-Illinois glass building is given on inclosure 8. The design of the existing floodwall, constructed by local interests at this location, was coordinated with this office.

(26) Par. 23. The reinforcement extending into the T-wall base from the concrete piles will consist of four No. 8 bars and the reinforcing in the bottom of the T-wall base will be No. 8 bars, 12" on center.

(27) Par. 24. In view of the fact that the bottom of the tunnel is at the same elevation as the sheet pile tip, it is our opinion that grout is not required beneath the existing tunnels.

(28) Par. 25. The new batter piles will be spaced to clear existing piles.

(29) Par. 26. This comment is concurred in. All gates are being checked for torsion and the designs modified accordingly. (Refer to inclosure 9.)

(30) Par. 27. Refer to above comment relative to paragraph 16d.

(31) Par. 28a. This comment is concurred in.

(32) Par. 28b. It is assumed that due to the nature of the rock material, a drain would become obstructed and thus be ineffective in preventing a build-up of seepage pressure under the wall. Consequently, the wall was designed for 100% uplift pressure across its entire width.

(33) Par. 29. It was assumed that movement in the wall would be insufficient to develop full active pressure; however, sufficient movement would occur to reduce the at-rest pressure. Therefore, in order to arrive at a reasonable earth pressure between that of active and at rest, a factor of safety of two was applied to $\emptyset_A$ (available) of 45° yielding a $\emptyset_D$ (developed) of 27°. Since analytical formulae for the determination of earth pressures

were not suited to cases where the slope of the backfill (45°) exceeds ϕ_D (27°), Engesser's Graphical Solution of the sliding wedge analysis was applied. Where the backfill was level, the analytical solution presented in EM 1110-2-2502 was applied. See inclosure 10 for application of these principles.

(34) Par. 30. Steel H-piles will be used in lieu of 12-inch square concrete piles.

(35) Par. 31. Since an earth pressure value between "at rest" and "fully active" was used, an angle of $\phi_{D/2}$ of 13.5° was used for the direction of the force relative to the horizontal.

(36) Par. 32a. This comment is concurred in. Refer to design assumptions shown on inclosure 10.

(37) Par. 32b. This comment is concurred in. Refer to design assumptions shown on inclosure 10. It should be noted that the T-wall has been moved 52.5 feet closer to the IHNC (see plate IV-46A, inclosure 11). The length of I-wall was thus reduced by over 100 feet resulting in a cost savings.

(38) Par. 33 & 34. Buttresses will be provided on each side of the tunnels to preclude high stress concentration at these points.

(39) Par. 35. Figures 4-83 and 4-84 have been revised to include the weight of earth over the footing. This did not change the steel used in the base slab. The statement "C1-1 is more severe for toe design" (marked in red on figure 4-83) is incorrect since the pile load indicated as critical is for compression pile row 1. Row 2 is the exterior compression pile row in question. Therefore, the calculations as shown are for the critical case. Inclosed are revised computation sheets, figures 4-83 and 4-84 (refer to inclosures 12 & 13.)

(40) Par. 36a.

(a) The average low bid for two recent floodwall contracts was $0.11 per lb.

(b) The average low bid for the same two recent contracts was $57.00 for the relief well riser and $59.25 for the relief well screen.

(41) Par. 36b.

(a) The cost of each ramp should be $45,000 instead of $90,000.

(b) The last pile test for the floodwall from Florida Avenue to the IHNC lock consisted of three pile test sites and cost $37,600. Using this figure, the cost for one pile test site was estimated at $12,000.

(c) The S&A percentage will be changed to 10.8%. The 10.8% value was taken from the S&I and overhead curves and includes a 20% increase.

(42) Par. 36c. The E&D percentages will be increased to 11.4% (comprises the curve value plus a 20% increase) and the S&A percentages will be increased to 10.8% as described above.

(43) In addition to the above disposition of comments relative to paragraph 36, the following comments are offered:

(a) Page IX-3. Your attention is called to comment above relative to paragraph 32b. This new alignment of the floodwall through the rock storage bin resulted in a savings of $9,760; however, the cost of additional sheet piling required, as stated in comment relative to paragraph 11 above, resulted in a reduced savings of only $6,440. These changes as well as those mentioned in comment relative to paragraph 36 above are shown on inclosure 14.

(b) Page IX-6. A review of the comparison of estimates revealed that an error was made in the breakdown for the project document. A value equal to twice the cost ($937,600) of the IHNC floodwall from the IHNC lock to Florida Avenue was erroneously deducted from item 11, Levees and Floodwalls. Item 11 should be $5,444,000 instead of $4,366,000. Items 30 and 31 are reduced accordingly. The cost of lands and damages for the floodwall along the IHNC from the IHNC lock to Florida Avenue was not deducted. This value should be $1,085,000 instead of $1,218,000. These changes are shown on inclosure 14.

(44) Par. 37.

(a) Plate IV-41. Revised plate is submitted as inclosure 15.

(b) Plate IV-45. The questioned items (in red) in sections A-A and B-B are parts of the existing intake structure. The only items concerned with flood protection are the new flood closure gate and those items related to seating this gate. The gate clearance will be reduced.

LMNED-PP (NOD 28 Feb 68) 4th Ind 6 Nov 68
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General - Supplement No. 8 - IHNC Remaining Levees

b. 2d Ind.

(1) Par. 2. In accordance with LMVED-G letter dated 14 June 1968, subject as above, this paragraph need not be complied with, as piling for the reach in question have already been driven to a design penetration which should prove adequate.

(2) Par. 3. The disposition of comments referred to in this paragraph is contained in paragraph a. above.

(3) Par. 4. Refer to comment in paragraph a(15) above relative to Mississippi River Commission comment 15b.

c. 3d Ind, par. 2. This paragraph is concurred in and will be complied with.

2. Approval of the disposition of comments presented herein is recommended. Further, it is requested that preparation of plans and specifications, except for the levee and floodwall in the vicinity of the proposed containerized shipping facility (refer to paragraph 1a(15) above), be allowed to proceed at the earliest practicable date in order to expedite construction of the flood protective works along the Inner Harbor Navigation Canal.

Herbert R. Haar, Jr.
HERBERT R. HAAR, JR.
Colonel, CE
District Engineer

13 Incl (16 cys) fwd sep
3. Dwg file H-4-24530
4. GDM wall stationing
5. Cost estimate
6. Dwg file H-2-24111, plate IV-27A
7. " " " plate IV-47A
8. " " " plate IV-38A
9. Plan of gate opening & pile layout
10. Design assumptions
11. Dwg file H-2-24111, plate IV-46A
12. Computation sheet, fig. 4-83
13. " " fig. 4-84
14. Section IX - Estimate of Cost
15. Dwg file H-2-24111, plate IV-41

LMVED-TD (NOD 28 Feb 68) 5th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 12 Dec 68

TO: District Engineer, New Orleans, ATTN: LMNED-PP

1. The proposed disposition of comments presented in the 4th Ind is satisfactory, subject to the following comments.

2. Para 1a(6)(a). Reference is made to para 4 of 2d Ind and para 2 of 3d Ind of this chain of correspondence. The notation on Plate III-17 of the subject supplement for the sheet pile analysis from Sta 119+59 to 132+00 indicates a factor of safety of 2.60 with water and shell stockpiling at elevation 14.0 on the floodside and the pile tip at elevation -8.0. Informal discussions with NOD personnel indicate that this design has been proposed due to uncertainties as to the height to which the shell may be placed against the wall, i.e., shell may be placed higher than the top of the wall. It is the position of LMVD that any design which produces a factor of safety greater than 1.5 with waterload only should be considered as a betterment and the additional cost of a wall constructed to higher standards should be borne by local interests. You should, therefore, thoroughly investigate stockpiling conditions which could occur, design a floodwall to withstand such a load and inform local interests of their obligation therefor.

3. Para 1a(11). A stage between elevation 11 and no waterload would probably produce a greater eccentricity about the elastic center, thereby producing greater transverse loading in the piles. Since greater transverse loads will result in higher bending stresses, the effect of intermediate water levels should be checked.

4. Para 1a(12). Additional Z-27 piling may not be required for the full reach from Sta 85+44 to 86+20 since the existing piling is Z-32 for part of this reach.

5. Para 1a(14). This comment is not clear. It is possible that the original comment was not understood. As shown on Plate IV-8, the wall is turned 90 degrees at each side of the bridge abutment to tie into the fill at the end of the bridge. The grade of the highway embankment is about 2 feet above the top of the wall, indicating that the wall could connect with the highway embankment landward of the end of the bridge rather than at the end of the bridge abutment.

LMVED-TD (NOD 28 Feb 68) 5th Ind 12 Dec 68
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

6. Para 1a(22). Cost estimates should be prepared comparing the cost of constructing the wall along the alignment we suggested, with erosion protection provided for the fill, with the cost of constructing the wall along your proposed alignment. The least costly alignment should be used.

7. Para 1a(32). The existing pavement should be checked for vulnerability to being lifted by excessive seepage pressure. If a drain is required, the collector pipe should discharge at each side of the storage bin.

8. Para 19(33), reference sheets 12 and 13 of Incl 10. ΣH is in error since passive pressure will be mobilized only to the extent required to balance the active forces.

9. Incl 10. a. A rough check of pile loads for Cases 1, 2, and 10 was made using the elastic center method (lateral resistance of piles neglected). The results for Cases 2 and 10 are within reasonable agreement with the results shown on Sheet 20. The results for Case 1 indicate a maximum load of 184^k in compression, which is 47 percent greater than the allowable. This overload is due primarily to the large moment of the resultant wall load about the elastic center. Since the lateral pile load to balance this moment is high (18^k per pile), the case should be checked.

b. In addition, the possible effect of rock fill below the top of the wall should be checked. For example, a fill sloping up from about half the height of the stem would produce a resultant load on the wall with a larger eccentricity about the elastic center. The resultant moment could result in higher loads in certain piles.

10. Incl 15. The details "10" ø H.P.G. and 10 "Oil Line Thru Steel Sheet Piling" should be deleted and the connection shown for "Typical Pipe Thru Steel Sheet Piling" should be used in all cases.

FOR THE DIVISION ENGINEER:

13 Incl
wd 1 cy ea Incl 3-15

A. J. Davis
A. J. DAVIS
Chief, Engineering Division

LMNED-PP (NOD 28 Feb 68) 6th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, New Orleans District, Corps of Engineers, PO Box 60267, New Orleans, La. 70160 24 Mar 69

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-TD

1. Proposed disposition of comments in the 5th Ind of this chain of correspondence is as follows: (Please note that all elevations herein are in feet and refer to mean sea level datum.)

2. Par. 2. As shown on inclosure 16, three possible alignments were considered for this reach. After full consideration of these alternatives, alignment 3, which passes through an existing shell stockpile, was recommended. Using this alignment with the sheet pile to elevation -8.0 resulted in a minimum savings of $150,000. The design computations for the shell stockpile against the I-wall are shown on inclosure 17. The 2-foot setback of the stockpile toe is required to prevent spillage over the top of the wall onto the railroad tracks. The factor of safety for the shell stockpile as indicated is 1.50. We recommend approval of this floodwall alignment with the sheet pile tip elevation to -8.0.

3. Par. 3. As shown on inclosure 18, the pile loads were checked with flood side water elevations of 14.0, 11.0, 10.0, 8.75, 7.5, 5.0, 3.0, and 0.0. Water elevation on the protected side was constant at elevation 0.0. The critical loading case occurred with water on the flood side at elevation 0.0 and with a cracked earth section on both sides, resulting in no horizontal loading. These pile loads had been checked previously and resulted in a 6.98 percent overstress in the transverse load on the compression piles as explained in paragraph 1a(11) of the 4th Ind. The eccentricity increases slightly as the flood side water elevation decreases, but the magnitude of the resultant decreases so that maximum axial pile loads are obtained with flood side water elevation 14.0. Allowable transverse loads increase as axial loads decrease and critical transverse loads are obtained only with flood side water elevation 0.0 and no horizontal loading.

4. Par. 4. This comment is concurred in.

5. Par. 5. This comment is concurred in. The floodwall will be changed to tie into the highway embankment approximately 40 feet landward of the present alignment.

6. Par. 6. The information shown on the plan and profile of plate IV-25 is insufficient to make a good appraisal of the existing condition. Inclosures 19 through 24 show the highway embankment and three alignments considered for a tie-in. Alignment 1 was selected because it will be

easier to construct (alignments 2 and 3 closely parallel the highway); it will not occupy as much of the highway shoulder; and it will eliminate the need for fill and riprap on the flood side of the I-wall. Calculations indicate little difference in the cost for alignments 1 and 2 but show an increased cost in alignment 3. It is recommended that alignment 1 as presented in the DM be approved.

7. Par. 7. Reference is made to inclosure 25 which shows a section through the rock storage bin. This bin is completely inclosed by a high retaining wall through which the proposed T-wall will be built. The original floor slab was constructed in 1926 on pile supports. Severe loading conditions caused a differential settlement and many of the piles punched through the slab. Repairs were made in 1953 and a new 4-inch floor slab was added which "floats" on top of a sandfill over the original slab. Neither of the two slabs are structurally connected to the adjacent retaining walls. Openings, 3 feet square, exist in the slabs at 8'-4" O.C. down the middle of the bin. For floodwaters to reach the flood side of the new T-wall, they must push under the high retaining walls and pass through the openings in the floor slabs or around their edges. In the process uplift pressures might develop under the flood side floor slabs. These pressures would certainly be greater than seepage pressures which might develop under the protected side slabs. In no case would the stability of the floodwall be affected by the uplift pressures since the floodwall was designed for maximum uplift pressure and the floor slab will be structurally independent of the floodwall. Furthermore, cracks in the slab do not adversely affect the operation of the storage bin and would be of no concern to local interests.

8. Par. 8. ΣH was corrected and made equal to zero. The corrected loads were put through the Hrennikoff program and were found to be not critical to the pile spacing.

9. Par. 9a. The calculated loads from load case 1 were rechecked and put through the Hrennikoff program for computing pile loads. The results indicated a maximum compressive load of 93^K and a maximum tensile load of 39^K, both well within the allowables of 125^K compression and 65^K tension. A further check was made using the method of elastic centers which also indicated pile loads within the allowables. The elastic centers solution is shown on inclosure 26.

10. Par. 9b. New load cases 12 through 17 were investigated to study the effect of fill sloping up from the mid-height of the T-wall stem (see inclosure 27). As a consequence, the pile spacing was reduced from

LMNED-PP (NOD 28 Feb 68) 6th Ind 24 Mar 69
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

6' O.C. to 4' O.C. for the center row. The spacing on the other two rows was not affected. Overstresses of 5 percent for case 14 and 14 percent for case 17 were judged to be within reasonable tolerances considering the loading conditions.

11. Par. 10. The details for 10" H.P.G. and 10" Oil Line through Steel Sheet Piling have been requested by New Orleans Public Service, Inc. It is necessary to insulate the gas and oil lines from the sheet pile to prevent possible pitting of the pipe due to galvanic action between sheet pile and pipe. The "Typical Pipe Thru Sheet Piling" detail will be used, except that the pipes will be insulated with a 1 1/2" concrete coating.

12. Sixteen copies of inclosures 3-15 of the 4th Ind hereto are reforwarded herewith for inclusion in your copies of the DM. Please note that necessary revisions have been made and revised sheets inserted in the inclosures.

13. Approval of the disposition of comments presented herein is recommended.

FOR THE DISTRICT ENGINEER:

JEROME C. BAEHR
Chief, Engineering Division

25 Incl (16 cys) fwd sep
3-15 of 4th Ind w/revisions
Added 12 incl
16. Alternate alignments sta. 119+59 to 132+00
17. I-wall stability analysis, sta. 119+59 to 132+00
18. T-wall analysis - elastic center method
19-24. Alternate I-wall alignments @ U.S. Hwy 90 bridge
25. Section through rock storage bin
26. Elastic center solution - Case 1
27. New loading cases 12 through 17

LMVED-TD (NOD 28 Feb 68) 7th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 19 May 69

TO: Chief of Engineers, ATTN: ENGCW-EZ

1. Forwarded in compliance with request contained in para 3 of 2d Indorsement.

2. The actions taken and explanations furnished to satisfy comments in previous indorsements are considered satisfactory, and approval is recommended.

3. The detailed stability analysis for the I-wall to retain the shell stockpile shown on Incl 17 is furnished with LMNED-PP letter, 28 Apr 69, subject as above, and copy inclosed herewith as Incl 28. The analysis submitted is considered satisfactory and the recommended sheet pile embedment is concurred in. We concur in the District Engineer's recommendation that Alignment No. 3 be approved.

FOR THE ACTING DIVISION ENGINEER:

A. J. Davis

A. J. DAVIS
Chief, Engineering Division

26 Incl (14 cy)
wd 2 cy ea incl 3-27
Added 1 incl
28. NOD ltr 4/28/69

CF:
NOD-LMNED-PP

ENGCW-EZ (LMNED-PP, 28 Feb 69) 8th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain
Barrier Plan, Design Memorandum No. 2 - General, Supplement
No. 8 - IHNC Remaining Levees

DA, Office of the Chief of Engineers, Washington, D. C. 20315, 7 July 1969

TO: Division Engineer, Lower Mississippi Valley

The actions indicated and the information furnished by the District Engineer in the 4th and 6th indorsements are satisfactory, subject to the comments of the Division Engineer in the 5th and 7th indorsements.

FOR THE CHIEF OF ENGINEERS:

wd all incl

Homer B. Willis
WENDELL E. JOHNSON
Chief, Engineering Division
Civil Works

LMVED-TD (NOD 28 Feb 68) 9th Ind
SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 11 Jul 69

TO: District Engineer, New Orleans, ATTN: LMNED-PP

Referred to note approval.

FOR THE DIVISION ENGINEER:

George B. Davis
GEORGE B. DAVIS
Acting Chief, Engineering Division

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNED-PP

28 February 1968

SUBJECT: Lake Pontchartrain, La. & Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Supplement No. 8 - IHNC Remaining Levees

TO: Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. The subject Supplement No. 8 is submitted herewith for review and approval in accordance with the provisions of ER 1110-2-1150 dated 1 July 1966.

3. Approval of Supplement No. 8 is recommended.

1 Incl (16 cys)
Supp. No. 8

Thomas J. Bowen
THOMAS J. BOWEN
Colonel, CE
District Engineer


LEGEND
EXISTING IMPROVEMENTS
Levee
Seawall
Location of work covered in this document.
AUTHORIZED IMPROVEMENTS
New Levee
Levee Enlargement
Control Structure
Drainage Structure
Lock
Floodgate
Navigation Channel
Floodwall
Seawall Strengthening
Rock Fill
Mandeville
Seawall
190
PASS MANCHAC
LAKE MAUREPAS
LAKE PONTCHARTRAIN CAUSEWAY
LAKE PONTCHARTRAIN
ST. TAMMANY PARISH
ORLEANS PARISH
11
90
Apple Pie Ridge
N
THE RIGOLETS
South Point
10
NEW ORLEANS EAST
90
WATERWAY
ORLEANS PARISH
ST. BERNARD PARISH
CHEF MENTEUR PASS
LAKE BORGNE
ST. JOHN THE BAPTIST PARISH
ST. CHARLES PARISH
ST. CHARLES PARISH
JEFFERSON PARISH
JEFFERSON PARISH
ORLEANS PARISH
New Orleans Lakefront Airport
Seabrook Lock
Seawall
CITRUS
90
GULF INTRACOASTAL
10
BONNET CARRÉ SPILLWAY
ST CHARLES PARISH
JEFFERSON PARISH
NEW ORLEANS
FLORIDA AVE. BRIDGE
INNER HARBOR NAVIGATION CANAL
EXISTING LOCK
CHALMETTE
47
61
MISSISSIPPI RIVER
MISSISSIPPI RIVER - GULF OUTLET
Chalmette
Violet
Bayou Dupre
Verret
Caernarvon
46
SCALE OF MILES
1 0 1 2 3 4 5
LAKE PONTCHARTRAIN AND VICINITY, LA.
(HURRICANE PROTECTION)
AUTHORIZED PLAN OF PROTECTION
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NOVEMBER 1965
FILE NO. H-2-23693

REV. MAY 1967

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 8
INNER HARBOR NAVIGATION CANAL REMAINING LEVEES

STATUS OF DESIGN MEMORANDA

Design Memo No.	Title	Status
1	Hydrology and Hydraulic Analysis	
	Part I - Chalmette	Approved 27 Oct 66
	Part II - Barrier	Approved 18 Oct 67
	Part III - Lakeshore	Scheduled Jul 68
	Part IV - Chalmette Extension	Approved 1 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Advance Supplement, Inner Harbor Navigation Canal Levees	Approved 31 May 67
2	Lake Pontchartrain Barrier Plan, GDM, Citrus Back Levee	Approved 29 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 1, Lake Pontchartrain Barrier, Rigolets Control Structure, Closure Dam, and Adjoining Levees	Scheduled Apr 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 2, Lake Pontchartrain Barrier, Rigolets Lock and Adjoining Levees	Scheduled Apr 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 3, Lake Pontchartrain Barrier, Chef Menteur Complex	Scheduled Apr 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 4, New Orleans East Back Levees	Scheduled Jul 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees	Scheduled Apr 70

STATUS OF DESIGN MEMORANDA (cont'd)

Design Memo No.	Title	Status
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 6, St. Charles Parish Lakefront Levees	Scheduled Dec 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 7, St. Tammany Parish, Mandeville Seawall	Scheduled Feb 71
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 8, IHNC Remaining Levees	Submitted Feb 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 9, New Orleans East Levee From South Point to GIW	Scheduled Mar 69
3	Chalmette Area Plan, GDM	Approved 31 Jan 67
3	Chalmette Area Plan GDM, Supplement No. 1, Chalmette Extension	Scheduled Arp 68
4	Lake Pontchartrain Barrier Plan & Chalmette Area Plan, GDM Florida Avenue Complex, IHNC	Not scheduled
5	Chalmette Area Plan, DDM, Bayous Bienvenue and Dupre	Scheduled Mar 68
6	Lake Pontchartrain Barrier Plan, DDM, Rigolets Control Structure and Closure	Scheduled Feb 69
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	Scheduled Feb 69
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Submitted Feb 69
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	Scheduled Jan 69

STATUS OF DESIGN MEMORANDA (cont'd)

Design Memo. No.	Title	Status
10	Lake Pontchartrain Barrier Plan, DDM, Gantry Crane - Chef Menteur Control Structure	Scheduled Jan 70
11	Lake Pontchartrain Barrier Plan, DDM, St. Charles Parish Drainage Structure	Scheduled Jan 70
12	Source of Construction Materials	Approved 30 Aug 66
13	Lake Pontchartrain Barrier Plan, DDM, Gantry Crane - Rigolets Control Structure	Scheduled Jul 70
14	Beautification	Not scheduled
1	Lake Pontchartrain, La. and Vicinity, and Mississippi River-Gulf Outlet, La., GDM, Seabrook Lock	Scheduled Mar 68
2	Lake Pontchartrain, La. and Vicinity, and Mississippi River-Gulf Outlet, La., DDM, Seabrook Lock	Scheduled Aug 68

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 8
INNER HARBOR NAVIGATION CANAL REMAINING LEVEES

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TABLES

PERTINENT DATA

Location of project	Southeastern Louisiana, Orleans Parish, IHNC
Hydrologic data	
Temperature: Maximum monthly	87.1° F.
Minimum monthly	43.0° F.
Average annual	69.7° F.
Annual precipitation: Maximum	85.73 inches
Minimum	31.07 inches
Average	60.58 inches
Hydraulic design criteria - tidal	
Design hurricane - Standard project hurricane (SPH)	
Frequency	1 in 200 yrs.
Central pressure index (CPI)	27.6 inches of mercury
Maximum 5-min. average wind	100 m.p.h.
Protective works - Levee and Floodwall	Net grade
Seabrook Lock to L&N RR Bridge	13.0 - 14.0
L&N RR Bridge to Mississippi River	14.0
Rights-of-way	55.2 acres
Estimated first cost	
Levees and Floodwalls	$5,923,000
Engineering and Design	$ 471,000
Supervision and Administration	$ 436,000
Relocations	$ 183,000
Lands and Damages	$ 987,000
Total	$8,000,000

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL
SUPPLEMENT NO. 8
INNER HARBOR NAVIGATION CANAL REMAINING LEVEES

SECTION I - GENERAL

1. Project location and description. The "Lake Pontchartrain, La. and Vicinity," hurricane protection project comprises two independent units--the Lake Pontchartrain Barrier Plan and the modified Chalmette Area Plan--and is located in southeast Louisiana in the parishes of St. Tammany, Orleans, St. Bernard, Jefferson, and St. Charles. The features of the project, as authorized, are shown on the flyleaf map File No. H-2-23693. Only the Lake Pontchartrain Barrier Plan unit is pertinent to this supplement. The salient feature of the Barrier Plan is the Lake Pontchartrain Barrier, a system of embankments and structures in Orleans and St. Tammany Parishes, the purpose of which is to limit the uncontrolled entry of hurricane tides into Lake Pontchartrain while preserving navigation access. Also included in the Barrier Plan are new lakeshore levees in St. Charles Parish and the Citrus and New Orleans East areas of Orleans Parish and enlargement or strengthening of existing protective works in Jefferson and Orleans Parishes and at Mandeville, Louisiana.

2. Project authorization. Public Law 298, 89th Congress, 1st Session, approved 27 October 1965, authorized the "Lake Pontchartrain, Louisiana and Vicinity," hurricane protection project, substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 231, 89th Congress, 1st Session, except that the recommendations of the Secretary of the Army in that document shall apply with respect to the Seabrook Lock feature of the project.

3. The report of the Chief of Engineers dated 4 March 1964 printed in House Document No. 231, 89th Congress, 1st Session, submitted for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers and the concurring report of the Mississippi River Commission for those areas under its jurisdiction. The report of the Board of Engineers for Rivers and Harbors stated:

> "...For protection from hurricane flood levels, the reporting officers find that the most suitable plan would consist of a barrier extending generally along United States Highway 90 from the easternmost levee to high ground east of the Rigolets, together with floodgates and a navigation lock in the Rigolets, and flood and navigation gates in Chef Menteur Pass; construction of a new lakeside levee in St. Charles

Parish extending from the Bonnet Carre Spillway guide levee to and along the Jefferson Parish line; extension upward of the existing riprap slope protection along the Jefferson Parish levee; enlargement of the levee landward of the seawall along the 4.1-mile lakefront, and construction of a concrete-capped sheet-pile wall along the levee west of the Inner Harbor Canal in New Orleans; raising the rock dikes and landward gate bay of the planned Seabrook Lock; construction of a new levee lakeward of the Southern Railway extending from the floodwall at the New Orleans Airport to South Point; enlargement of the existing levee extending from United States Highway 90 to the Gulf Intracoastal Waterway, thence westward along the waterway to the Inner Harbor Canal, together with riprap slopes along the canal; construction of a concrete capped sheet-pile wall along the east levee of the Inner Harbor Canal between the Gulf Intracoastal Waterway and the New Orleans Airport...."

4. The report of the Chief of Engineers stated:

"...The Board [of Engineers for Rivers and Harbors] recommends authorization for construction essentially as planned by the reporting officers....I concur in the recommendation of the Board of Engineers for Rivers and Harbors."

5. Purpose and scope. This supplement presents the essential data, assumptions, criteria, and computations for developing the plan, design, and costs for the protective works for that portion of the Lake Pontchartrain Barrier Plan located on the west bank of the Inner Harbor Navigation Canal (IHNC) extending from Florida Avenue to approximately 400 feet south of Hayne Boulevard and on the east bank of the IHNC extending from the west terminus of the Citrus back levee to approximately 400 feet south of Hayne Boulevard (see plates IV-2 through IV-31). Advance submission of a supplement covering the entire protective system for the IHNC was proposed by LMNED-PP letter dated 7 October 1965 subject "Outline of Proposed Planning Procedures for Proposed 'Lake Pontchartrain, La. and Vicinity,' Project," and approved by 1st indorsement dated 8 December 1965 to LMNED-PP letter dated 5 November 1965 subject "Revised Outline of Planning Procedures for 'Lake Pontchartrain, La. and Vicinity,' Project." Subsequently, based on a request by the Orleans Levee District, local sponsors of the project, the supplement coverage was reduced to further expedite construction. The reduction in coverage was proposed in LMNED-PP letter dated 8 November 1966 subject "Lake Pontchartrain, La. and Vicinity - Revised Approach to Advance Supplement on Inner Harbor Navigation Canal Levees," and approved by 1st indorsement thereto dated 18 November 1966. Design Memorandum No. 2, General, Advance Supplement, Inner Harbor Navigation Canal West Levee, Florida Avenue to IHNC Lock, was submitted 13 March 1967 and approved 31 May 1967. A feature design

memorandum will be prepared covering the protective works on both banks of the canal in the vicinity of the Florida Avenue siphon crossing. Copies of the above-referenced correspondence are included herein as Appendix A.

6. The project, "Mississippi River-Gulf Outlet, La.," a tidewater navigation channel from New Orleans, La. to the Gulf of Mexico, was authorized by the River and Harbor Act of 1956. The channel, completed in 1965, is connected to the Mississippi River by a portion of the Inner Harbor Navigation Canal with a navigation lock in the east bank of the Mississippi River at mile 92.6 above Head of Passes. The authorizing legislation provided for construction of a new or replacement ship lock, with suitable connections, when justified by obsolescence of the existing lock or by increased traffic. A report titled "Mississippi River, Baton Rouge to the Gulf of Mexico, Mississippi River-Gulf Outlet, Report on Need for New Ship Lock," which established the need for a new ship lock, was approved on 13 December 1966, and authority was granted to prepare a general design memorandum thereon. Detail planning of the new ship lock is presently underway and is being coordinated with the "Lake Pontchartrain, La. and Vicinity," hurricane protection project.

7. Local cooperation. The conditions of local cooperation, pertinent to this supplement, specified in the report of the Board of Engineers for Rivers and Harbors, and concurred in by the report of the Chief of Engineers, are as follows:

> "...That the barrier plan for protection from hurricane floods of the shores of Lake Pontchartrain...be authorized for construction,...Provided that prior to construction of each separable independent feature local interests furnish assurances satisfactory to the Secretary of the Army that they will, without cost to the United States:
>
> "(1) Provide all lands, easements, and rights-of-way, including borrow and spoil-disposal areas, necessary for construction of the project;"
>
> "(2) Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities made necessary by the construction works;"
>
> "(3) Hold and save the United States free from damages due to the construction works;"

"(4) Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (1) and (2) above and a cash contribution presently estimated at $14,384,000 for the barrier plan and $3,644,000 for the Chalmette plan, to be paid either in a lump sum prior to initiation of construction or in installments at least annually in proportion to the Federal appropriation prior to start of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, or, as a substitute for any part of the cash contribution, accomplish in accordance with approved construction schedules items of work of equivalent value as determined by the Chief of Engineers, the final apportionment of costs to be made after actual costs and values have been determined;"

"(5) For the barrier plan, provide an additional cash contribution equivalent to the estimated capitalized value of operation and maintenance of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated at $4,092,000, said amount to be paid either in a lump sum prior to initiation of construction of the barrier or in installments at least annually in proportion to the Federal appropriation for construction of the barrier;"

"(6) Provide all interior drainage and pumping plants required for reclamation and development of the protected areas;"

"(7) Maintain and operate all features of the works in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates and approach channels, drainage structures, drainage ditches or canals, floodwalls, seawalls, and stoplog structures, but excluding the Rigolets navigation lock and channel and the modified dual-purpose Seabrook Lock; and "

"(8) Acquire adequate easements or other interest in land to prevent encroachment on existing ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly;"

"Provided that construction of any of the separable independent features of the plan may be undertaken independently of the others, whenever funds for that purpose are available and the prescribed local cooperation has been provided...."

8. Investigations.

a. Studies and investigations made in connection with the report on which authorization is based (H. D. No. 231, 89th Congress, 1st Session) consisted of: research of information which was available from previous reports and existing projects in the area; extensive research in history and records of hurricanes; damage and characteristics of hurricanes; extensive tidal hydraulics investigations involving both offices and model studies relating to the ecological impact of the project on Lakes Pontchartrain and Borgne; an economic survey; and preliminary design and cost studies. A public hearing was held in New Orleans on 13 March 1956 to determine the views of local interests.

b. Subsequent to project authorization, detailed investigations were undertaken as follows:

(1) Aerial and topographic surveys of the IHNC levee between Florida Avenue and Seabrook Bridge on the west side and between Seabrook Bridge and the MR-GO on the east side.

(2) Soils investigations including general and undisturbed type borings and associated laboratory evaluations;

(3) Detailed design studies for levee, I-type and inverted T-type floodwall, and gap closures including levee section stability determinations;

(4) Tidal hydraulics studies required for establishing design grades for protective works based on revised hurricane parameters furnished subsequent to project authorization by the U. S. Weather Bureau;

(5) Real estate requirements and appraisals;

(6) Cost estimates for levees, floodwalls, gap closures, and relocations.

9. Status of local cooperation. The conditions of local cooperation as specified by the authorizing law are quoted in paragraph 7. Essentially local interests must:

a. Provide all lands, easements, and rights-of-way required for construction;

b. Accomplish necessary alterations and relocations to existing facilities required by construction of the project;

c. Hold and save the United States free from damages due to the construction works;

d. Bear 30 percent of the first cost including the fair market value of items a. and b. above;

e. Provide an additional cash contribution equivalent to the estimated capitalized value of operating and maintaining the Rigolets lock;

f. Provide all interior drainage and pumping plants required for development of the protected areas;

g. Maintain and operate the project works in accordance with regulations prescribed by the Secretary of the Army; and

h. Acquire adequate easements to prevent encroachments on existing ponding areas and/or provide substitute storage or pumping capacity.

10. On 2 November 1965, the Governor of the State of Louisiana designated the State of Louisiana, Department of Public Works, as "...the agency to coordinate the efforts of local interests and to see that the local commitments are carried out promptly...." By State of Louisiana Executive Order dated 17 January 1966, the Board of Levee Commissioners of the Orleans Levee District was designated as the local agency to provide the required local cooperation for all portions of the Lake Pontchartrain, La. and Vicinity, project in Orleans, Jefferson, St. Charles, and St. Tammany Parishes. Assurances covering all of the local cooperation required for the Lake Pontchartrain Barrier Plan were requested through the Department of Public Works from the Board of Levee Commissioners of the Orleans Levee District on 21 January 1966, and a satisfactory act of assurances, supported by a resolution of the Board of Levee Commissioners of the Orleans Levee District dated 28 July 1966, was approved and accepted on behalf of the United States on 10 October 1966. The principal officers currently responsible for the fulfillment of the conditions of local cooperation are as follows:

Mr. Leon Gary, Director
State of Louisiana
Department of Public Works
Baton Rouge, Louisiana 70804

Mr. Milton E. Dupuy, President
Board of Levee Commissioners
Orleans Levee District
Room 200, Wild Life and Fisheries Building
400 Royal Street
New Orleans, Louisiana 70130

11. Views of local interests. The Board of Levee Commissioners of the Orleans Levee District represents local interests. The plan presented herein was coordinated in detail with the Board's engineering staff and bears the approval of the Board. The intention and capability of the local sponsor to provide the required non-Federal contribution have been amply demonstrated; in fact, considerable work which **ultimately** will be incorporated into the overall project has already been accomplished by the sponsor.

12. Coordination with other agencies. The approval of the plan of protection by the Orleans Levee District covers all agencies, firms, and individuals having a legitimate interest in the work covered in this supplement. General coordination for the overall Lake Pontchartrain Barrier Plan was accomplished in connection with the preparation of the general design memorandum for that plan, and the results of such coordination were reported on in that memorandum.

13. Protective works. The plan presented herein covers all of project works along the IHNC between Florida Avenue and approximately 400 feet south of Hayne Boulevard on the west side and between the west terminus of the Citrus back levee and approximately 400 feet south of Hayne Boulevard on the east side consisting of levee floodwalls, ramps, and gap closures.

14. Departures from project document plan. The plan presented herein is generally the same as that presented in the authorizing document. The following changes, which are considered to be within the discretionary authority of the Chief of Engineers, have been incorporated into the plan.

a. The net grades of the protective works presented herein were revised upward in accordance with the results of tidal hydraulic studies utilizing more severe hurricane parameters developed by the U. S. Weather Bureau subsequent to project authorization. Results of these studies relative to the protective works described herein are contained in "Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part I - Chalmette," dated 18 August 1966 and approved 27 October 1966. The revised net grade of the protective works along the IHNC varies from el. 13.0 ft. mean sea level(1)

(1) Elevations in this memorandum are in feet referred to mean sea level unless otherwise noted

at Seabrook to el. 14.0 at the L&N RR and is at el. 14.0 from the L&N RR to the IHNC Lock.

b. Engineering investigations and designs during the planning stage show that the use of the "sheet piling wall with concrete cap" provided in the project document plan is impracticable since the required height of the wall above the ground is in excess of 6 feet. Accordingly, an I-type floodwall was adopted where the height above ground is less than 10 feet and a bearing pile supported concrete inverted T-type floodwall where the height above ground is greater than 10 feet. In addition to its structural inadequacy for the instant case, the exposed steel of the concrete capped sheet pile wall would be subject to rapid corrosion due to the highly saline water in the IHNC.

15. Costs. Based on December 1967 price levels the estimated first cost of the improvements covered herein is $8,000,000. This estimate consists of $987,000 for Lands and Damages, $183,000 for Relocations, $5,923,000 for Levees and Floodwalls, $471,000 for Engineering and Design and $436,000 for Supervision and Administration. Detailed estimates of first cost are shown in Table IX-1.

16. Economic justification. The work covered herein is not a separable unit of the Lake Pontchartrain Barrier Plan. Economic data for the overall Lake Pontchartrain Barrier Plan is included in Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General, Citrus Back Levee, dated 21 August 1967 and approved 29 December 1967. The additional costs of the portion of the IHNC protective works presented in this memorandum over that shown in GDM No. 2 will not significantly increase the approved benefit cost ratio for the Lake Pontchartrain Barrier Plan.

SECTION II - HYDROLOGY AND HYDRAULICS

1. General. The hydrology and hydraulic analysis and design for the IHNC levees covered herein are presented in Design Memorandum No. 1, "Hydrology and Hydraulic Analysis, Part I - Chalmette," approved 27 October 1966, which contains descriptions and analyses of the methods and procedures used in the tidal hydraulic design and covers essential data, climatology, assumptions, and criteria used, and the results of studies which provide the bases for determining surges, routings, wind tides, runup, overtopping, and frequencies.

2. Design elevations. The design hurricane for the protective works on the IHNC is the standard project hurricane (SPH) having a frequency of about once in 200 years, a central pressure index of 27.6 inches of mercury, a maximum 5-minute average wind velocity of 100 m.p.h. at 30 feet above ground level and a radius of 30 nautical miles from the center, moving on a track critical to the IHNC at a forward speed of 11 knots. Detailed information on the design hurricane is contained in the referenced D.M. No. 1. The maximum wind tide levels along the IHNC resulting from the design hurricane and net grade elevations are as follows:

Location	WTL ft.m.s.l.	Runup feet	Net grade ft.m.s.l.
Seabrook to L&N RR Bridge	11.4-12.9	0	13.0-14.0
L&N RR Bridge to Mississippi River	12.9-13.0	0	14.0

SECTION III - FOUNDATION INVESTIGATIONS

GEOLOGY

(2)

1. Physiography. The project area is located within the Central Gulf Coastal Plain, or more specifically, on the eastern flank of the Mississippi River Deltaic Plain. Dominant physiographic features are marshes, natural levees, and abandoned distributaries. Relief in the area is very slight with a maximum of 4 feet between the remnant alluvial ridge marking the location of an ancient distributary of the Mississippi River and the adjacent lowlands. Maximum elevations of 2 feet are found toward the southern end of the project area along the remnant alluvial ridge located between U. S. Highway 90 and Interstate Highway No. 10 (I-10). Minimum elevations of -4 feet are found in drained marsh areas near the north or Lake Pontchartrain end of the project.

2. General geology. Only the geologic history since the end of the Pleistocene period is significant for this project. At that time, with sea level about 450 feet below its present level, the project area was a flat, highland plain bordering on the northeast side of the deeply entrenched Mississippi River. During this period the upper part of the Pleistocene was desiccated and weathered. About 5,000 years ago, sea level reached its present stand and the Mississippi began to migrate laterally back and forth across the alluvial valley. Approximately 4500 to 4000 years ago, the first Recent deltaic and alluvial sediments were carried into the project area when the Mississippi River occupied the Cocodrie Course. About 3500 years ago, the Mississippi River shifted its course over to the western part of the delta and occupied the Teche Course until approximately 2800 years ago. During this period, the project area was subjected to erosion and subsidence. The river then shifted eastward again about 2800 years ago ~~the~~ to the La Loutre or St. Bernard Course and sediments were once again carried into the area. A major distributary at this time was Bayou Metairie, trending east-northeast ~~through~~ through New Orleans. The remnant alluvial ridge from this distributary transverses the project area between U. S. Highway 90 and I-10. About 1500 years ago, the Mississippi River abandoned the La Loutre course and occupied the Lafourche course to the west. The project area was not subject to a heavy influx of sediments again until approximately 1200 years ago when the Mississippi shifted its course back into the study area and occupied the present Plaquemine course. Construction of levees along the Mississippi River has eliminated flood waters from the region and at present no sediments are being introduced into the project area.

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(2) The term "project" as used in this section refers only to the portion of the overall project covered by this supplement

3. Subsidence. Progressive subsidence and downwarping of the region in the vicinity of the project area have been occurring since the end of the Pleistocene Epoch. The Pleistocene surface has been downwarped towards the south and west from zero at the Pleistocene outcrop north of Lake Pontchartrain to a maximum of about 500 feet near the edge of the Continental Shelf, about 80 miles south of New Orleans. The overall rate of subsidence in the project area has been about 0.39 foot per century. In addition, large settlements of the ground surface have occurred in the marsh and swampland area that have been reclaimed and drained, as a result of the shrinking of the highly organic surface soils after drainage.

4. Investigations performed. Sufficient general type and undisturbed borings were made in connection with this project. In addition, borings and geologic information from other sources were available for the interpretation of the physiography, subsurface, and foundation conditions of the area.

5. Foundation conditions. Foundation conditions on the east and west sides of the Inner Harbor Navigation Canal are generally the same. The subsurface, as shown on Plates III-1, III-2, and III-3 consists of Recent Deposits varying in thickness from about 50 feet at the north or Lake Pontchartrain end of the project on both sides of the Inner Harbor Navigation Canal, to about 70 feet near Florida Avenue along the west levee. Exceptions to this are in the vicinity of Station 130+00 along the east levee and Station 126+00 along the west levee where the ancient Bayou Metairie Distributary has incised into the Pleistocene surface, and south of Station 133+00 on the east levee and Station 165+00 on the west levee where an ancient reentrant exists on the Pleistocene surface. The Recent deposits are underlain by Pleistocene (Prairie Formation) deposits. Generally, the Recent at the northern end of the project consists of a discontinuous layer of very soft marsh clays with organic matter and peat, and soft to stiff natural levee clays with lenses and layers of silt, underlain by a thick sequence of buried beach sands with shells and shell fragments that overline a thin medium to stiff pro-delta clays. South of Station 80+00 along the east and west levees to the vicinity of Station 126+50 along the east levee and Station 124+00 along the west levee, a wedge of very soft to soft interdistributary clays with lenses and layers of silt and sand exists between the upper marsh and natural levee deposits and the underlying buried beach sands. In the vicinity of Station 133+00 on the east levee and Station 165+00 on the west levee an abandoned distributary, consisting of silt and silty sands with layers of clay exists to a depth of at least 100 feet. South of the abandoned distributary deposit, the Recent consists of a discontinuous layer of marsh and natural levee deposits underlain by a thick sequence of interdistributary deposits and estuarine clays, silts, and sands with shells and shell fragments. The fill material, marsh, natural levee, interdistributary, abandoned

distributary, buried beach, prodelta, and estuarine deposits are underlain by Pleistocene deposits along the entire east and west levees.

6. Mineral resources. Oil and gas production are not found in the immediate vicinity of the project. However, future exploration and production of these natural resources may take place in the area, but this will not be adversely affected by the project.

7. Sources of construction materials. Design Memorandum No. 12 "Lake Pontchartrain Hurricane Protection, Sources of Construction Materials," dated 27 June 1966 and approved 30 August 1966 lists the sources of sand, gravel, shell, and rocks.

8. Conclusions. Because of the low shear strength of some of the Recent materials and because of the compressibility of some of these sediments, stability and settlement are major problems, particularly along the southern portion of the project. In addition, due to the existence of large sand deposits and silt layers and their proximity to the surface, particularly near the north end of the project, conditions are conducive to seepage and uplift problems.

SOILS AND FOUNDATIONS DESIGN

9. General. This section covers the soils and foundation investigations and design for the project between Seabrook Bridge at Lake Pontchartrain and Florida Avenue along the west levee; and between Seabrook Bridge and the Citrus Back Levee along the east levee.

10. Field Investigation. Ten 5-inch diameter undisturbed soil borings were made along the west levee alignment and nine were made along the east alignment. Twenty-eight 1-7/8-inch ID general-type (GT) soil borings were made on the west side of which twenty-six were made along the levee alignment and two on an abandoned alignment. Twenty-three general-type borings were made on the east side of which sixteen were made along the levee alignment, three on an abandoned alignment and four on the Chalmette side of the Mississippi River-Gulf Outlet. Eighteen 1-7/8-inch GT borings were made in a borrow area along the north shore in Lake Pontchartrain. The locations of these borings and generalized geologic sections derived therefrom are shown on Plate III-60.

11. Borings were made generally along the project alignment at intervals varying from 350 to 1,500 feet through existing levees, at the toe of the levees at selected locations, and along the centerline of protection works between existing levees. The borings extended

in depth to elevations -15.0 to -98.0. The locations of the borings are shown on plates IV-1 through IV-31 and the logs are shown on plates III-46 through III-56 and IV-32 through IV-34.

12. Three piezometers were installed, in the buried beach sands, along each of four ranges extending from the canal to landside of the levees. The locations of the ranges are at baseline stations 38+00 and 76+00 on the west levee and baseline stations 44+00 and 76+00 on the east levee. The piezometers were read at frequent intervals to determine existing piezometric conditions in the buried beach sand (see plates III-4 through III-9).

13. Laboratory tests. Visual classifications were made on all samples obtained from the soil borings. Water content determinations were made on all cohesive soil samples. Consolidation (C) tests, unconfined compression (UC), unconsolidated-undrained (Q), consolidated-undrained (R), and consolidated-drained (S) shear tests were performed on representative soil samples encountered in the undisturbed borings. Six permeability tests were performed on three undisturbed buried beach sand samples; one vertically and one horizontally on each sample. Liquid and plastic limits were determined for all cohesive samples on which consolidation and shear tests were performed. Grain size gradation tests were performed on representative foundation sand samples. The locations and results of the soils tests are shown on Plates III-46 through III-59 and IV-32 through IV-34.

14. Foundation conditions. The subsurface along the project consists generally of 6 to 10 feet of artificial fill overlying 40 to 50 feet of Recent deposits of sands, silts, and clays which are underlain by the Pleistocene soils. The top of the Pleistocene was encountered at approximate elevation -50 at the lake end of the project, and -70 at various locations along the alignment except for ancient entrenchments incised deeper into the Pleistocene. Generalized soil and geology profiles are shown on plates III-1 through III-3.

15. The portion of the subsurface soils above the Pleistocene deposit, which directly affect the foundation design for this project, consists generally of the following:

a. Station 31+00 (lake end of the project) to station 85+00 (on both east and west side of IHNC). There is predominantly fine sand fill which extends to elevations varying from 0 to -10, underlain by a 5 to 10-foot layer of organic clay which overlies a buried beach sand extending to elevations varying from -35 to -50 where a 5 to 20-foot layer of fat clay exists overlying the Pleistocene soils.

b. Station 85+00 to station 140+00 (on both sides of IHNC). There is predominantly fat clay fill which extends to elevations varying from 4 to 0 overlying a 5 to 10-foot layer of natural levee clay, which in turn is underlain by fat clays with lenses and layers of lean clay and silt extending down to approximate elevation -40 where a stratified layer of silt, sand and clay overlies the Pleistocene soils.

c. Station 140+00 to 180+00 (on both sides of IHNC) and from station 180+00 along the west side of IHNC to Florida Avenue. There is predominantly fat clay fill which extends to elevations varying from 10 to 4 overlying a 2 to 20-foot layer of natural levee clay, underlain by organic clays extending to elevations varying from -15 to -20. Beneath the organic clay is a 20 to 30-foot layer of fat clay with lenses and areas of silt and lean clay overlying a 4 to 30-foot stratified layer of sands, silts, and clays overlying the Pleistocene soils.

d. Water contents of soils. The clays in the fill material have water contents varying from about 35 to 40 percent. The clays in the natural levee deposits have water contents varying from about 40 to 45 percent. The water contents of the organic clays vary from about 70 to 375 percent, depending on the organic content. The Recent clays below approximate elevation -25 have water contents varying from about 45 to 65 percent. The Pleistocene clays have water contents of about 40 percent or less.

16. Design and construction problems. The following were the principal design and construction problems on this project:

a. Type of protection.

b. Location of protection.

c. Levee, wall, and ramp stability.

d. Seepage control, hydrostatic uplift relief, and relief well discharge collection and disposal.

e. Pile capacities for the T-walls and gated structures.

f. Settlement.

g. Erosion protection.

h. Sources of fill material.

i. Methods of construction.

17. Type of protection. Because of the limited space available due to the nearness of dwellings, roads, railroads, and industrial plant facilities; the necessity to cut off seepage in the sandy levee fill in the buried beach area; and the economical advantage of walls over the cost of right-of-way for the large levees and berms required, the protection will consist predominantly of a cantilever I-type floodwall of steel sheet piling driven through existing levees, and/or fill, and capped with a concrete wall. T-type floodwalls supported by bearing piles will provide the protection in the more congested areas in the vicinity of road and railroad crossings. Conventional earthen levees will be used in the less congested areas.

18. Location of protection. The protection is located so that it will preserve and not interfere with, insofar as possible, existing dwellings, roads, railroads, power and telephone lines, and industrial plant facilities. The protection alignment is shown on plates IV-2 through IV-31. Specific data relative to location and type of protection are listed in Tables III-1 and III-2.

TABLE III-1

LOCATION AND TYPE OF PROTECTION

WEST LEVEE

Location			Elevation M.S.L.							Stability Analyses		
			I-Wall		T-Wall		Gate					
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee and/or Ramp	I-Wall	Gate and/or T-Wall
									Plate		
31+00	41+01	8.0	14.0	-10.0	-	-	-		III-20	III-12	-
41+01	61+00	8.0	14.0	-8.0	-	-	-	-	III-20	III-12	-
61+00	65+17	8.0	14.5	-8.0	-	-	-	-	III-21	III-13	-
65+17	69+90	8.0	14.5	-6.0	-	-	-	-	III-21	III-13	-
69+90	76+96	9.0	14.5	-6.0	-	-	-	-	III-22	III-13	-
76+96	77+97	8.0	14.5	-7.0	-	-	-	-	III-22	III-14	-
77+97	80+58	7.5	14.5	-7.0	-	-	-	-	III-23	III-14	-
80+58	80+63	7.5	14.5	-4.0	-	-	-	-	-	-	-
80+63	80+98	7.5	14.5	-7.0	-	-	-	-	III-23	III-14	-
80+98	91+00	6.0	14.5	-15.0	-	-	-	-	III-23	III-15	-
91+00	106+01	8.0	15.0	-17.0	-	-	-	-	III-24	III-15	-
106+01	106+25	8.0 to 14.5	15.0	-17.0	-	-	-	-	-	-	-
106+25	106+57	14.5	-	-	-	-	-	-	III-28	-	-
106+57	106+84.5	14.5 to 6.5	15.0	-17.0	-	-	-	-	-	-	-

* Used for stability analyses purposes

TABLE III-1 (cont'd)

LOCATION AND TYPE OF PROTECTION

WEST LEVEE

Location		Elevation M.S.L.								Stability Analyses		
			I-Wall		T-Wall		Gate					Gate
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	and/or T-Wall
										Plate	
106+84.5	109+81.5	-	14.5	-17.0	-	-	-	-	-	III-16	-
109+81.5	110+37.5	-	-	-	14.0	-10.0	-10.0	1W	-	-	III-44
110+37.5	112+15	-	14.5	-17.0	-	-	-	-	-	III-16	-
112+15	112+56	-	-	-	14.0	-10.0	-10.0	2W	-	-	III-44
112+56	115+65	-	14.5	-17.0	-	-	-	-	-	III-16	-
115+65	117+50	-	15.0	-17.0	-	-	-	-	-	III-16	-
117+50	118+85	-	15.0	-19.0	-	-	-	-	-	III-16	-
118+85	119+59	17.0	-	-	-	-	-	-	Chef Hwy.	-	-
119+59	121+78.5	-	14.5	-8.0	-	-	-	-	-	III-17	-
121+78.5	122+07.5	-	-	-	14.0	-8.0	-8.0	3W	-	-	III-44
122+07.5	124+88.5	-	14.5	-8.0	-	-	-	-	-	III-17	-
124+88.5	125+17.5	-	-	-	14.0	-8.0	-8.0	4W	-	-	III-44
125+17.5	128+41.5	-	14.5	-8.0	-	-	-	-	-	III-17	-
128+41.5	128+70.5	-	-	-	14.0	-8.0	-8.0	5W	-	-	III-44
128+70.5	130+53.5	-	14.5	-8.0	-	-	-	-	-	III-17	-

TABLE III-1 (cont'd)

LOCATION AND TYPE OF PROTECTION

WEST LEVEE

Station Location		Elevation M.S.L.							Stability Analyses		
			I-Wall		T-Wall		Gate				
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
130+53.5	130+82.5	-	-	-	14.0	-8.0	-8.0	6W	-	-	III-44
130+82.5	132+00	-	14.5	-8.0	-	-	-	-	-	III-17	-
132+00	135+41	9.0	15.0	-9.0	-	-	-	-	-	III-17	-
135+41	136+10	-	-	-	14.0	-8.0	-8.0	7W	-	-	III-44
136+10	136+27	-	-	-	14.0	-8.0	-	-	-	-	III-44
136+27	136+94.5	-	-	-	14.0	-8.0	-8.0	8W	-	-	III-44
136+94.5	137+42	9.0 to 14.5	15.0	-9.0	-	-	-	-	-	III-18	-
137+42	137+72	14.5	-	-	-	-	-	-	25	-	-
137+72	141+30	15.0	-	-	-	-	-	-	25	-	-
141+20	143+76	9.0	15.0	-8.5	-	-	-	-	25	III-18	-
143+76	144+01	-	-	-	14.0	-8.5	-	-	-	-	III-44
144+01	144+52	-	-	-	14.0	-8.5	-15.75	9W	-	-	III-44
144+52	145+39	9.0	15.0	-8.5	-	-	-	-	-	III-19	-
145+39	145+76	14.5	-	-	-	-	-	-	28	-	-

*

TABLE III-1 (cont'd)

LOCATION AND TYPE OF PROTECTION

WEST LEVEE

Station Location		Elevation M.S.L.							Stability Analysis		
			I-Wall		T-Wall		Gate			Plate	
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
145+76	148+28	15.0	-	-	-	-	-	-	26	-	-
148+00	210+10	9.0	15.0	-10.0	-	-	-	-	26	III-19	-
210+10	210+70	-	-	-	14.0	-10.0	-	-	-	-	III-44
210+70	211+17	-	-	-	-	-	-10.0 & -17.5	10W	-	-	III-44
211+17	211+46	5.0 to 14.5	15.0	-10.0	-	-	-	-	-	-	-
211+46	211+81	14.5	-	-	-	-	-	-	28	-	-
211+81	226+44	15.0	-	-	-	-	-	-	27	-	-
226+34	226+60	15.0 to 10.0	15.0	-10.0	-	-	-	-	-	III-19	-
226+60	226+80	10.0 to 5.0	-	-	14.0	-15.0	-	-	-	-	III-44
226+80	235+77	-	-	-	14.0	-22.5	-	-	-	-	III-44

*

TABLE III-2

LOCATION AND TYPE OF PROTECTION

EAST LEVEE

Wall Station Location		Elevation M.S.L.								Stability Analyses Plate		
			I-Wall		T-Wall		Gate					
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
34+00	37+75	9.0	14.0	-9.0	-	-	-	-	37	III-29	-
37+75	47+00	9.0	14.0	-9.0	-	-	-	-	37	III-29	-
47+00	59+10	9.0	14.0	-5.0	-	-	-	-	38	III-30	-
59+10	60+00	9.0	14.5	-7.0	-	-	-	-	38	III-30	-
60+00	60+10	9.0 to 8.0	14.5	-14.5	-	-	-	-	-	-	-
60+10	60+60	8.0	14.5	-14.5	-	-	-	-	39	III-31	-
60+60	61+38	-	-	-	13.25	-7.0	-	-	-	-	III-44
61+38	61+88	-	-	-	-	-	-7.0	1E	-	-	III-44
61+88	63+47 = 63+61	-	-	-	13.25	-7.0	-	-	-	-	III-44
63+61	67+06	9.0	14.5	-5.0	-	-	-	-	39	III-31	-
67+06	67+86	-	-	-	13.50	-7.0	-7.0	2-E	-	-	III-44
67+86	71+44	9.0	14.5	-5.0	-	-	-	-	39	III-31	-
71+44	80+44.5	9.0	14.5	-8.0	-	-	-	-	40	III-32	-
80+44.5	83+45.5	8.0	15.0	-10.0	-	-	-	-	40	III-32	-

* Used for stability analyses purposes

TABLE III-2 (cont'd)

LOCATION AND TYPE OF PROTECTION

EAST LEVEE

Wall Station Location			Elevation M.S.L.						Stability Analyses		
			I-Wall		T-Wall		Gate				
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
										Plate	
83+45.5	85+07	-	-	-	14.75	-10.0	-	-	40	-	III-43
85+05	85+58 B/L	-	-	-	14.75 to 11.75	-10.0	-	-	40	-	-
85+07	85+44	14.5	clay core 13.0 to 3.0 sht pile cut-off 5.0 to -10.0				-	-	40	-	-
85+44	86+20	-	15.0	-14.53	-	-	-	-	-	-	-
86+20	86+66	-	15.0	-10.0	-	-	-	-	-	III-33	-
86+66	87+41	-	-	-	13.75	-10.0	-10.0	3E	-	-	III-44
87+41	87+55	-	15.0	-10.0	-	-	-	-	-	III-33	-
87+55	91+78	9.0	15.0	-10.0	-	-	-	-	41	III-34	-
91+78	93+75.5	9.0	15.0	-10.0	-	-	-	-	41	III-34	-
93+75.5	94+19	-	-	-	14.0	-10.0	-10.0	4E	-	-	III-44
94+19	94+71	9.0	15.0	-	14.0	-10.0	-	-	-	-	-
94+71	97+43	9.0	15.0	-10.0	-	-	-	-	41	-	-
97+34	97+73	-	-	-	14.0	-10.0	-	-	-	-	III-44
97+64	100+86	9.0	15.0	-10.0	-	-	-	-	41	III-34	-
100+86	105+60	9.0	15.0	-10.0	-	-	-	-	42	III-35	-
105+60	112+03	10.0	Sht. pile cut-off beneath bldg.				-9.0		35	III-35	III-35

TABLE III-2 (cont'd)

LOCATION AND TYPE OF PROTECTION

EAST LEVEE

Wall Station Location		Elevation M.S.L.								Stability Analyses Plate		
			I-Wall		T-Wall		Gate					
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
112+03	121+63	9.0	15.0	-10.0	-	-	-	-	42	III-35	-
121+63	122+41	-	15.0	-10.0	-	-	-	-	-	-	-
122+41	123+05	17.0	-	-	-	-	-	-	Chef Hwy.	-	-
123+05	130+60	-	14.5	-15.0	-	-	-	-	-	III-35	-
130+60	130+91	7.0 to 15.0	15.0	-15.0	-	-	-	-	-	III-35	-
130+81	136+07	15.0	-	-	-	-	-	-	42	-	-
135+97	136+43	15.0 to 7.5	15.0	-13.0	-	-	-	-	-	III-36	-
136+43	137+19	-	-	-	14.0	-10.0	-10.0	5E	-	-	III-44
137+19	138+29	-	14.5	-13.0	-	-	-	-	-	III-36	-
138+29	139+05	-	-	-	14.0	-10.0	-10.0	6E	-	-	III-44
139+05	139+90	-	15.0	-10.0 to -7.5	-	-	-	-	-	III-36	-
139+90	141+44	-	15.0	-2.5 to 2.0	-	-	-	-	-	III-36	-
141+44	141+75	14.5	-	-	-	-	-	-	Ramp	-	-
141+75	147+14	15.0	-	-	-	-	-	-	42	-	-

TABLE III-2 (cont'd)

LOCATION AND TYPE OF PROTECTION

EAST LEVEE

Wall Station Location		Elevation M.S.L.								Stability Analyses Plate		
			I-Wall		T-Wall		Gate					
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.	Levee	I-Wall	Gate and/or T-Wall
147+04	147+34	15.0 to 9.0	15.0	-10.5	-	-	-	-	-	III-36	-
147+34	147+47	-	14.5	-10.5	-	-	-	-	-	III-36	-
147+47	147+90	-	-	-	14.0	-10.5	-10.5	7E	-	-	III-44
147+90	148+30	-	14.5	-10.5	-	-	-	-	-	III-36	-
148+30	148+60	9.0 to 15.0	15.0	-10.5	-	-	-	-	-	III-36	-
148+50	153+37	15.0	-	-	-	-	-	-	42	-	-
153+27	153+57	15.0 to 10.0	15.0	-10.5	-	-	-	-	-	III-36	-
153+57	154+57	-	14.5	-10.5	-	-	-	-	-	III-36	-
154+57	155+02	-	-	-	14.0	-10.5	-10.5	8E	-	-	III-44
155+02	155+43	-	14.5	-10.5	-	-	-	-	-	III-36	-
155+43	155+73	9.0 to 15.0	15.0	-10.5	-	-	-	-	-	III-36	-
155+63	162+62	15.0	-	-	-	-	-	-	42	-	-
162+52	162+72	15.0 to 11.0	15.0	-10.5	-	-	-	-	-	III-36	-
162+72	162+86	11.0 to 8.5	14.5	-10.5	-	-	-	-	-	III-36	-

TABLE III-2 (cont'd)

LOCATION AND TYPE OF PROTECTION

EAST LEVEE

Wall Station Location		Elevation M.S.L.								Stability Analyses		
			I-Wall		T-Wall		Gate					Gate
From Sta.	To Sta.	Levee Crown	*Top	Sheet Pile Tip	Top	Sheet Pile Tip	Sheet Pile Tip	No.		Levee	I-Wall	T-Wall
162+86	163+32	-	-	-	14.0	-10.5	-10.5	9E		-	Plate -	III-44
163+32	163+51	8.5 to 12.0	14.5	-10.5	-	-	-	-		-	III-36	-
163+51	163+71	12.0 to 15.0	15.0	-10.5	-	-	-	-		-	III-36	-
163+61	169+59	15.0	-	-	-	-	-	-		42	-	-
169+49	169+69	15.0 to 11.0	15.0	-10.5	-	-	-	-		-	III-36	-
169+69	169+87	11.0 to 8.5	14.5	-10.5	-	-	-	-		-	III-36	-
169+87	170+33	-	-	-	14.0	-10.5	-10.5	10E		-	-	III-44
170+33	170+53	8.5 to 11.0	14.5	-10.5	-	-	-	-		-	III-36	-
170+53	170+73	11.0 to 15.0	15.0	-10.5	-	-	-	-		-	III-36	-
170+63	179+47	15.0	-	-	-	-	-	-		42	-	-

19. Stability.

a. Cantilever I-type floodwall. The stability and required penetration of the steel sheet pile below the earth surface were determined by the method of planes using the (S) shear strengths shown on the stability plates. A factor of safety of 1.5 was applied to the design shear strengths as follows: $(C = 0)$; ϕ developed $= \tan^{-1} \left(\frac{\tan \phi \text{ available}}{\text{factor of safety}}\right)$. Using the resulting shear strengths, net lateral water and earth pressure diagrams were determined for movement toward each side of the sheet pile. Using these distributions of pressure, the summation of horizontal forces was equated to zero for various tip penetrations. At these penetrations, summations of overturning moments about the bottom of the sheet pile were determined. The required depths of penetration to satisfy the stability criteria were determined as those where the summation of moments was equal to zero. The stability of I-type floodwalls on both sides of the IHNC was determined for a hurricane water level 6-inches below the top of the wall on the floodside; and on the protected side, for a water level equal to the water table assuming the water table at the average ground surface where the ground surface is below elevation zero and for a water level at elevation zero where the ground surface is above zero, except along the swampy area on the east side of the IHNC where el. zero was used for the landside water level even though the ground surface is below zero. Factors of safety (F.O.S.) were also determined for the headwater level at the top of the walls, and for high tail water conditions in the sandy fill along the buried beach sand reach. These F.O.S. are shown on the stability plates. The I-wall analyses are shown on plates III-12 through III-19 and III-29 through III-36. Where I-walls serve as floodwalls and earth retaining bulkheads the stability condition that governed for design penetration is presented on the plate III-16.

b. Levees and road ramps. Using sections representative of existing conditions along the protection alignment, the slopes and berm distances for the recommended levees and ramps were designed for a hurricane water condition 1.5-feet above still water level for the project hurricane and for assumed failure toward the landside. The stability of the levees and ramps was determined by the method of planes using the design (Q) shear strengths (shown on the stability plates) and applying a minimum factor of safety with respect to the shear strength of approximately 1.3. In the stability analyses for the levees in the buried beach sand reaches, hydrostatic uplift was applied on the base of the clay, from the top of the sands to the midwell piezometric head, determined by the relief well analysis, and dissipating to the water surface at the landside along the passive earth wedge. The levee and ramp analyses are shown on plates III-20 through III-28 and III-37 through III-42.

20. Seepage and hydrostatic uplift relief. Because of the sandy levee and foundation in the buried beach area, interception of seepage through the levee and reduction of hurricane piezometric heads in the foundation sands are necessary to maintain stability. The I-wall sheet pile was extended in depth below that required for stability where necessary to cut off the upper sand fill strata.

a. Relief wells. Permanent hydrostatic pressure relief wells will be provided along both the west and east levees in the buried beach sand area. As shown on plate III-10, the wells will be located between approximate stations 30+00 and 90+00 and stations 33+00 and 86+00 on the west and east levees, respectively. The piezometers installed with tips in the buried beach sand were read at frequent intervals to determine existing piezometric conditions in the vicinity of the levees. In addition to intermittent readings, a series of continuous observations were made during periods when a maximum tide change was expected. Continuous observations for periods of 45 and 31 hours are shown on plates III-5 and 6. A compilation of these data is shown on plate III-7.

(1) Sections were developed across the canals which parallel the protective works on the IHNC levee to determine what effect the canals will have on piezometric heads in the foundation sands. These sections are shown on plate III-4.

(2) Details of the subsurface drainage along Pauline Drive were obtained from the Sewerage and Water Board of New Orleans and utilized in determining the effect of the drains along streets which parallel the IHNC levees on the west side will have on piezometric heads. Details of the subsurface drainage are shown on plate III-4.

(3) To determine the relationship between the piezometric uplift and the IHNC water level; and to determine the effective canal side entrance and landside exit drainage distances, the mean high stage readings from the compilation of piezometer data were plotted on the levee sections at the piezometer locations. These data are shown on plates III-8 and 9. This information indicates that the effective landside exit drainage is governed by the mean landside ground surface along the east levee and by the subsurface drainage along Pauline Drive along the west levee. Using the hydraulic gradients established by these existing piezometric conditions, effective entrance and exit drainage distances were determined. The design peizometric heads at the exit distances were based on the following reasoning: Information from inhabitants in the developed area on the west side indicates that during hurricanes the excess heads in the foundation sands caused severe "boiling" in the subsurface drainage manholes. Since the design hurricane is more severe than those experienced, an elevation of zero was used at the exit point for the design hurricane condition. On the

east side there is a large ponding area between the levee and the nearest inhabited area where subsurface drainage exists. In this area the elevation of the ground varies from -4 to -5 m.s.l. During hurricane rains, it was estimated that existing storm pumping facilities would be incapable of handling all of the runoff. Based on the foregoing, an elevation of zero m.s.l. was used at the exit point for the design hurricane condition.

(4) The projected piezometric heads for the design hurricane conditions were based on the canal water level at the effective entrance distance and the assigned piezometric and/or water surface elevations at the effective exit distance from the well line. These data are also shown on plates III-8 and 9.

(5) To determine the possible effect of feeding from Lake Pontchartrain, the soil profiles along the west and east levees were extended by utilizing boring data made for the authorized Seabrook Lock and the local interest sponsored Seabrook Bridge. These data are shown on plate III-10. This information indicates that the buried sand beach terminates in the immediate vicinity of the ends of the recommended well lines. The water level in the lake, concurrent with the design hurricane condition in the IHNC, is elevation 3.0 and feed-back will not be an influencing factor for design of the wells at the lake end of the project. The well line, however, will be extended along the tie-in levees to the lake end of the project as part of the Seabrook Lock construction.

(6) Using the water level design data shown on plate III-4, the piezometric conditions derived from data shown on plates III-8 and 9 and shown in the soil profiles on plate III-10, the grain size gradations shown on plate III-7, the permeability shown on plate III-10, the well details shown on plate III-4, and procedures in accordance with EM 1110-2-1905, 1 March 1965, "Design of Finite Relief Well System", well spacings and discharges were determined for a line of landside relief wells along the west and east levees in the buried sand beach area. Pertinent design data and spacings are shown on plate III-10. Recommended locations of relief wells and allied well data are shown in tabular form on plate III-7.

(7) A small sodded ditch will be provided along the west levee berm toe to collect and carry the discharge from the wells to existing facilities crossing open areas and thence to the existing storm drainage facilities. A 3-foot wide concrete surface will be provided at the well locations extending from 3 feet beyond the riser to and across the ditch to provide protection against erosion. See plate III-4.

(8) The wells between approximate stations 33+00 and 60+00 along the east levee toe will discharge into the low swampy ponding area. To preclude multiple passage of the well discharge pipes beneath

the paralleling railroad and the extensive ditching required for well discharge disposal, the wells between stations 60+00 and 86+00 will discharge into a collector pipe as shown on plate III-11. As the area along the landside of the east levee is developed, the discharge from the wells will be routed to the storm drainage facilities.

b. Permanent piezometers. Additional piezometers will be installed in the beach sand, as shown on plates IV-2, 4, 5, 18, 19, 20, and 21, to obtain readings on piezometric conditions before, during, and after high flood heads in the IHNC. The data will be used in evaluating the effectiveness of the relief well system and remedial measures will be initiated if found to be necessary.

21. Foundation for structures. Pile bearing capacities and lengths for the gated structures and T-walls were determined by use of the design criteria shown on plate III-44. Bearing pile subgrade moduli for estimating lateral restraint of the soil were determined by use of the design criteria shown on plate III-45. Prior to construction, bearing pile tests will be conducted at selected locations along the line of protection for selecting the pile lengths to be used for construction. The results will be forwarded for review. The pile tip elevations resulting from the design capacities are shown on plates IV-36 and 37. Steel sheet pile cut-offs will be provided beneath the structures to provide protection against seepage. Pile capacities and lengths for the rock storage bin were based on the data shown on plate III-5 of Design Memorandum No. 2 - General; Advance Supplement, IHNC West Levee, Florida Avenue to IHNC Lock, approved 31 May 1967.

22. Settlement. Based on foundation conditions determined from the soil borings and consolidation test data from the undisturbed borings, estimates of settlement beneath the levees along the line of protection were determined. The settlement estimates beneath levees containing I-walls indicate that the proposed wall construction grades are sufficient to provide ultimate protection to the design grade. Some settlement, however, will occur beneath the landside stability berms placed along portions of the levees containing I-walls. In the areas where existing facilities will not impose restrictions, the berms will be overbuilt and left one foot above net grade to allow for future settlement. In the areas where existing facilities preclude overbuilding, the berms will be built to net section and raised later as required.

23. Within the last year, local interests have constructed interim protection levees along the reaches where conventional levees are recommended, except for that portion between U. S. Highway 90 and Highway I-10 along the east levee. Local interests also have constructed the required road ramps except the ramps recommended near

U. S. Highway 90 on the west levee and at Jourdan Road on the east levee. There are no settlement data available on these levees; however, based on theoretical data, it is estimated that an additional 2 feet of settlement will occur. The levees will be maintained to net grade, using semi-compacted fill stage construction methods, as required. Estimates indicate that approximately 4.5 and 2.0 feet of settlement will occur beneath the road ramps on the west side near U. S. Highway 90 and at Jourdan Road on the east side, respectively.

24. Erosion protection. Due to the short duration of hurricane floods, the resistant nature of the clayey soils, and the limited conditions for wave generation; no erosion protection is considered necessary along the major portion of the line of protection. However, where the levees and walls are near the canal proper in the vicinity of U. S. Highway 90 and Florida Avenue, erosion protection will be provided where required. A concrete strip will be provided around the relief wells, on the west side, and extend into the sodded discharge collection ditch, as shown on the drawings.

25. Sources of fill material. The earth fill for completing the road ramps and leveed portion of the protection will be obtained from excess material cut from some of the reshaped existing levees and from a borrow area in the bottom and along the north shore of Lake Pontchartrain. The borrow material from the lake area consists primarily of stiff Pleistocene clays and will be transported to the project on barges. Data relative to the borrow area are shown on plate III-60.

26. Methods of construction. The location of steel sheet pile installations and earthwork that have been accomplished along portions of the protection line are shown on plates IV-1 through IV-31. The earthwork required along the project consists of degrading, shaping, and rehandling of existing fill on the west levee in the buried beach area; placing additional fill on the existing east levee; raising the conventional levees and ramps constructed by local interests; building the new levee on the east side between U. S. Highway 90 and Highway I-10; and constructing the two remaining road ramps. The structural work consists of completing the existing and constructing the new I-walls; and constructing the T-walls and gates. Work pertinent to hydrostatic uplift relief in the buried beach area consists of installing the relief wells and piezometers; and constructing the collection facilities for the disposal of the discharge from the wells.

27. The sequence of construction in the buried beach area is as follows: install steel sheet piling, degrade, rehandle, and shape the existing fill along the west levee and place additional fill on the east levee and berms; install pressure relief wells, piezometers, and collector systems; construct the concrete I-wall on the steel hseet piling; and fill

and dress the levee crowns to grade and section. Semi-compacted fill methods of construction will be used in placing the earthfill.

28. Where earthfilling is required along the levees in which the steel sheet pile has not been installed, the fill will be placed using semi-compacted methods in advance of installation of the steel sheet piling and wall construction to reduce the ultimate settlement of the walls. For the same reasons, the fill for road ramps will be placed ahead of the tie-in wall construction.

29. Settlement observations. The locations of the recommended settlement reference markers will be shown on the construction plan and profile drawings. Settlement observations will be made along the floodwalls after (1) the steel sheet piling is driven, (2) the concrete wall is constructed, (3) the levee is completed, and (4) yearly thereafter until settlement is essentially complete. Profiles and sections of the levees, berms, and road ramps will be obtained before and after construction and yearly thereafter until settlement is essentially complete. Observations will be made after construction of the gates, and periodically thereafter.

UNIFIED SOIL CLASSIFICATION

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

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

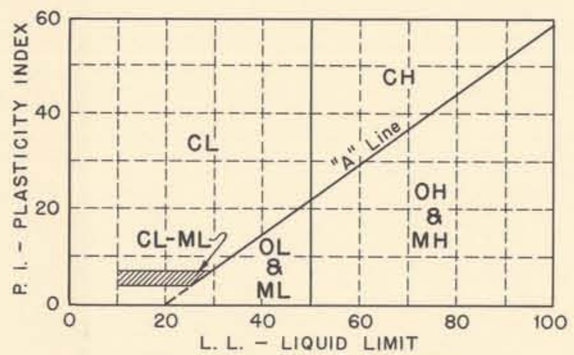
DESCRIPTIVE SYMBOLS

COLOR

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

CONSISTENCY FOR COHESIVE SOILS

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



PLASTICITY CHART

For classification of fine - grained soils

MODIFICATIONS

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

NOTES:

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

Are natural water contents in percent dry weight

When underlined denotes D_{10} size in mm *

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

Are liquid and plastic limits, respectively

SYMBOLS TO LEFT OF BORING

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

FIGURES TO RIGHT OF BORING

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

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

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

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

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

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

GENERAL NOTES:

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of clause 4 of the contract.

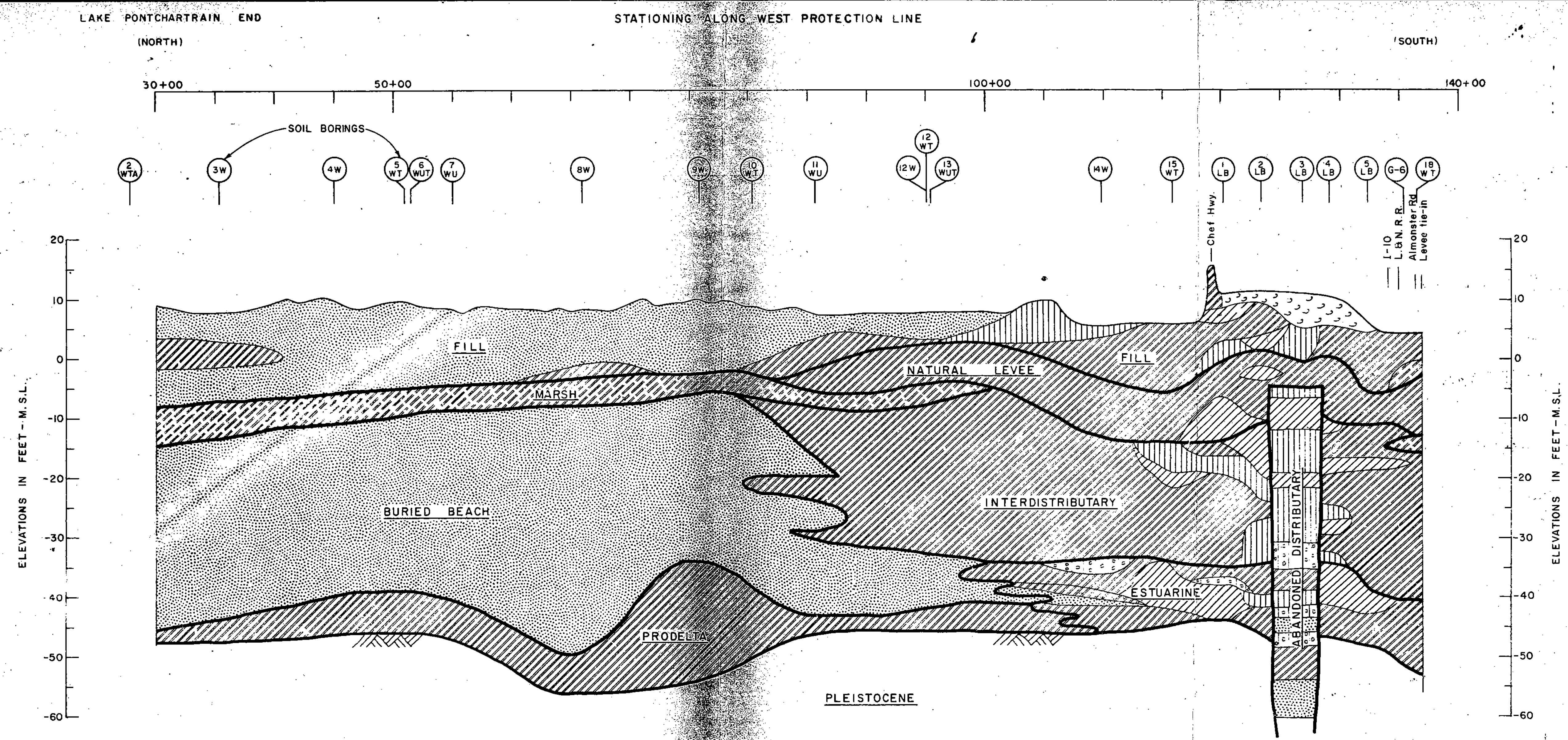
Ground-water elevations shown on the boring logs represent ground-water surfaces encountered on the dates shown. Absence of water surface data on certain borings implies that no ground-water data is available, but does not necessarily mean that ground water will not be encountered at the locations or within the vertical reaches of these borings.

Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression tests are shown.

REVISION	DATE	DESCRIPTION	BY
2	6-8-64	SYMBOL FW, NOTE REVISED	ORAL FROM L.M.V.G.G. 5 JUNE 1964
1	9-17-63	1ST. PAR. OF GENERAL NOTES REVISED	L.M.V.D. MULTIPLE LETTER, DATED 5 SEPT., 1963

SOIL BORING LEGEND

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO. H-2-21800



LEGEND

- CH - Fat clay
- CHO- Fat clay with organic matter and peat
- CL - Lean clay
- ML - Silt
- SM - Silty sand
- SP - Fine sand
- SI - Shells
- Pleistocene Horizon

NATURAL LEVEE - soft to stiff clays with lenses and layers of silt

MARSH - very soft clays with organic matter and peat

ABANDONED DISTRIBUTARY - silts, silty sands with clay layers

INTERDISTRIBUTARY - very soft to soft clays with lenses and layers of silt and sand

BURIED BEACH - sand with shell and shell fragments

PRODELTA - medium to stiff clays

ESTUARINE - sand, clay and silt with shell and shell fragments

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

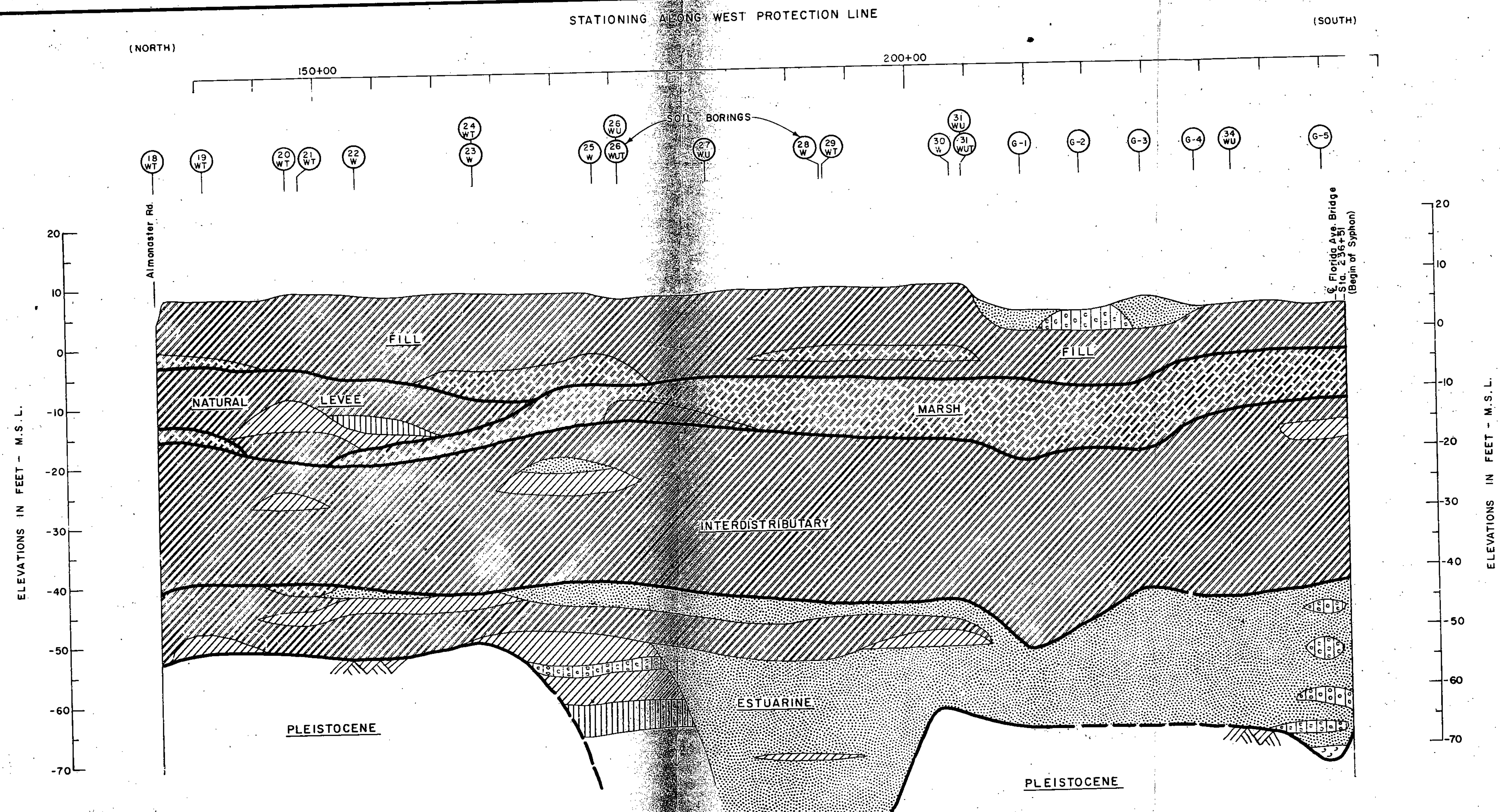
GENERALIZED SOIL AND GEOLOGIC PROFILE

WEST LEVEE-LAKE PONTCHARTRAIN TO ALMONASTER AVE.

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE III-1



LEGEND

- CH - Fat clay
- CHO - Fat clay with organic matter and peat
- CL - Lean clay
- ML - Silt
- SM - Silty sand
- SP - Fine sand
- SI - Shell
- Pleistocene Horizon

NATURAL LEVEE - soft to stiff clays with lenses and layers of silt

MARSH - very soft clays with organic matter and peat

INTERDISTRIBUTARY - very soft to soft clays with lenses and layers of silt and sand

ESTUARINE - sand, clay and silt with shell and shell fragments

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

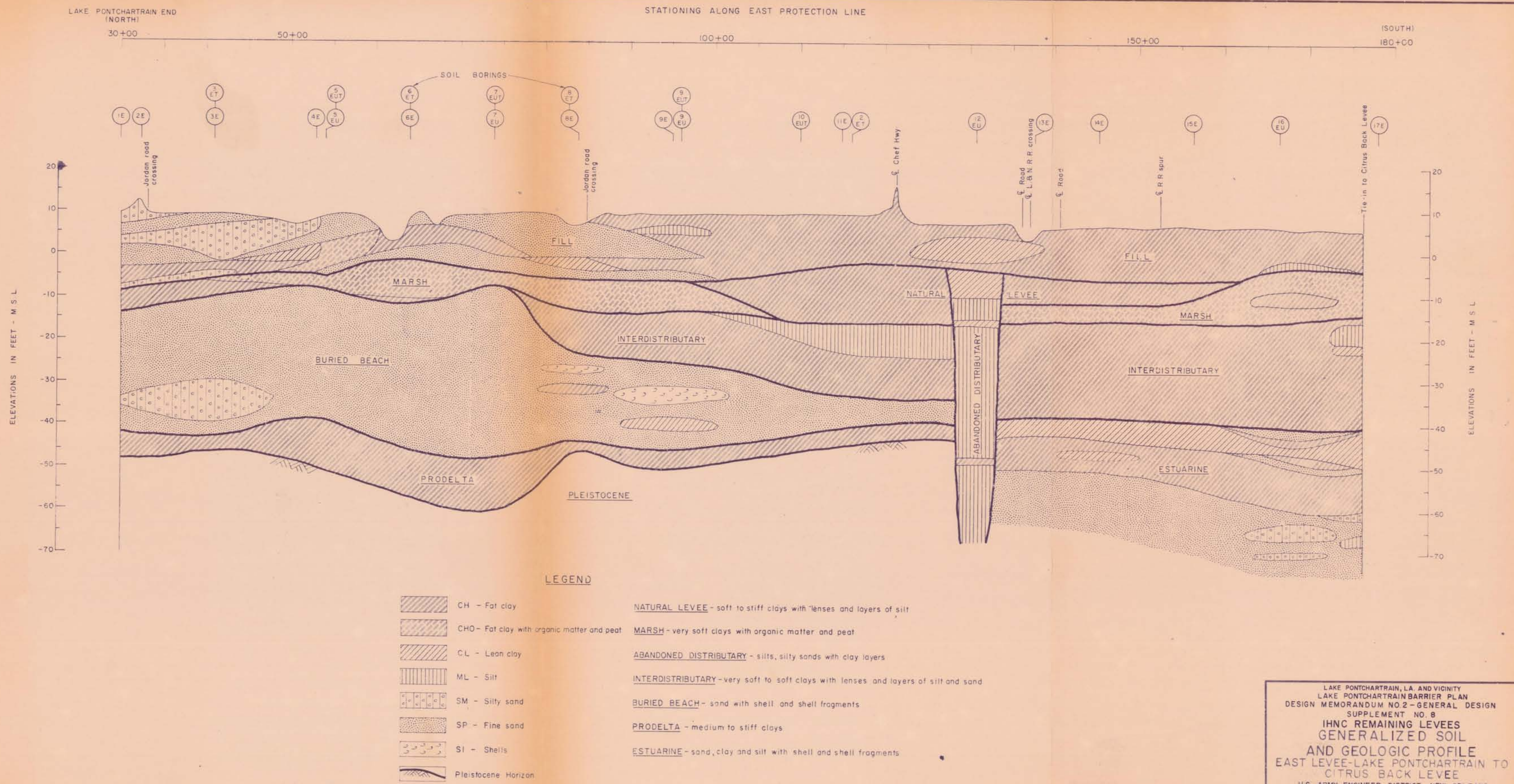
GENERALIZED SOIL AND GEOLOGIC PROFILE
WEST LEVEE - ALMONASTER AVE. TO FLORIDA AVE.

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

FEBRUARY 1968

FILE NO. H-2-24111

PLATE III-2



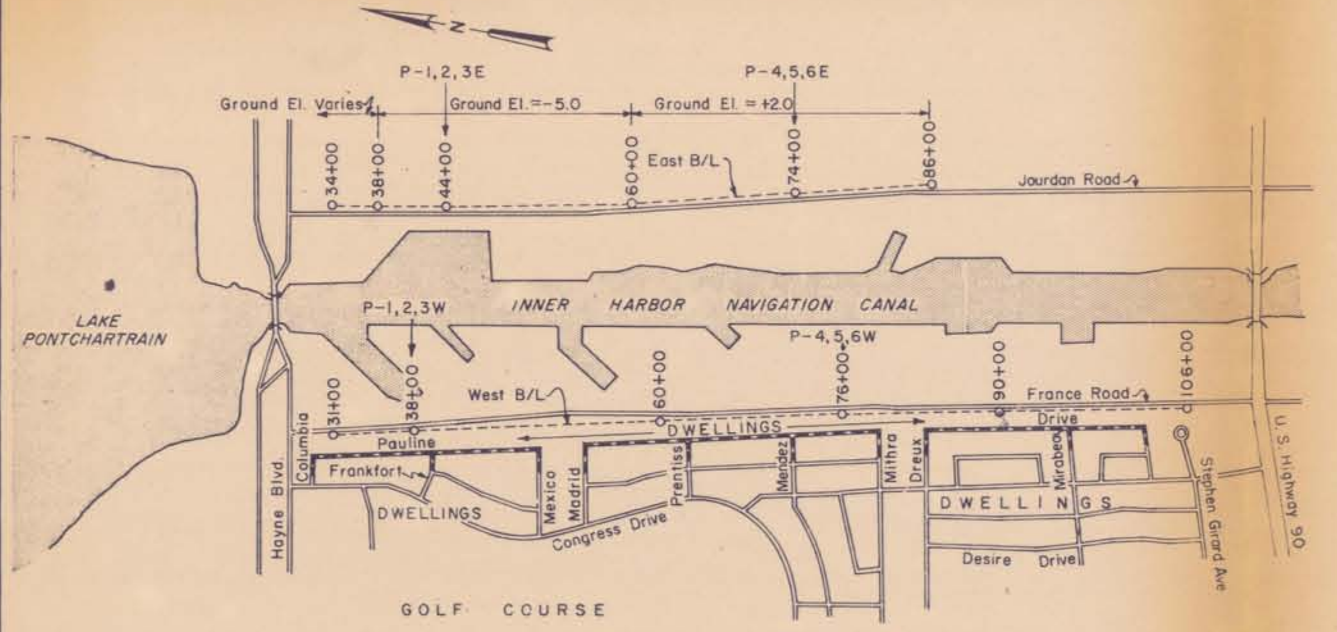
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

GENERALIZED SOIL AND GEOLOGIC PROFILE
EAST LEVEE-LAKE PONTCHARTRAIN TO CITRUS BACK LEVEE

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

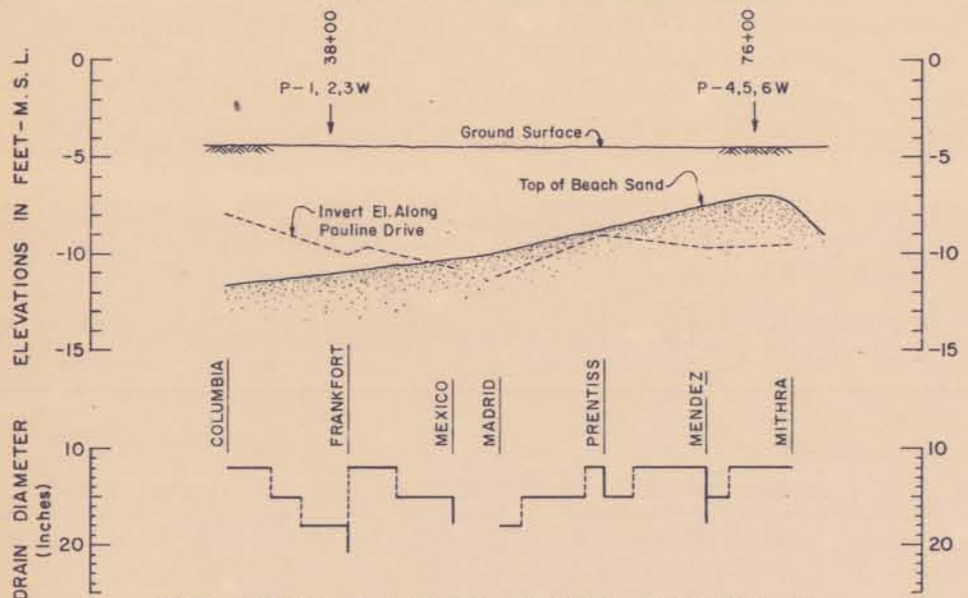
FEBRUARY 1968 FILE NO. H-2-24111

PLATE III - 3

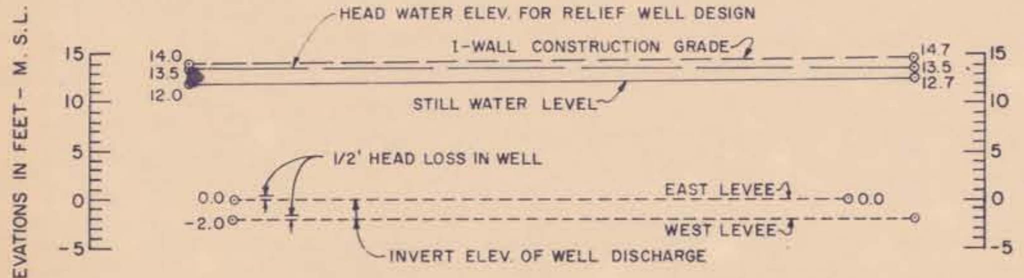


PLAN

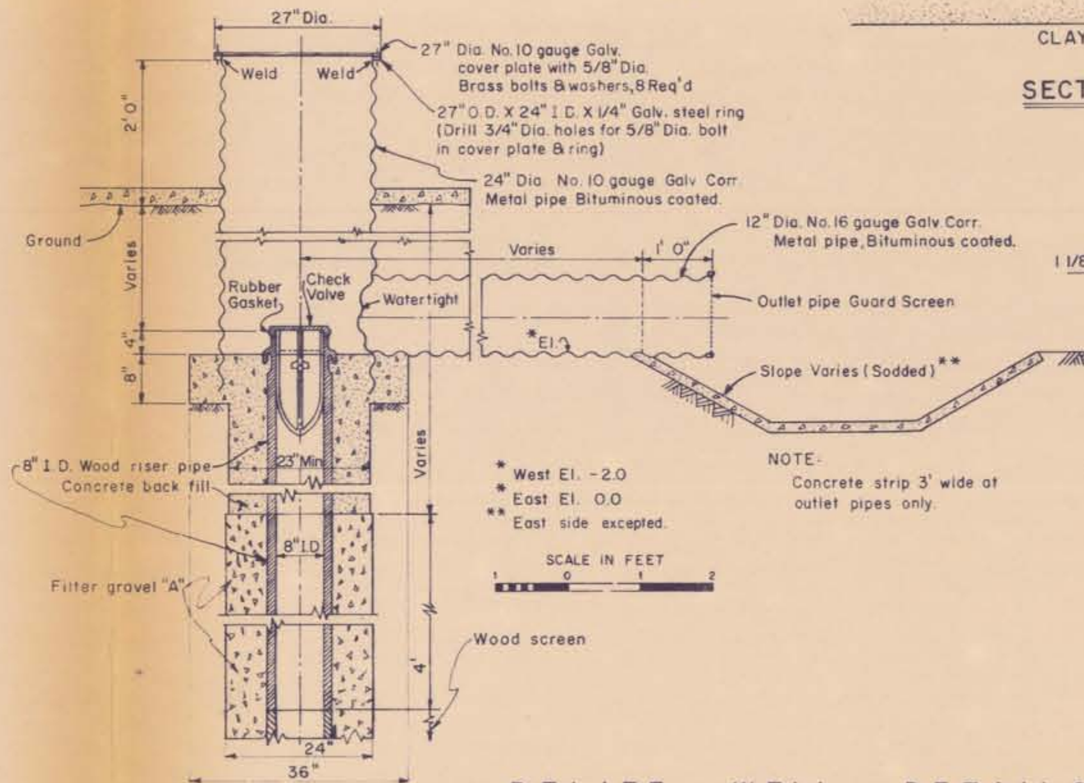
SCALE IN FEET
500 0 500 1,000 1,500 2,000



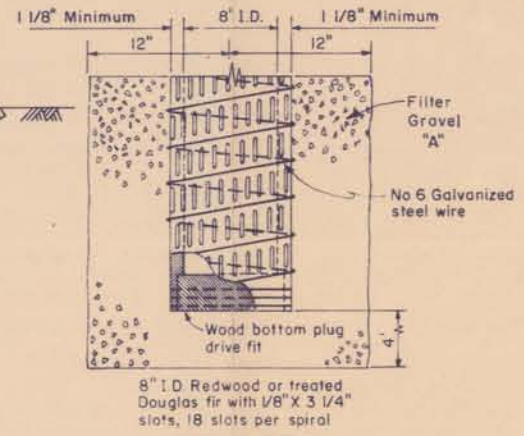
SUBSURFACE DRAINAGE ALONG PAULINE DR.



WATER LEVEL DATA

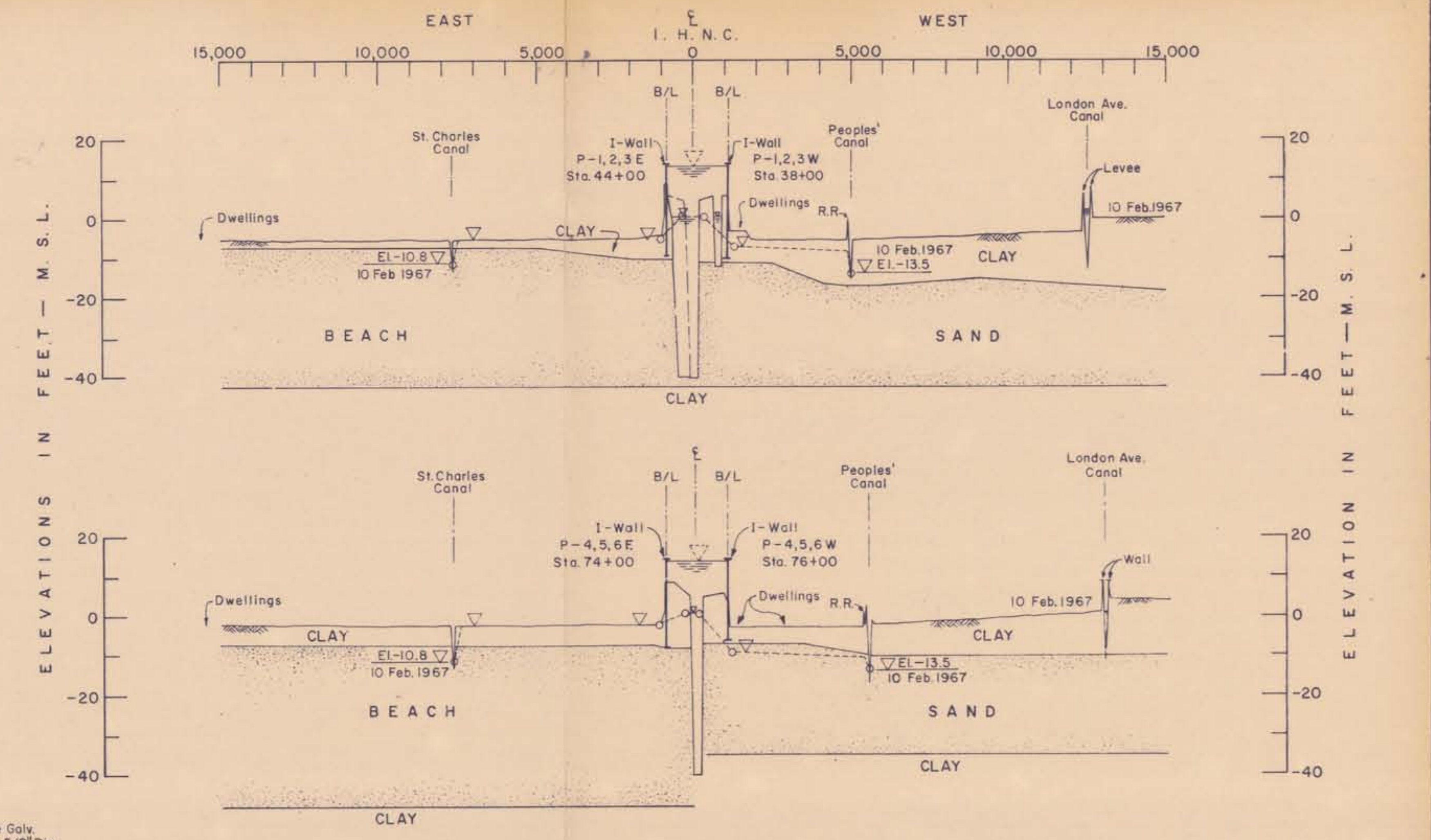


RELIEF WELL DETAILS



WOOD SCREEN

SCALE IN FEET



SECTIONS ACROSS GENERAL AREA

GENERAL NOTES

St. Charles and Peoples' are interior drainage canals to pumping stations.

London Ave. canal carries pumping station discharge to Lake Pontchartrain

For piezometric data see plates III-5, III-6 & III-7

For piezometer sections see plates III-8 & III-9

For relief well design analyses see plate III-10

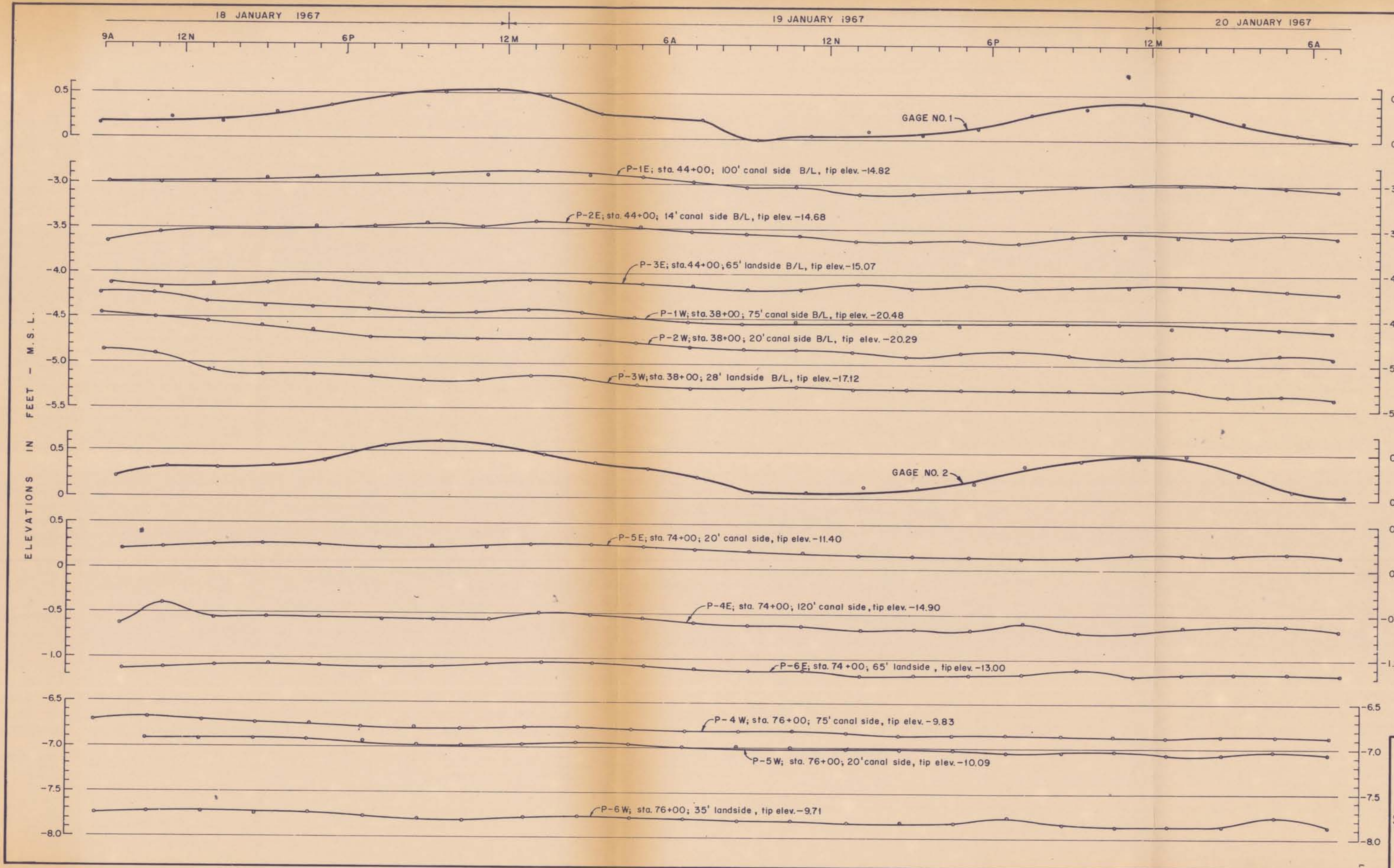
For collector design on east levee (22 EW to 37 EW) see plate III-11

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

GENERAL PLAN, SECTIONS, WATER LEVEL, AND WELL DATA

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

FEBRUARY 1968 FILE NO. H-2-24111



LEGEND

P-1E Piezometer on east levee

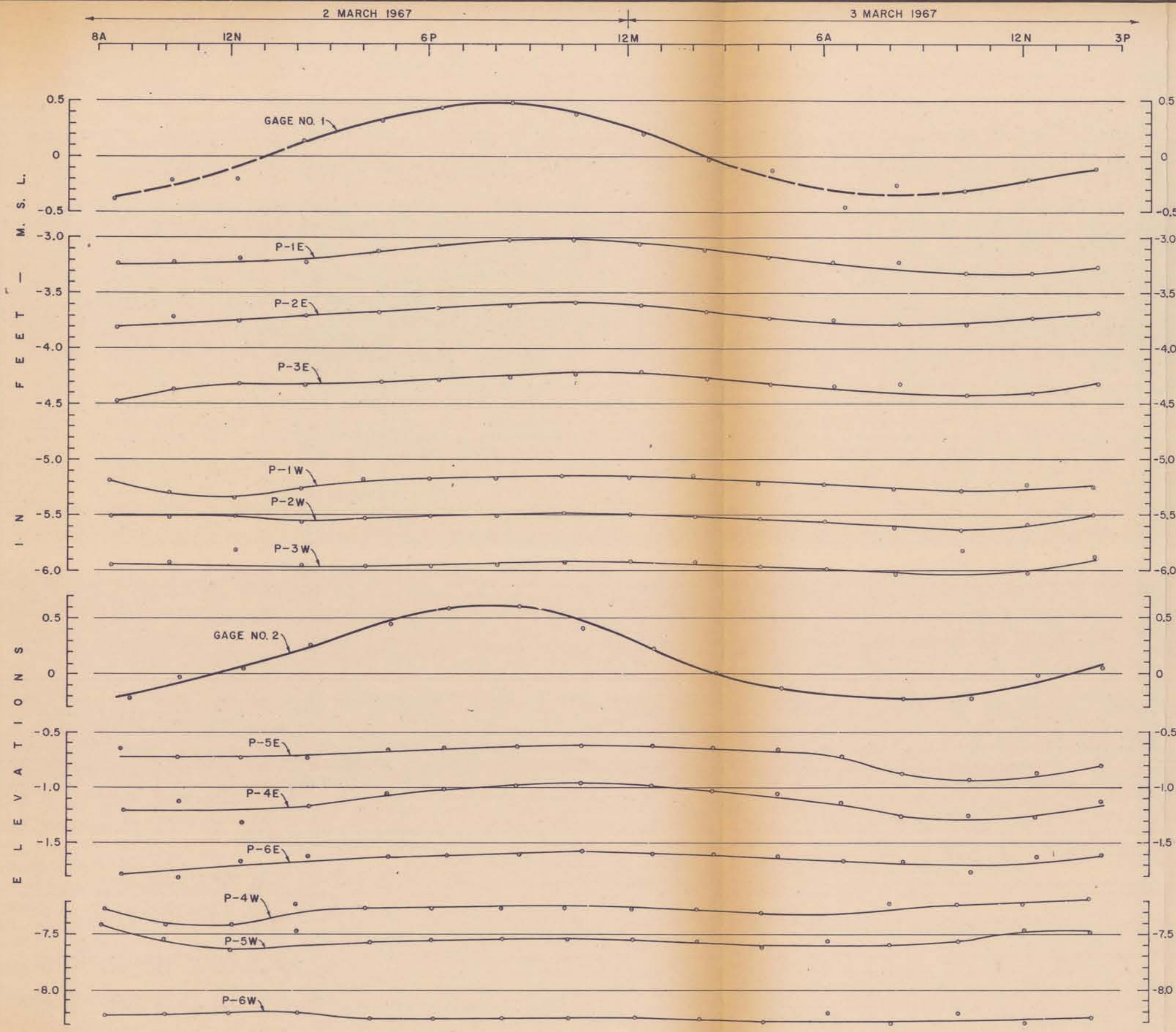
P-1W Piezometer on west levee

NOTE:
"W" piezometer readings are probably affected by the subsurface drainage along Pauline Drive, approximately 155' landside of B/L. For compilation of piezometer data see plate III-7

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
I. H. N. C. REMAINING LEVEES

SERIES PIEZOMETER READINGS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



For piezometer locations and tip elevations and general notes see plate III-4 & III-5

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
I. H. N. C. REMAINING LEVEES

SERIES PIEZOMETER READINGS

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

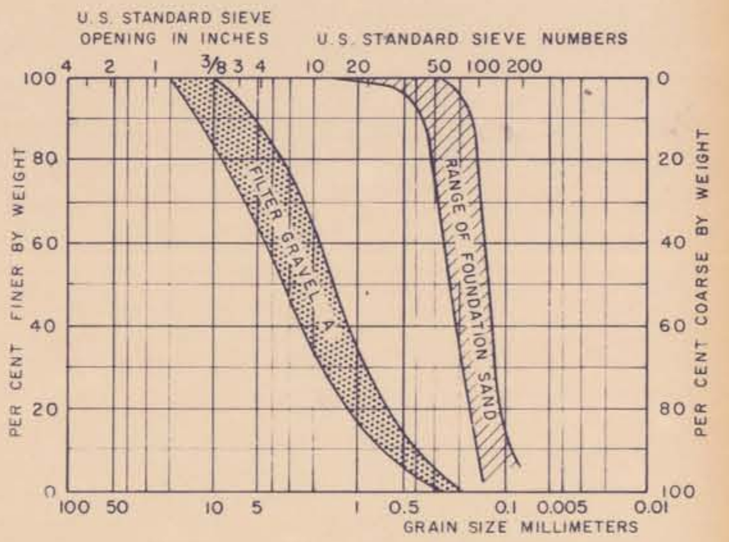
FEBRUARY 1968 FILE NO. H-2-24111

DATE READ	STAGE	GAGE	READINGS			HYDRAULIC GRADIENT = $i = \frac{h}{L}$			READINGS			HYDRAULIC GRADIENT = $i = \frac{h}{L}$		
			PIEZOMETER NUMBER						PIEZOMETER NUMBER					
			1 - E	2 - E	3 - E	1 - E TO 2 - E	2 - E TO 3 - E	AVERAGE	1 - W	2 - W	3 - W	1 - W TO 2 - W	2 - W TO 3 - W	AVERAGE
			LOCATION						LOCATION					
			100' F.S.	14' F.S.	65' P.S.				75' F.S.	20' F.S.	28' P.S.			
18 - 20 JAN. 1967	HIGH (AVERAGE)	0.54	-2.87	-3.43	-4.08	0.0065	0.0082	0.00735	-4.40	-4.73	-5.14	0.0060	0.0085	0.00725
		0.42	-2.98	-3.54	-4.10	0.0065	0.0071	0.00680	-4.53	-4.90	-5.26	0.0067	0.0075	0.00710
		0.48	-2.93	-3.48	-4.09	0.0065	0.0077	0.00710	-4.46	-4.82	-5.20	0.00635	0.0080	0.00717
	LOW	0.04	-3.11	-3.63	-4.17	0.0060	0.0068	0.00640	-4.55	-4.91	-5.27	0.0065	0.0075	0.00700
	CHANGE	0.44'	0.18	0.15	0.08'	0.0005	0.0009	0.00070	0.09'	0.09'	0.07'	-0.00015	0.0005	0.00017
2 - 3 MAR. 1967	HIGH	0.48	-3.01	-3.59	-4.21	0.0067	0.0078	0.00725	-5.15	-5.49	-5.92	0.0062	0.0090	0.00760
	LOW	-0.35	-3.33	-3.79	-4.42	0.0053	0.0080	0.00665	-5.29	-5.64	-6.03	0.0064	0.0081	0.00725
	CHANGE	0.83'	0.32'	0.20'	0.21'	0.0014	0.0002	0.00060	0.14'	0.15'	0.11'	-0.0002	0.0009	0.00065
AVERAGE	HIGH	0.48	-2.97	-3.53	-4.15	0.0066	0.0078	0.00720	-4.80	-5.15	-5.56	0.00627	0.0085	0.00738
	LOW	-0.16	-3.22	-3.71	-4.30	0.0057	0.0074	0.00655	-4.92	-5.27	-5.65	0.00645	0.0080	0.00713
	CHANGE	0.64'	0.25'	0.18'	0.15'	0.0009	0.0004	0.00065	0.12'	0.12'	0.09'	-0.00018	0.0005	0.00041

DATE READ	STAGE	GAGE	READINGS			HYDRAULIC GRADIENT = $i = \frac{h}{L}$			READINGS			HYDRAULIC GRADIENT = $i = \frac{h}{L}$		
			PIEZOMETER NUMBER						PIEZOMETER NUMBER					
			4 - E	*5 - E	6 - E	4 - E TO *5 - E	*5 - E TO 6 - E	4 - E TO 6 - E	4 - W	5 - W	6 - W	4 - W TO 5 - W	5 - W TO 6 - W	AVERAGE
			LOCATION						LOCATION					
			120' F.S.	20' F.S.	65' P.S.				75' F.S.	20' F.S.	35' P.S.			
18 - 20 JAN. 1967	HIGH (AVERAGE)	0.61	-0.50		-1.04			0.0029	-6.77	-6.95	-7.77	0.0033	0.0149	0.0091
		0.50	-0.62		-1.15			0.0029	-6.85	-7.04	-7.76	0.0035	0.0131	0.0083
		0.55	-0.56		-1.10			0.0029	-6.81	-7.00	-7.77	0.0034	0.0140	0.0087
	LOW	0.06	-0.68		-1.19			0.0028	-6.86	-7.05	-7.85	0.0035	0.0145	0.0090
	CHANGE	0.49'	0.12'		0.09'			0.0001	0.05'	0.05'	0.08'	-0.0001	-0.0005	-0.0003
2 - 3 MAR. 1967	HIGH	0.51	-0.95		-1.56			0.0033	-7.25	-7.54	-8.25	0.0053	0.0129	0.0091
	LOW	-0.23	-1.29		-1.70			0.0022	-7.32	-7.55	-8.28	0.0042	0.0133-	0.0088
	CHANGE	0.74'	0.34'		0.14'			0.0011	0.07'	0.01'	0.03'	0.0011	-0.0004	0.0003'
AVERAGE	HIGH	0.53	-0.75		-1.33			0.0031	-7.03	-7.27	-8.01	0.0044	0.0135	0.0090
	LOW	-0.09	-0.98		-1.45			0.0025	-7.09	-7.30	-8.06	0.0038	0.0139	0.0088
	CHANGE	0.62'	0.23'		0.12'			0.0006	0.06'	0.03'	0.05'	0.0006	-0.0004	0.0002

*Indicated perched condition.

COMPILATION OF PIEZOMETER DATA



FILTER GRAVEL

WEST LEVEE										
WELL			*LENGTH IN FEET						*AMOUNT	
NO.	B/L STATION	LOCATION (P.S. B/L) FEET	GRAVEL FILTER	WOOD 8" SCREEN	WOOD 8" RISER	CONC. B/FILL	CORRUGATED METAL PIPE 24"φ	CORRUGATED METAL PIPE 12"φ	CHECK VALVE	GUARD SCREEN
1 W	30+25	14	30	22	16	12	4.5	6	1 EACH WELL	1 EACH WELL
2 W	31+30	14	30	22	16	12	4.5	6		
3 W	32+35	14	30	22	16	12	4.5	6		
4 W	33+40	14	30	22	16	12	4.5	6		
5 W	34+45	14	30	22	16	12	4.5	6		
6 W	35+50	16	30	22	16	12	4.5	6		
7 W	36+55	16	30	22	15	11	4.5	6		
8 W	37+85	16	30	22	15	11	4.5	6		
9 W	39+15	16	30	22	15	11	4.5	6		
10 W	40+45	18	29	21	14	10	4.5	6		
11 W	41+75	19	29	21	14	10	4.5	6		
12 W	43+05	16	29	21	13	9	5.0	7		
13 W	44+35	18	29	21	13	9	5.0	7		
14 W	45+65	21	29	21	13	9	5.0	8		
15 W	46+95	22	30	22	12	8	5.0	8		
16 W	48+25	25	30	22	12	8	5.0	8		
17 W	49+55	32	30	22	12	8	5.0	8		
18 W	50+85	37	30	22	12	8	5.0	8		
19 W	52+15	42	30	22	12	8	5.0	8		
20 W	53+45	42	31	23	11	7	5.0	8		
21 W	54+75	42	31	23	11	7	5.0	8		
22 W	56+05	42	32	24	11	7	5.0	8		
23 W	57+35	42	33	25	11	7	5.0	8		
24 W	58+65	45	34	26	11	7	5.0	8		
25 W	59+95	45	37	29	10	6	5.0	8		
26 W	61+35	46	38	30	10	6	4.5	6		
27 W	62+75	46	39	31	10	6	4.5	6		
28 W	64+15	41	41	33	10	6	4.5	6		
29 W	65+55	11	41	33	10	6	4.5	6		
30 W	66+95	11	40	32	10	6	4.5	6		
31 W	68+35	11	37	29	10	6	4.5	6		
32 W	69+75	12	35	27	10	6	4.5	6		
33 W	71+15	12	31	23	9	5	4.5	6		
34 W	72+55	12	30	22	9	5	4.5	6		
35 W	73+95	14	28	20	8	4	4.5	6		
36 W	75+35	18	28	20	8	4	4.5	6		
37 W	76+75	19	28	20	8	4	5.0	8		
38 W	78+15	15	30	22	8	4	5.0	8		
39 W	79+55	15	30	22	8	4	5.0	8		
40 W	80+95	8	30	22	11	7	5.5	9		
41 W	82+35	16	31	23	11	7	5.5	9		
42 W	83+50	13	28	20	16	12	5.5	9		
43 W	84+65	10	29	21	16	12	5.5	9		
44 W	85+80	8	25	17	19	15	5.5	9		
45 W	86+95	7	26	18	19	15	5.5	9		
46 W	88+10	7	26	18	19	15	5.5	9		
47 W	89+25	7	26	18	19	15	5.5	9		

WELL DATA

EAST LEVEE										
WELL			*LENGTH IN FEET						*AMOUNT	
NO.	B/L STATION	LOCATION (F.S. B/L) FEET	GRAVEL FILTER	WOOD 8" SCREEN	WOOD 8" RISER	CONC. B/FILL	CORRUGATED METAL PIPE 24"φ	CORRUGATED METAL PIPE 12"φ	CHECK VALVE	GUARD SCREEN
1 E	33+00	35	31	23	16	12	5	30	1 EACH WELL	1 EACH WELL
2 E	34+15	35	31	23	16	12	3	22		
3 E	35+30	35	31	23	16	12	3	20		
4 E	36+45	35	31	23	16	12	3	22		
5 E	37+60	35	32	24	15	11	3	23		
6 E	38+75	35	32	24	15	11	3	11		
7 E	39+90	35	32	24	15	11	3	7		
8 E	41+30	35	32	24	14	10	3	7		
9 E	42+70	35	32	24	14	10	3	12		
10 E	44+10	35	32	24	14	10	4	15		
11 E	45+50	35	31	23	13	9	3	8		
12 E	46+90	35	31	23	13	9	3	6		
13 E	48+30	35	31	23	13	9	3	5		
14 E	49+70	35	30	22	12	8	3	5		
15 E	51+10	35	30	22	12	8	3	8		
16 E	52+50	35	30	22	12	8	3	6		
17 E	53+90	35	30	22	12	8	3	6		
18 E	55+30	40	31	23	13	9	3	8		
19 E	56+70	45	32	24	13	9	3	5		
20 E	58+10	45	31	23	15	11	3	5		
21 E	59+90	45	32	24	15	11	3	5		
22 E	61+70	45	32	24	16	12	SEE PLATE III-11 COLLECTOR SYSTEM DETAILS			SEE PLATE III-11
23 E	63+50	45	33	25	16	12				
24 E	65+30	35	36	28	15	11				
25 E	67+10	35	36	28	15	11				
26 E	68+90	35	38	30	14	10				
27 E	70+70	35	38	30	14	10				
28 E	72+50	35	40	32	12	8				
29 E	74+30	35	40	32	12	8				
30 E	76+10	35	36	28	15	11				
31 E	77+90	35	35	27	15	11				
32 E	79+30	35	28	20	19	15				
33 E	80+70	35	28	20	19	15				
34 E	82+10	35	27	19	19	15				
35 E	83+50	35	27	19	19	15				
36 E	85+00	35	27	19	19	15				
37 E	0+60 "A"	35	27	19	19	15				

WELL DATA

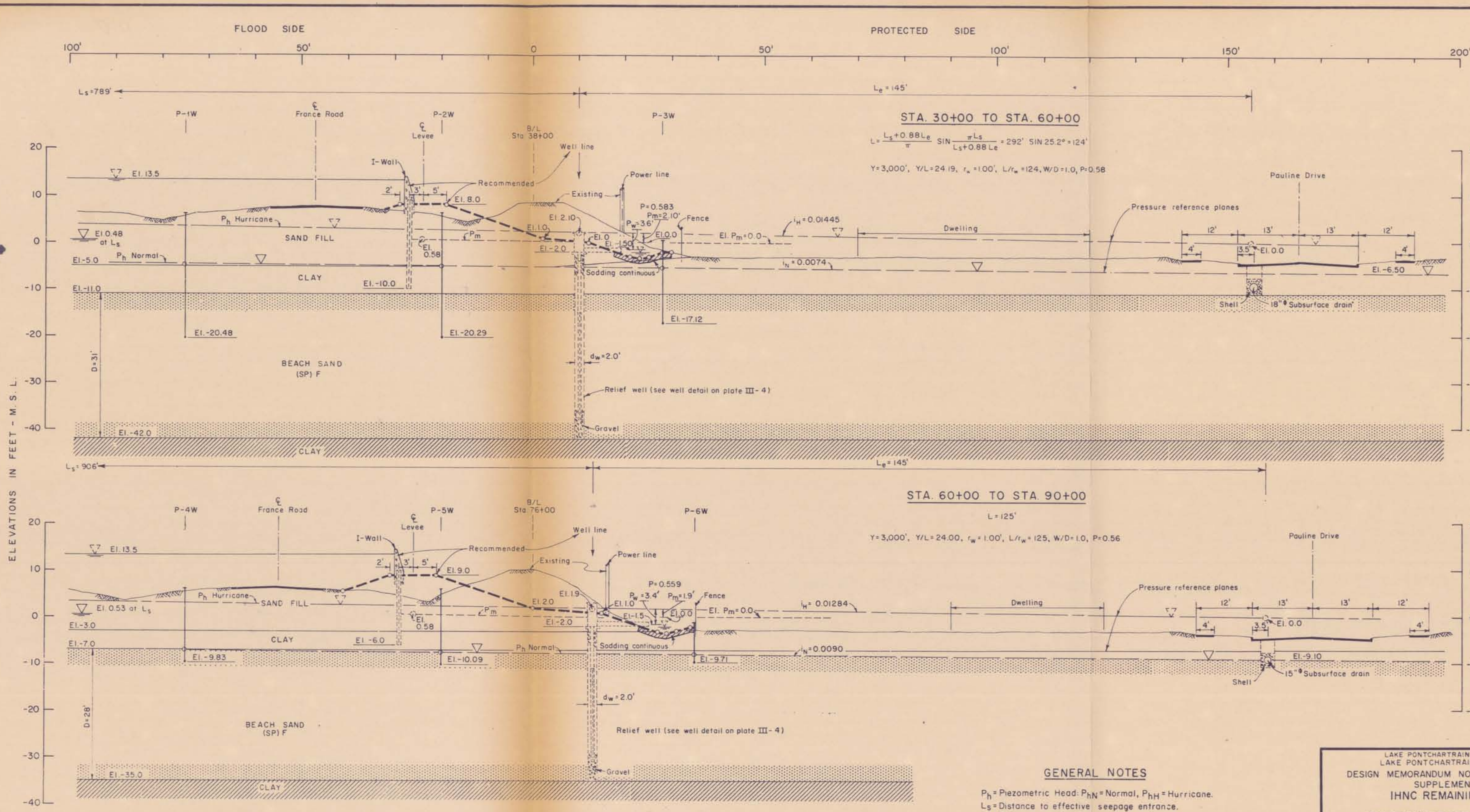
NOTE:
P.S. Denotes protected side
Wells Nos. 22 E thru 37 E discharge into a collector pipe, see plate III-11
* For cost estimating purposes.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

COMPILATION OF PIEZOMETER DATA, WELL DATA, AND FILTER DATA

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

FEBRUARY 1968 FILE NO. H-2-24111



$L = \frac{L_s + 0.88 L_e}{\pi} \; SIN \frac{\pi L_s}{L_s + 0.88 L_e} = 292' \; SIN \, 25.2° = 124'$

$Y = 3{,}000'$, $Y/L = 24.19$, $r_w = 1.00'$, $L/r_w = 124$, $W/D = 1.0$, $P = 0.58$

GENERAL NOTES

P_h = Piezometric Head: P_{hN} = Normal, P_{hH} = Hurricane.
L_s = Distance to effective seepage entrance.
L_e = Distance to effective seepage exit.
P-1W to P-6W = Existing piezometer locations.
i = Hydraulic Gradient: i_N = Normal, i_H = Hurricane.
P_w = Hurricane head at well, P_m = Hurricane head relief at well for well design, $P = P_w / P_m$, dw = well diameter.
*See EM 1110-2-1905, 1 March 63, "Design of Finite Relief Well Systems"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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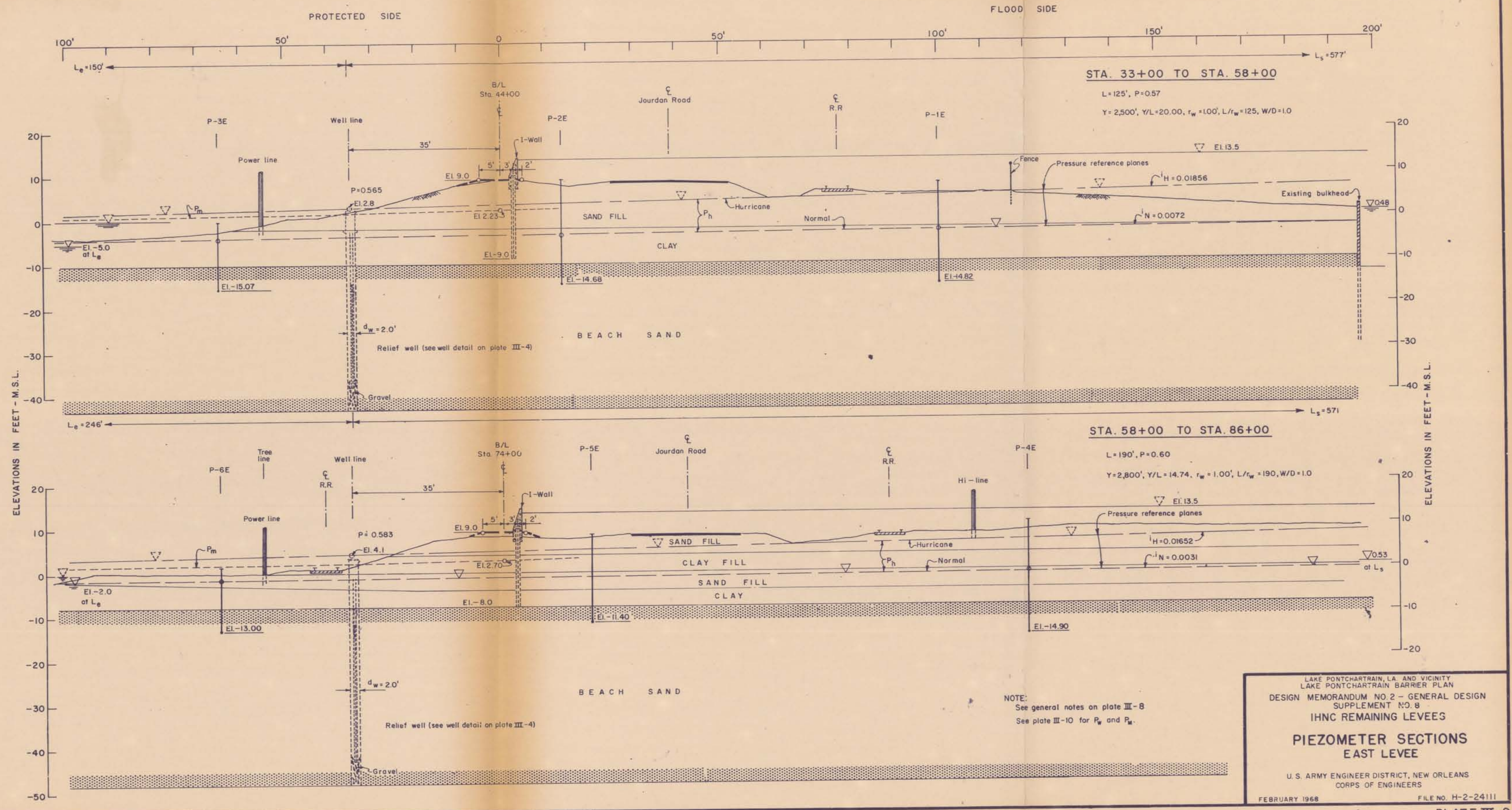
IHNC REMAINING LEVEES

PIEZOMETER SECTIONS
WEST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

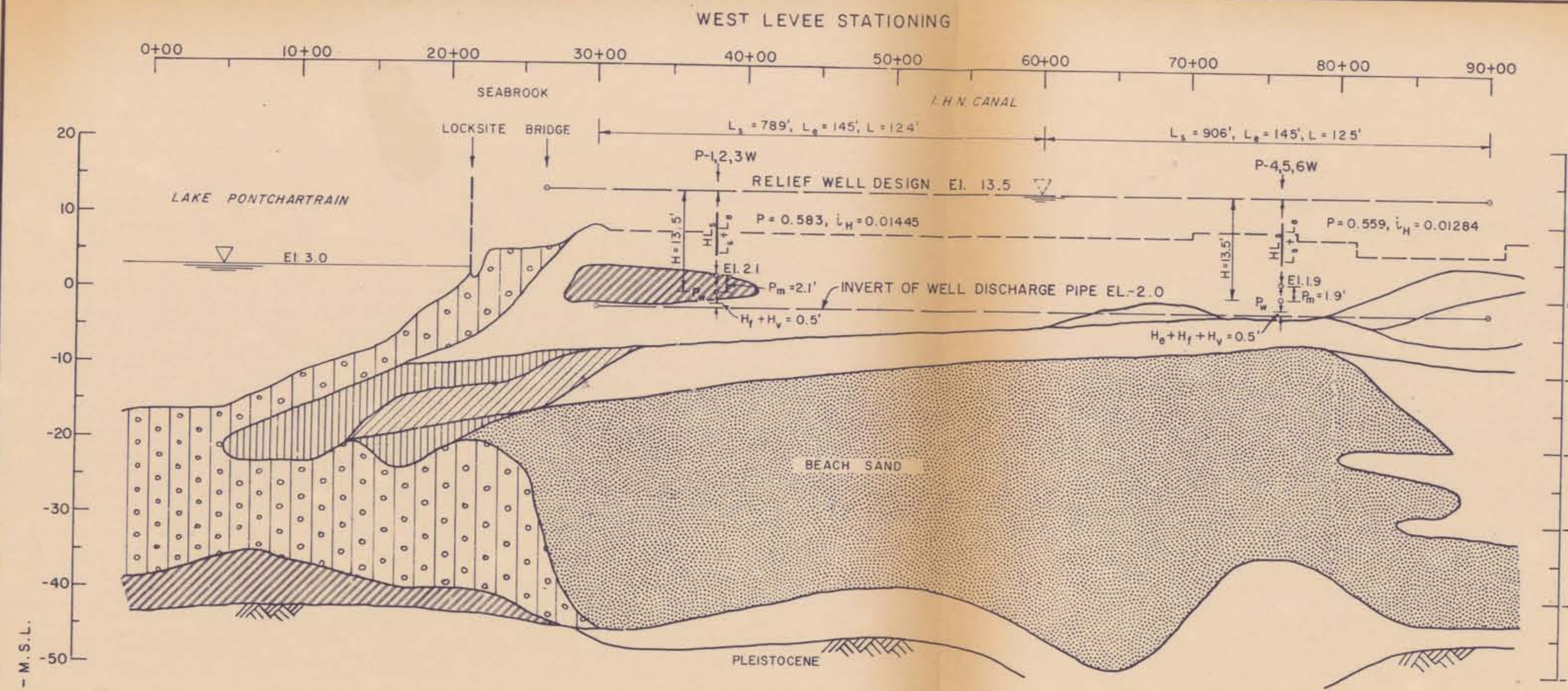


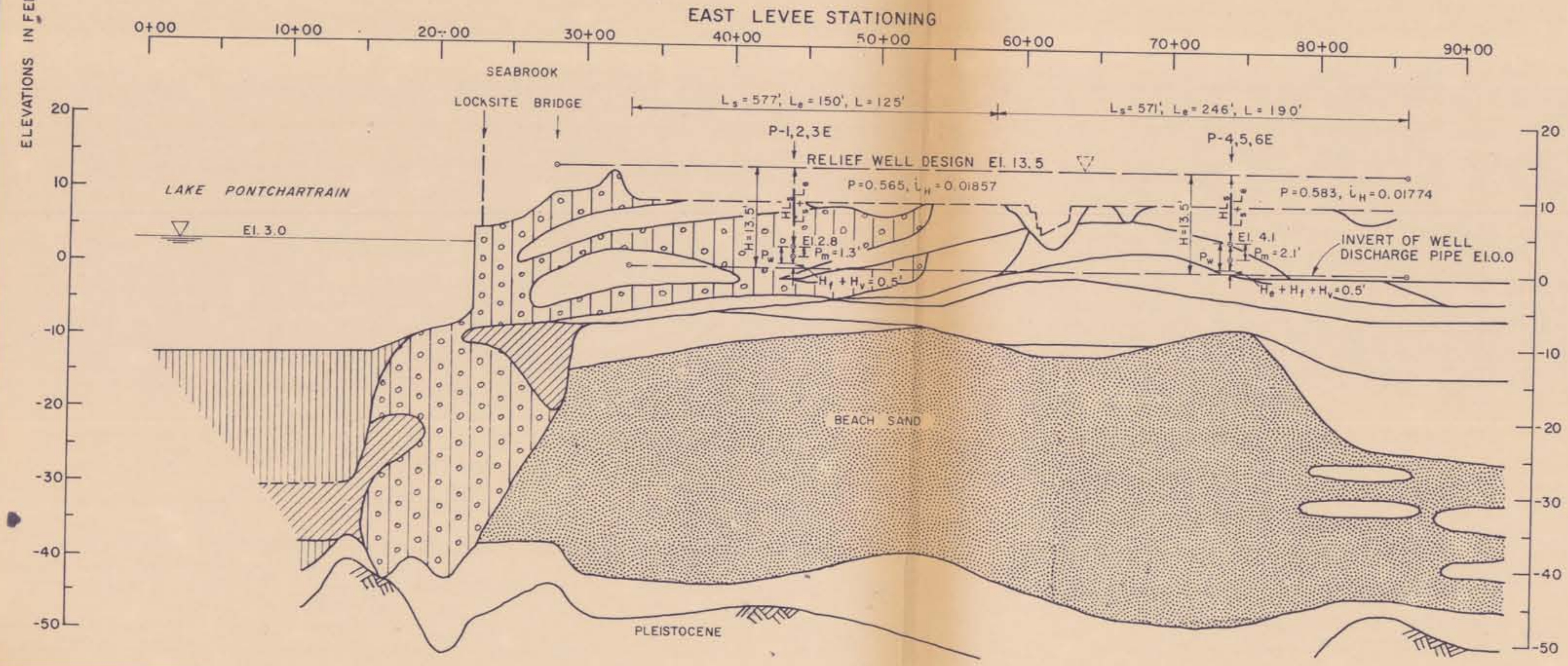
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

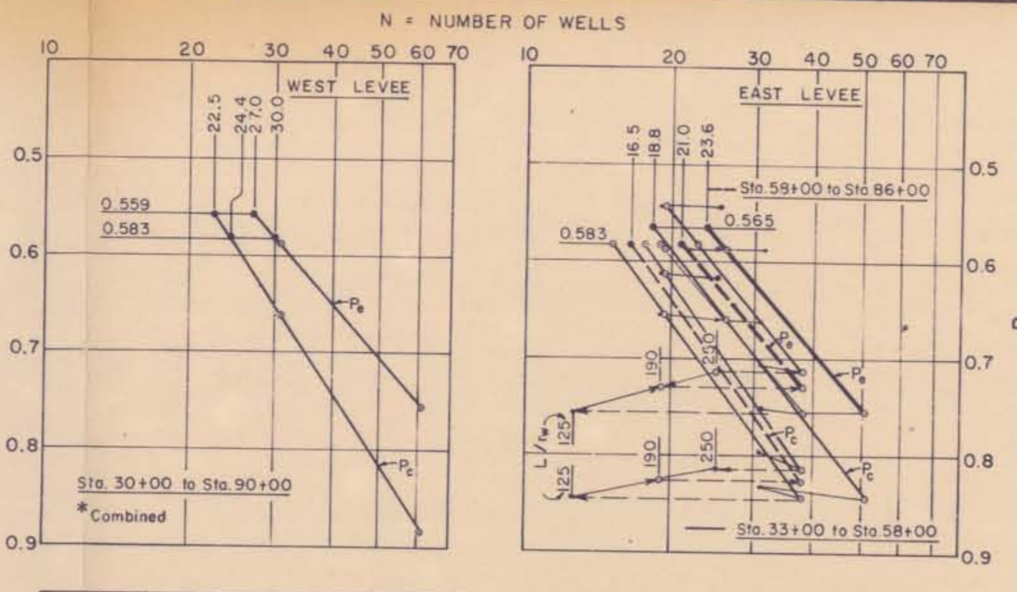
PIEZOMETER SECTIONS
EAST LEVEE

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

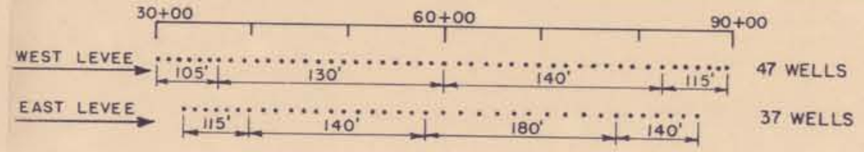
FEBRUARY 1968 FILE NO. H-2-24111



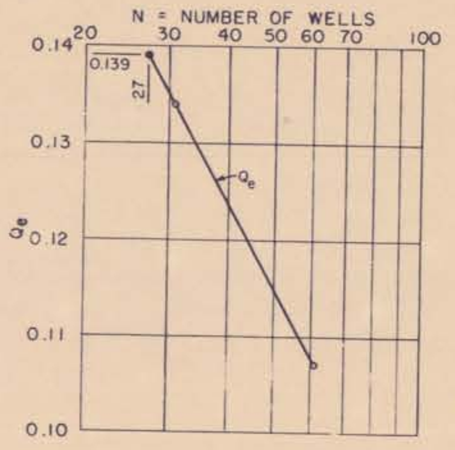




LEVEE	STATION	P	Y'	N_e-1	N_c-1	SPACING d_e'	SPACING d_c'	P_w'
WEST	30+00 to 60+00	0.583	3,000	29.0	23.4	103	128	3.6*
	60+00 to 90+00	0.559	3,000	26.0	21.5	115	140	3.4*
EAST	33+00 to 58+00	0.565	2,500	22.6	17.8	111	140	2.3
	58+00 to 86+00	0.583	2,800	20.0	15.5	140	180	3.6



WELL DESIGN SPACING



WEST LEVEE
STA. 60+00 TO 90+00

$K = 325 \times 10^{-4}$ cm/sec = 0.064 ft/min
$Q_e = 0.139$, $D = 31'$, $P_w = 3.4'$

$Q = 2\pi K D P_w Q_e = 5.934$ cfm
$Q = 7.5 \times 5.934 = 44.5$ gal/min

dia. screen + riser = 8" = 0.666'
A = 0.3484 sq ft

$V_{riser} = \frac{5.934}{0.3484} = 17$ ft/min

Riser loss = $H_f + H_v = 0.11$
$0.11 \times 15'$ length = 0.165'

H_e = screen + filter loss = $\frac{1}{3} \times 30' \times 0.025 = 0.250'$

Total loss = 0.165' + 0.250' = 0.415', Used 0.5'

WELL DISCHARGE AND HEAD LOSS

NOTE:
See EM 1110-2-1905, 1 March 1963, "Design of Finite Relief Well Systems" for design procedure and notation definitions.

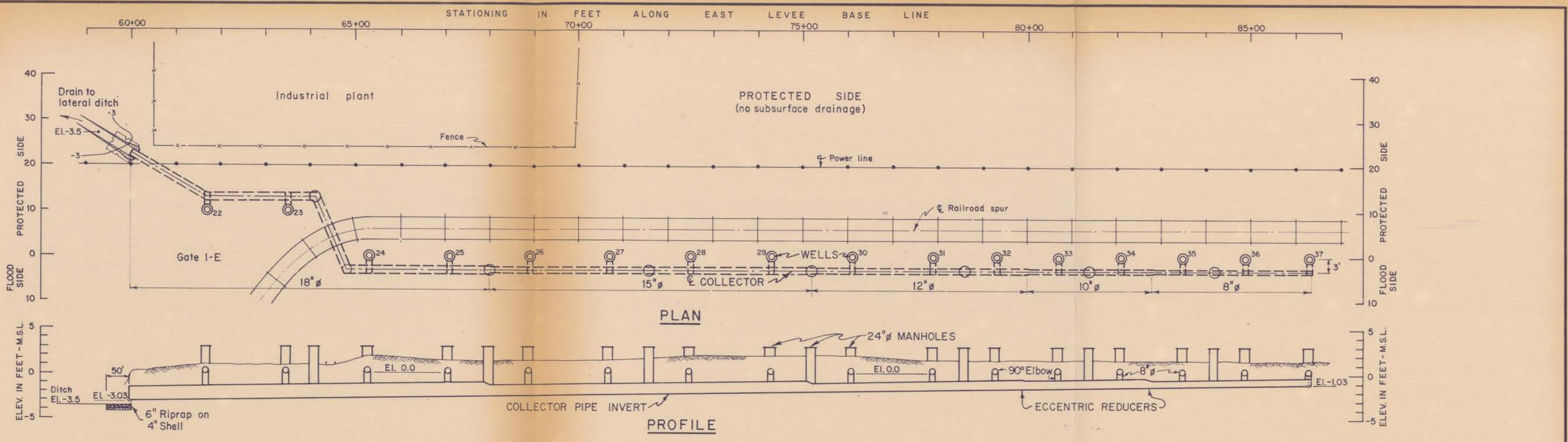
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

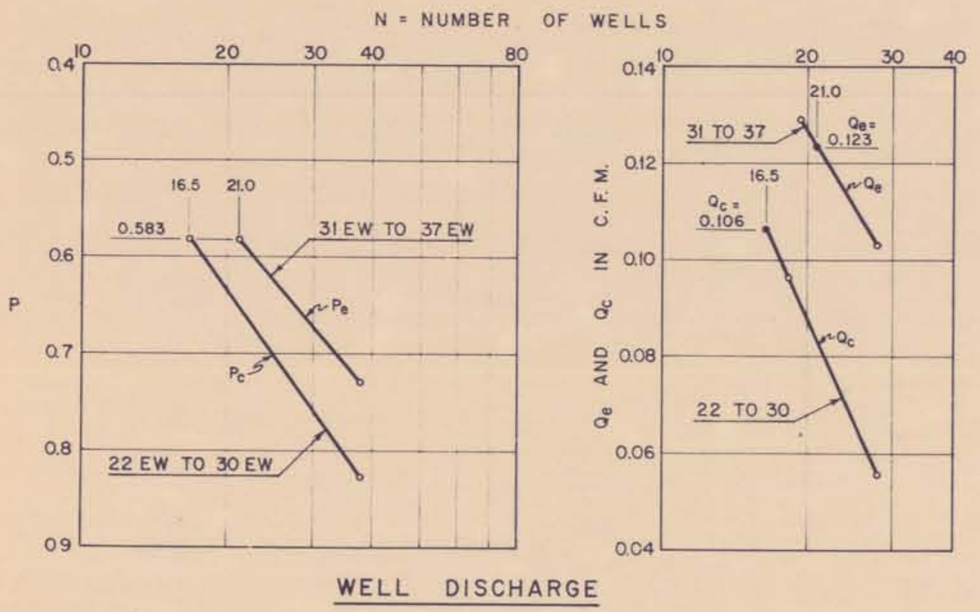
RELIEF WELL DESIGN
SPACING, DISCHARGE, AND HEAD LOSS

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE III-10



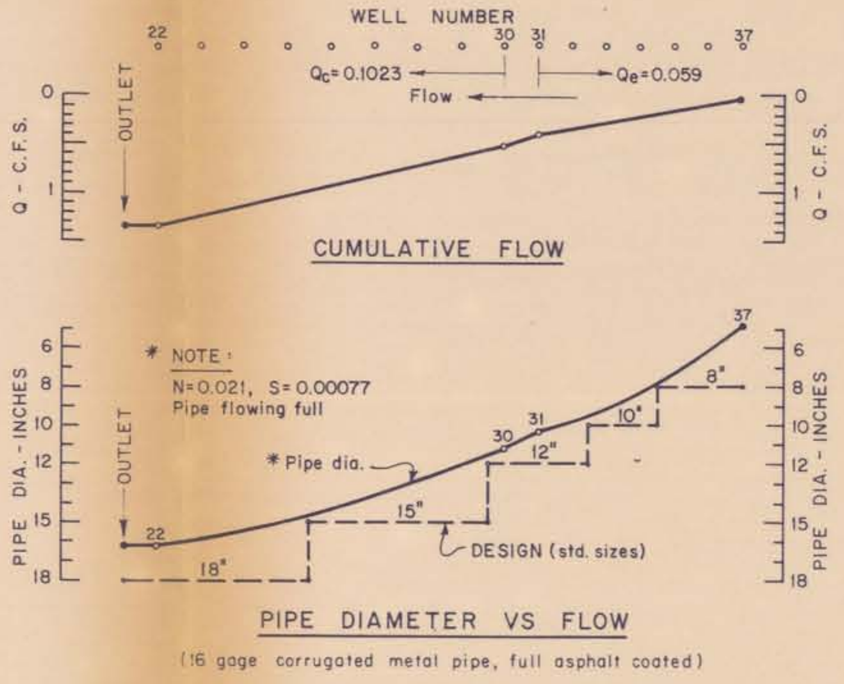


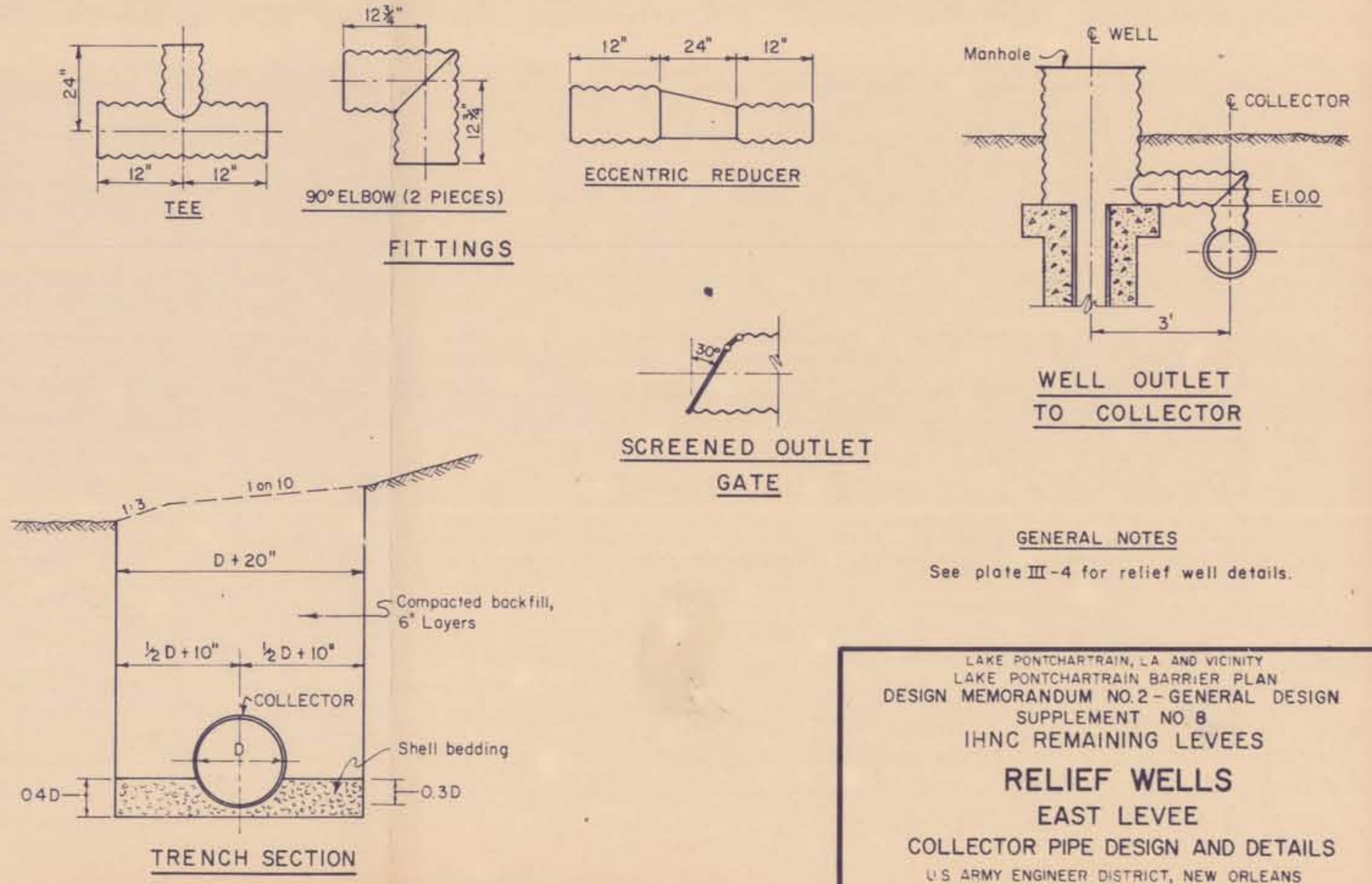
$Q = 2\pi KDP_w Q$

$P_w = 3.6'$, $K = 325 \times 10^{-4}$ cm/sec $= 0.064'$/min.

22 EW TO 30 EW: $Q_c = 0.106$ cfm, $D = 40'$, $Q = 57.906$ $Q_c = 6.138$ cfm $= 0.1023$ c.f.s.

31 EW TO 37 EW: $Q_e = 0.123$ cfm, $D = 20'$, $Q = 28.95$ $Q_e = 3.561$ cfm $= 0.059$ c.f.s.





GENERAL NOTES

See plate III-4 for relief well details.

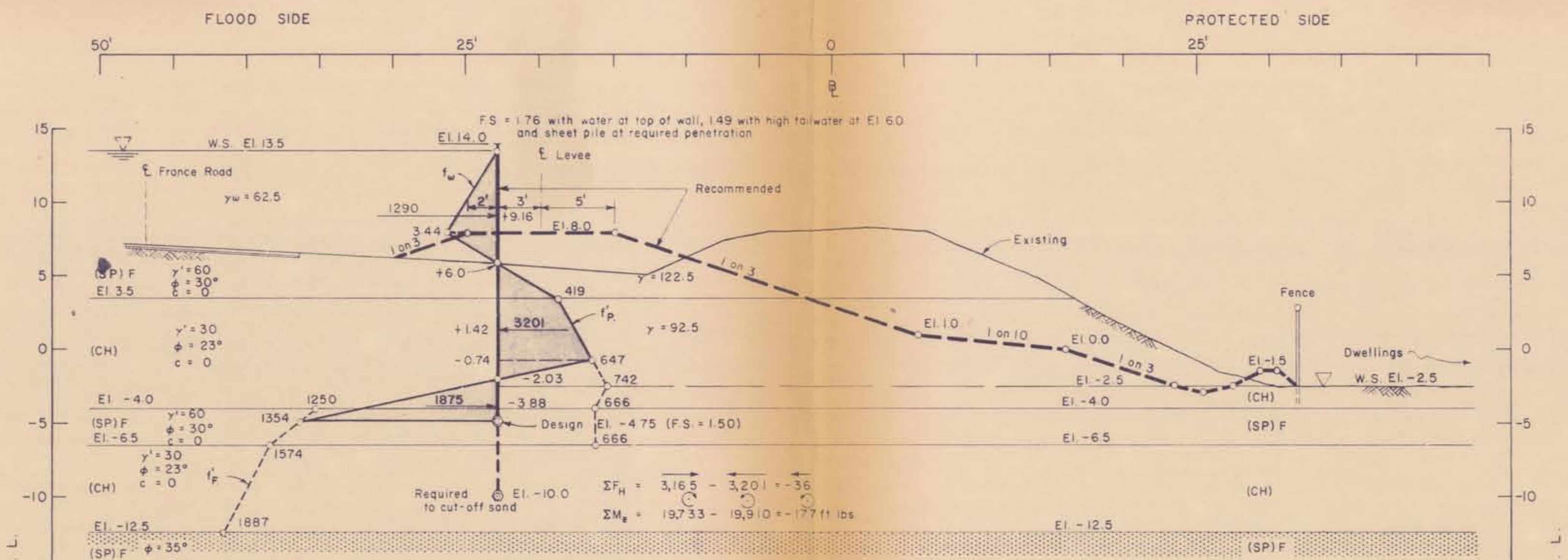
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO 8
IHNC REMAINING LEVEES

RELIEF WELLS
EAST LEVEE
COLLECTOR PIPE DESIGN AND DETAILS

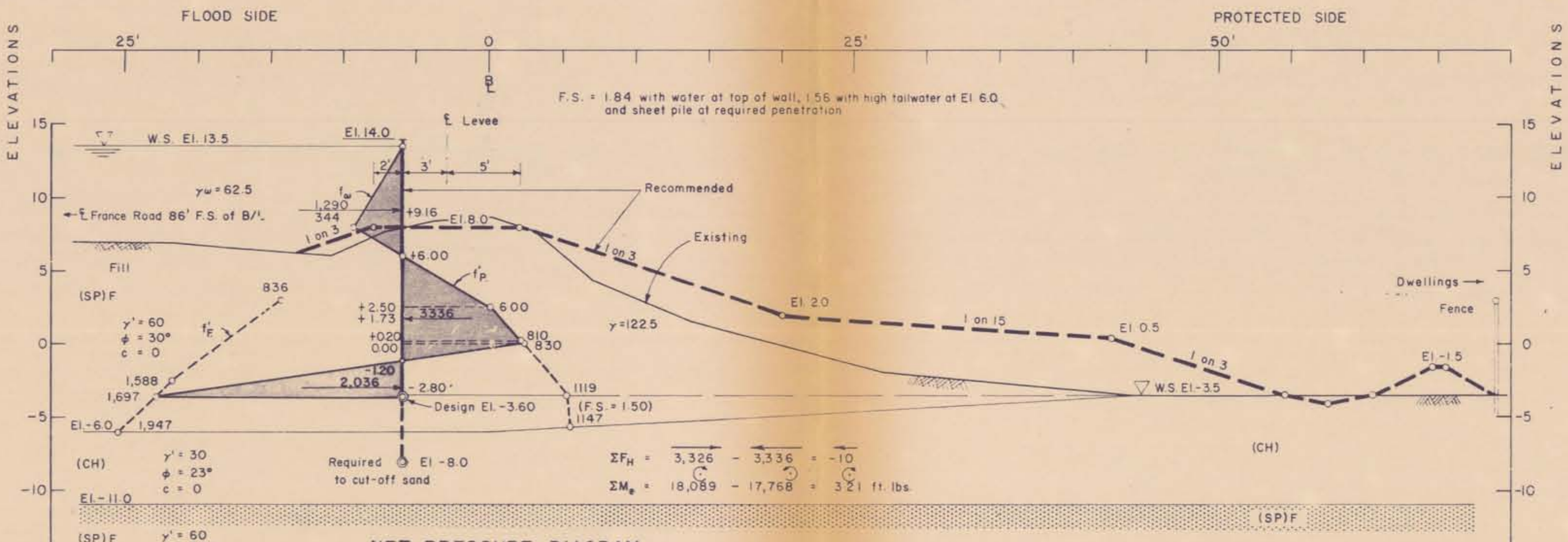
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

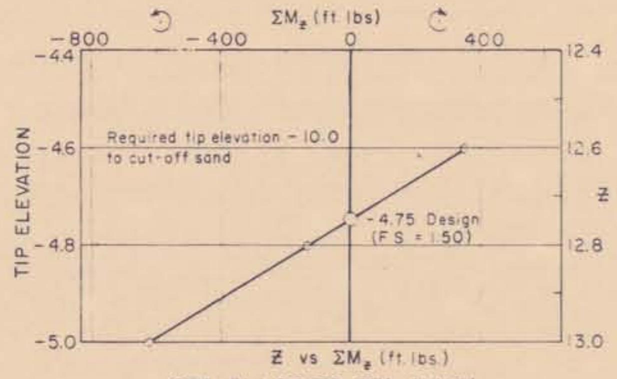
PLATE III-11



NET PRESSURE DIAGRAM
STA. 31+00 TO STA. 41+01



NET PRESSURE DIAGRAM
STA. 41+01 TO STA. 61+00



STA. 31+00 TO STA. 41+01

GENERAL NOTES

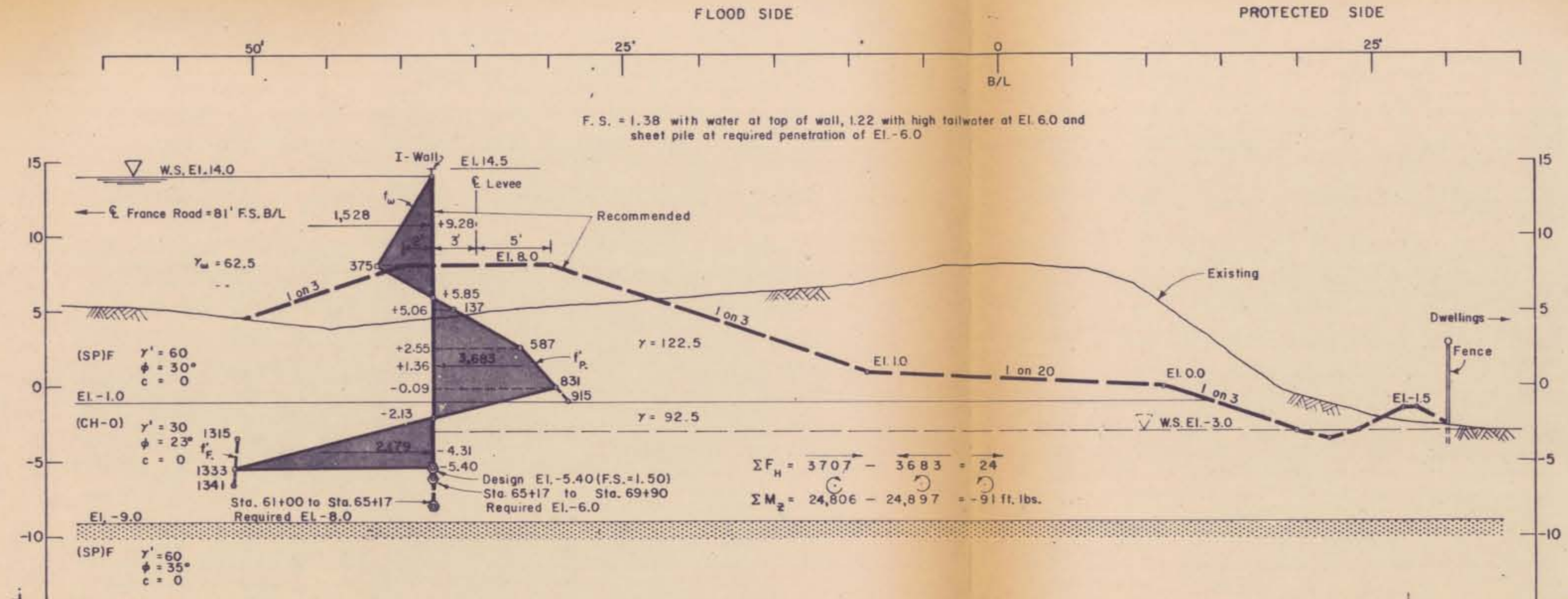
Cantilever sheet pile stability by method of planes analysis
(S) — Consolidated-drained shear strength, c = o
(f_w) — Lateral water pressure
(f'_F) — Net lateral pressure on flood side, soil and water
(f'_P) — Net lateral pressure on protected side, soil and water
γ_w — Unit weight of water in p.c.f.
γ — Unit weight of soil-water system in p.c.f.
γ' — Submerged unit weight of soil in p.c.f.
c — Unit cohesion in p.s.f.
ΣF_H — Summation of horizontal forces in lbs.
ΣM_e — Summation of moments about tip, in ft. lbs.
Z — Penetration of sheet pile below levee crown in feet.
F.S. Factor of safety with respect to (S) shear strength, $\phi_d = \tan^{-1}(\frac{\tan\phi}{F.S.})$
ϕ Angle of internal friction in degrees.

For undisturbed soil boring data, see plates III-46 thru III-56
See plate III-4 for well design
Stations are referenced to centerline of wall.

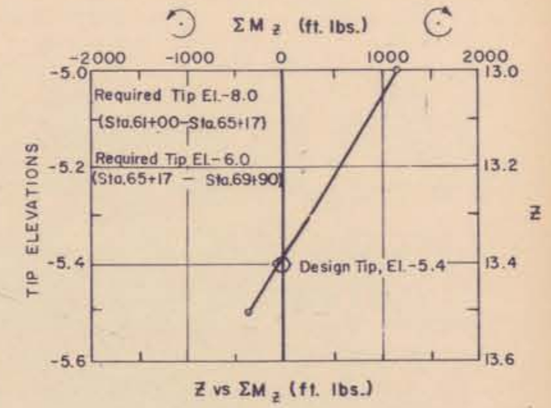
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

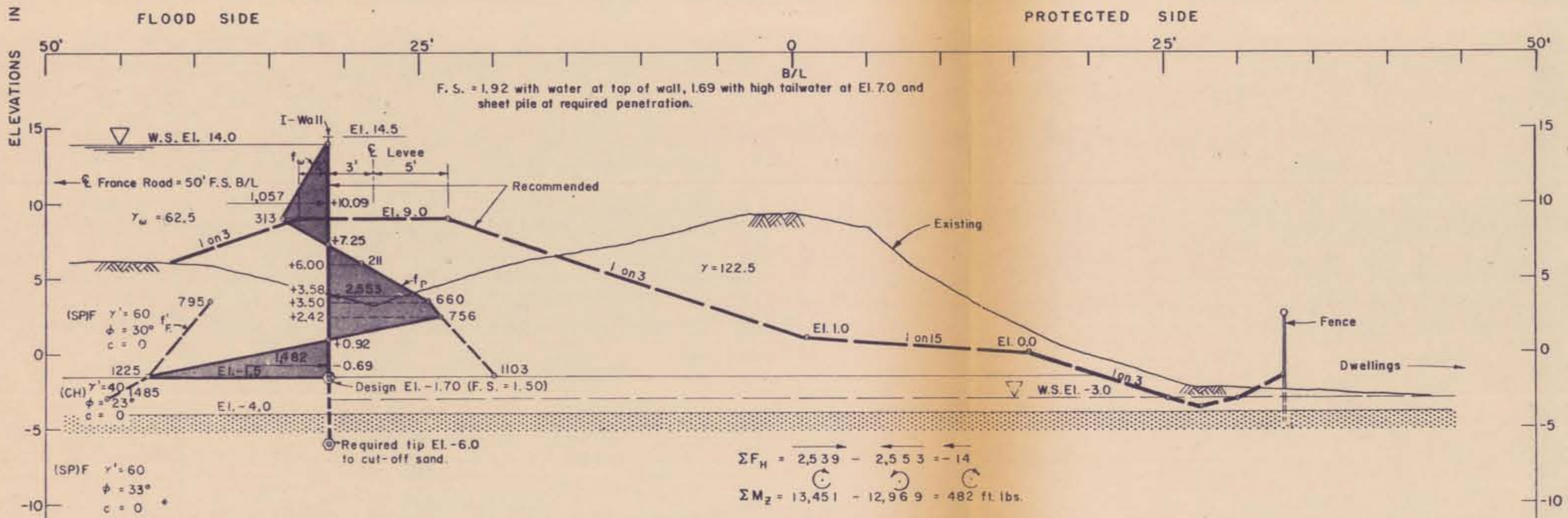
WEST LEVEE
STA 31+00 TO STA. 61+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



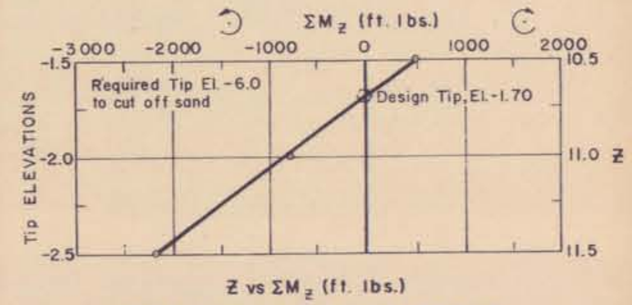
NET PRESSURE DIAGRAM
STA. 61+00 TO STA. 69+90



STA. 61+00 TO STA. 69+90



NET PRESSURE DIAGRAM
STA. 69+90 TO STA. 76+96



STA. 69+90 TO STA. 76+96

NOTE

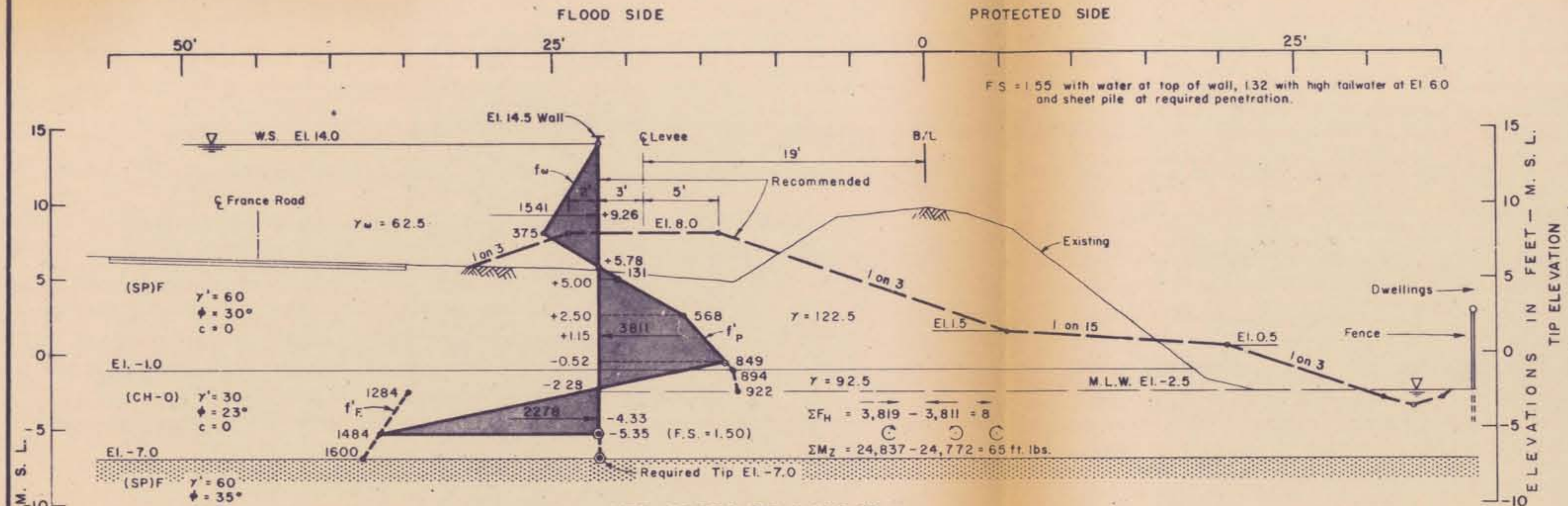
For general notes see plate III - 12

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

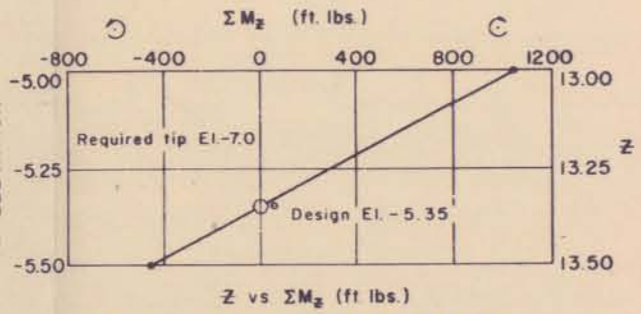
CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
STA. 61+00 TO STA. 76+96
U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS

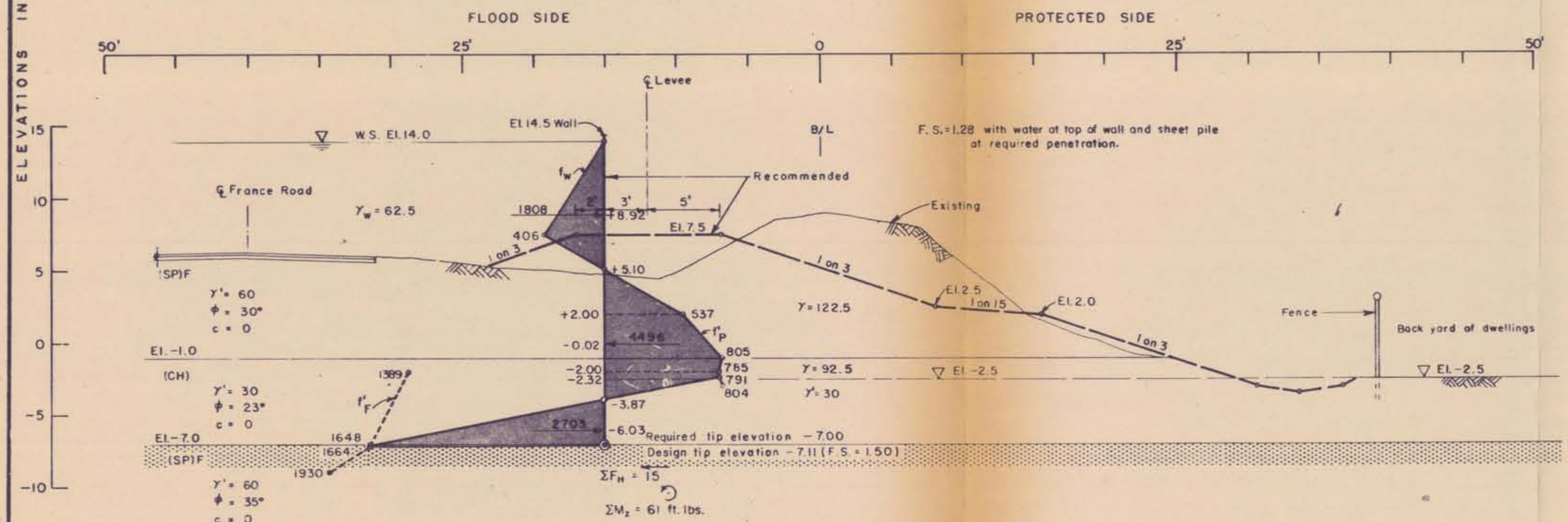
FEBRUARY 1968 FILE No. H-2-24111



NET PRESSURE DIAGRAM
STA. 76+96 TO STA. 77+97



Z vs ΣM_Z (ft. lbs.)
STA. 76+96 TO STA. 77+97



NET PRESSURE DIAGRAM
STA. 77+97 TO STA. 80+98

NOTE
For general notes see plate III-12

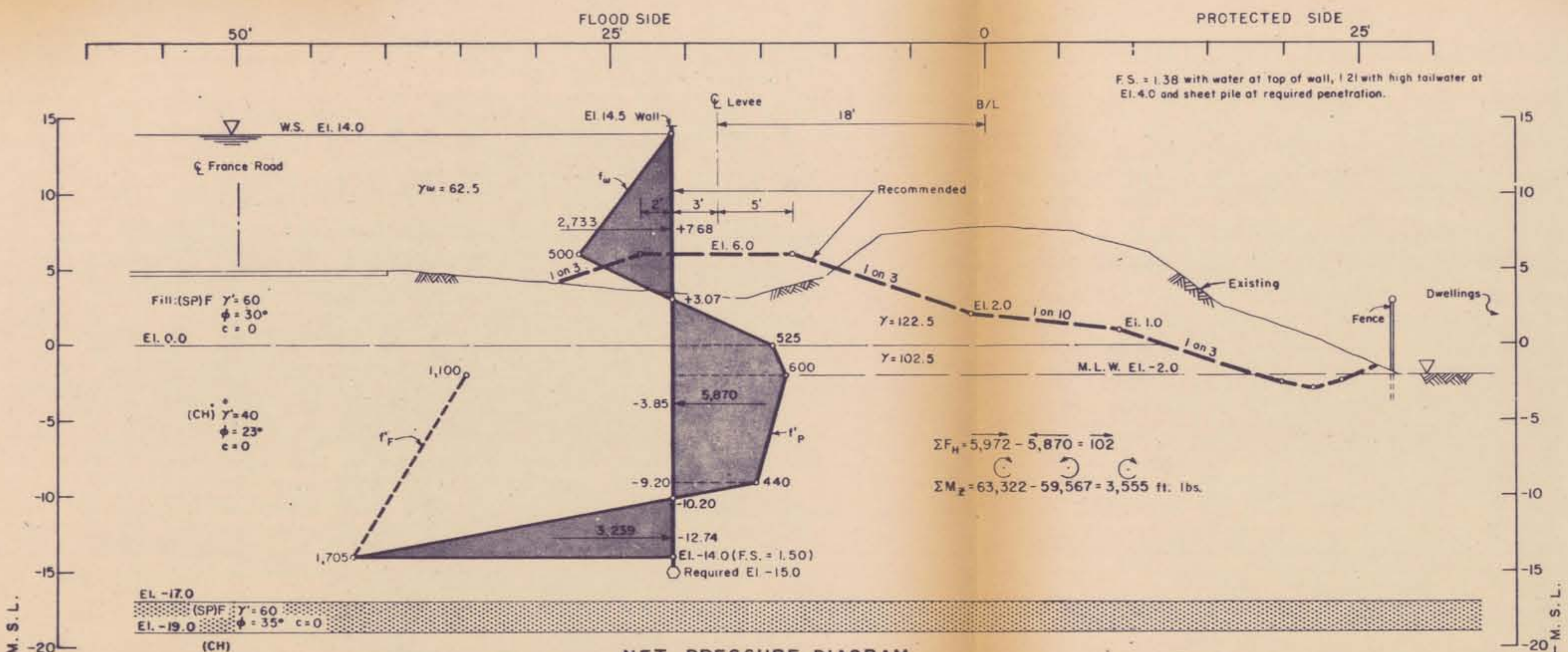
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
STA. 76+96 TO STA. 80+98

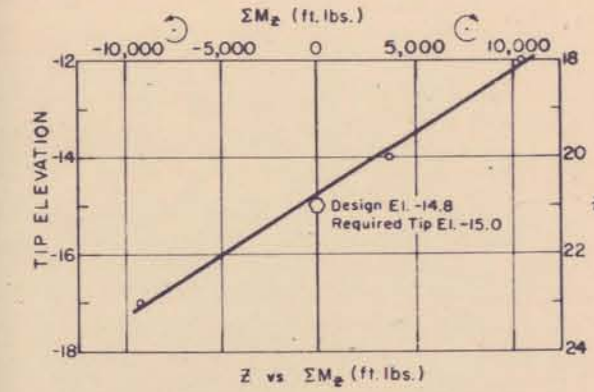
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111



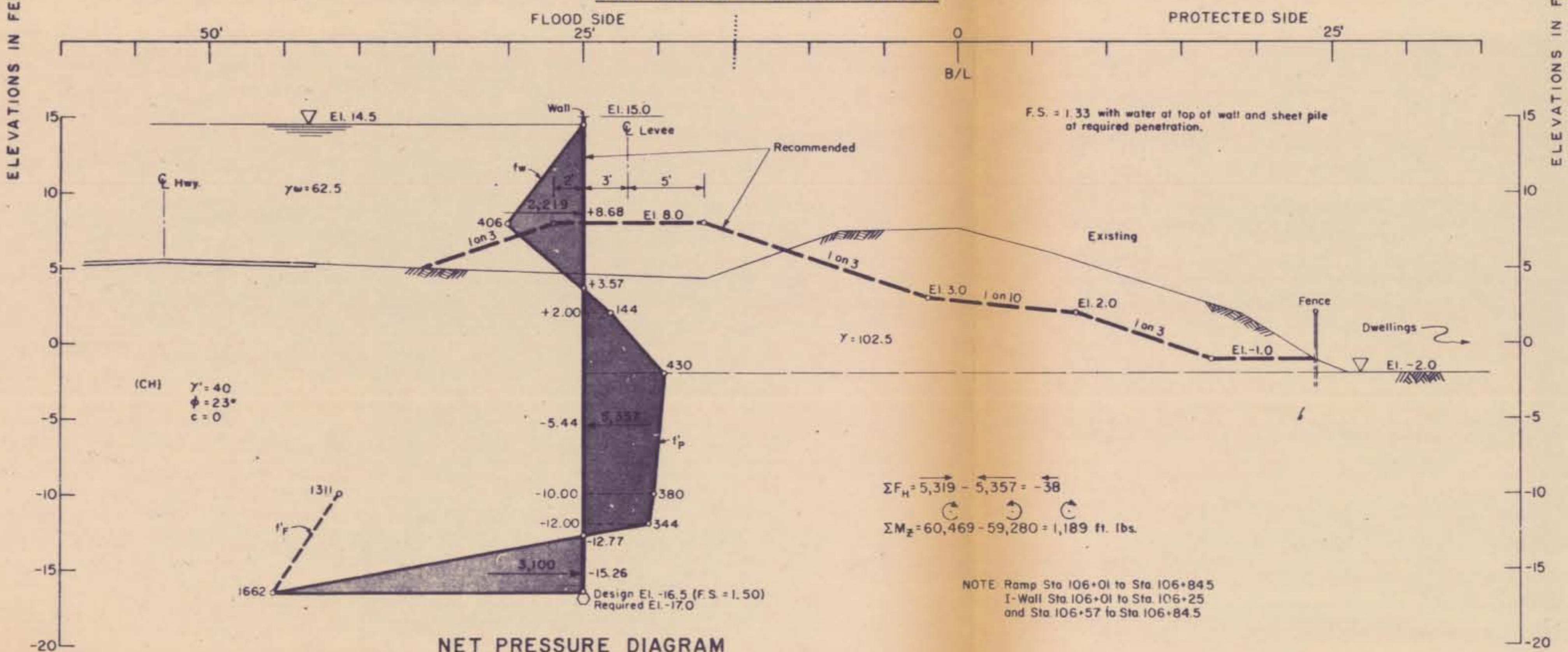
NET PRESSURE DIAGRAM

STA. 80+98 TO STA. 91+00



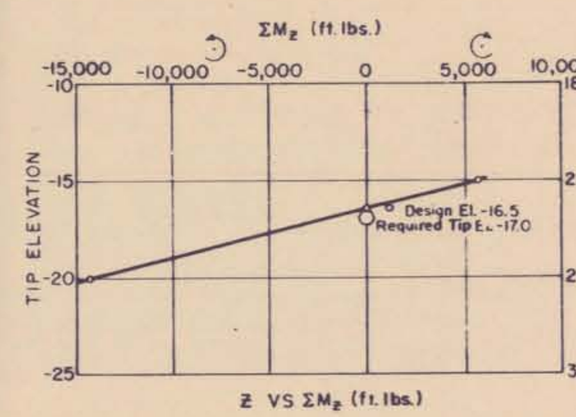
STA. 80+98 TO STA. 91+00

NOTE:
For General Notes see Plate III-12



NET PRESSURE DIAGRAM

STA. 91+00 TO STA. 106+01



STA. 91+00 TO STA. 106+01

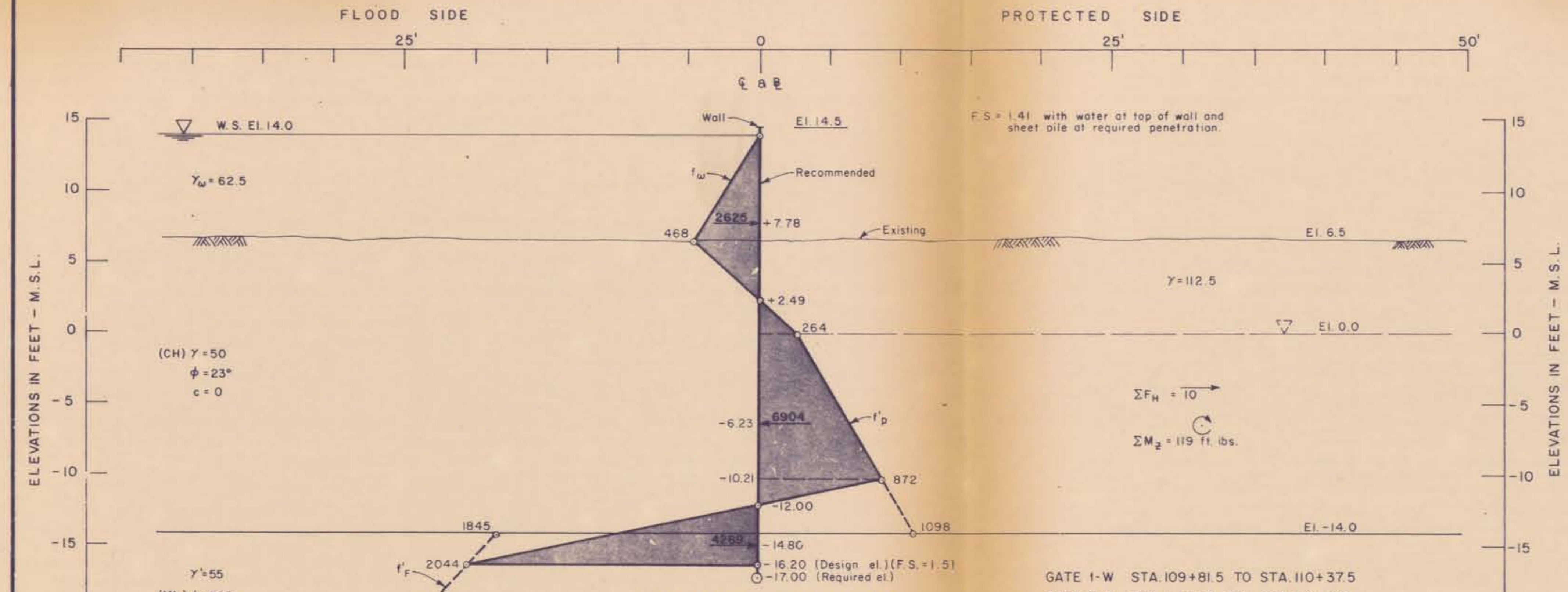
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
STA. 80+98 TO STA. 106+01

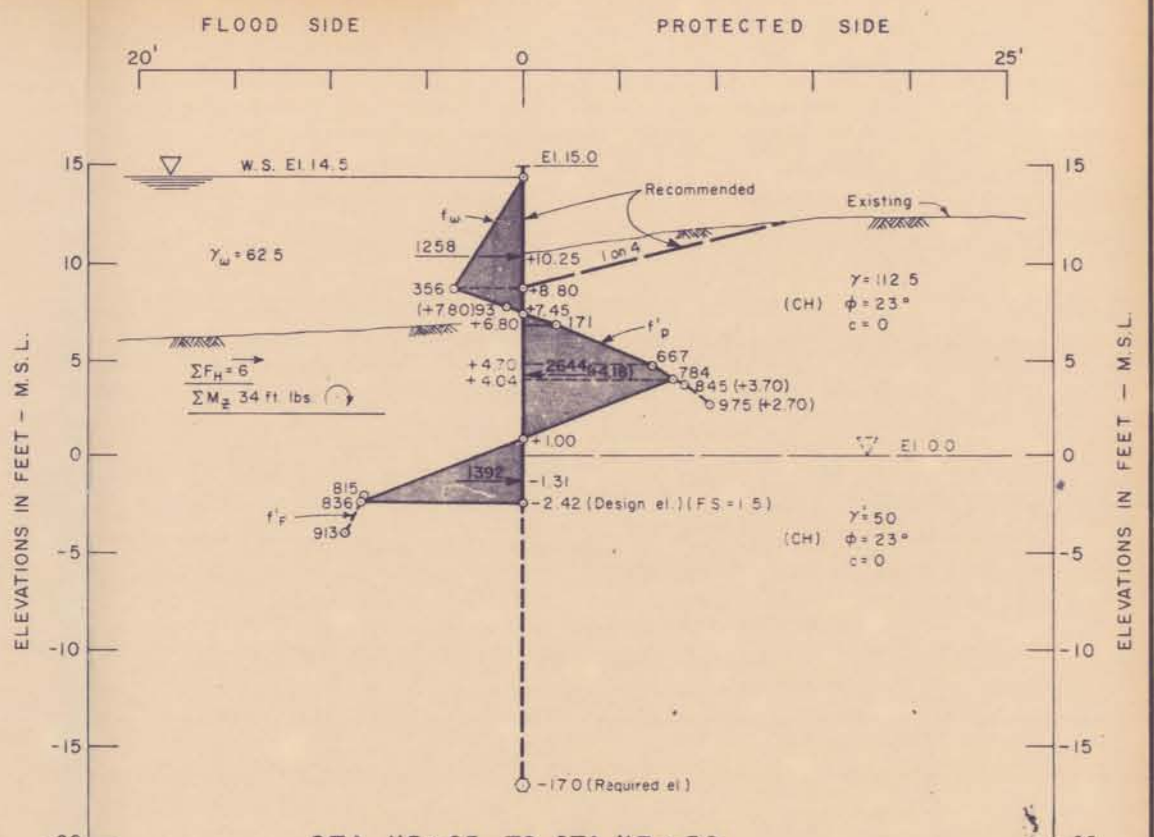
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

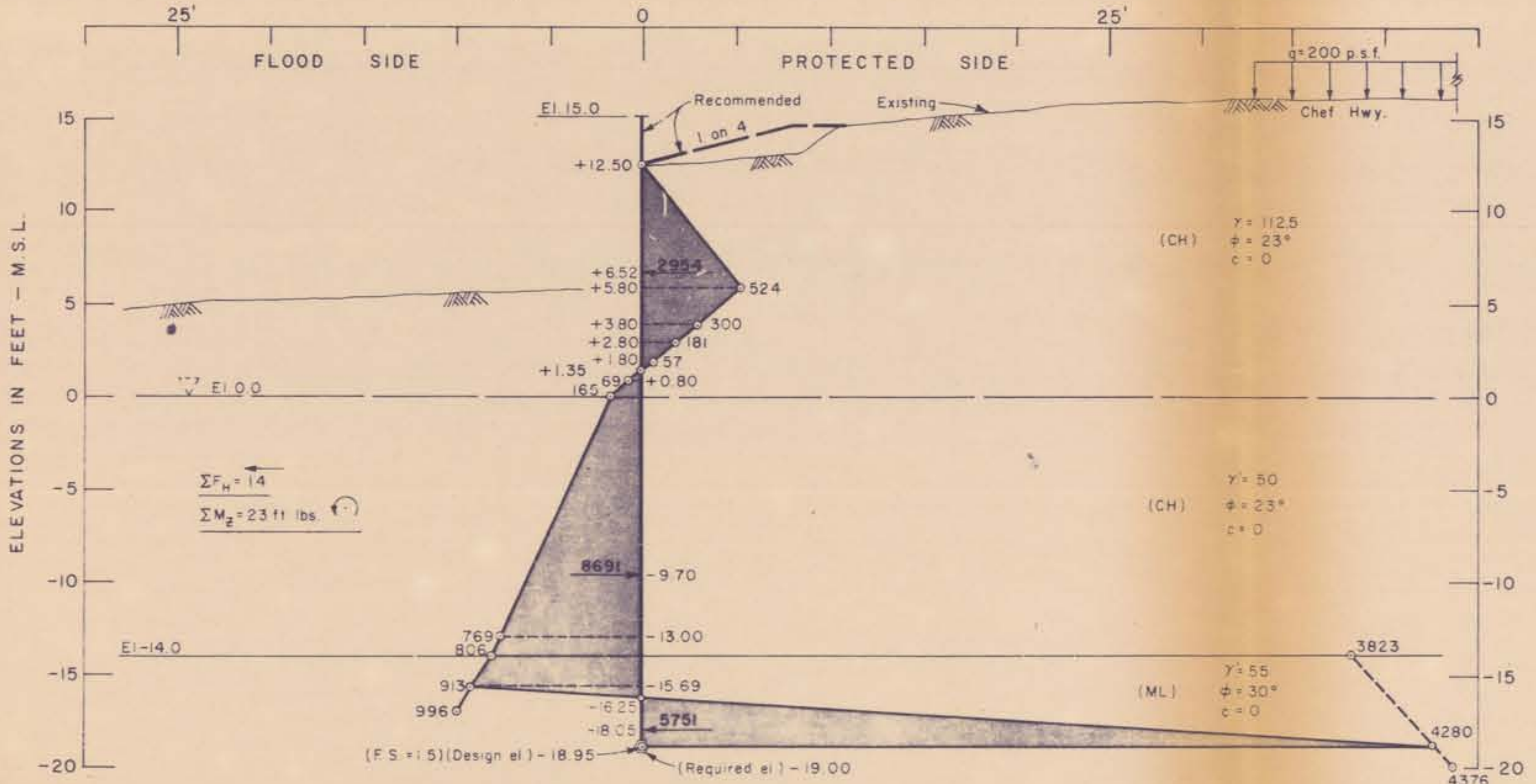


NET PRESSURE DIAGRAM
STA. 106+84.5 TO STA. 115+65

GATE 1-W STA. 109+81.5 TO STA. 110+37.5
GATE 2-W STA. 112+15 TO STA. 112+56

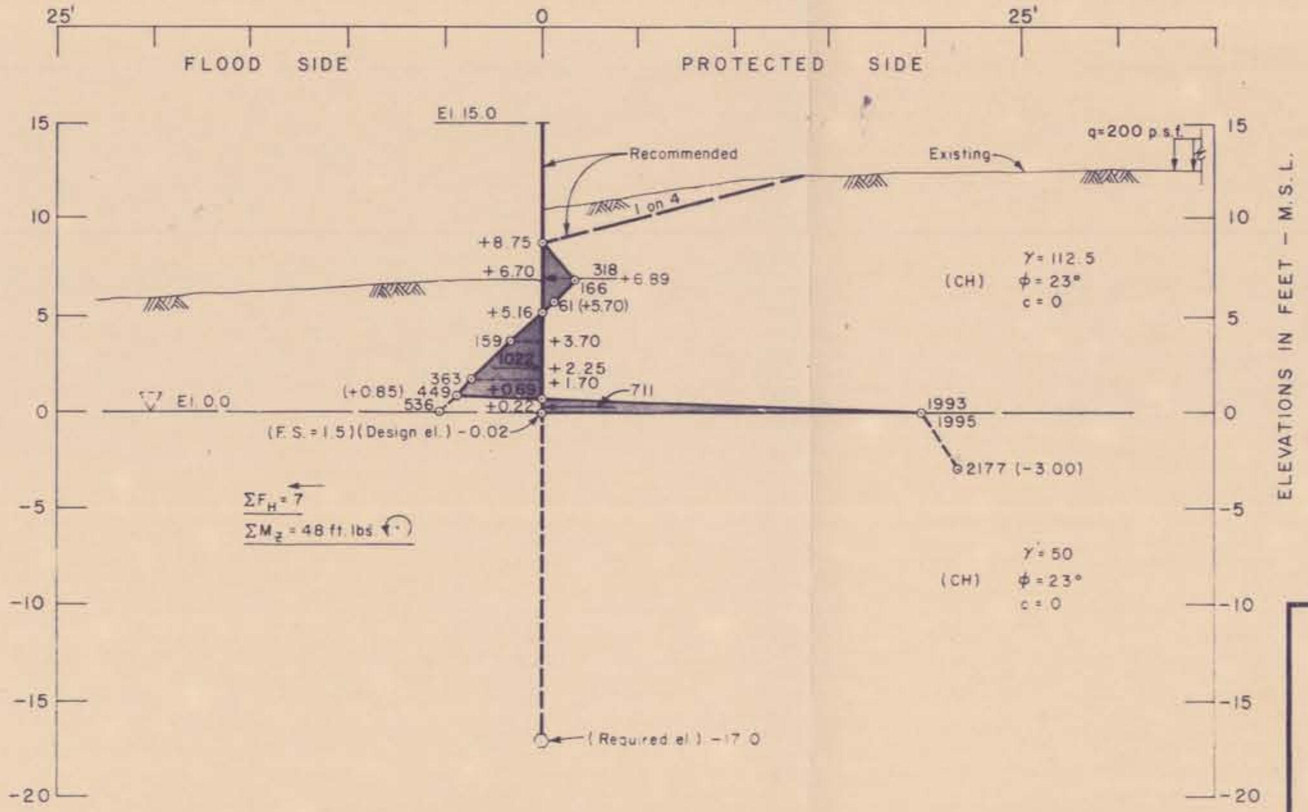


STA. 115+65 TO STA. 117+50



NET PRESSURE DIAGRAM
STA. 117+50 TO STA. 118+85

NOTE:
Highway approach sta. 118+85 to sta. 119+59.



NET PRESSURE DIAGRAM
STA. 115+65 TO STA. 117+50

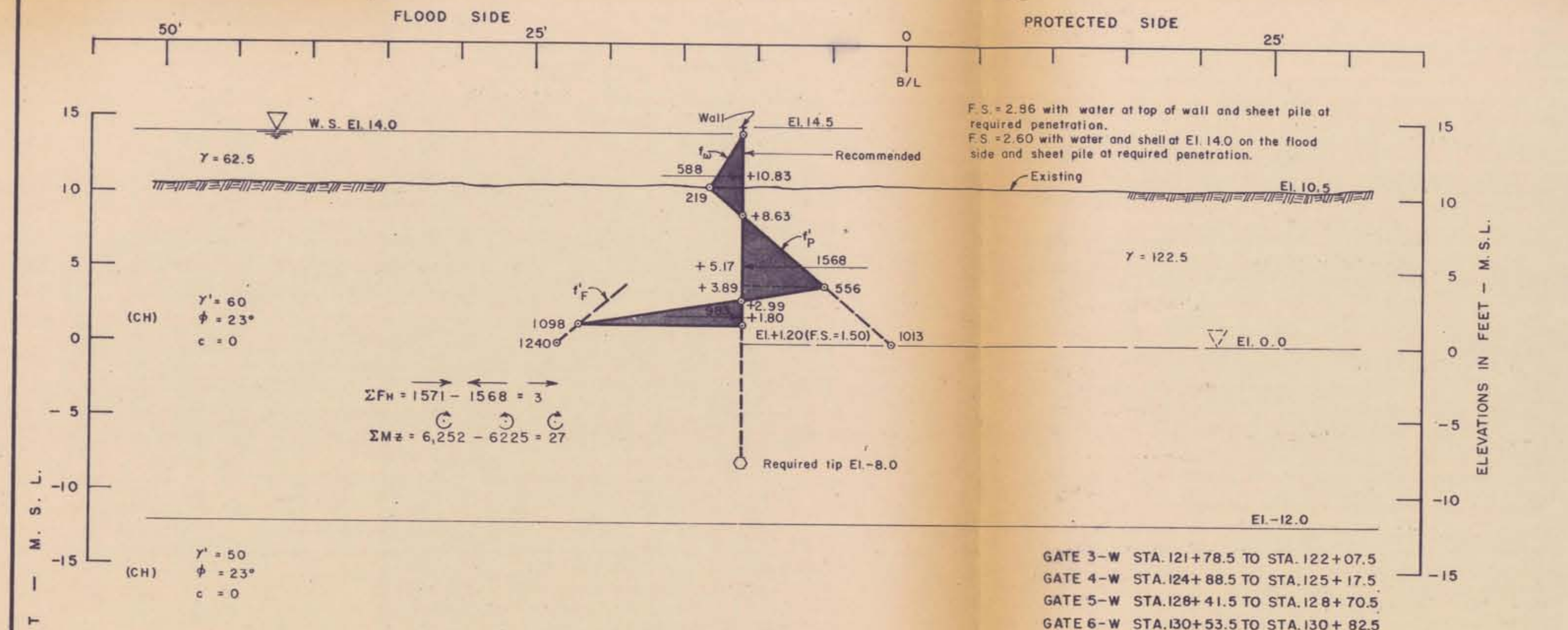
NOTE:
For general notes see plate III-12.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

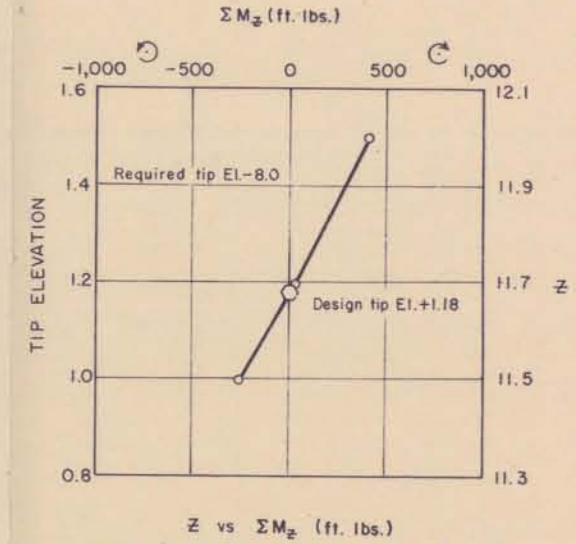
CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
LAKE PONTCHARTRAIN TO CHEF HIGHWAY
STA. 106+84.5 TO STA. 118+85

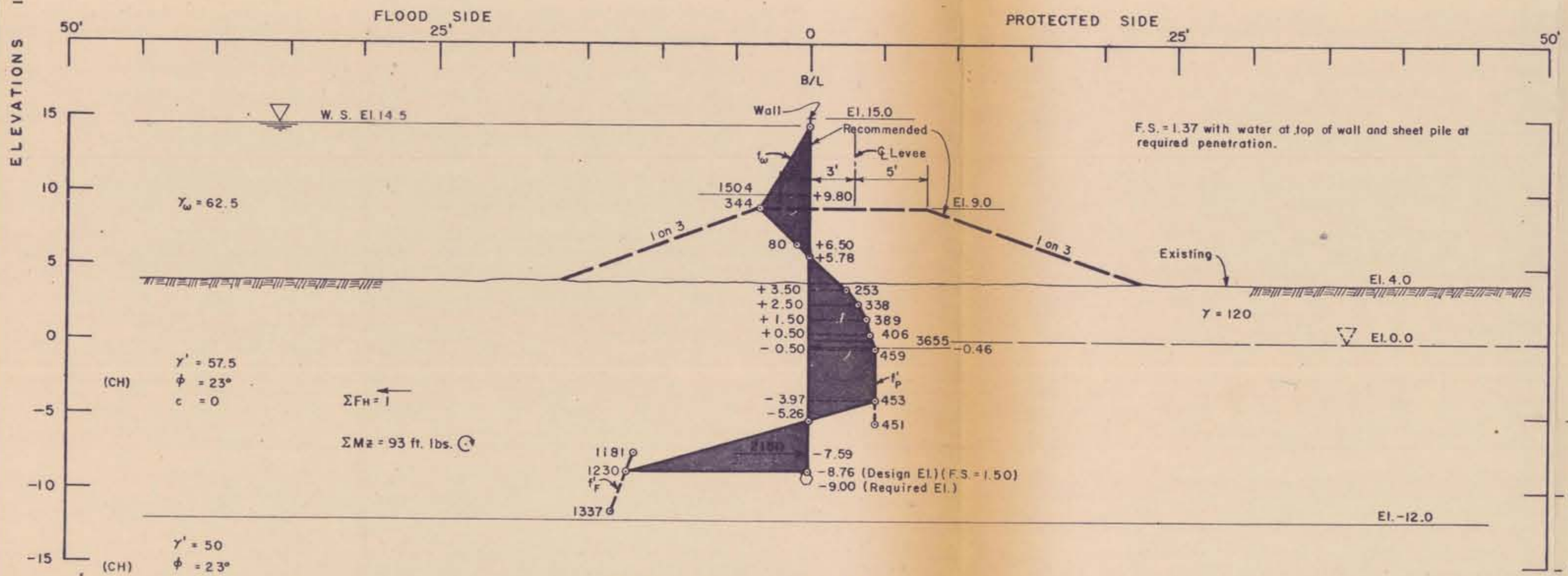
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111



NET PRESSURE DIAGRAM
STA. 119+59 TO STA. 132+00



STA. 119+59 TO STA. 132+00



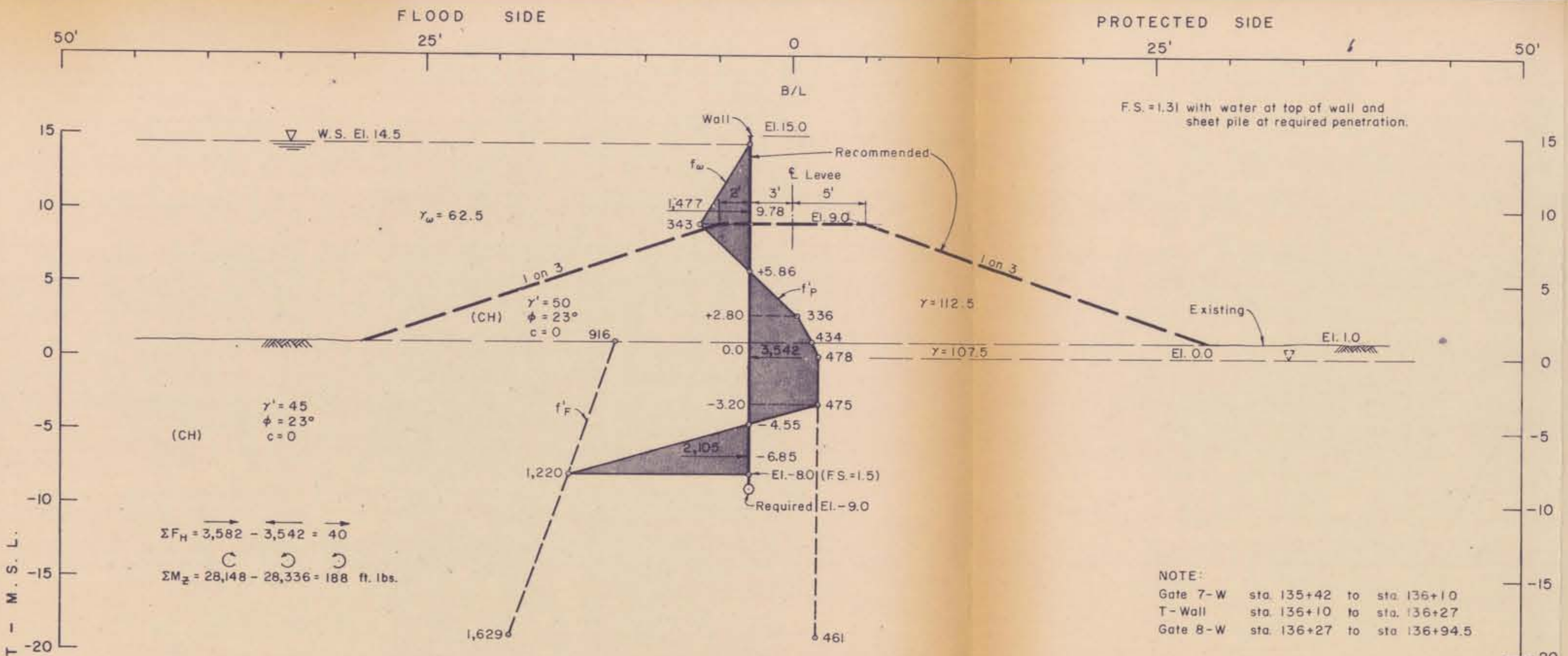
NET PRESSURE DIAGRAM
STA. 132+00 TO STA. 135+41

NOTE:
For general notes see plate III-12

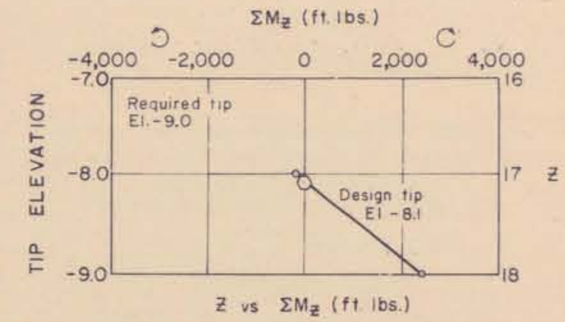
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 — GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE
(S) STABILITY

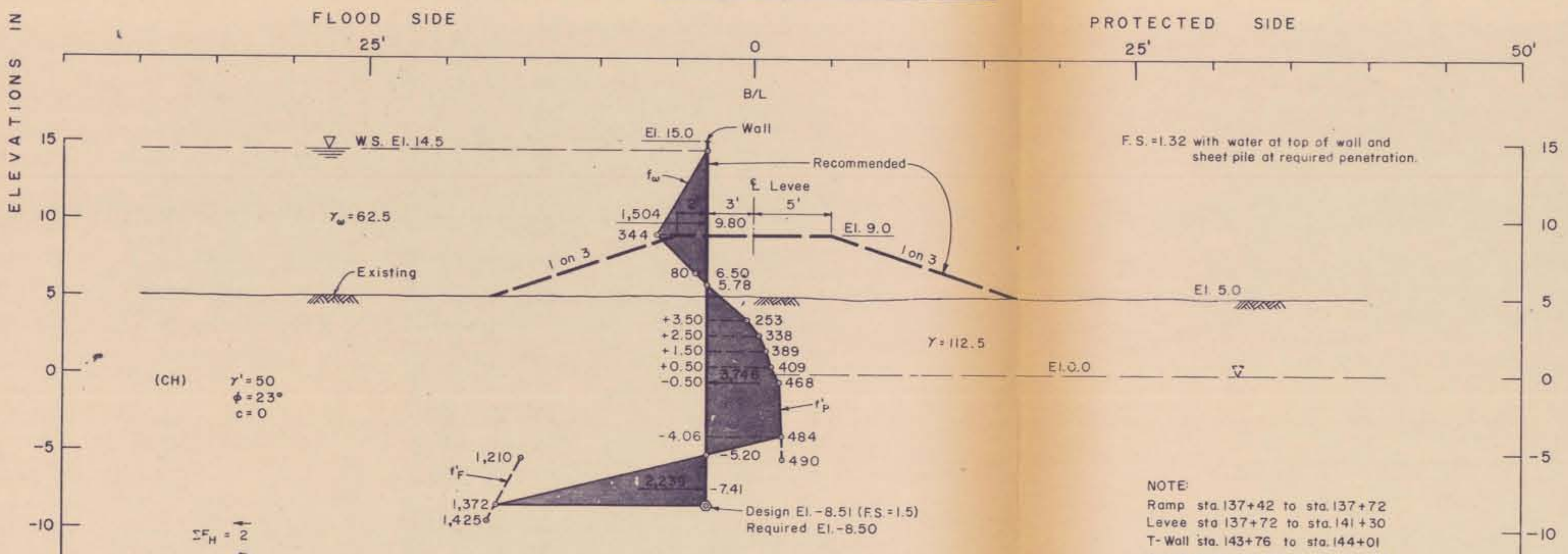
WEST LEVEE
CHEF HIGHWAY TO FLORIDA AVE.
STA. 119+59 TO STA. 135+41
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



NET PRESSURE DIAGRAM
STA. 136+94.5 TO STA. 137+42



STA. 136+94.5 TO STA. 137+42



NET PRESSURE DIAGRAM
STA. 141+20 TO STA. 143+76

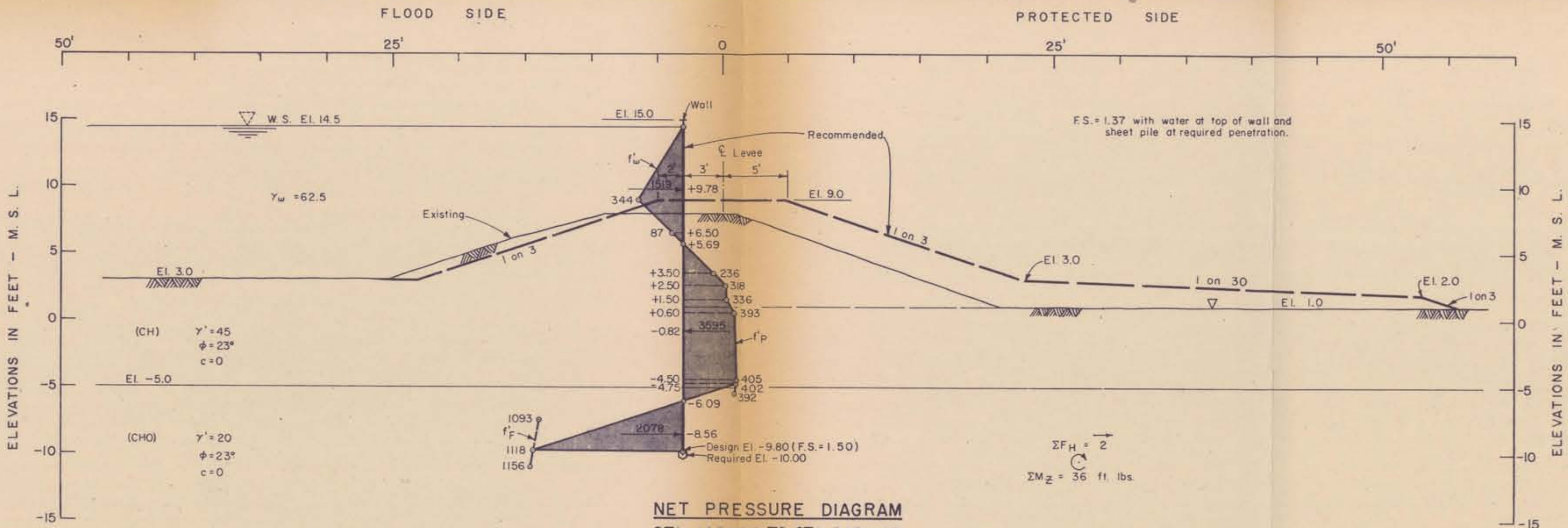
NOTE:
For general notes see plate III-12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

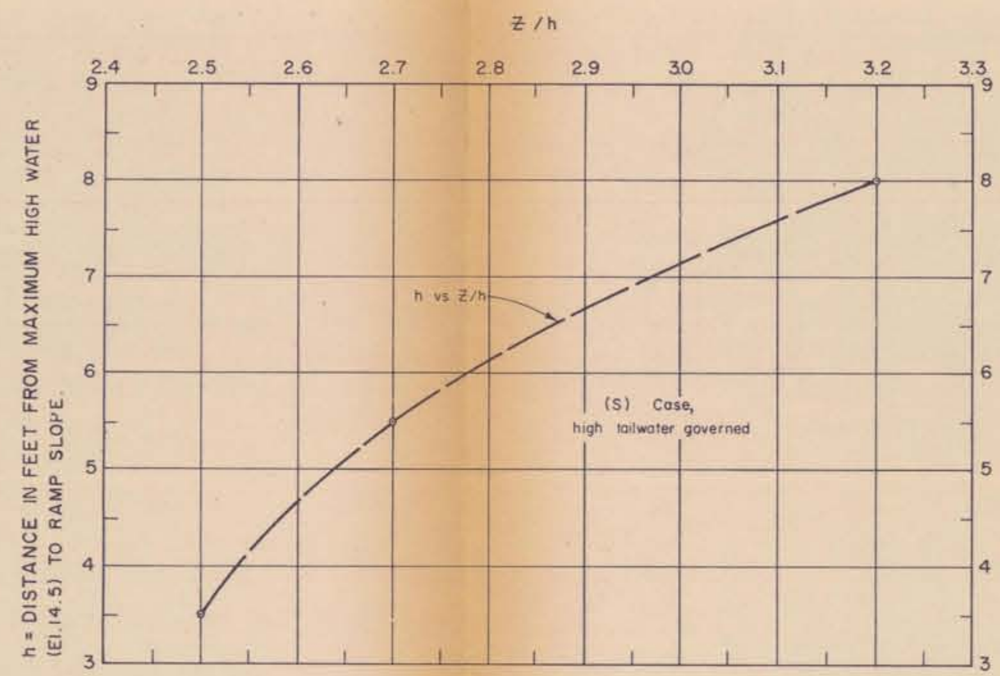
CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
CHEF HIGHWAY TO FLORIDA AVE.
STA. 136+94.5 TO STA. 143+76
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111

PLATE III-18



NET PRESSURE DIAGRAM
STA. 148+00 TO STA. 210+10



LEVEE TIE-IN TO RAMPS IN THE VICINITY OF ALMONASTER AND FLORIDA AVENUES

NOTE:

T-Wall	Sta. 210+10	to	Sta. 210+70
Gate 10-W	Sta. 210+70	to	Sta. 211+17
Ramp	Sta. 211+46	to	Sta. 211+81
Levee	Sta. 211+81	to	Sta. 226+44
I-Wall	Sta. 226+34	to	Sta. 226+60
T-Wall	Sta. 226+60	to	Sta. 235+27

NOTE:
For general notes see plate III-12

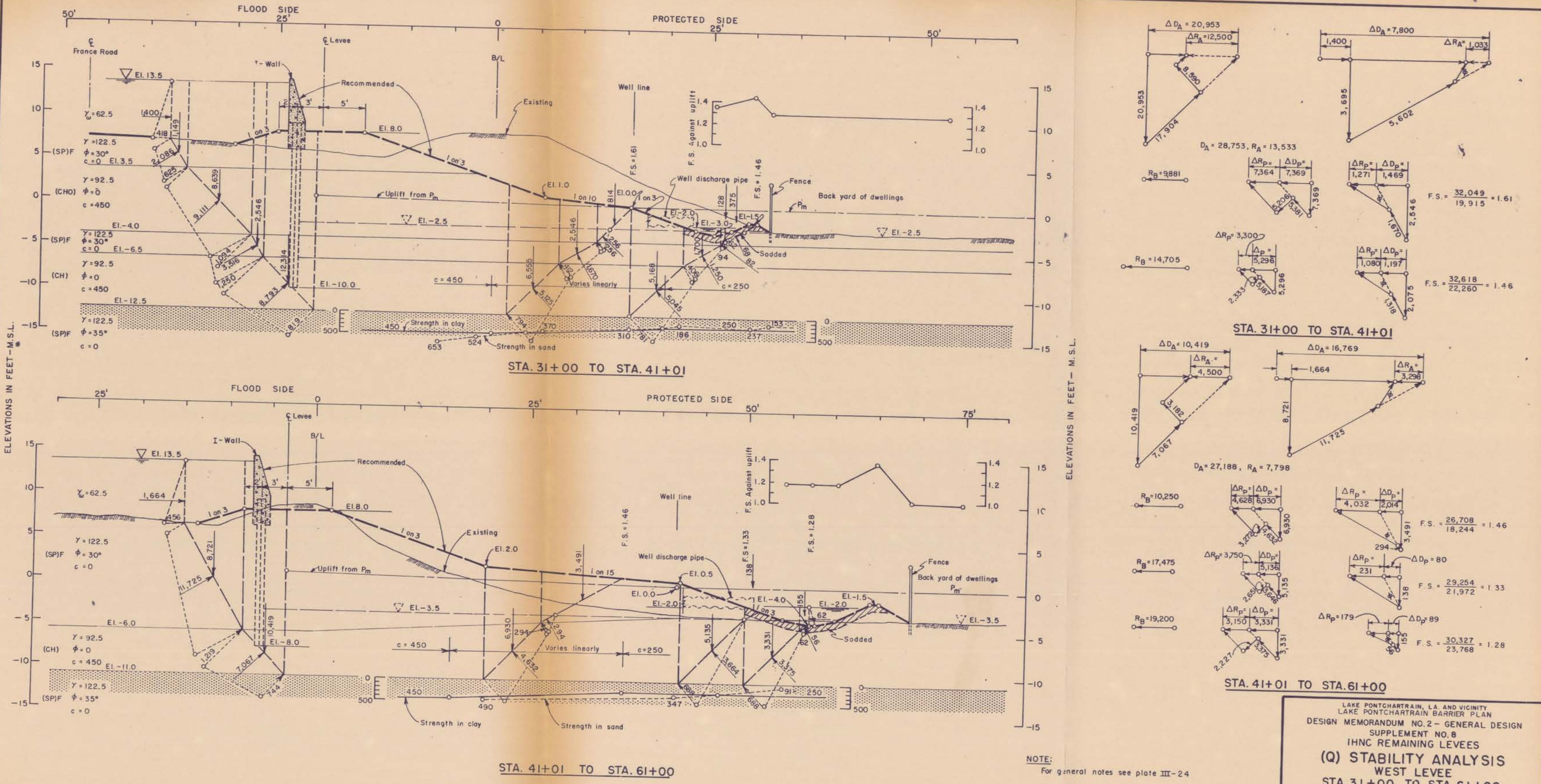
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
I. H. N. C. REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

WEST LEVEE
STA. 147+97 TO STA. 235+77

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

FEBRUARY 1968 FILE NO. H-2-24111



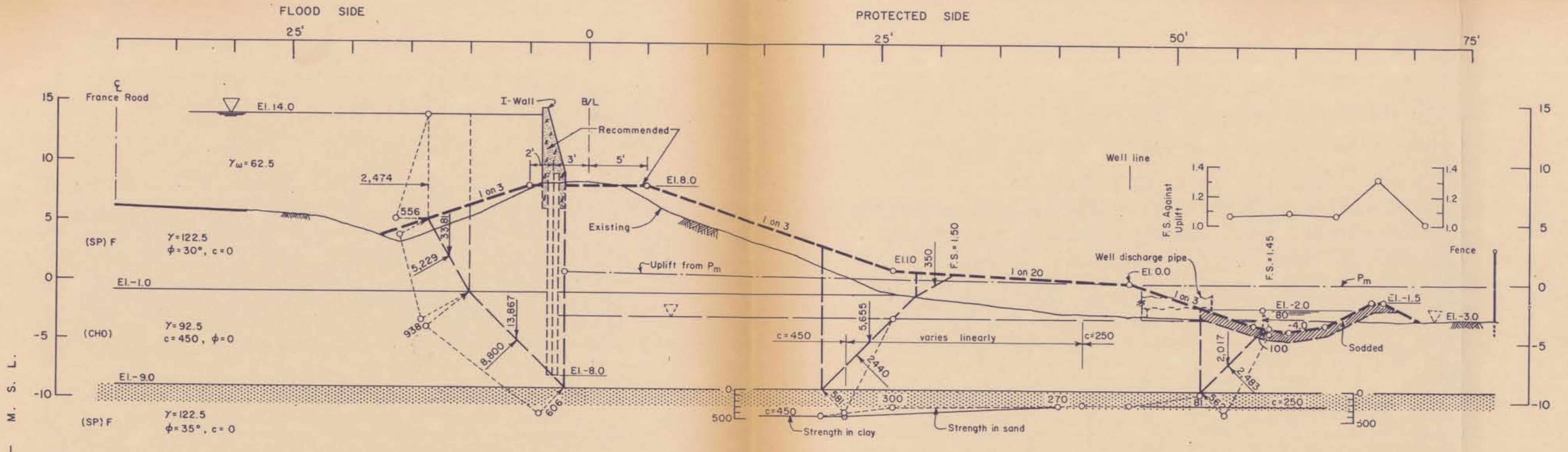
NOTE:
For general notes see plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

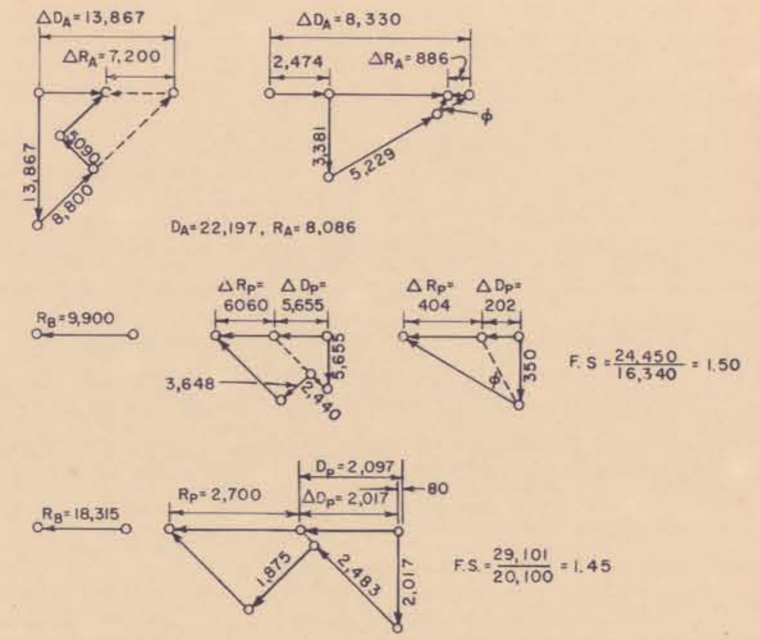
(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 31+00 TO STA. 61+00

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

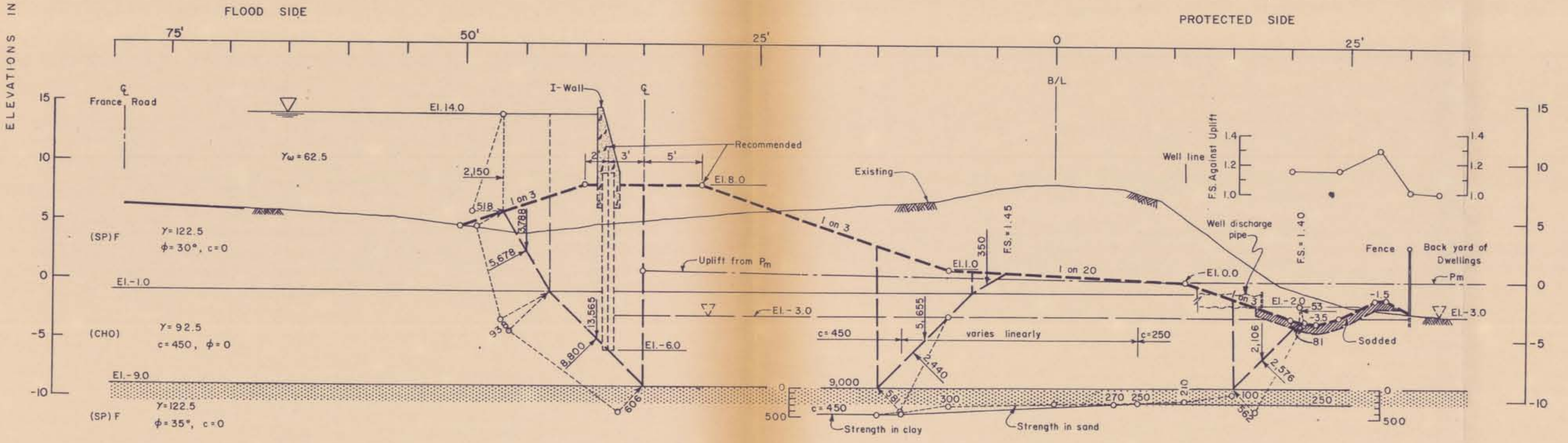
FEBRUARY 1968 FILE NO. H-2-24111



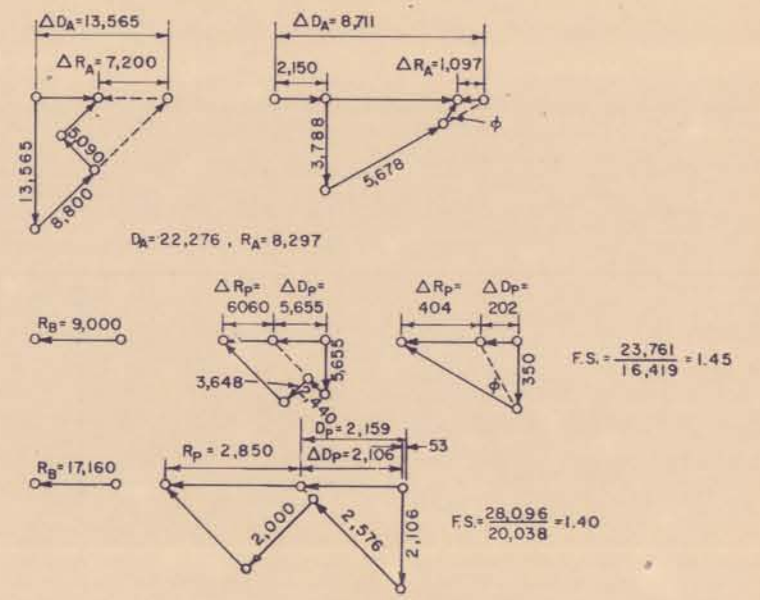
STA. 61+00 TO STA. 65+17



STA. 61+00 TO STA. 65+17



STA. 65+17 TO STA. 69+90



STA. 65+17 TO STA. 69+90

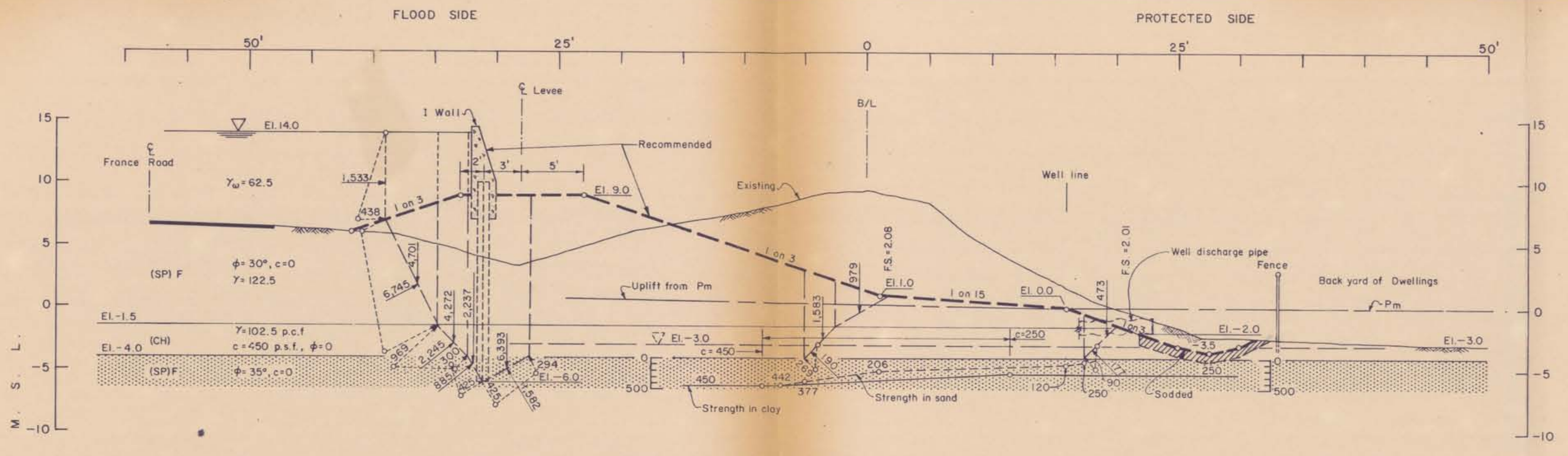
NOTE:
For general notes see plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

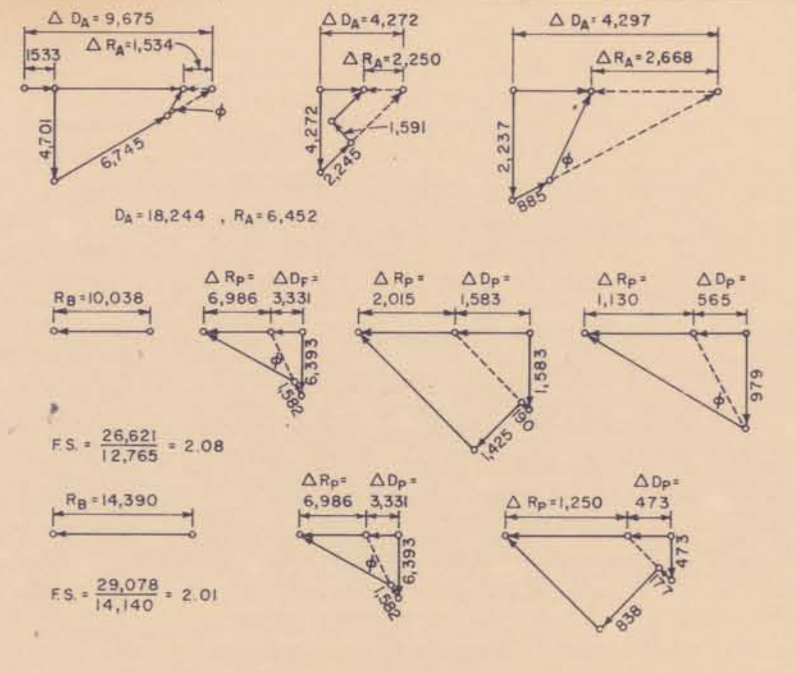
(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 61+00 TO STA. 69+90

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

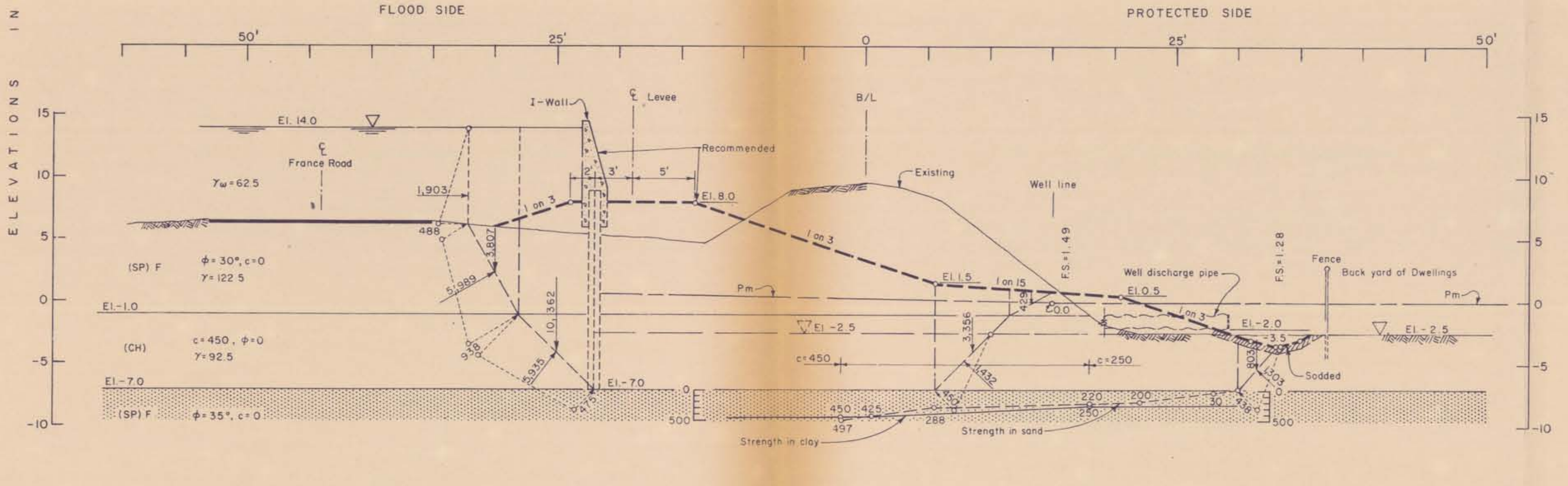
FEBRUARY 1968 FILE NO. H-2-24111



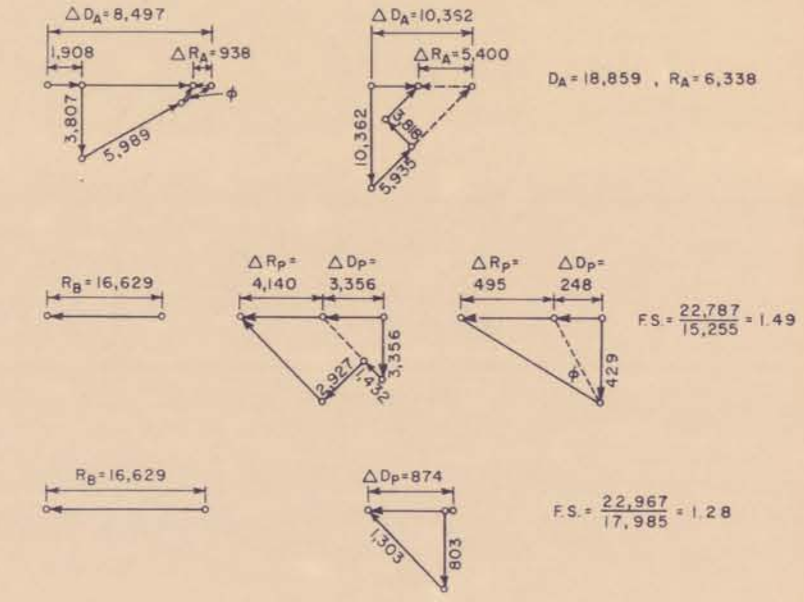
STA. 69+90 TO STA. 76+96



STA. 69 + 90 TO STA. 76 + 96



STA. 76+96 TO STA. 77+97



STA. 76 + 96 TO STA. 77 + 97

NOTE:
For general notes see plate III - 24

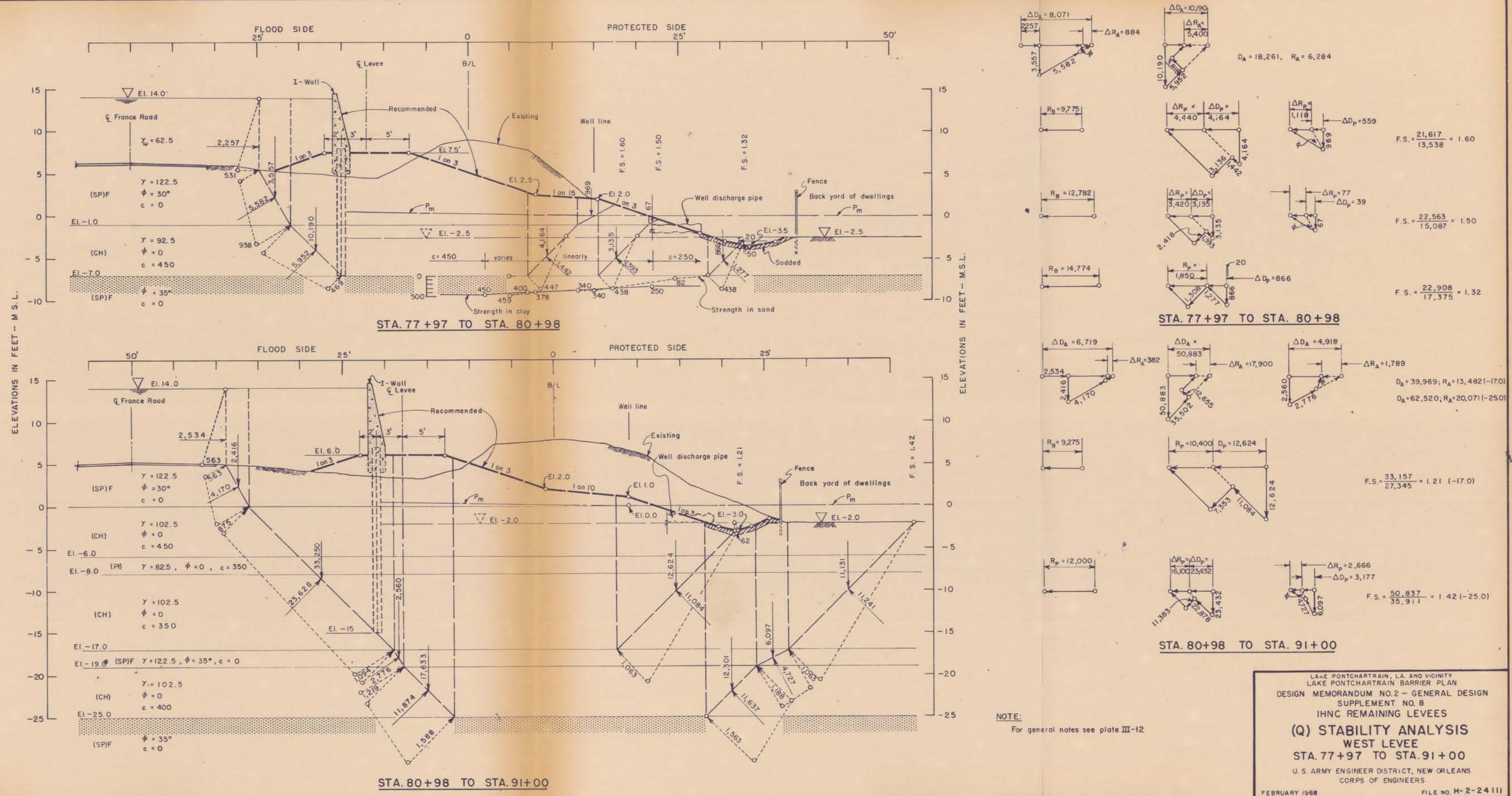
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 69+90 TO STA. 77+97

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE III - 22



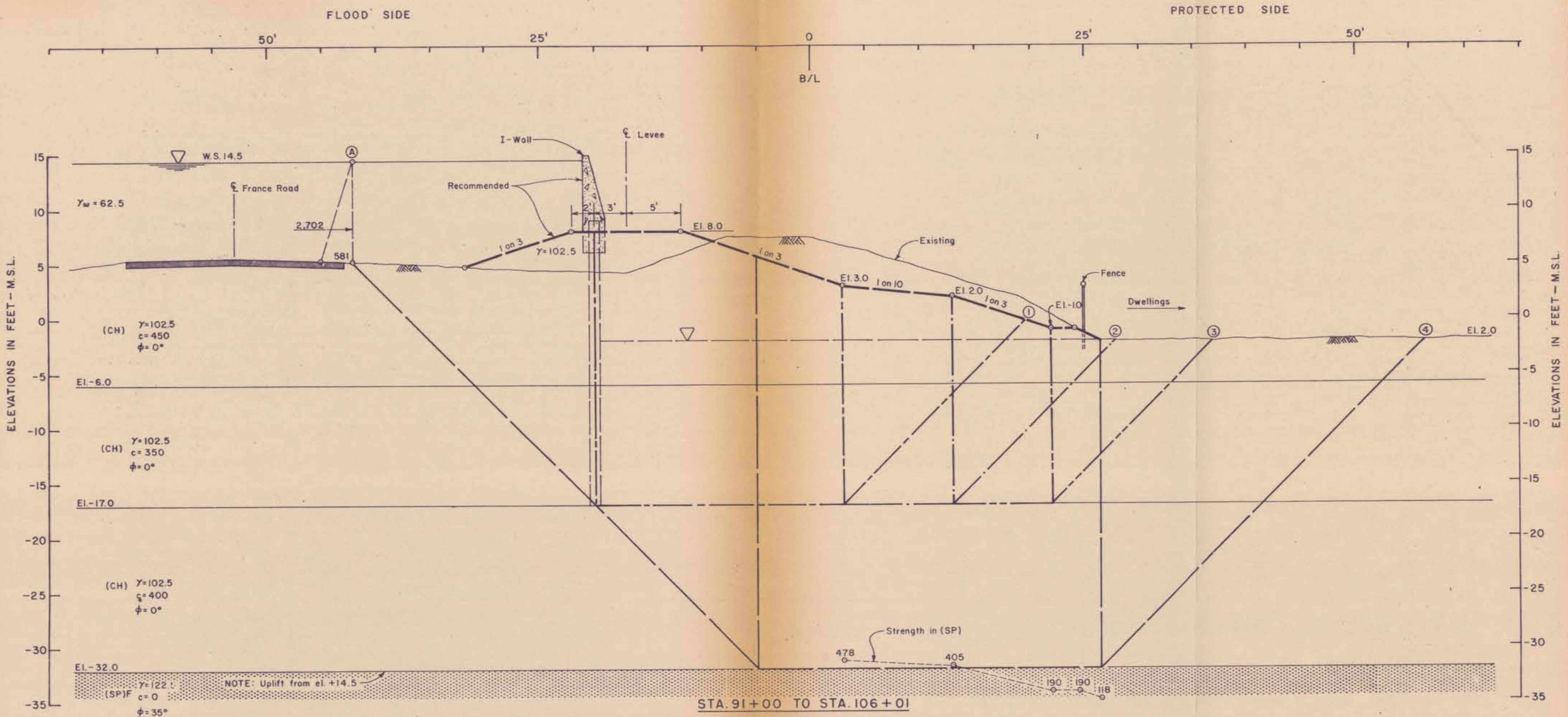
NOTE:
For general notes see plate III-12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 77+97 TO STA. 91+00

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

FEBRUARY 1968 FILE NO. H-2-24111



STA. 91+00 TO STA. 106+01

SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	$\Sigma R/\Sigma D$
A	1	-17.0	41,298	18,173	23,125	17,780	8,050	12,830	38,660	1.67
	2			14,196	27,102		11,550	11,300	40,630	1.50
	3			11,890	29.408		14,700	11,300	43,780	1.49
A	4	-32.0	90,430	46,125	44,305	29,780	10,691	23,300	63,771	1.44

GENERAL NOTES

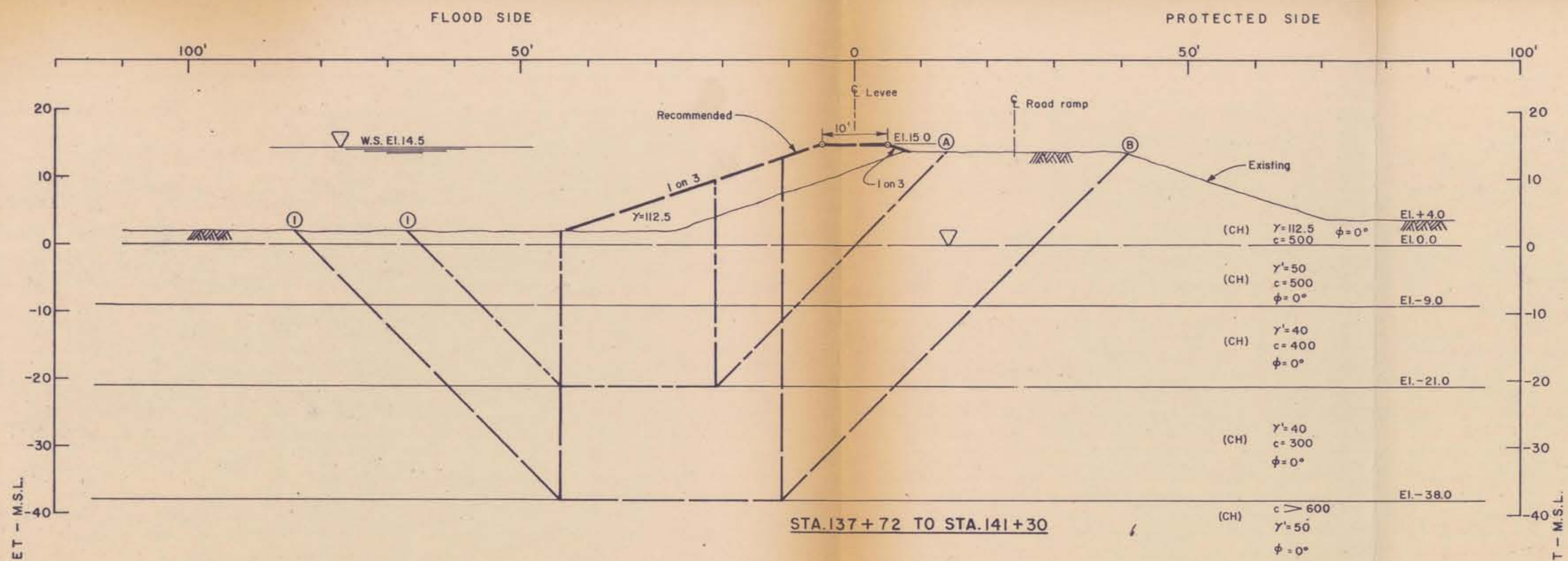
(Q) – Unconsolidated – undrained shear strength in lbs. per sq. ft.
(γ) – Unit weight of soil water system in lbs. per cu. ft.
(γ') – Submerged unit weight in lbs. per cu. ft.
(ϕ) – Angle of internal friction in degrees.
$\bar{D}$ – Horizontal driving force in lbs.
R – Horizontal resisting force in lbs.
F.S. – Factor of safety with respect to (Q) shear strength.
U.E. – 5" diameter undisturbed soil boring.
γ_ω – Unit weight of water in p.c.f.
Stations are referenced to centerline of wall.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

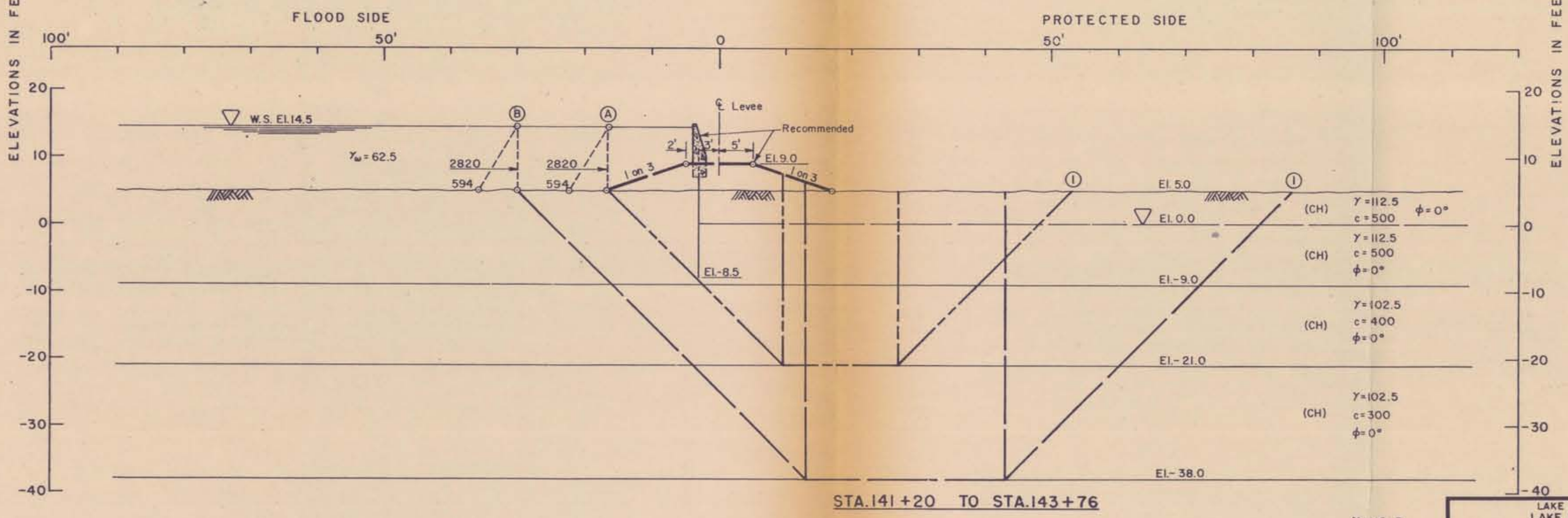
(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 91+00 TO STA. 106+01

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

FEBRUARY 1968 FILE NO. H-2-24111



STA.137+72 TO STA.141+30



STA.141+20 TO STA.143+76

STATION	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	$\Sigma R/\Sigma D$
137+72 TO 141+30	A	1	-21.0	52,706	15,255	37,451	32,600	6,900	20,600	60,100	1.60
	B	1	-38.0	103,832	40,695	63,137	42,100	9,900	30,800	82,800	1.31
141+20 TO 143+76	A	1	-21.0	55,561	37,305	18,256	23,600	5,250	23,600	52,450	2.87
	B	1	-38.0	125,311	99,801	25,510	33,800	9,000	33,800	76,600	3.00

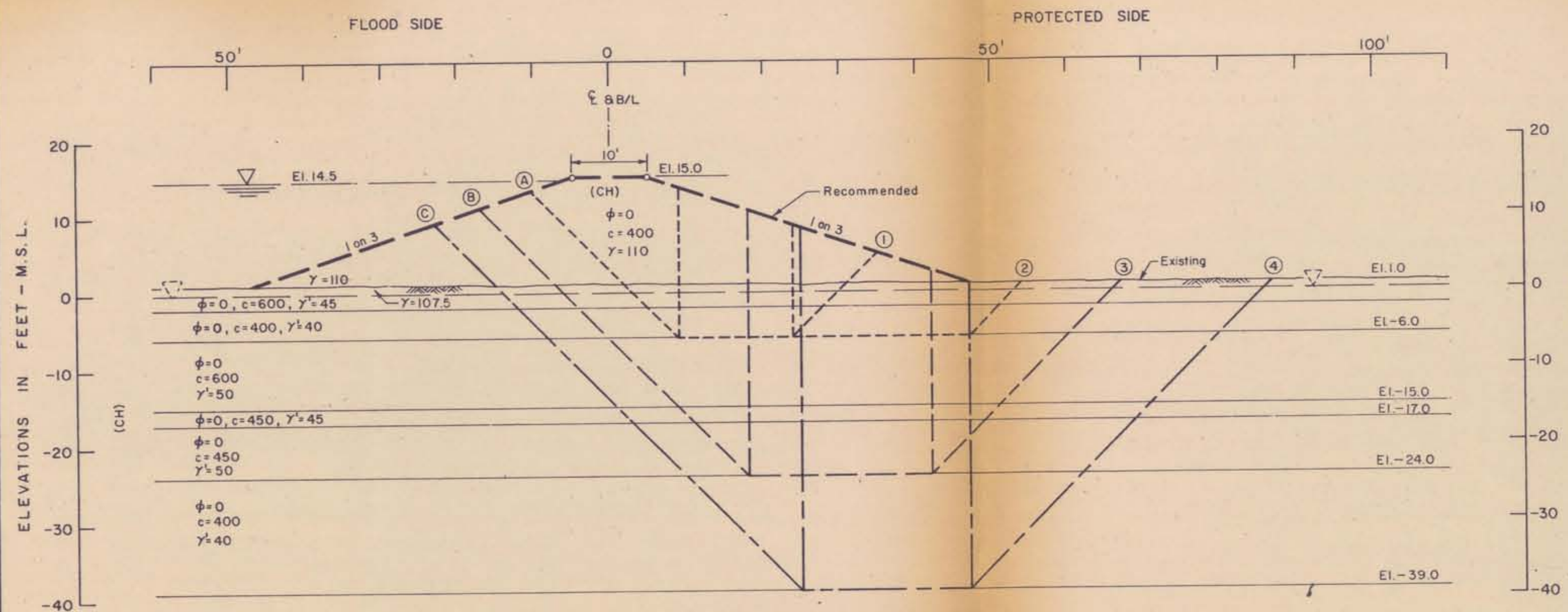
NOTE: For General Notes see Plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
WEST LEVEE
STA.137+72 TO STA.143+76

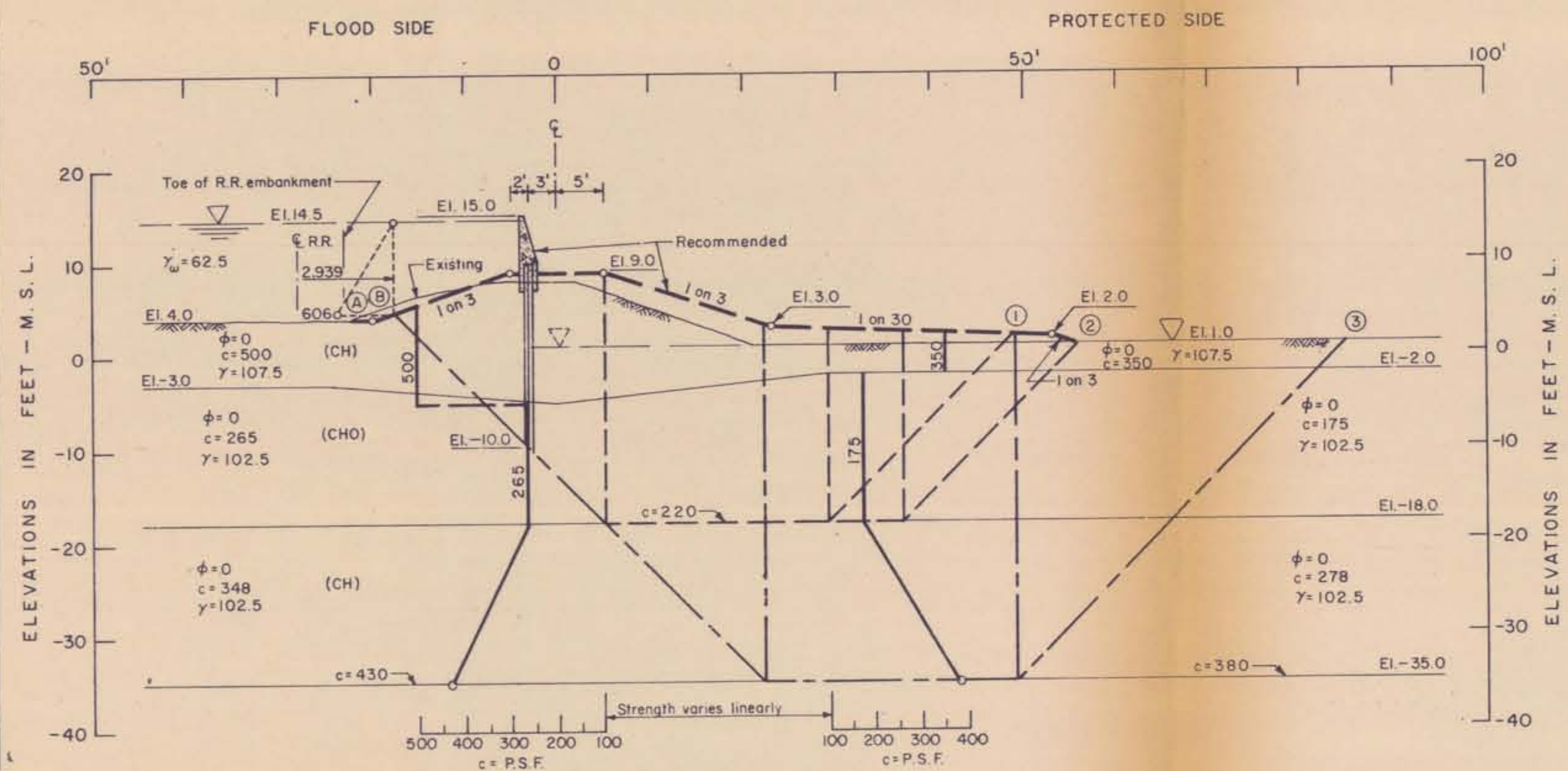
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111



STA.145+76 TO STA.148+28

NOTE:
For general notes see plate III-24



STA.148+00 TO 210+10

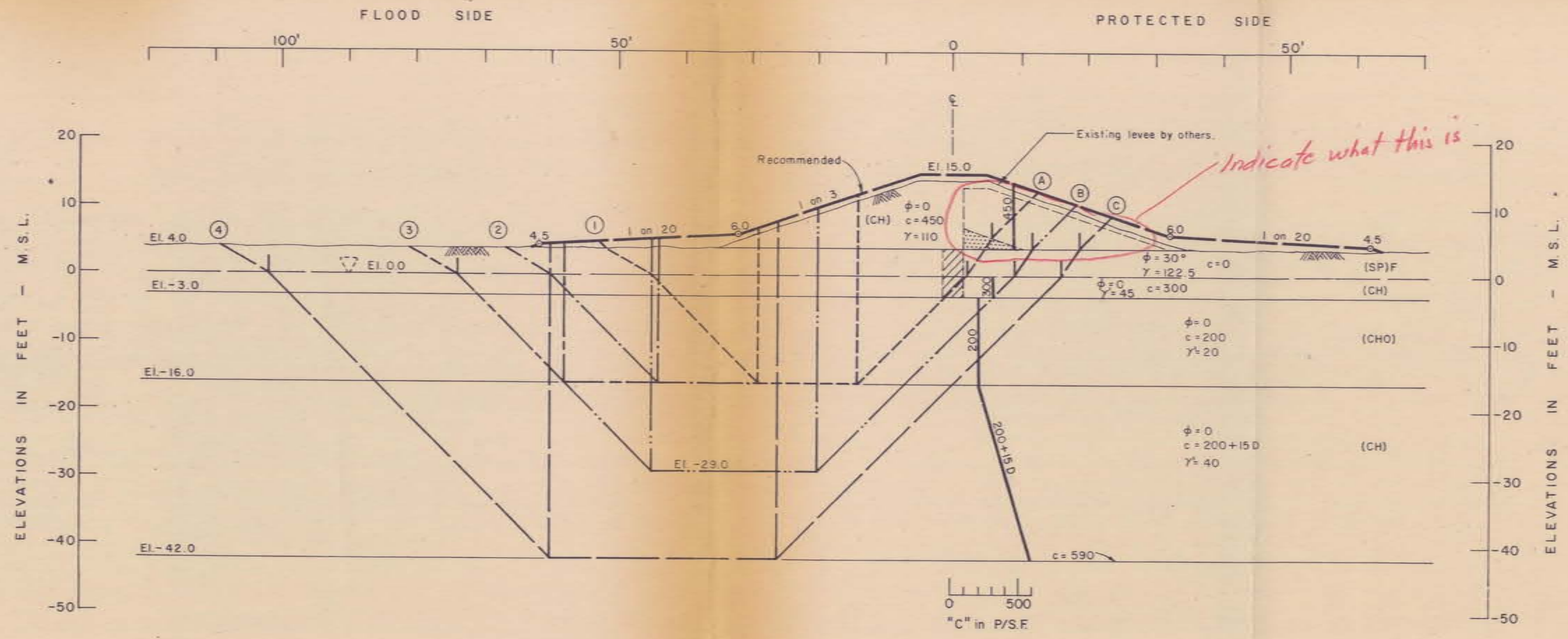
LEVEE FEATURE	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	ΣR/ΣD
STA. 145+76 TO 148+10	A	1	-6.0	22,085	7,700	14,385	16.400	6,000	10,000	32,400	2.25
		2			1,485	20,600		15,200	6,800	38,400	1.86
	B	3	-24.0	60,295	16,569	43,726	33,700	10,800	25,700	70,200	1.61
	C	4	-39.0	100,071	39,255	60,816	44,100	8,800	37,700	90,600	1.49
STA. 147+97 TO 209+90	A	1	-18.0	44,368	21,769	22,599	16,288	5,280	8,435	30,003	1.33
		2			21,438	22.930		6,680	7,700	30,668	1.34
	B	3	-35.0	101,949	66,937	35,012	27,270	10,309	17,152	54,731	1.56

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
WEST LEVEE
STA.145+76 TO STA.210+10

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

FEBRUARY 1968 FILE NO. H-2-24111



STA. 211+81 TO STA. 226+44

LEVEE STATION	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	
211+81 TO 226+44	A	1	-16	40,419	16,240	24,179	18,758	3,000	10,853	32,611	1.35
		2			14,314	26,105		6,000	9,161	33,919	1.30
		3			12,772	27,647		8,800	8,957	36,515	1.32
	B	3	-29	65,437	29,105	36,332	24,119	9,875	16,705	50,699	1.40
	C	4	-42	94,436	49,115	45,321	34,647	20,060	29,497	84,204	1.86

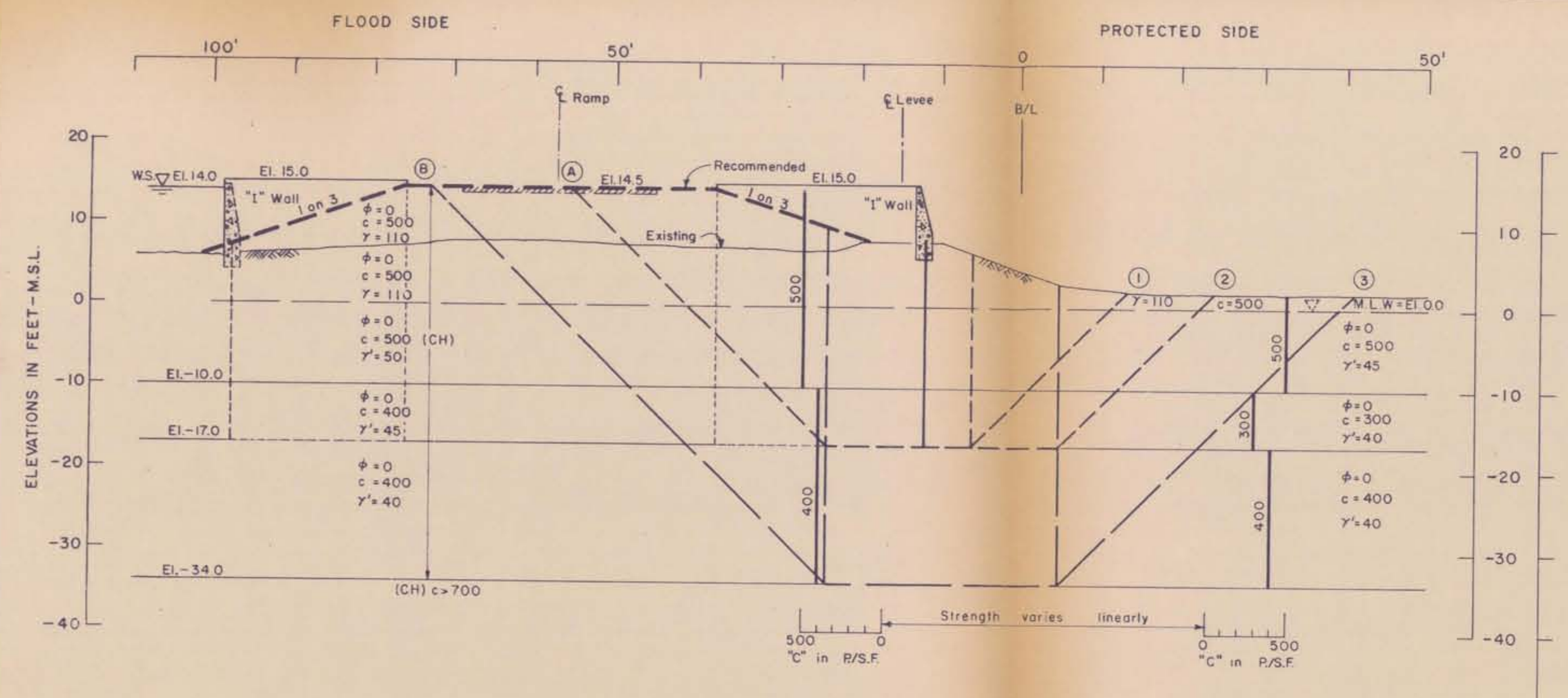
NOTE:
For general notes see plate III - 24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

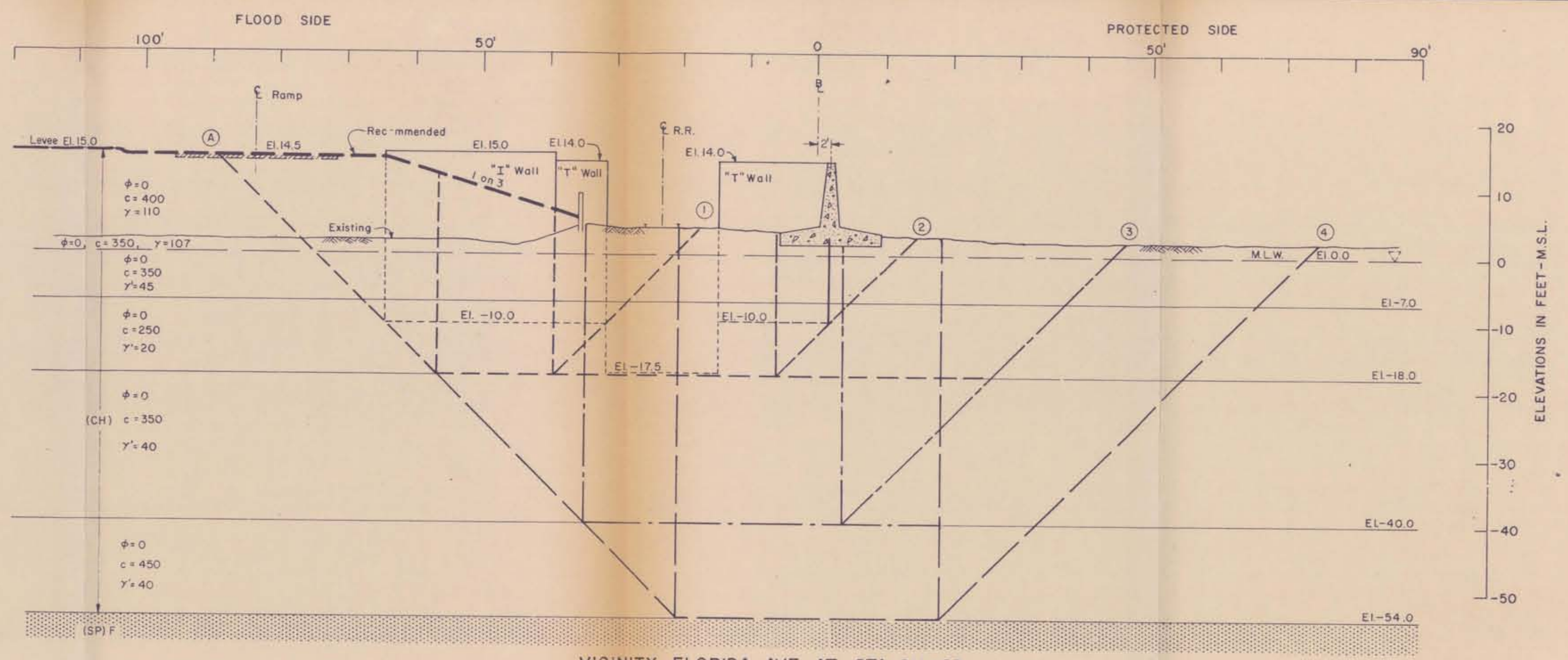
(Q) STABILITY ANALYSIS
WEST LEVEE
STA. 211+81 TO STA. 226+44

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

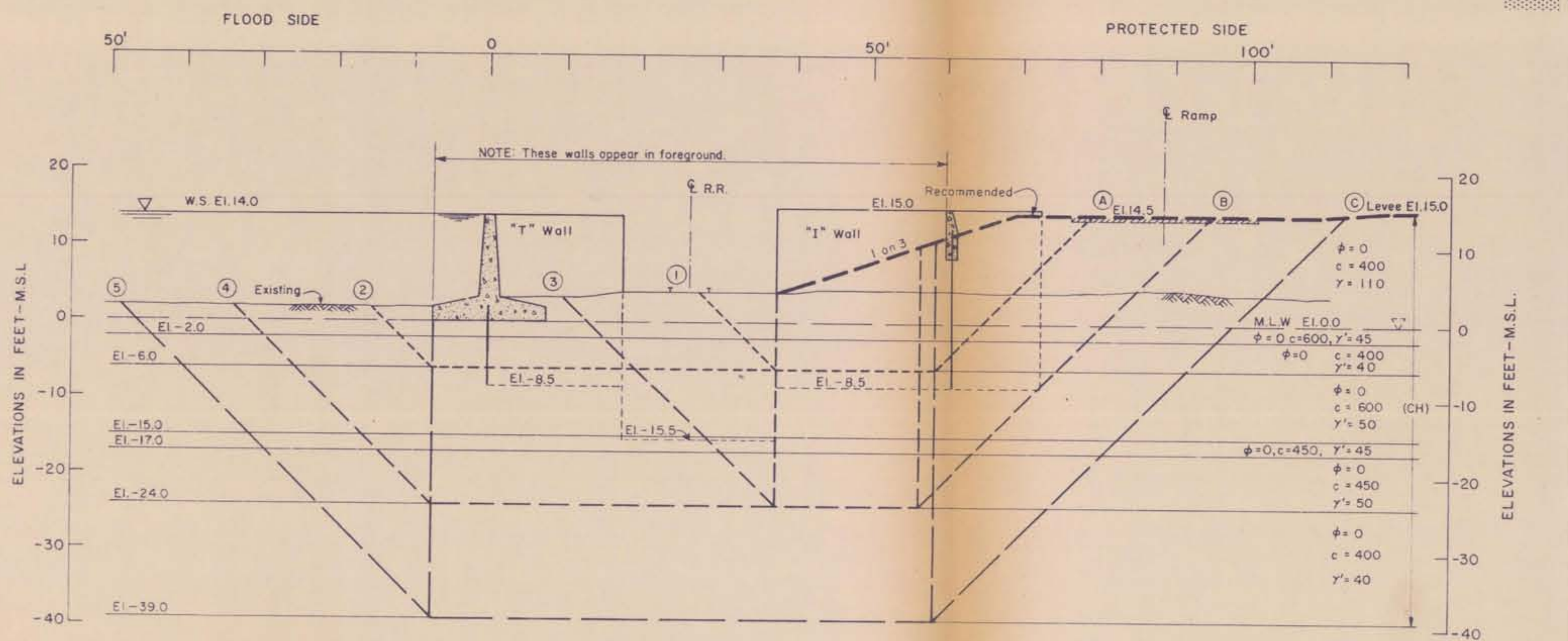
FEBRUARY 1968 FILE NO. H-2-24111



VICINITY CHEF HWY. AT STA. 106+40.5



VICINITY FLORIDA AVE. AT STA. 211+63



VICINITY L&N R.R. AT STA. 145+57

STABILITY CALCULATIONS

RAMP	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		El.	D_A	D_P	ΣD	R_A	R_B	R_P	ΣR	
STA. 106+40.5	A	1	-17	42,303	15,243	27,060	30,100	7,048	17,294	54,442	2.01
		2			11,613	30,690		10,995	16,708	57,803	1.88
	B	3	-34	88,990	34,270	54,720	43,700	11,600	29,800	85,100	1.56
STA. 211+63	A	1	-18	44,824	14,739	30,085	21,800	4,250	13,800	39,850	1.32
		2			12,264	32,560		12,750	12,360	46,910	1.44
	A	3	-40	87,482	37,037	50,445	37,200	13,650	27,200	78,050	1.55
	A	4	-54	117,288	62,728	54,560	49,800	17,550	39,800	107,150	1.96
STA. 145+57	A	1	-6	19,869	3,850	16,019	17,200	8,400	8,400	34,000	2.12
		2			2,310	17,559		26,400	7,200	50,800	2.89
	B	3	-24	60,274	23,204	37,070	36,100	7,600	27,300	71,000	1.92
		4			18,790	41,484		25,600	26,100	97,800	2.12
	C	5	-39	106,602	43,690	62,912	48,100	26,400	38,100	112,600	1.79

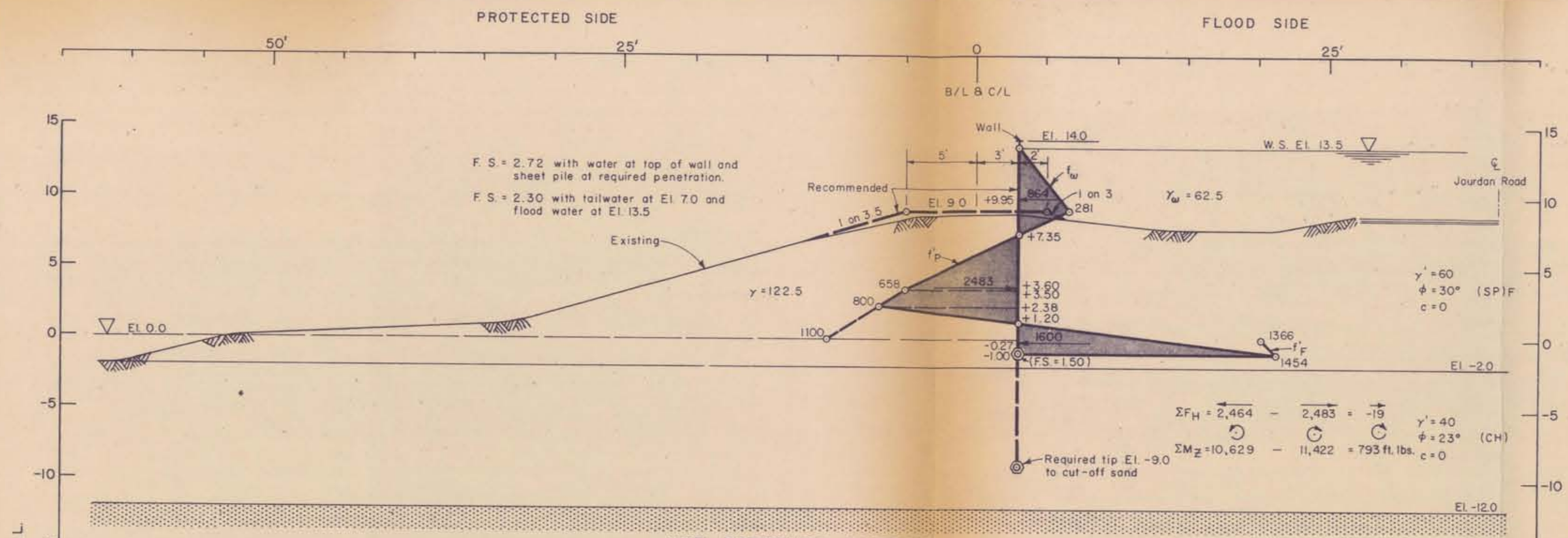
NOTE:
For general notes see plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

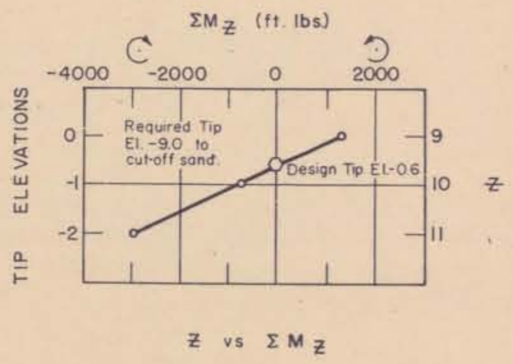
(Q) STABILITY ANALYSIS
WEST LEVEE
FRANCE ROAD RAMPS

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

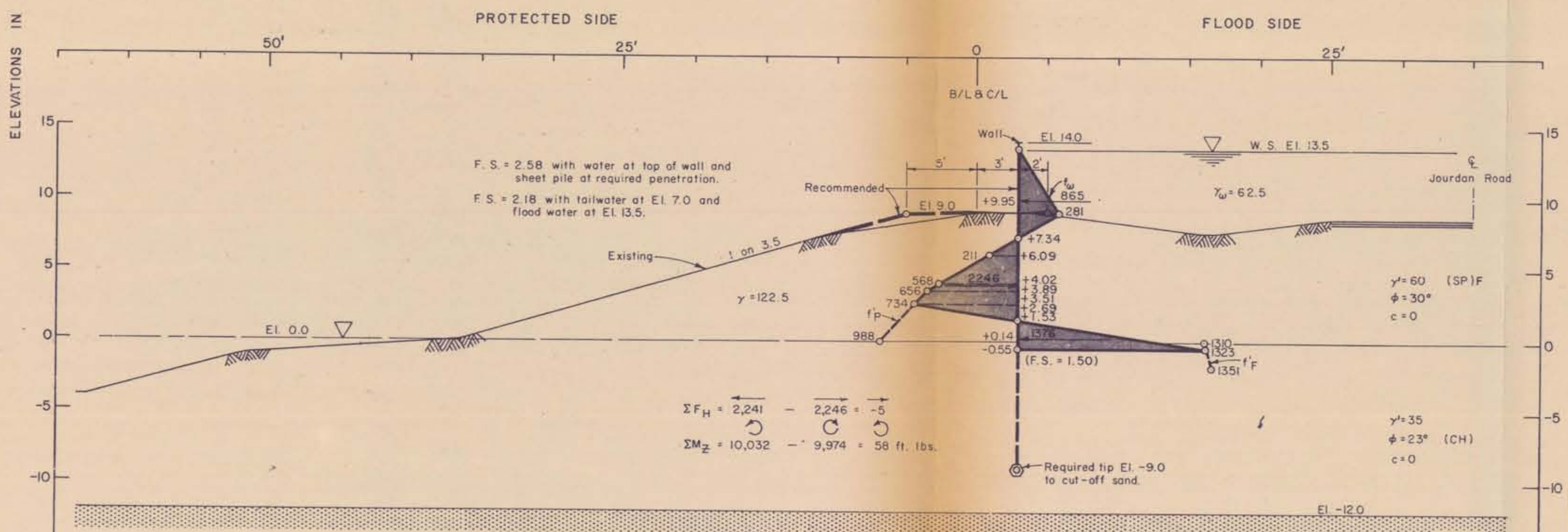
FEBRUARY 1968 FILE NO. H-2-24111



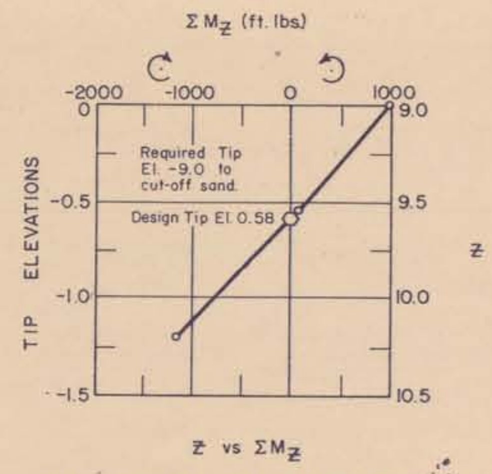
NET PRESSURE DIAGRAM
STA. 34+00 TO STA. 37+75



STA. 34+00 TO STA. 37+75



NET PRESSURE DIAGRAM
STA. 37+75 TO STA. 47+00



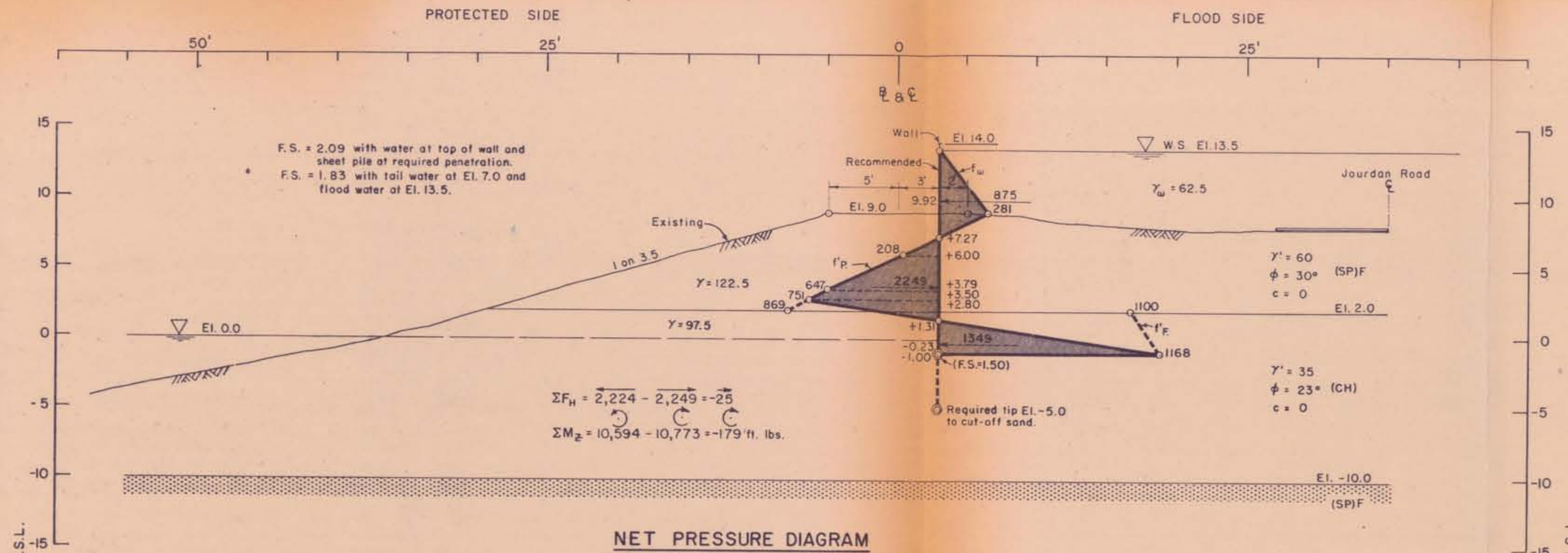
STA. 37+75 TO STA. 47+00

NOTE:
For general notes see plate III-12

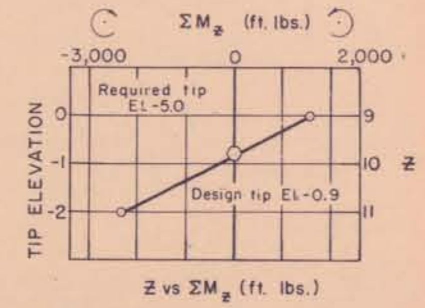
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

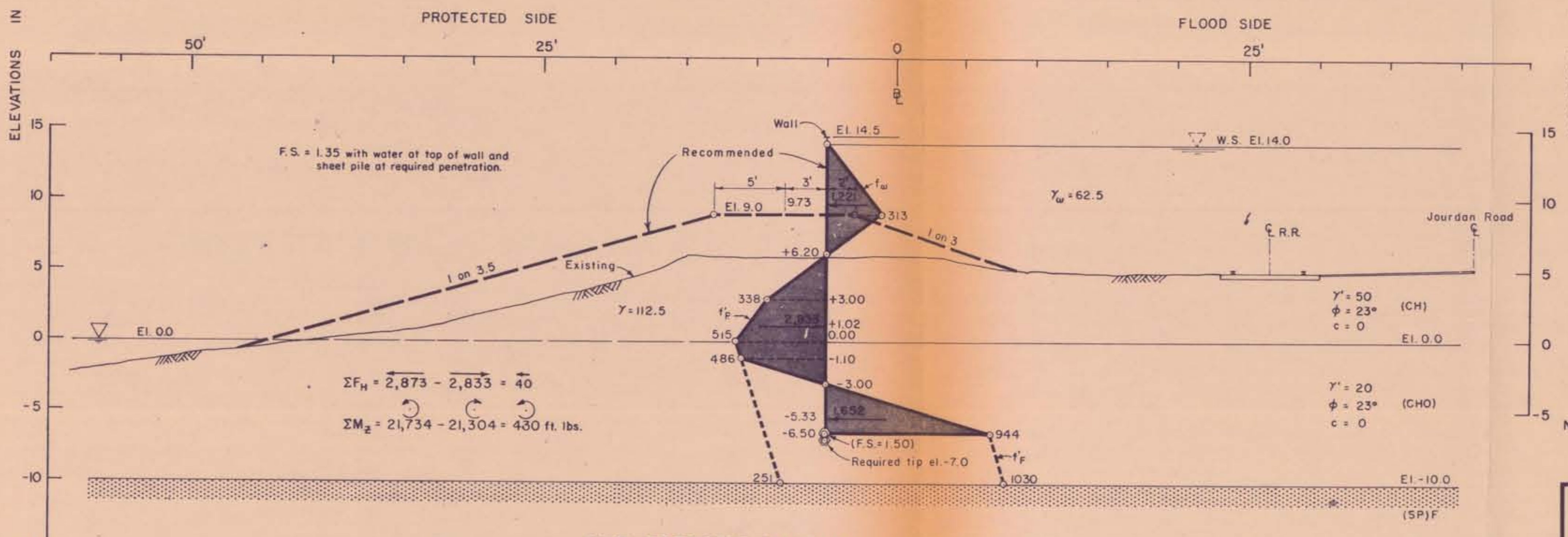
EAST LEVEE
LAKE PONTCHARTRAIN TO CHEF HWY.
STA. 34+00 TO STA. 47+00
U.S. ARMY ENGINEER DISTRICT NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



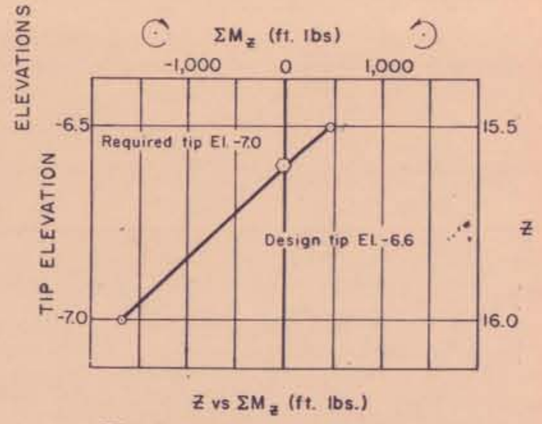
NET PRESSURE DIAGRAM
STA. 47+00 TO STA. 59+10



STA. 47+00 TO STA. 59+10



NET PRESSURE DIAGRAM
STA. 59+10 TO STA. 60+00



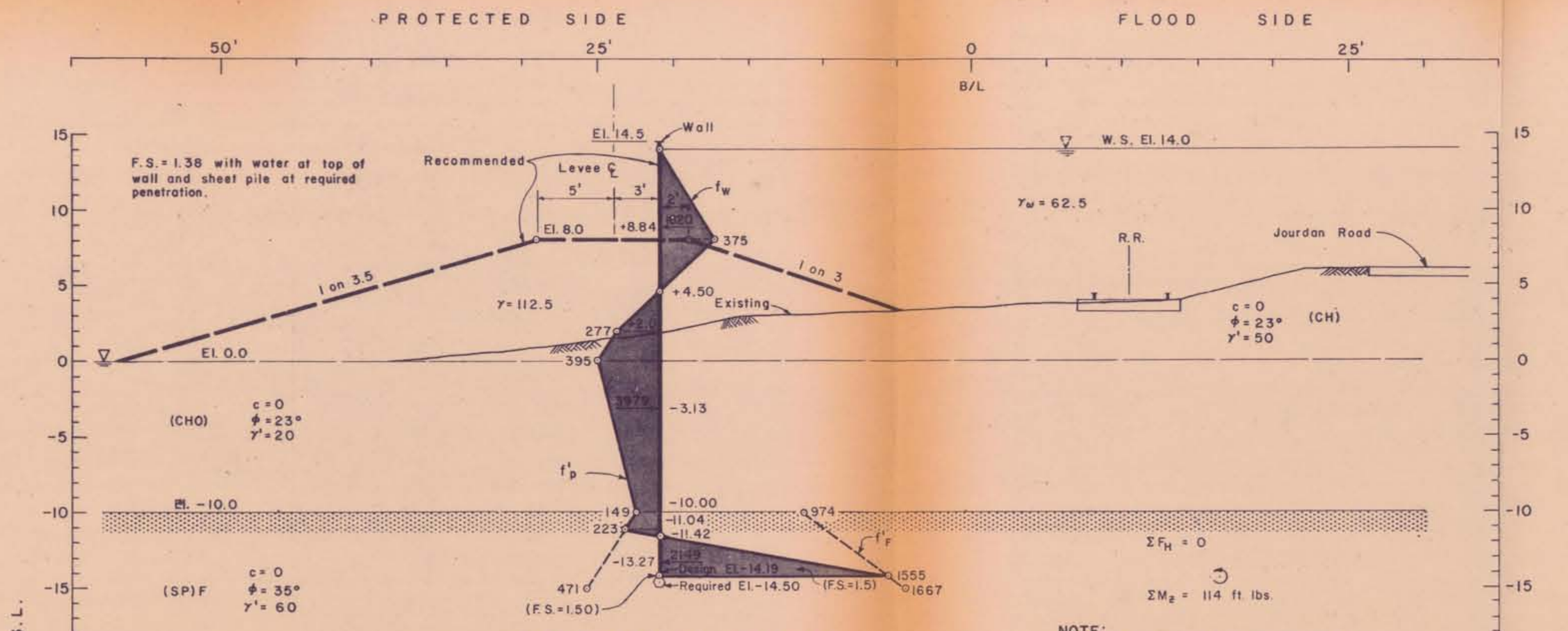
STA. 59+10 TO STA. 60+00

NOTE:
For general notes see plate III - 12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY

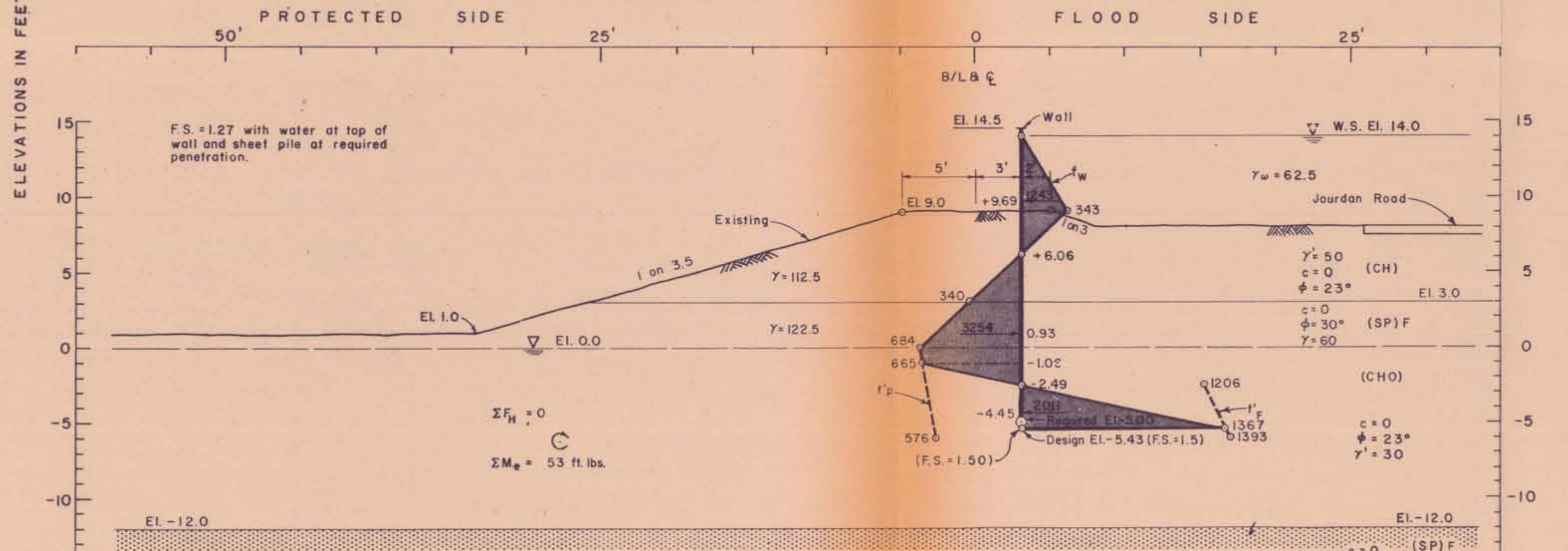
EAST LEVEE
STA. 47+00 TO STA. 60+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



NET PRESSURE DIAGRAM

STA. 60+10 TO STA. 60+60

NOTE:
T-Wall Sta.60+60 TO Sta.61+38
Gate I-E Sta.61+38 TO Sta.61+88
T-Wall Sta.61+88 TO Sta.63+47=63+61



NET PRESSURE DIAGRAM

STA. 63+47=STA. 63+61 TO STA. 71+44

NOTE:
T-Wall Sta.67+06 TO Sta.67+24.5
Gate 2-E Sta.67+24.5 TO Sta.67+70.5
T-Wall Sta.67+70.5 TO Sta.67+86

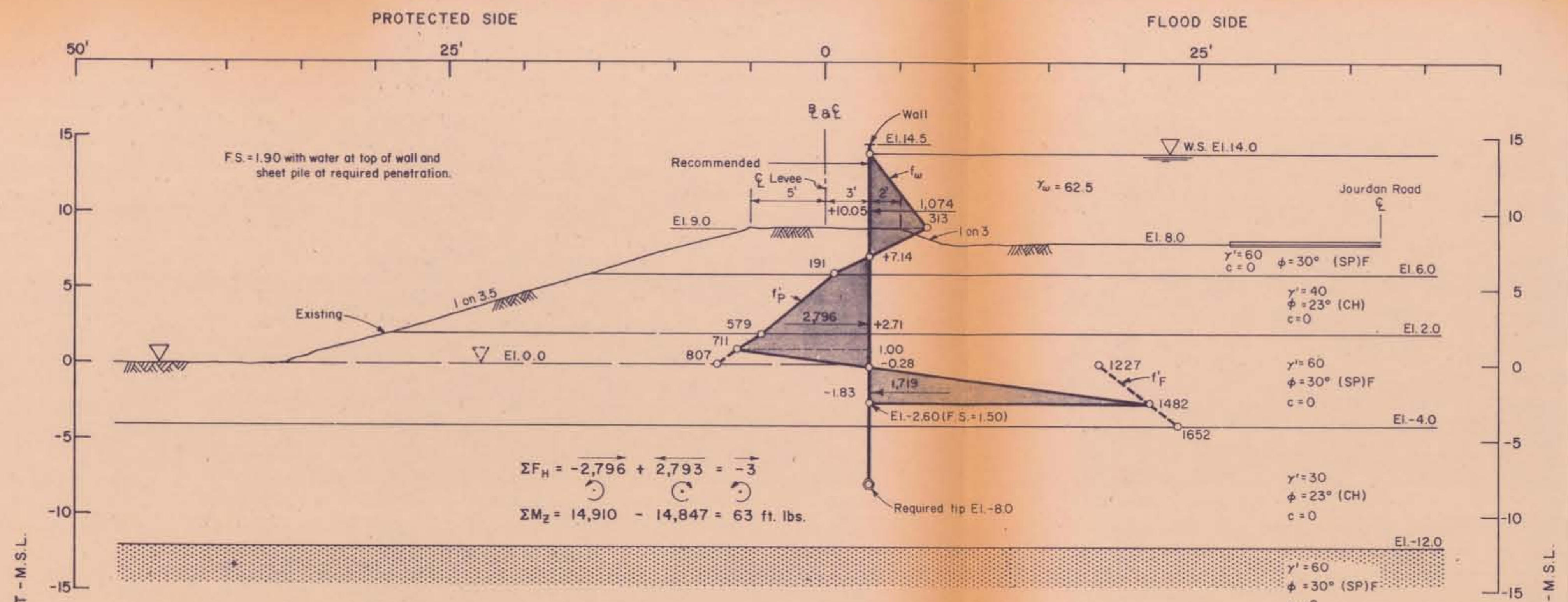
NOTE:
For general notes see plate III-12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
I. H. N. C. REMAINING LEVEES

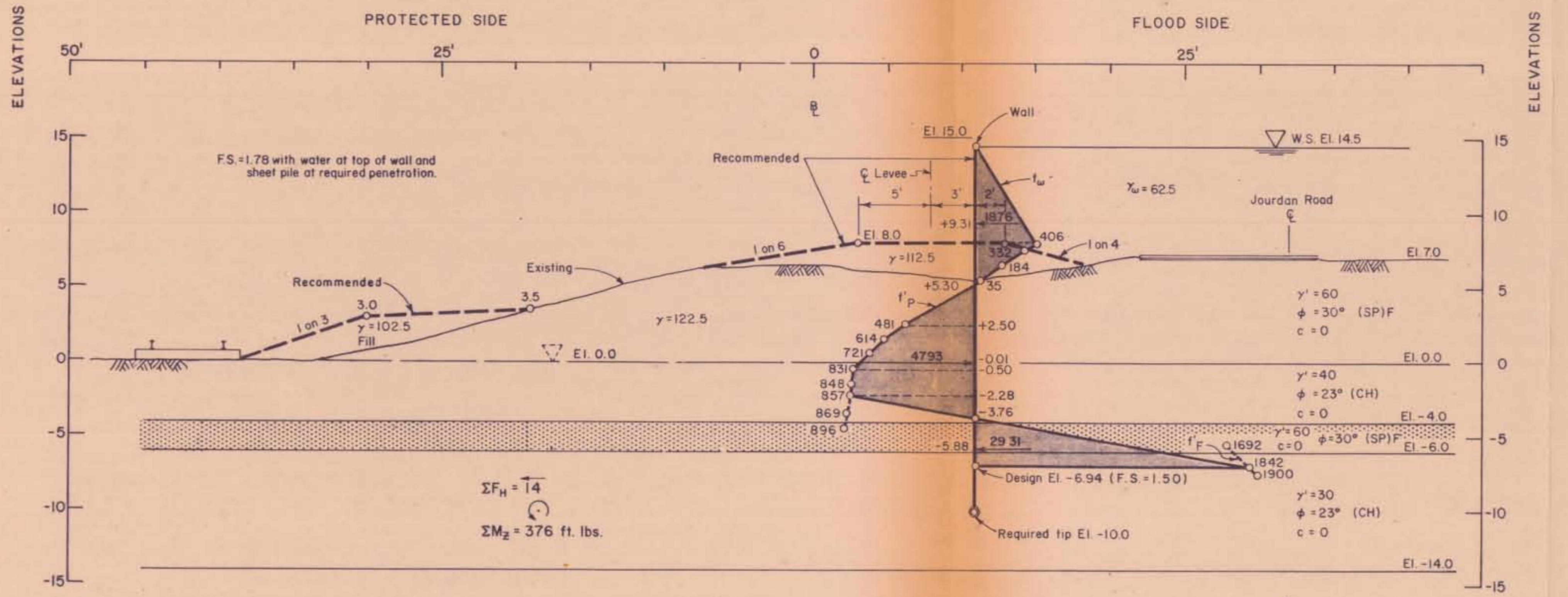
CANTILEVER SHEET PILE (S) STABILITY

EAST LEVEE
STA. 60+10 TO STA. 71+44

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111

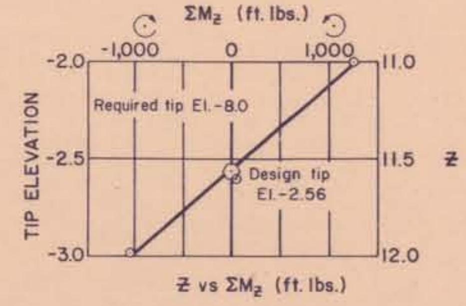


NET PRESSURE DIAGRAM
STA. 71+44 TO STA. 80+44.5



NET PRESSURE DIAGRAM
STA. 80+44.5 TO STA. 85+07

NOTE:
T-wall sta. 83+45.5 to sta. 85+07
Ramp sta. 85+07 to sta. 85+44



STA. 71+44 TO STA. 80+44.5

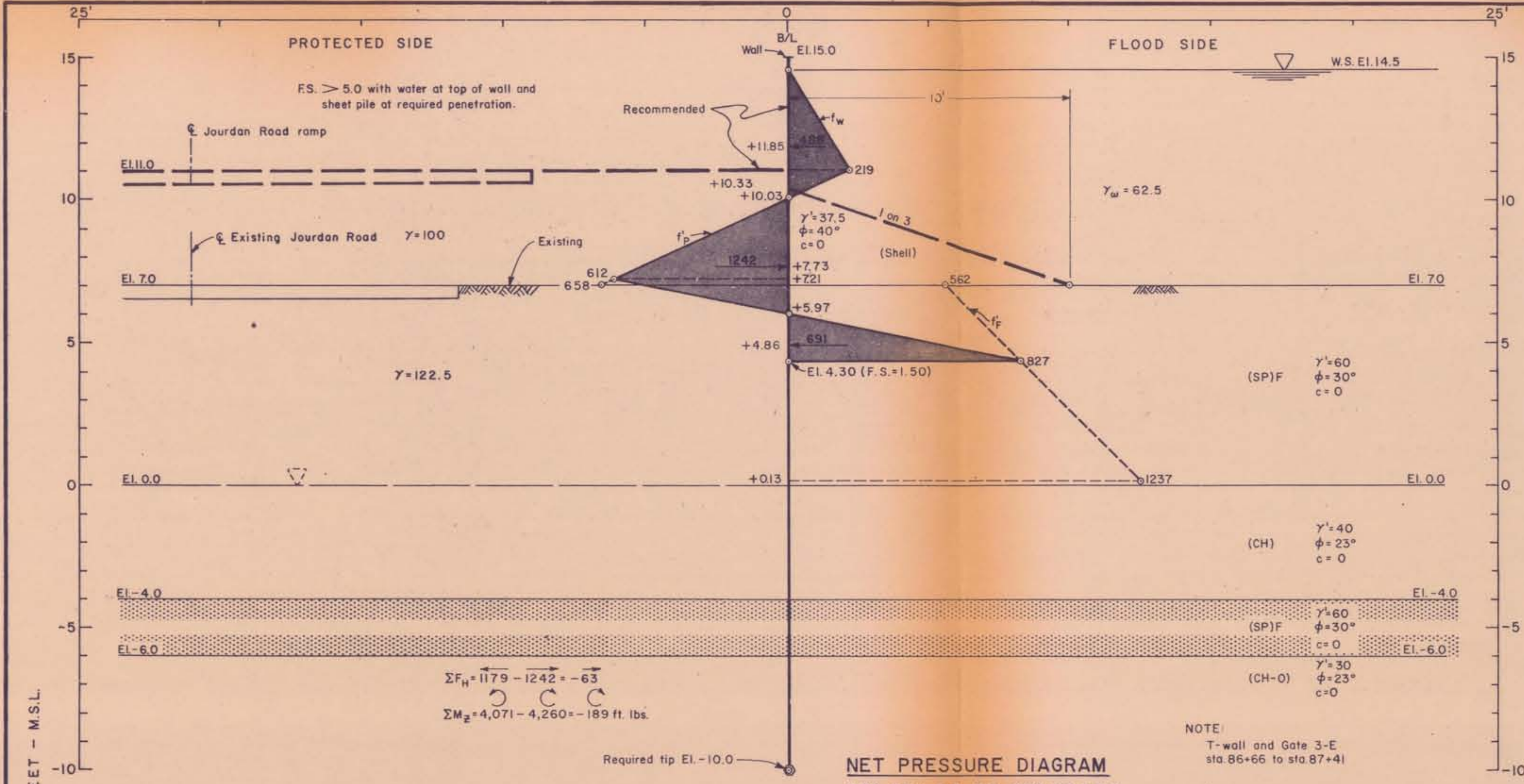
NOTE:
For general notes see plate III-12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

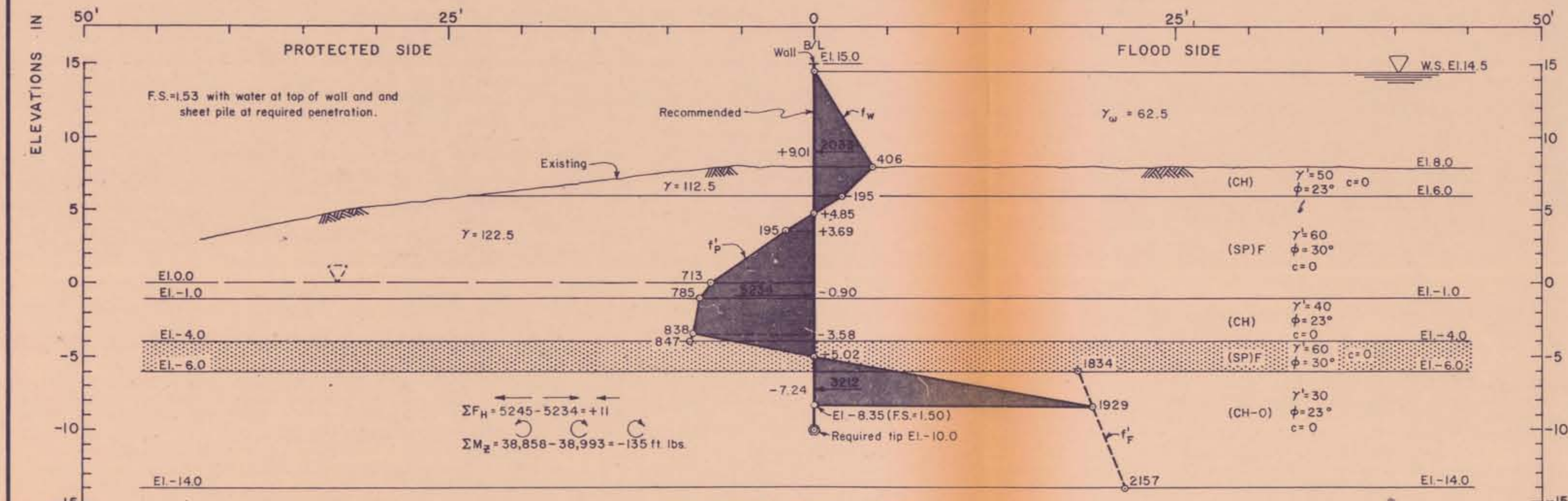
CANTILEVER SHEET PILE (S) STABILITY

EAST LEVEE
STA. 71+44 TO STA. 85+07

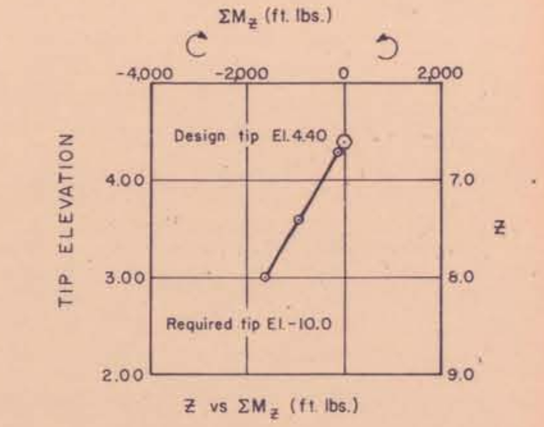
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



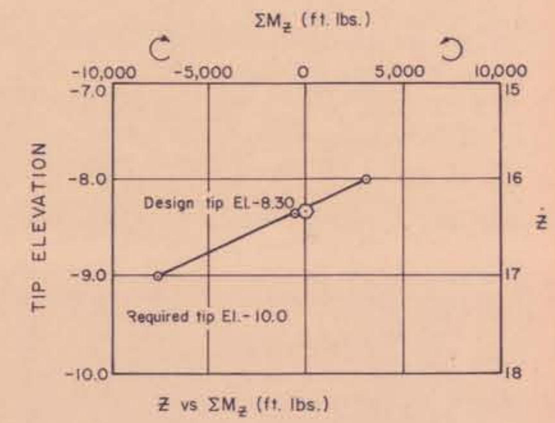
NET PRESSURE DIAGRAM
STA. 85+44 TO STA. 86+66



NET PRESSURE DIAGRAM
STA. 87+41 TO STA. 87+55



STA. 85+44 TO STA. 86+66



STA. 87+41 TO STA. 87+55

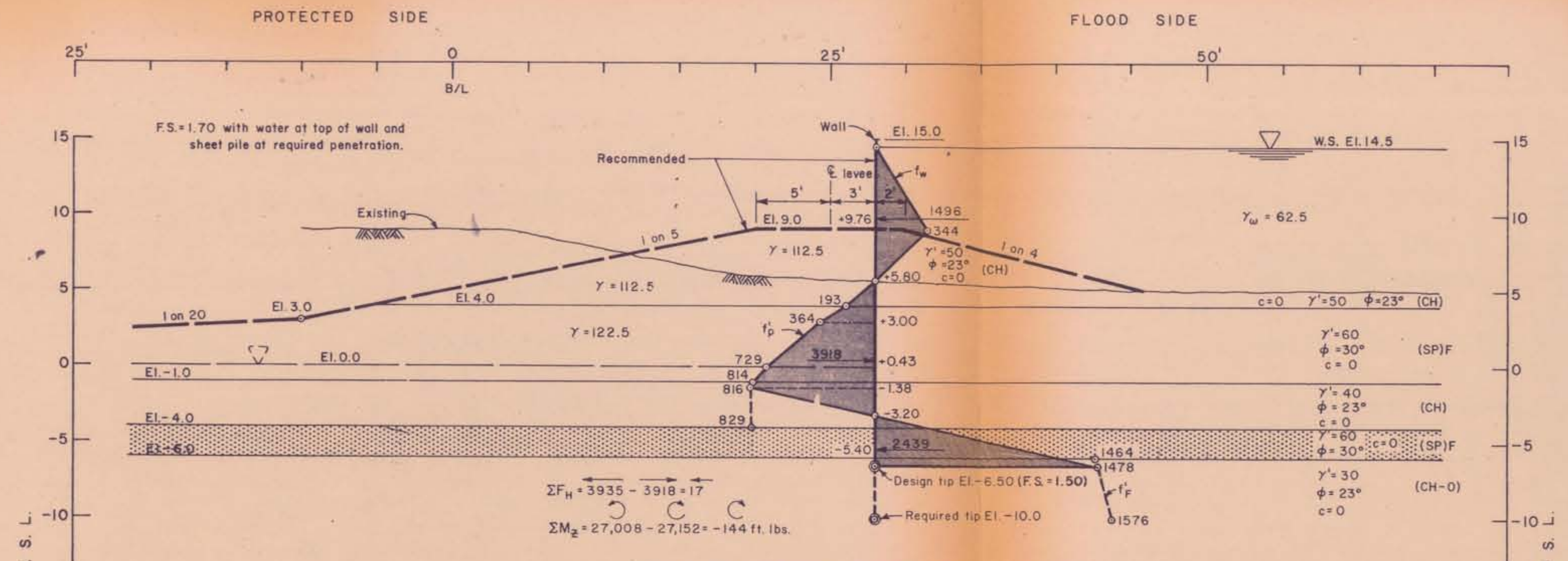
NOTE:
For general notes see plate III - 12

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

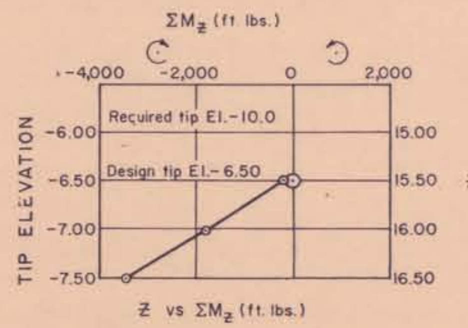
CANTILEVER SHEET PILE (S) STABILITY

EAST LEVEE
LAKE PONTCHARTRAIN TO CHEF HWY.
STA. 85+44 TO STA. 87+55

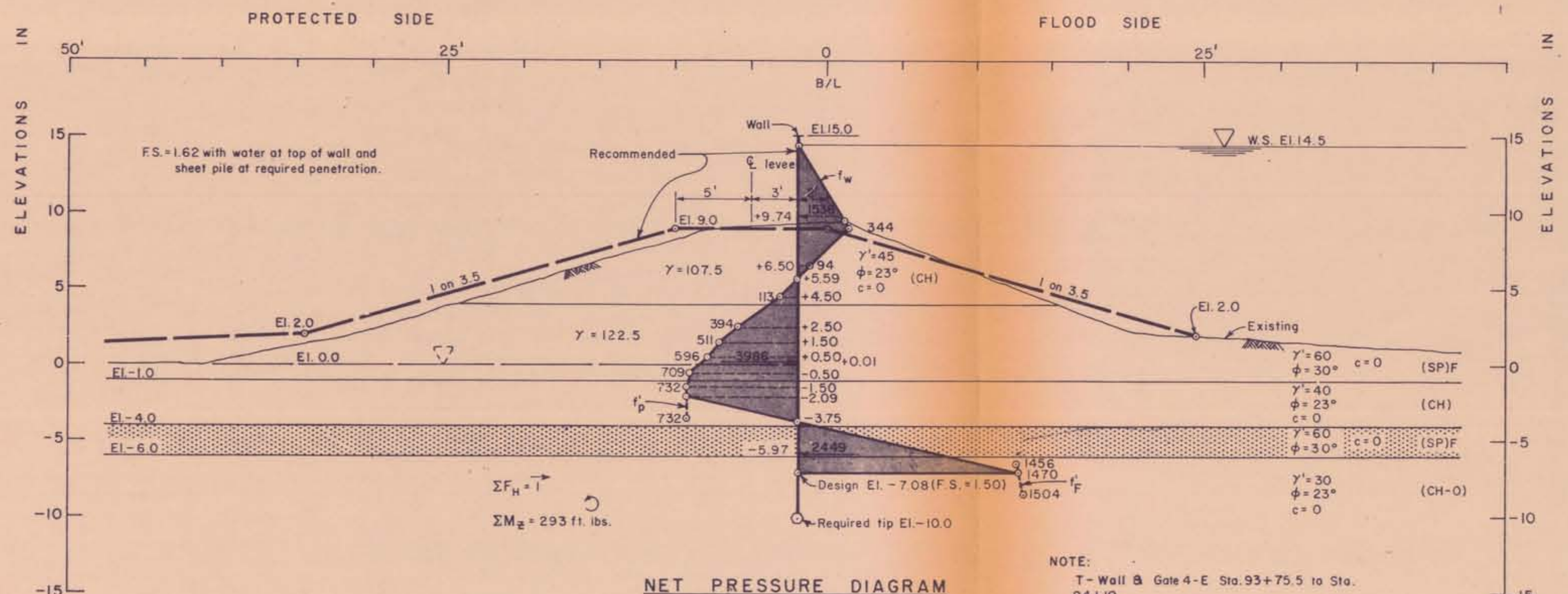
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



NET PRESSURE DIAGRAM
STA. 87+55 TO STA. 91+78



STA. 87+55 TO STA. 91+78



NET PRESSURE DIAGRAM
STA. 91+78 TO STA. 100+86

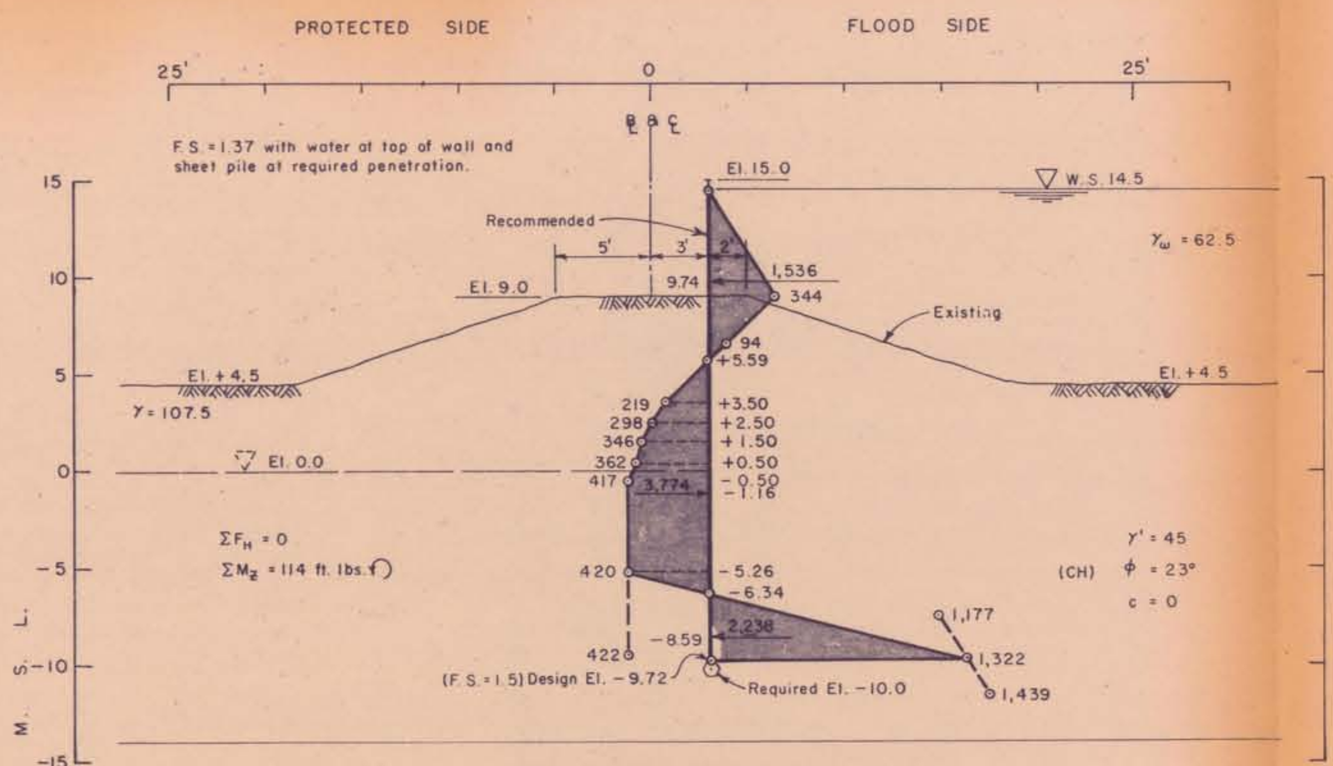
NOTE:
T-Wall & Gate 4-E Sta. 93+75.5 to Sta. 94+19.
T-Wall Sta. 94+71 to Sta. 97+19.
T-Wall Sta. 97+43 to Sta. 97+73.

NOTE:
For general notes see plate III-12

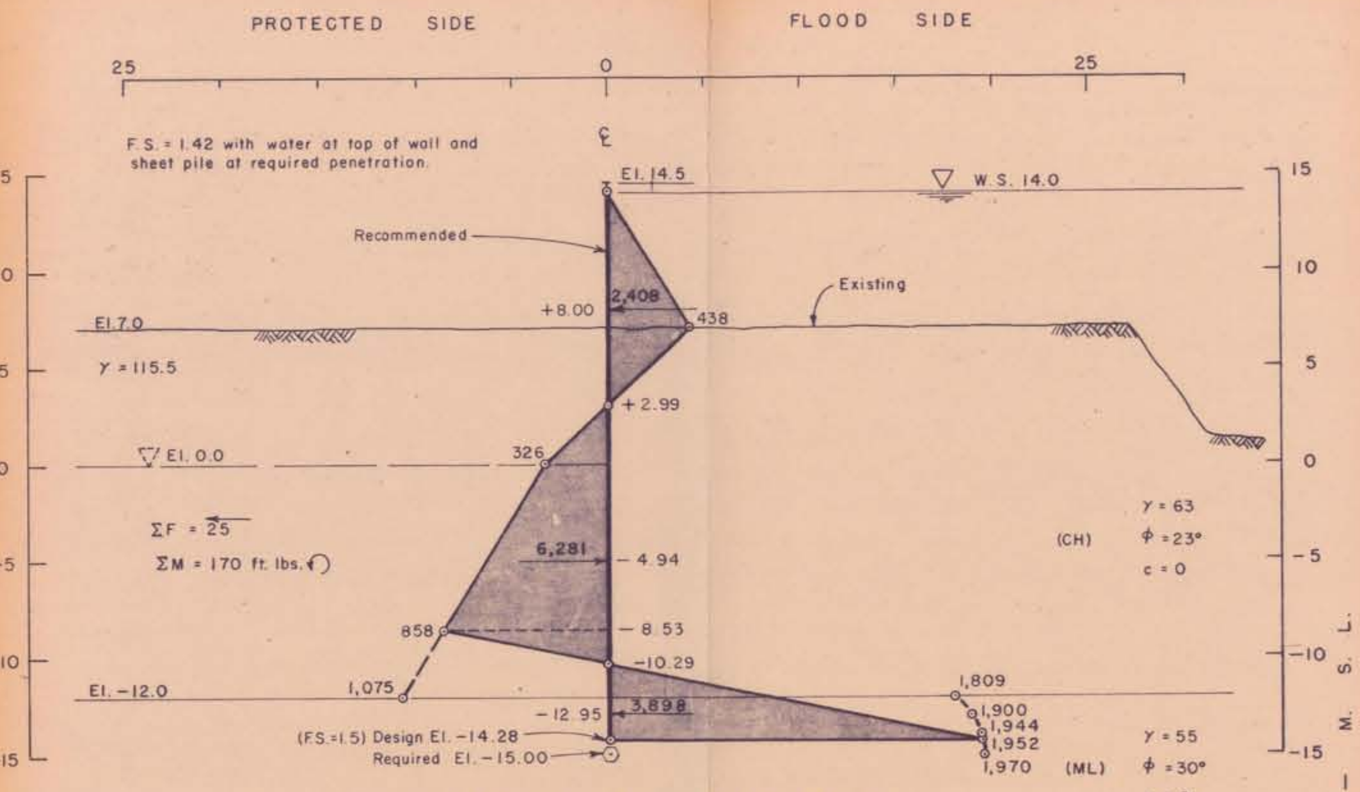
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

CANTILEVER SHEET PILE (S) STABILITY
EAST LEVEE
STA. 87+55 TO STA. 100+86

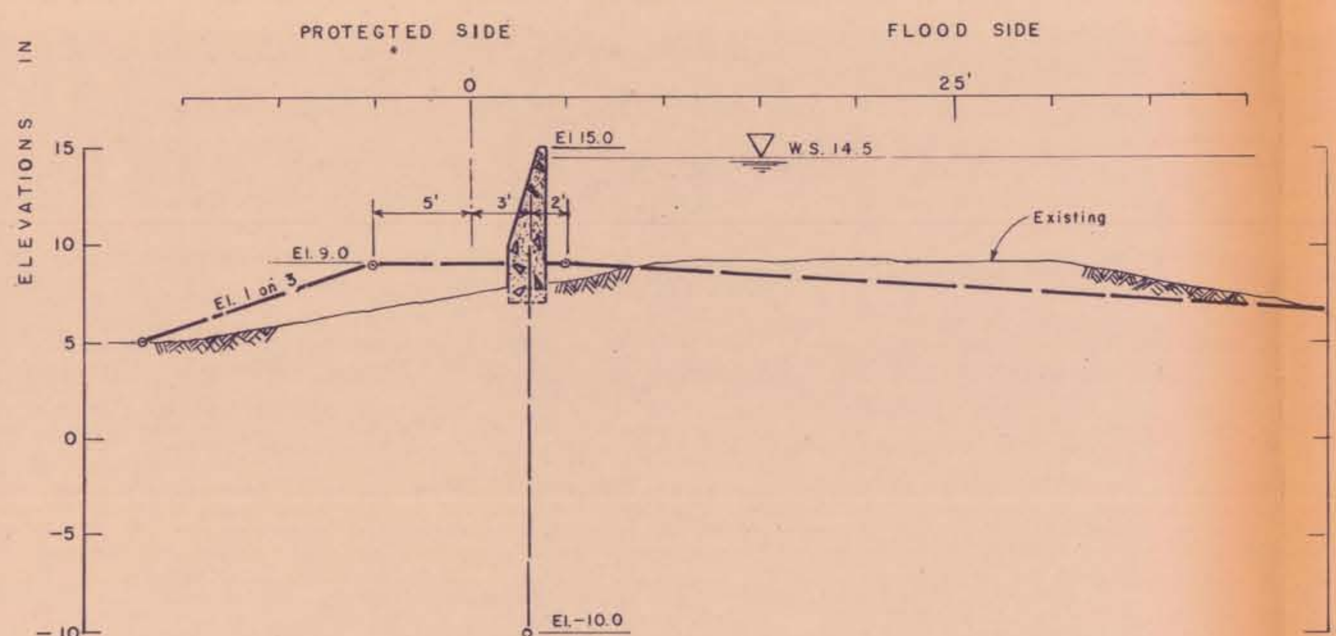
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



STA. 100+86 TO STA. 122+41
EXCEPTIONS SHOWN BELOW



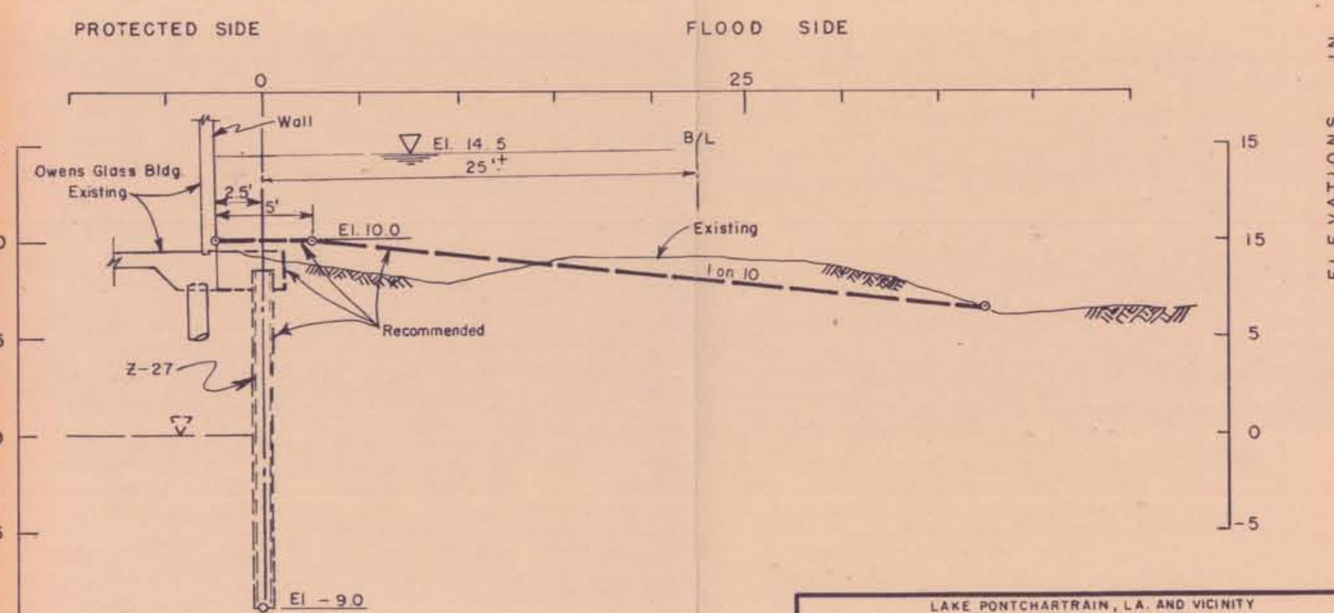
STA. 123+05 TO STA. 130+91



STA. 105+28 TO STA. 105+60

STA. 112+03 TO STA. 112+37

NOTE:
For general notes see plate III-12
Ramp between sta. 122+41 to sta. 123+05.



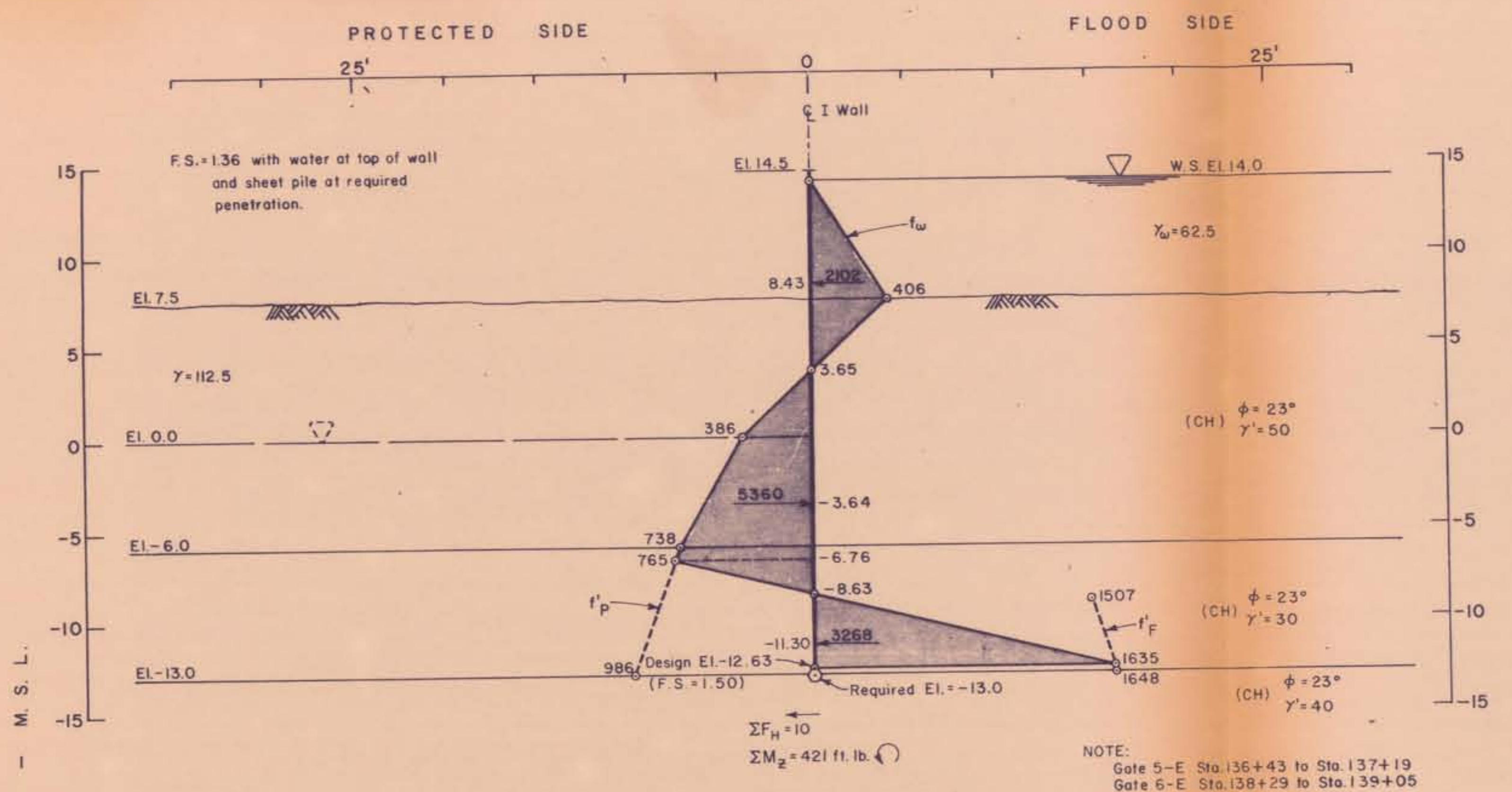
STA. 105+60 TO STA. 112+03
ALONG OWENS GLASS BUILDING

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 — GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

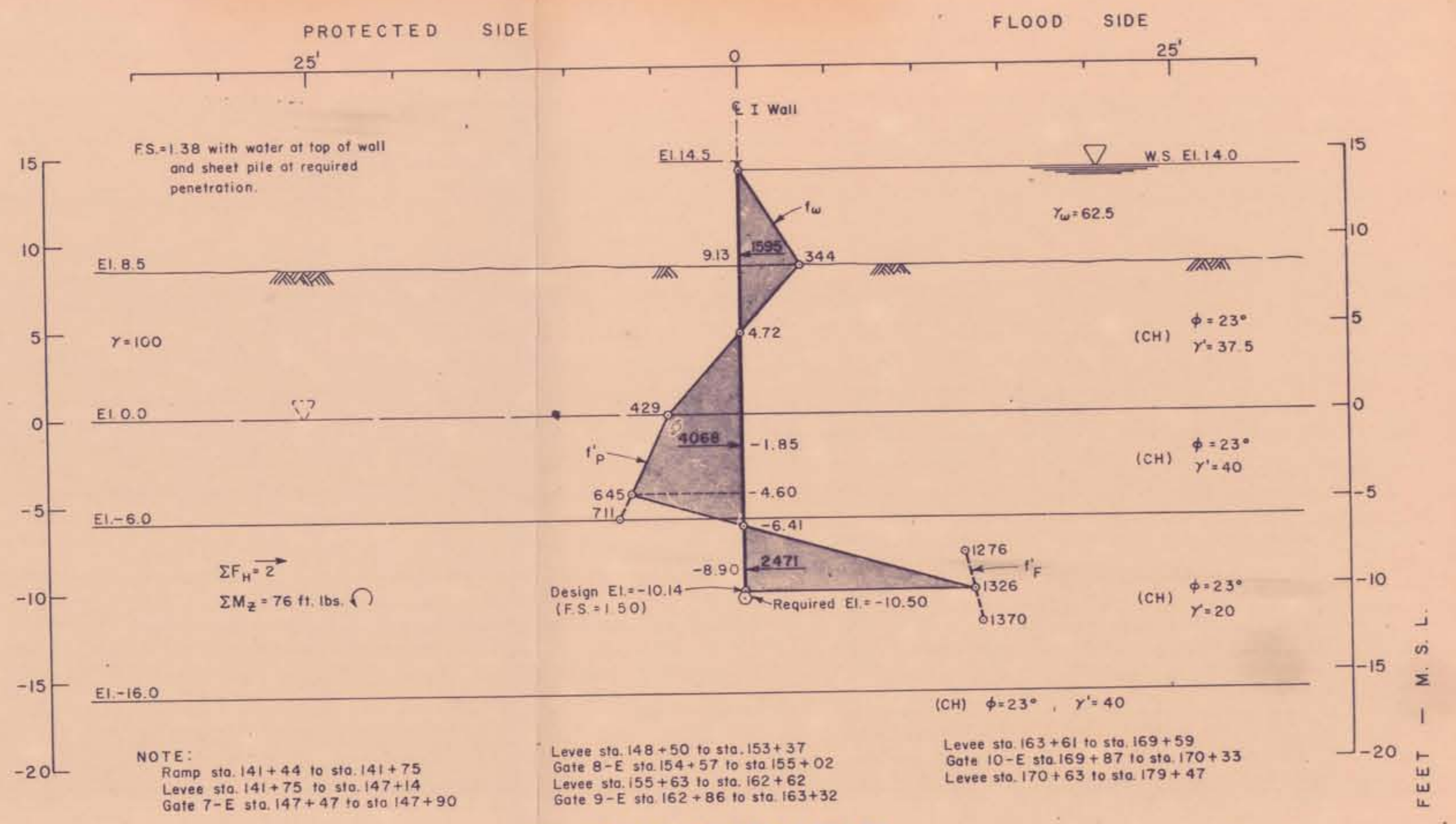
WALL (S) STABILITY
EAST LEVEE

STA. 100+86 TO STA. 130+91
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

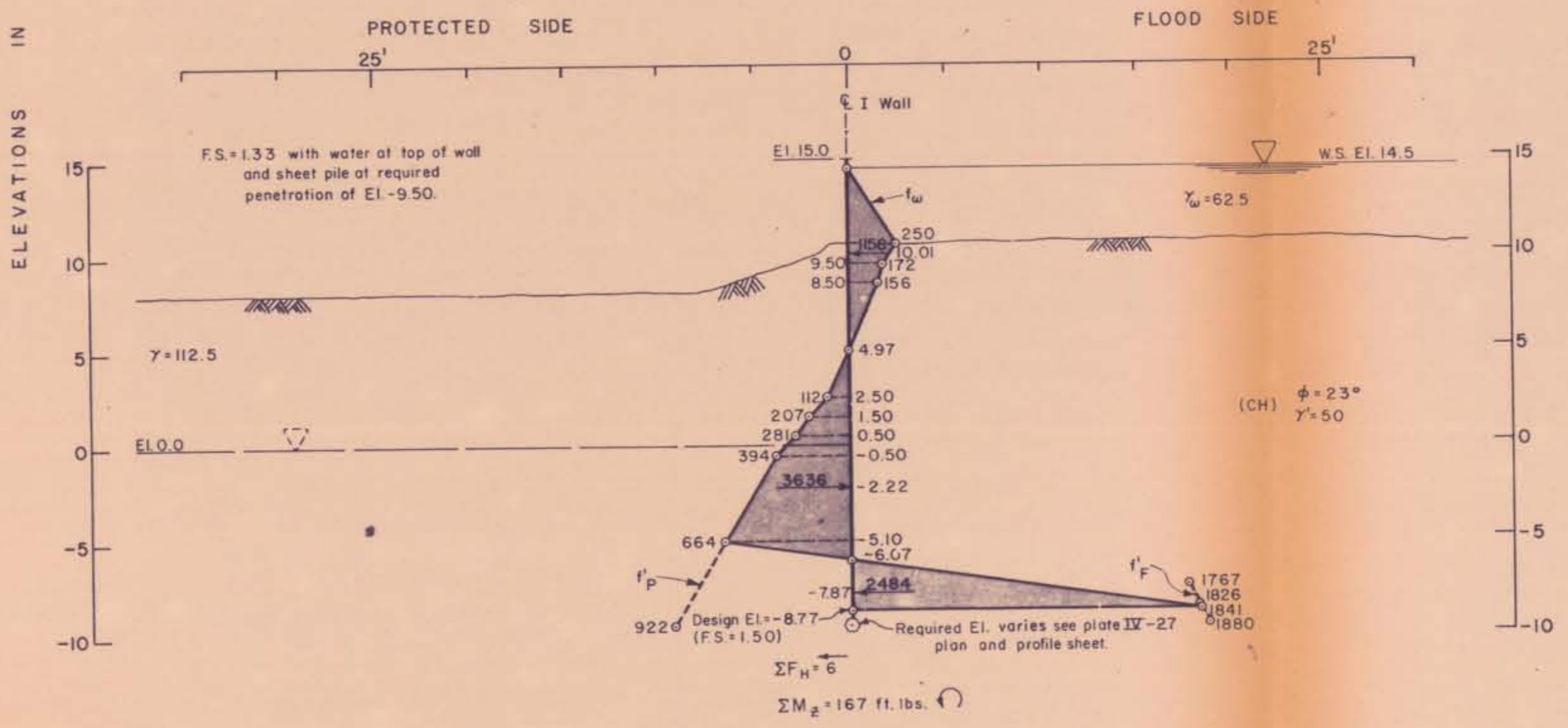
FEBRUARY 1968 FILE NO. H−2−24111



STA. 135+97 TO STA. 138+29

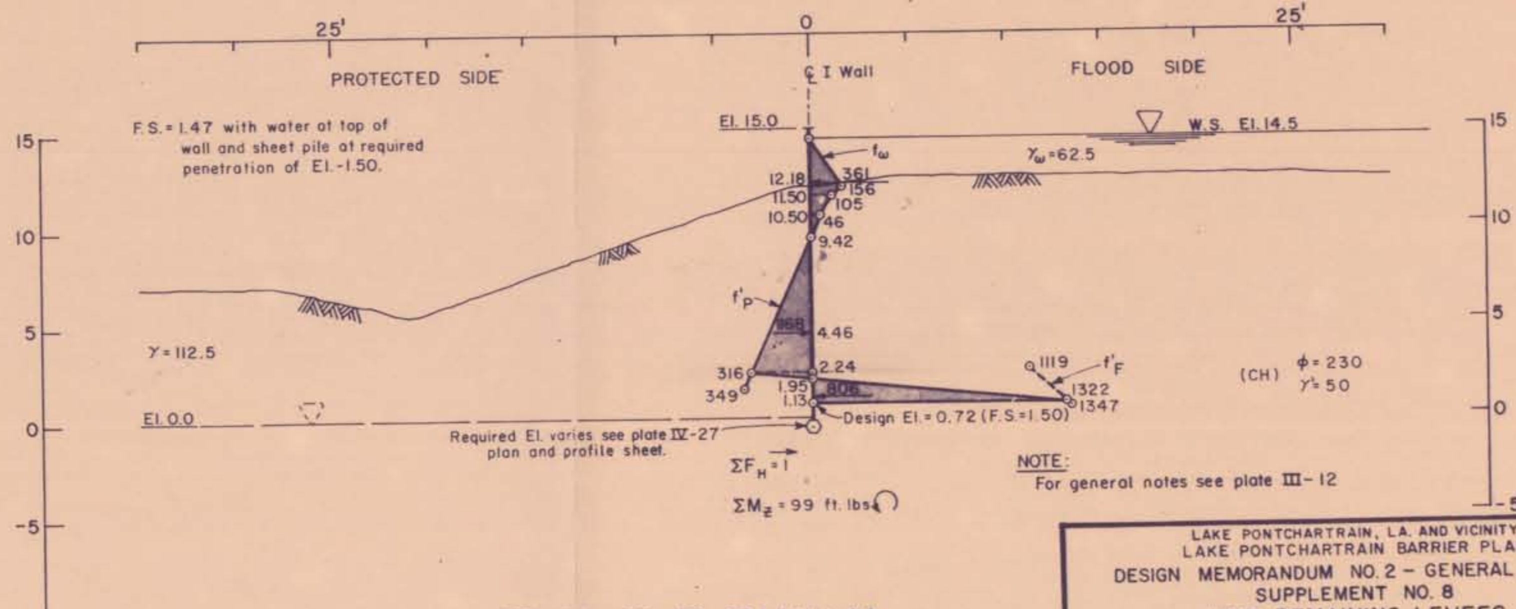


STA. 147+04 TO STA. 170+73



STA. 139+05 TO STA. 139+90

ALMONASTER RAMP



STA. 139+90 TO STA. 141+44

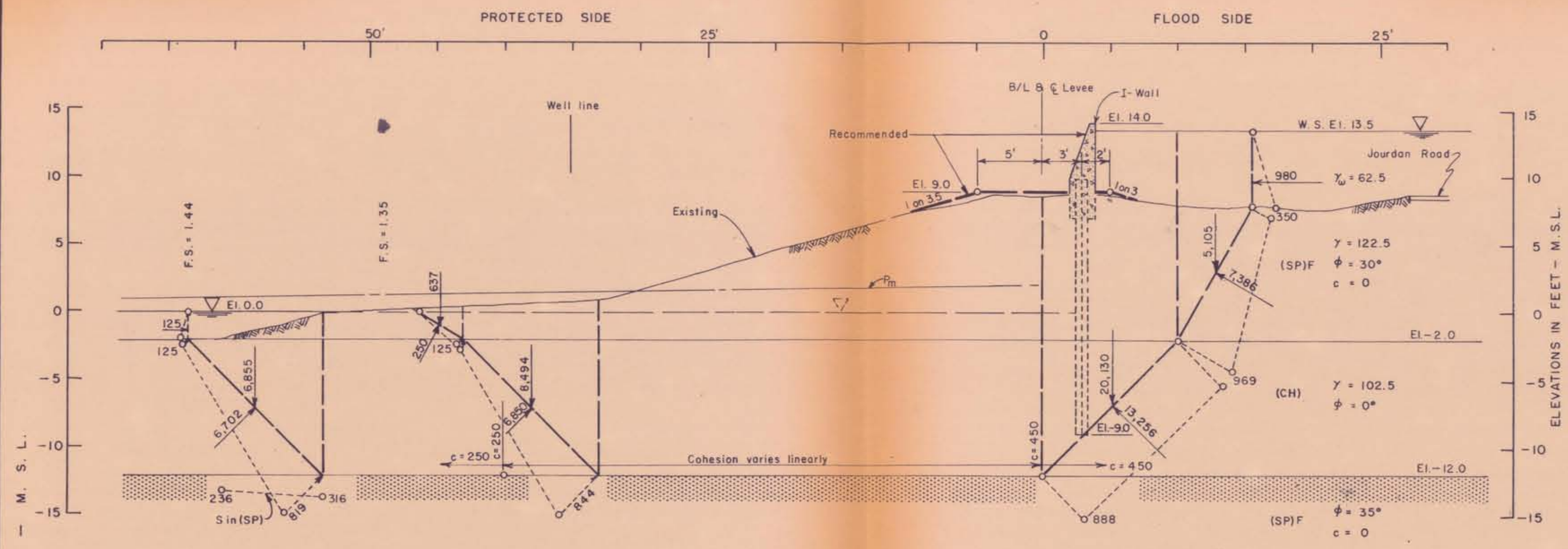
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(S) WALL STABILITY
EAST LEVEE
STA. 135+97 TO STA. 179+47

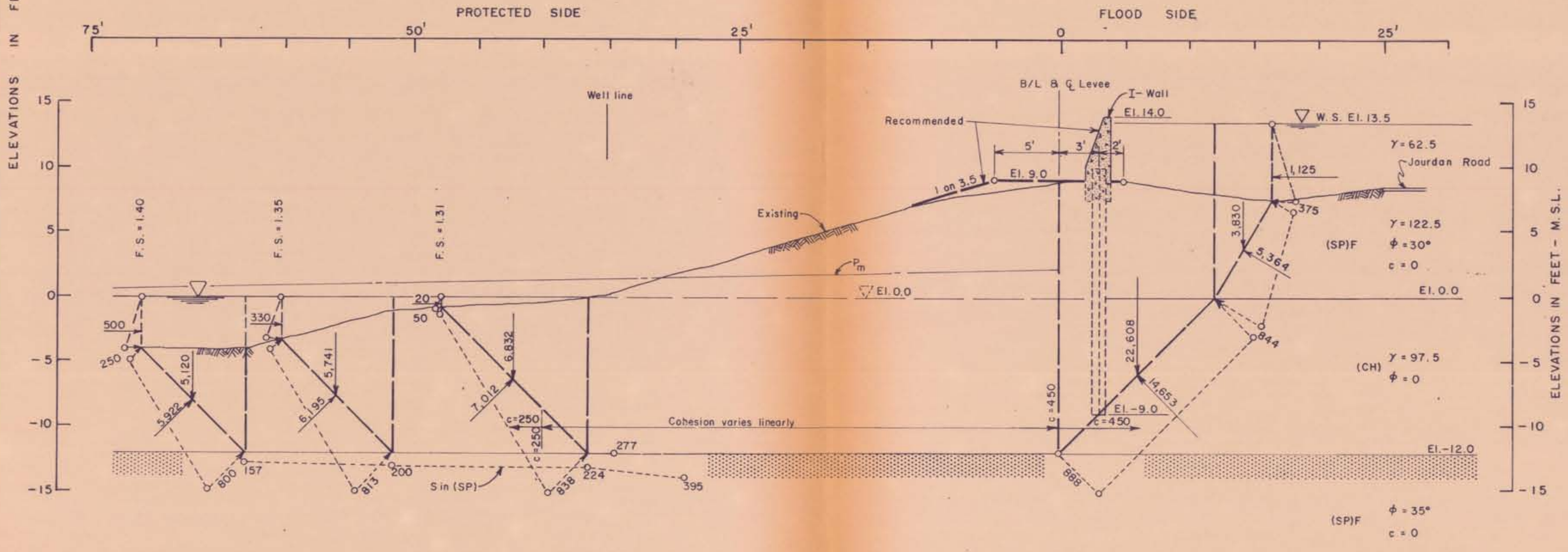
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

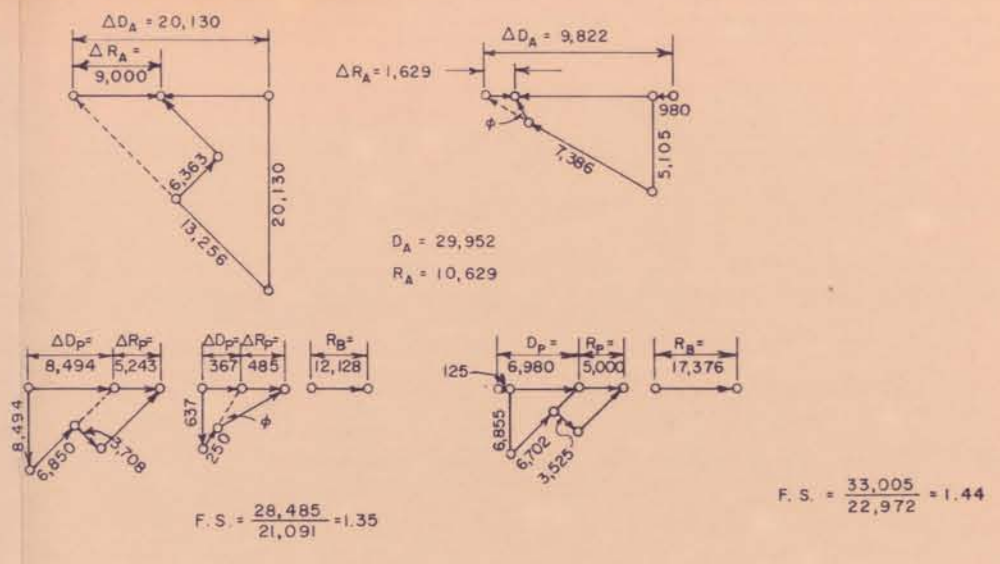
PLATE III-36



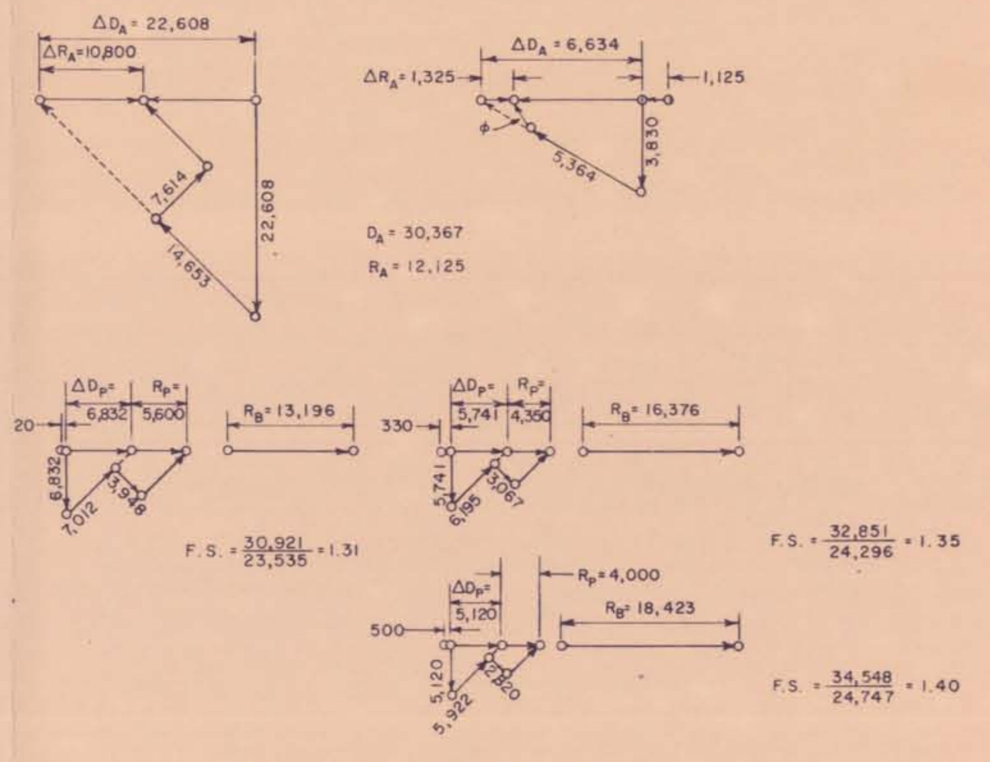
STA. 34+00 TO STA. 37+75



STA. 37+75 TO STA. 47+00



STA. 34+00 TO STA. 37+75



STA. 37+75 TO STA. 47+00

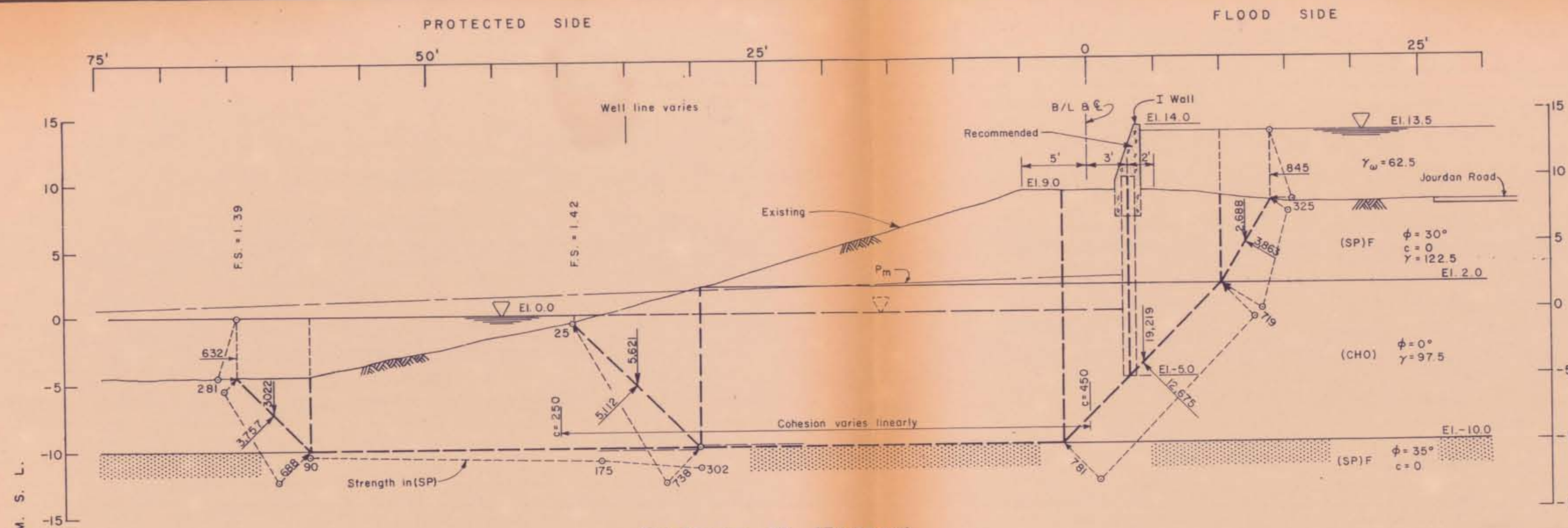
NOTE:
For general notes see plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

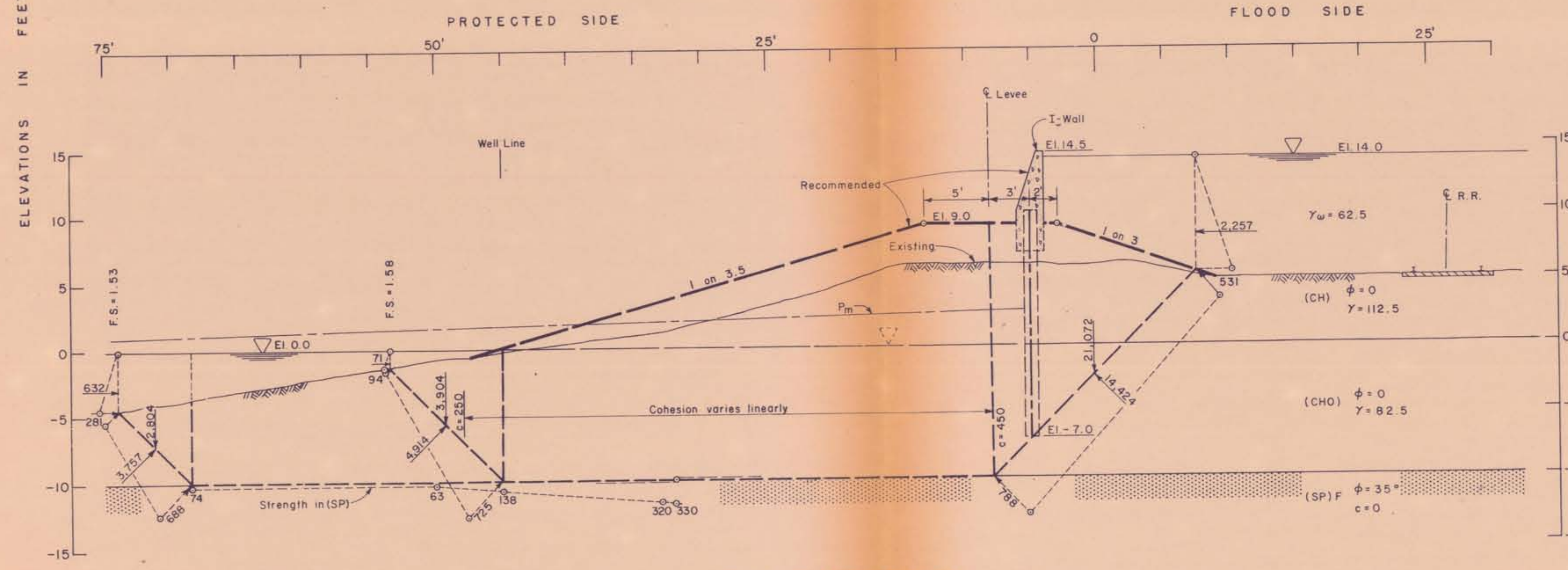
(Q) STABILITY ANALYSIS
EAST LEVEE
STA. 34+00 TO STA. 47+00

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

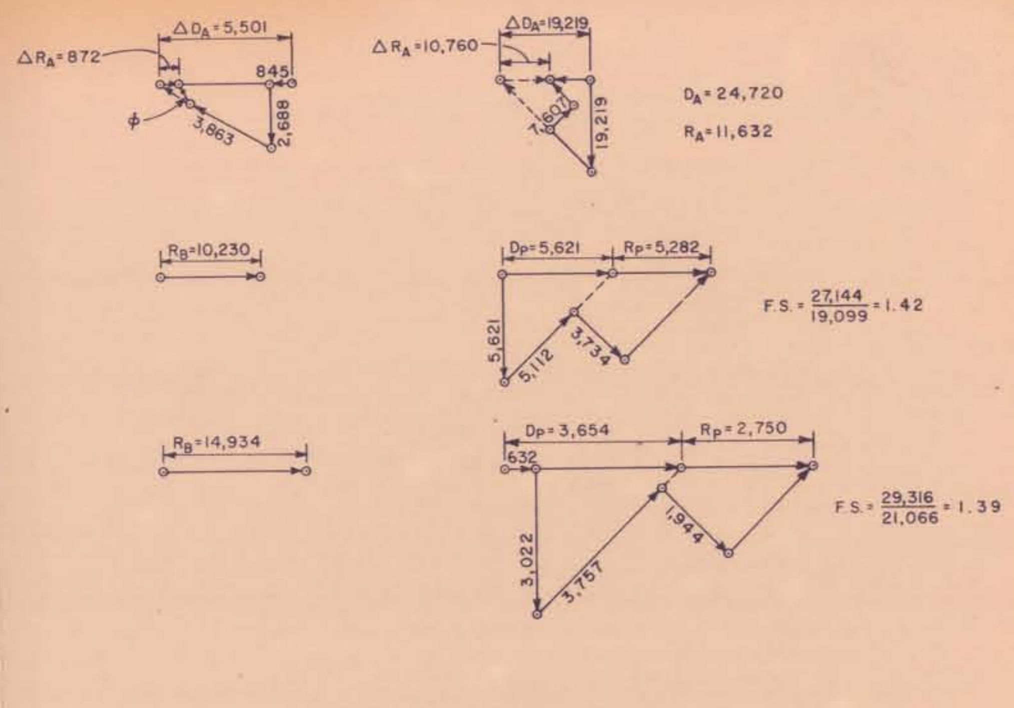
FEBRUARY 1968 FILE NO. H-2-24111



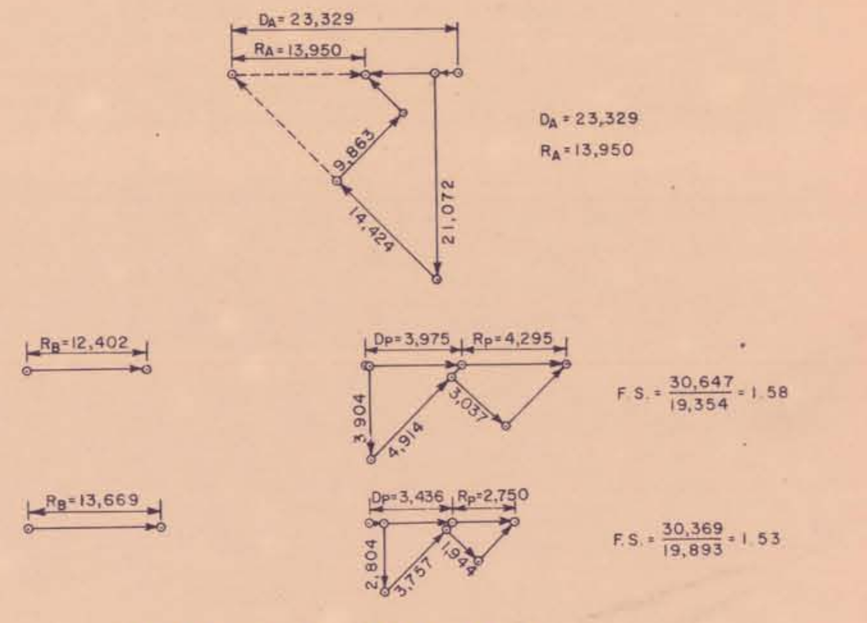
STA. 47+00 TO STA. 59+10



STA. 59+10 TO STA. 60+00



STA. 47+00 TO STA. 59+10



STA. 59+10 TO STA. 60+00

NOTE: For general notes see plate III - 24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
EAST LEVEE
STA. 47+00 TO STA. 60+00

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

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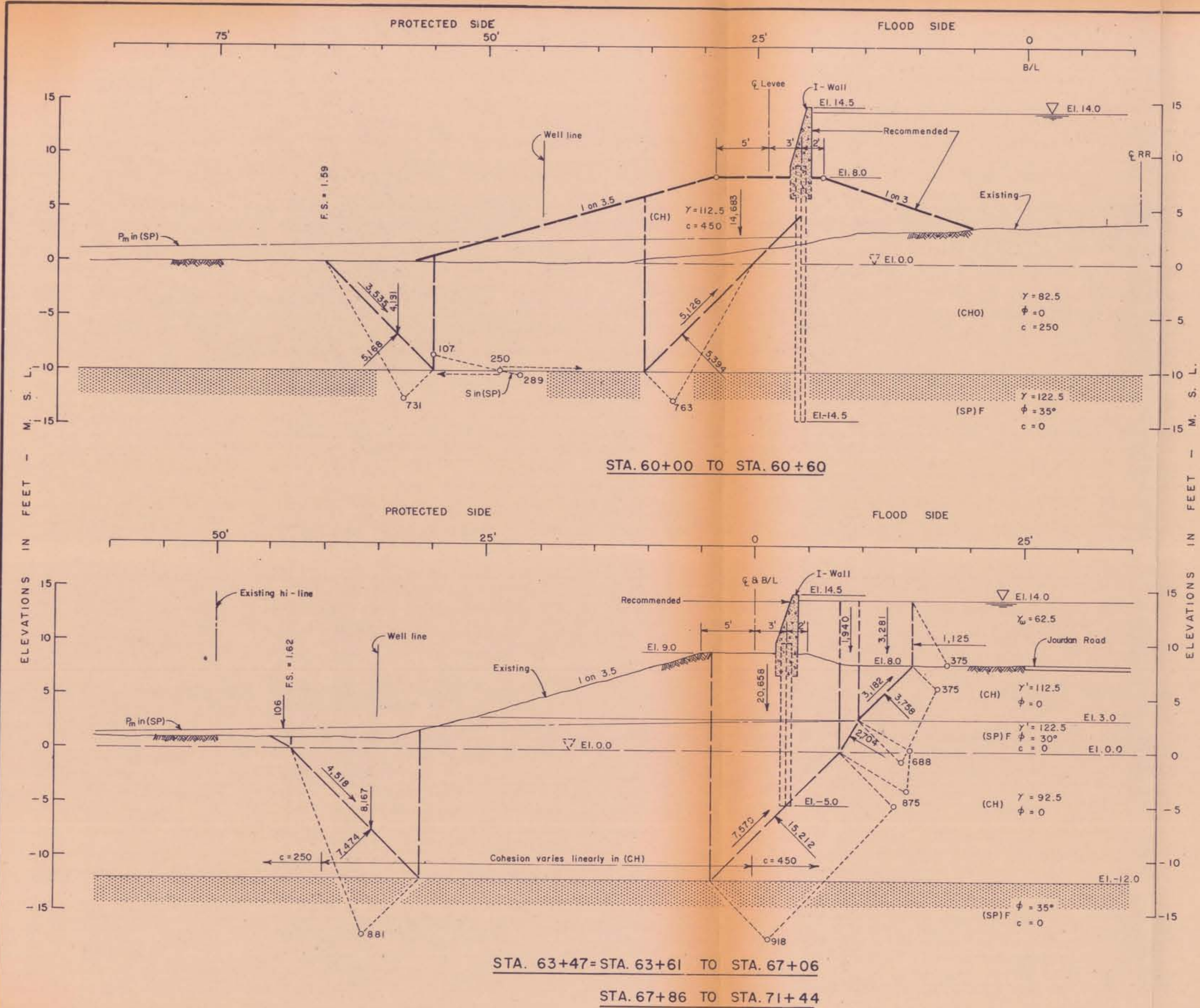
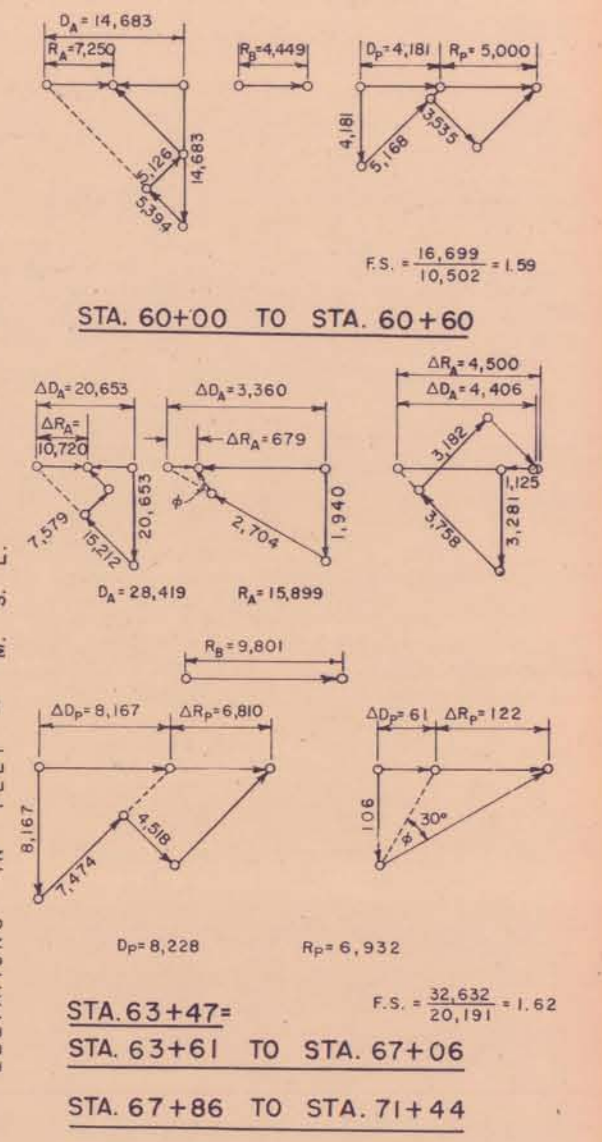




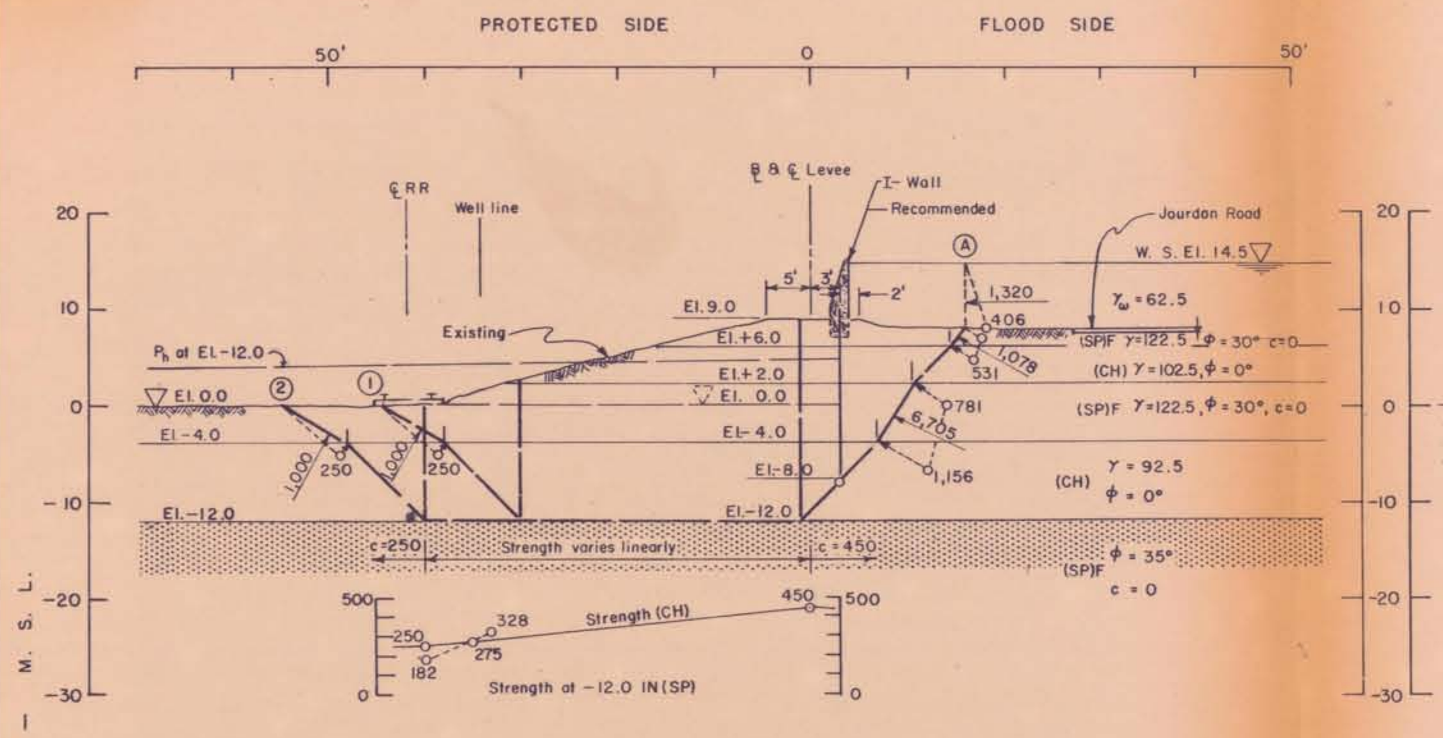
NOTE:
For general notes see plate III - 24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

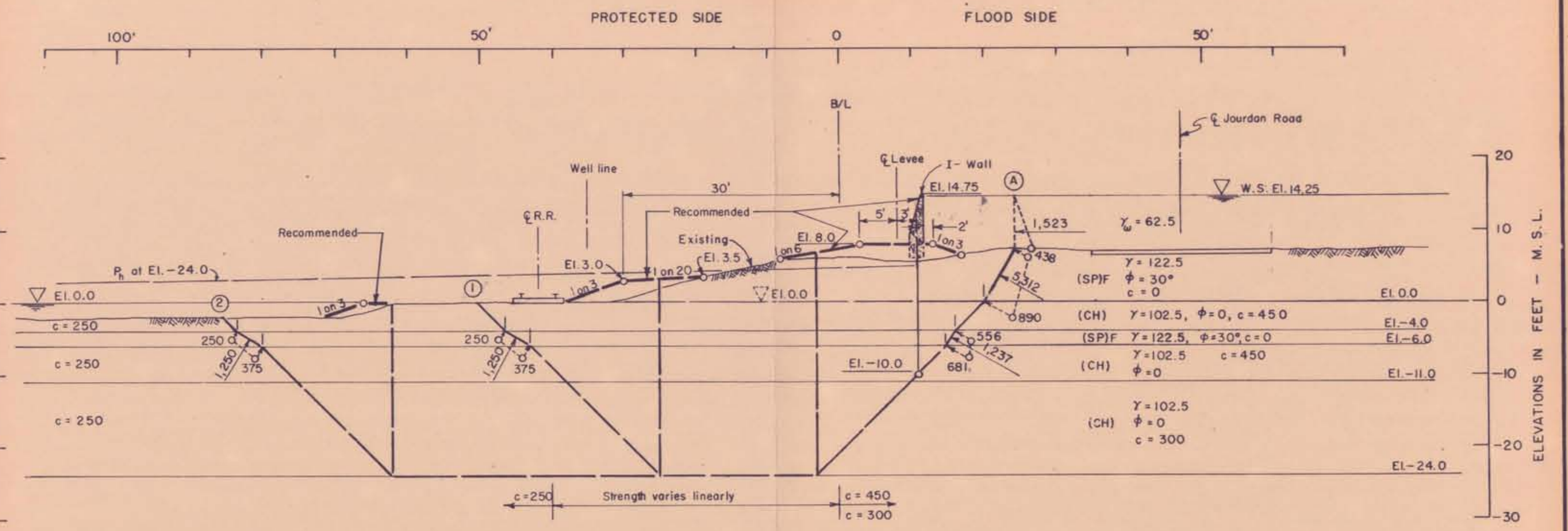
(Q) STABILITY ANALYSIS
EAST LEVEE
STA. 60+00 TO STA. 60+60
STA. 63+61 TO STA. 71+44

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

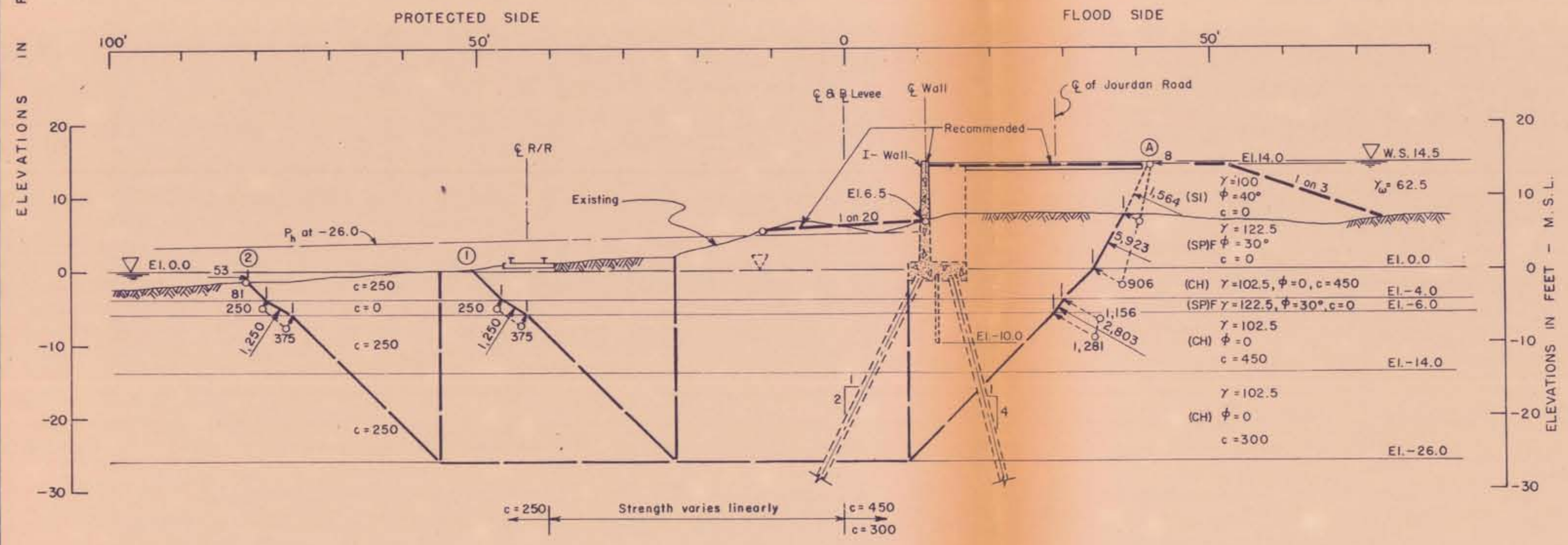
FEBRUARY 1968 FILE NO. H-2-24111



STA. 71+44 TO STA. 80+44.5



STA. 80+44.5 TO STA. 83+45.5



STA. 83+45.5 TO STA. 85+07

STA. 85+07 TO STA. 85+44

JOURDAN ROAD RAMP

LEVEE STATION	SLIP SURFACE NO.		SLIP SURFACE EL.	DRIVING $+D_A$	DRIVING $-D_P$	DRIVING ΣD	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
71+44 TO 80+44.5	A	1	-12.0	30,764	9,548	21,216	12,710	10,803	5,659	29,172	1.38
		2			7,872	22,892		13,555	4,960	31,225	1.36
80+44.5 TO 83+45.5	A	1	-24.0	61,840	34,392	27,448	18,356	6,226	11,303	35,885	1.31
		2			28,078	33,762		15,611	10,000	43,967	1.30
85+07 TO 85+44	A	1	-24.0	65,677	33,174	32,503	21,003	9,194	12,822	43,019	1.32
		2			29,911	35,776		17,375	11,540	49,918	1.40

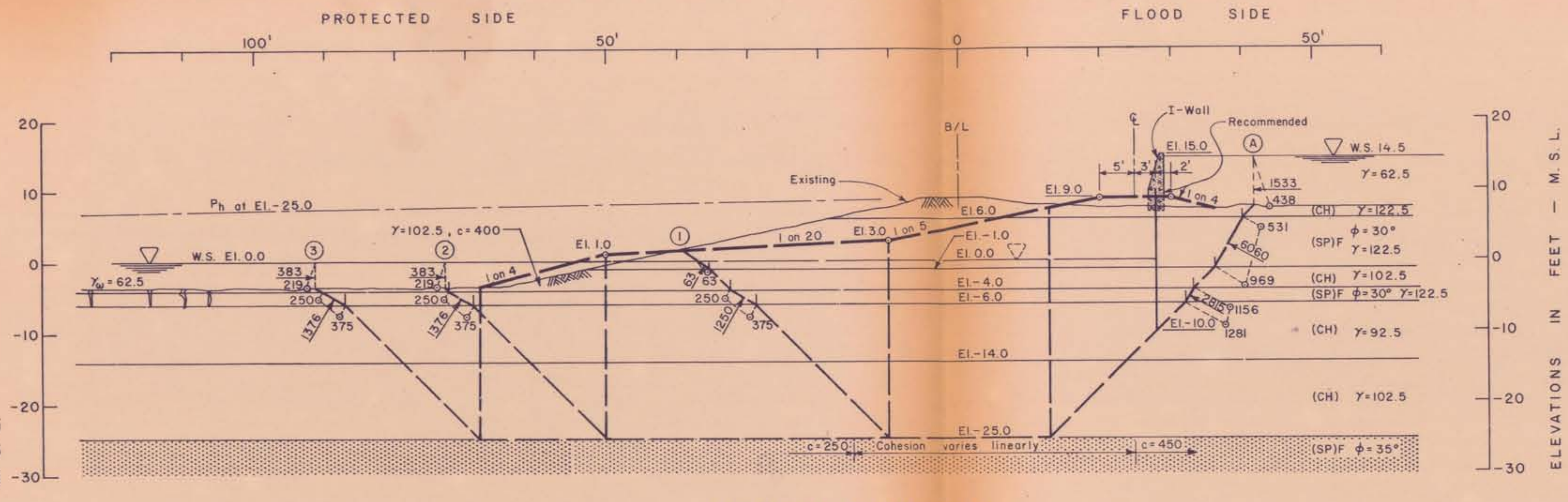
NOTE:
For general notes see plate III - 24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) LEVEE & ROAD RAMP STABILITY
EAST LEVEE
STA. 71+44 TO STA. 85+44

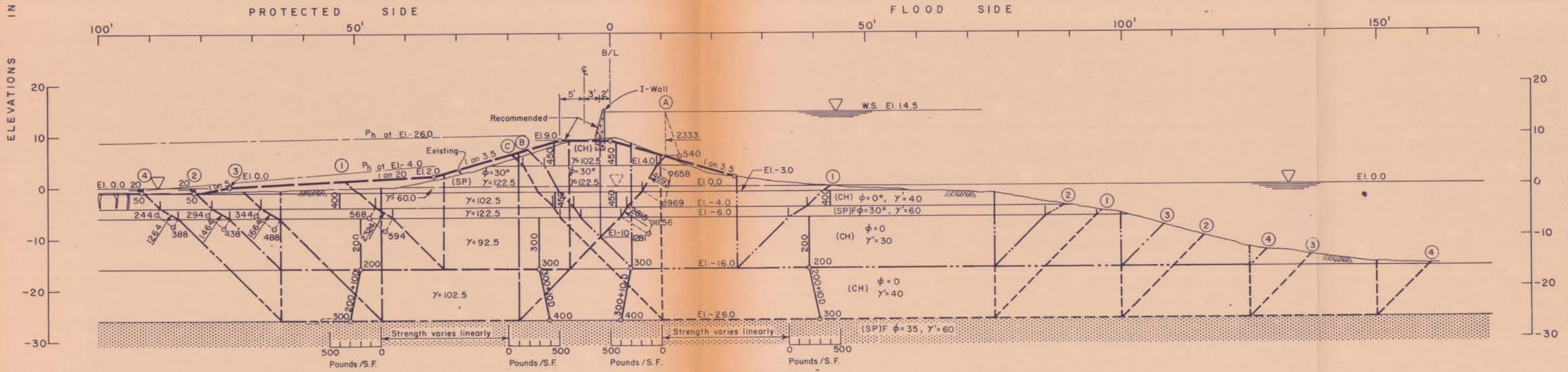
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

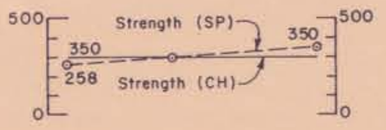
FEBRUARY 1968 FILE NO. H-2-24111



STA. 87+55 TO STA. 91+78

STATIONS	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	$\Sigma R / \Sigma D$
STA. 87+55 TO 91+78	A	1	-25.0	69,351	37,219	32,132	22,802	7,648	12,935	43,385	1.35
		2			30,549	38,802		17,710	10,067	50,579	1.30
		3			28,349	41,002		22,210	10,067	55,079	1.34
STA. 91+78 TO 100+86	A	1	-16.0	39,854	17,215	22,639	12,275	7,038	10,100	29,413	1.30
		2			14,158	25,696		14,063	7,104	33,442	1.30
		3	-26.0	69,036	37,110	31,926	19,275	9,550	13,104	41,929	1.31
		4			34,246	34,790		15,280	12,217	46,772	1.34
	B	1	-16.0	25,734	10,318	15,416	16,510	5,250	8,162	29,922	1.94
		2			6,548	19,186		15,450	4,336	36,296	1.89
		3			1,291	24,443		20,450	3,280	40,240	1.65
		4			178	25,556		25,450	1,280	43,240	1.69
	C	1	-26.0	41,046	9,616	31,430	21,807	20,750	9,052	51,609	1.64
		2			5,420	35,626		28,250	7,400	57,457	1.61
		3			2,930	38,116		35,750	5,840	63,397	1.66
		4			2,189	38,857		43,250	5,240	70,297	1.81





STA. 91+78 TO STA. 100+86

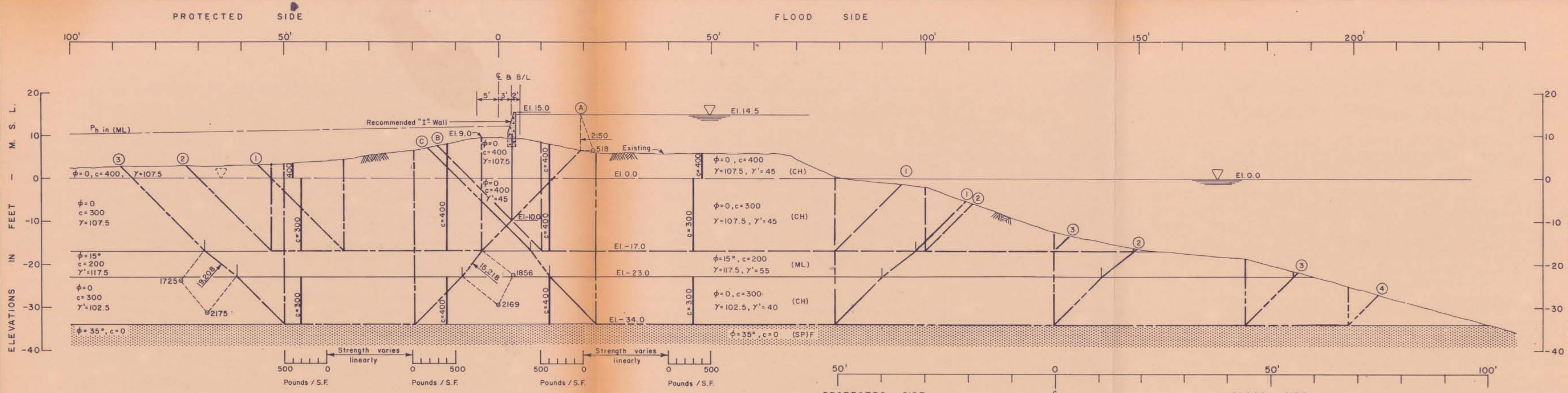
NOTE: For general note see plate III-24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

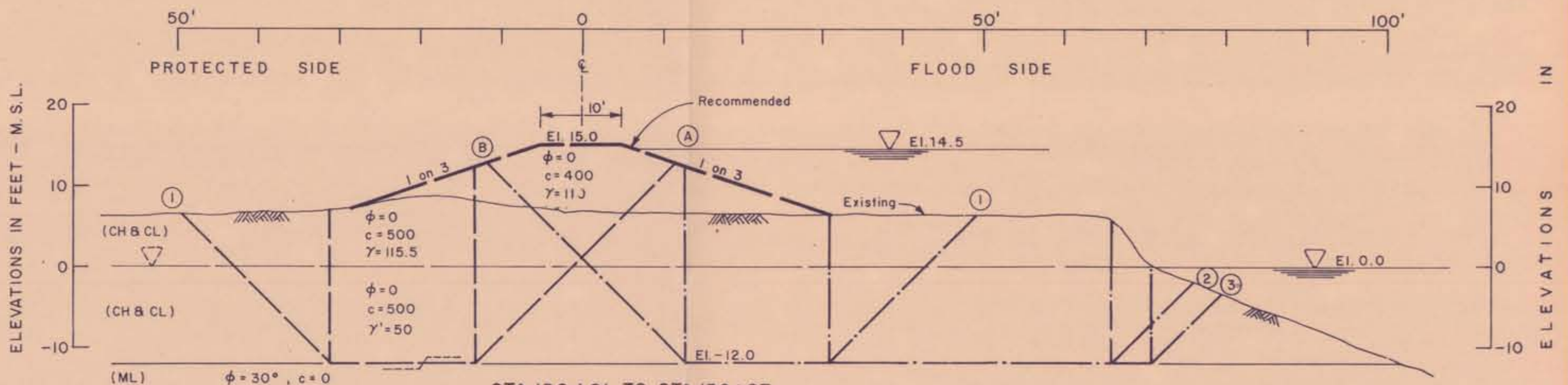
(Q) STABILITY ANALYSIS
EAST LEVEE
STA. 87+55 TO STA. 100+86

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

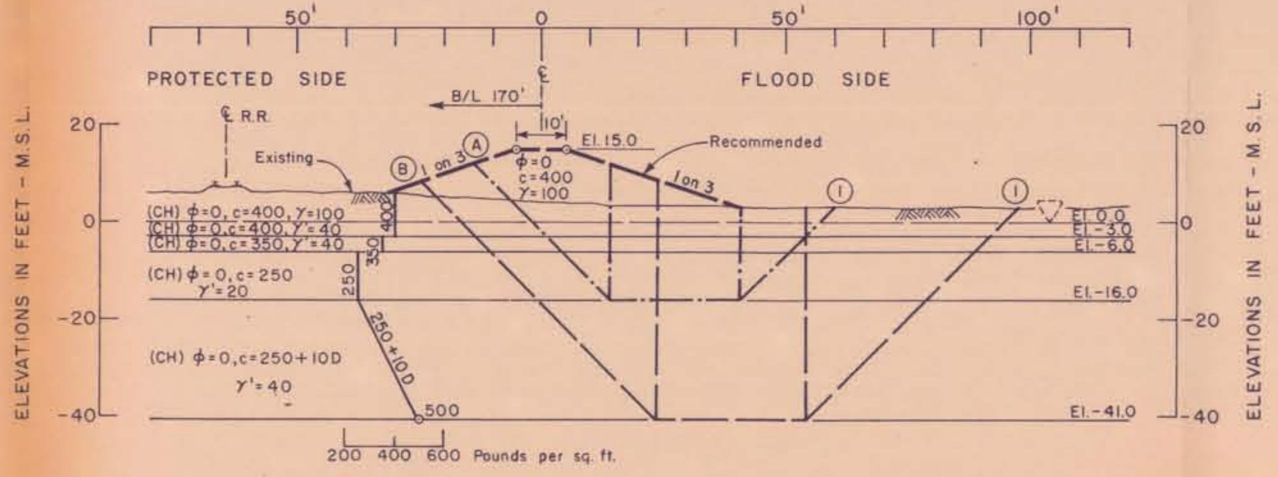
FEBRUARY 1968 FILE NO. H-2-24111



STA. 100+86 TO STA. 122+41



STA. 130+81 TO STA. 136+07



STA. 141+75 TO STA. 179+47

LEVEE FEATURE	SLIP SURFACE			DRIVING			RESISTING				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	$\Sigma R/\Sigma D$
STA. 100+86 TO 122+41	A	1	-17.0	42,919	22,575	20,344	18,560	12,160	12,080	42,800	2.10
		2			21,285	21,634		17,300	11,820	47,680	2.20
		3	-34.0	105,096	73,457	31,639	31,993	10,200	23,663	65,856	2.08
	B	1	-17.0	26,229	5,929	20,300	19,600	22,700	9,300	51,600	2.54
		2			3,713	22,516		29,000	6,600	55,200	2.45
		3			252	25,977		38,000	2,200	59,800	2.30
	C	1	-34.0	58,931	19,374	39,557	34,212	17,514	20,257	71,983	1.82
		2			8,998	49,933		32,814	10,685	77,711	1.56
		3			4,283	54,648		46,314	7,200	87,726	1.61
		4			1,224	57,707		53,394	4,200	91,806	1.59
STA. 130+81 TO 136+07	A	1	-12.0	34,078	15,150	19,528	23,300	7,512	18,500	49,312	2.53
	B	1	-12.0	34,195	14,307	19,888	24,500	9,000	18,000	51,500	2.59
		2			4,752	29,443		26,500	10,000	61,000	2.07
		3			2,550	31,645		29,000	8,500	62,000	1.96
STA. 141+75 TO 179+15	A	1	-16.0	38,578	9,570	29,008	19,100	6,750	11,900	37,750	1.30
	B	1	-41.0	89,304	40,370	48,934	34,650	15,000	30,650	80,300	1.64

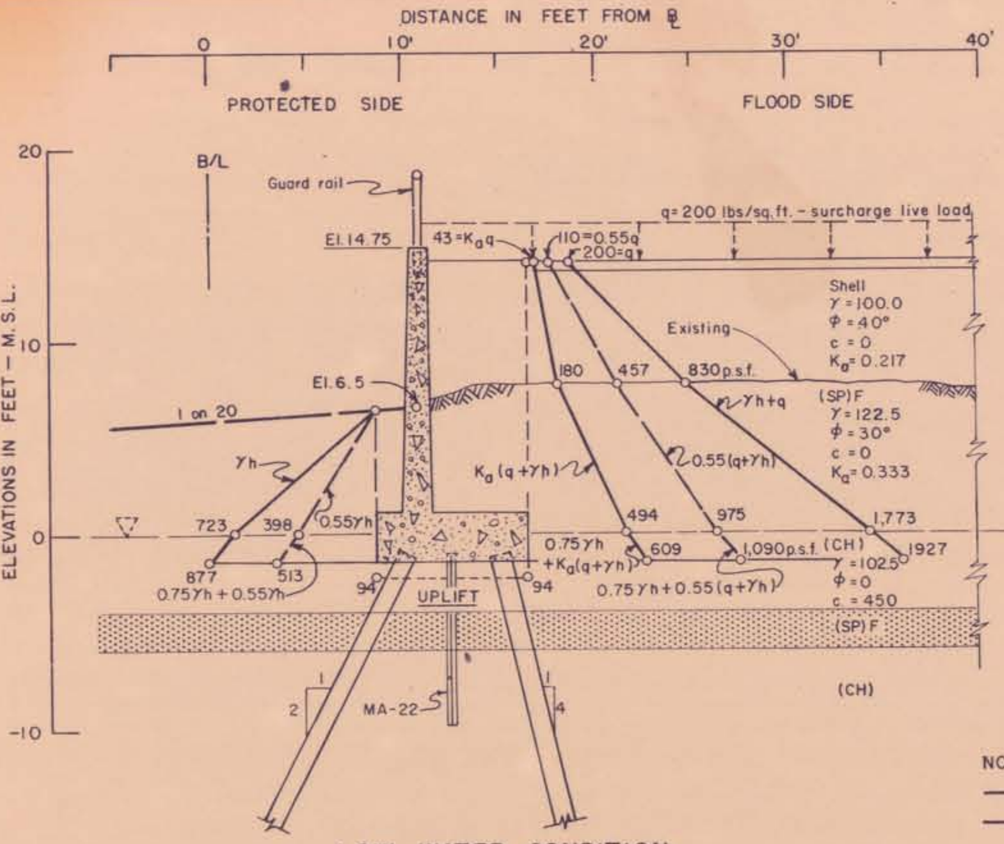
NOTE: For general notes see plate III - 24

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

(Q) STABILITY ANALYSIS
EAST LEVEE
LAKE PONTCHARTRAIN TO CHEF HWY.

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

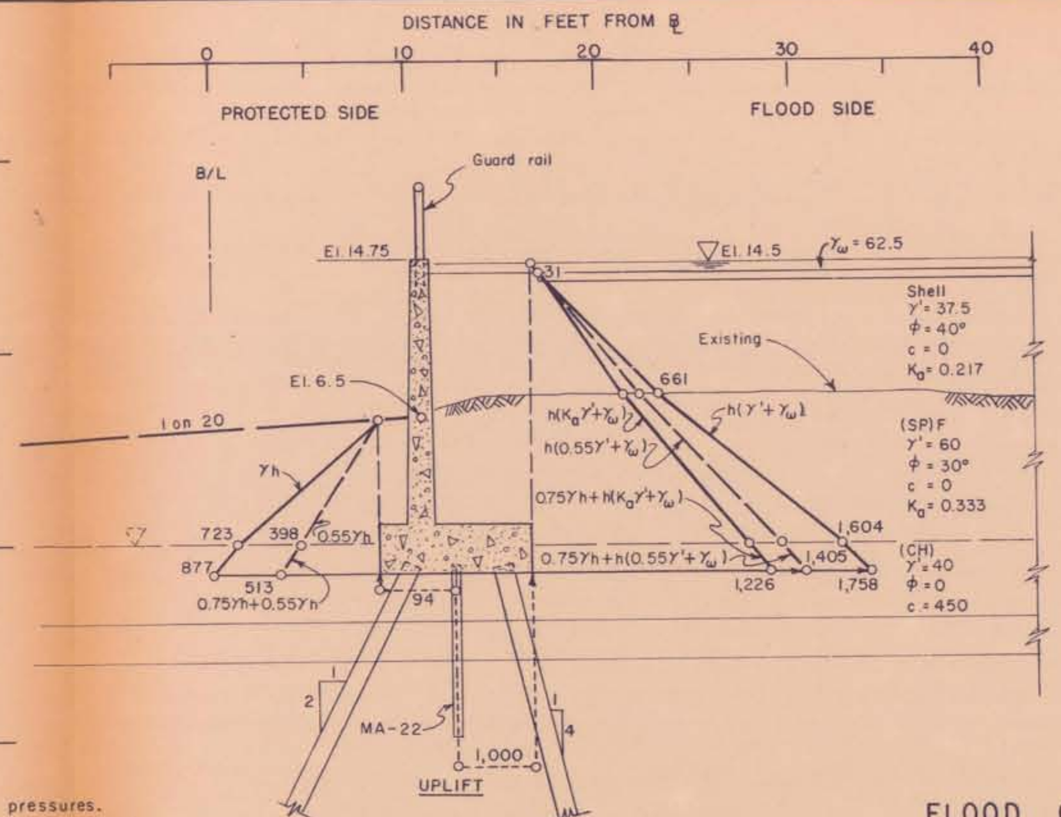
FEBRUARY 1968 FILE NO. H-2-24111



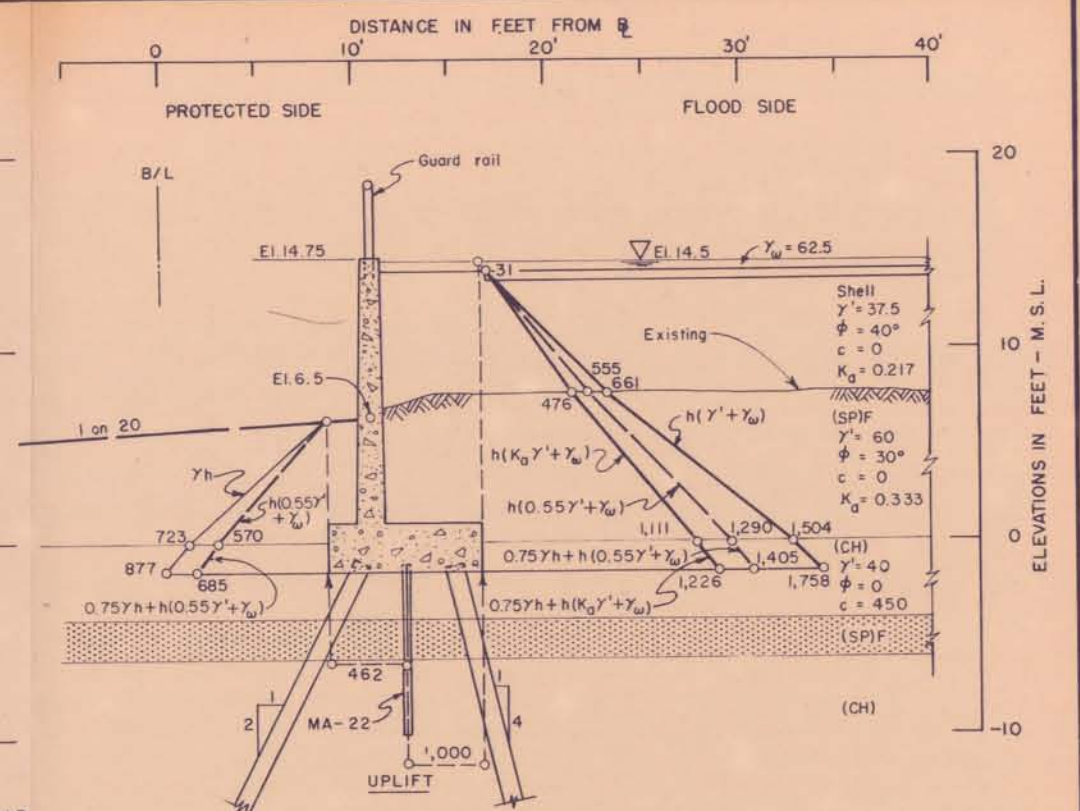
LOW WATER CONDITION

NOTE:
Lateral pressures.
Recommended for design.

FLOOD CONDITIONS

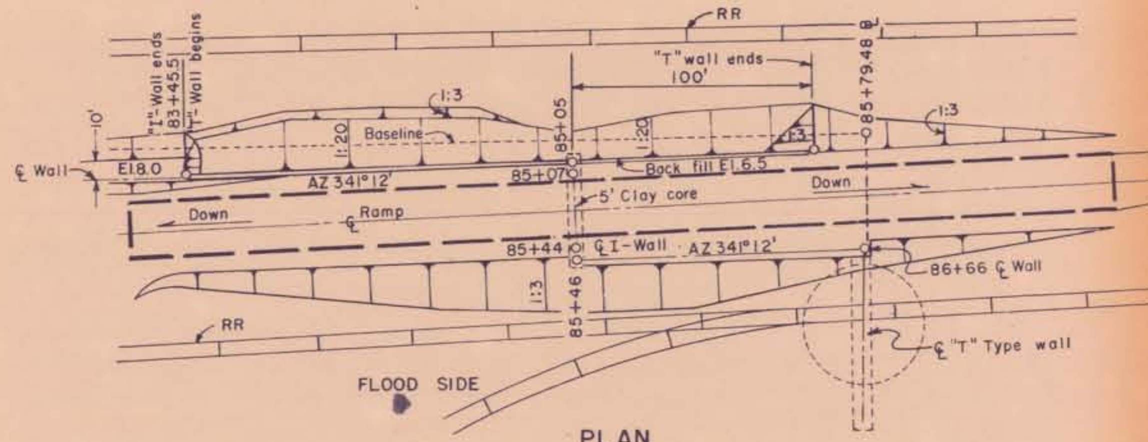


LOW TAIL WATER



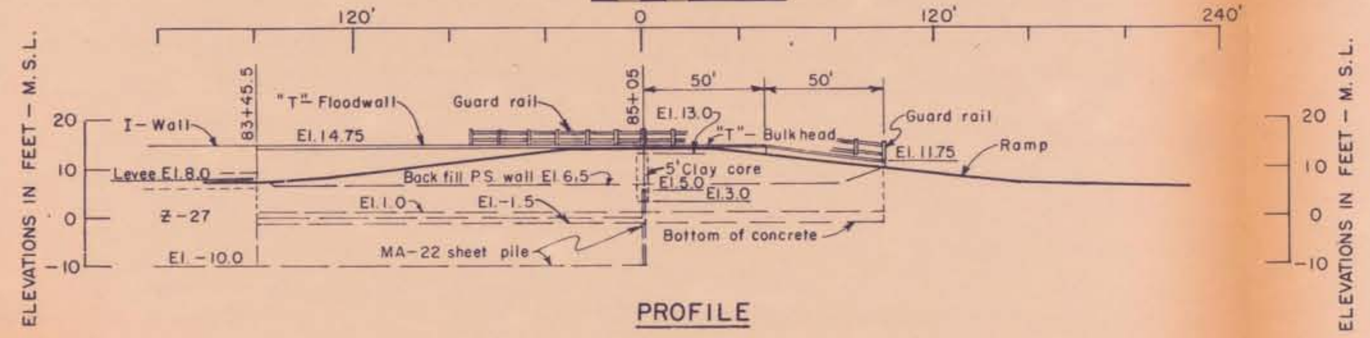
HIGH TAIL WATER

PROTECTED SIDE

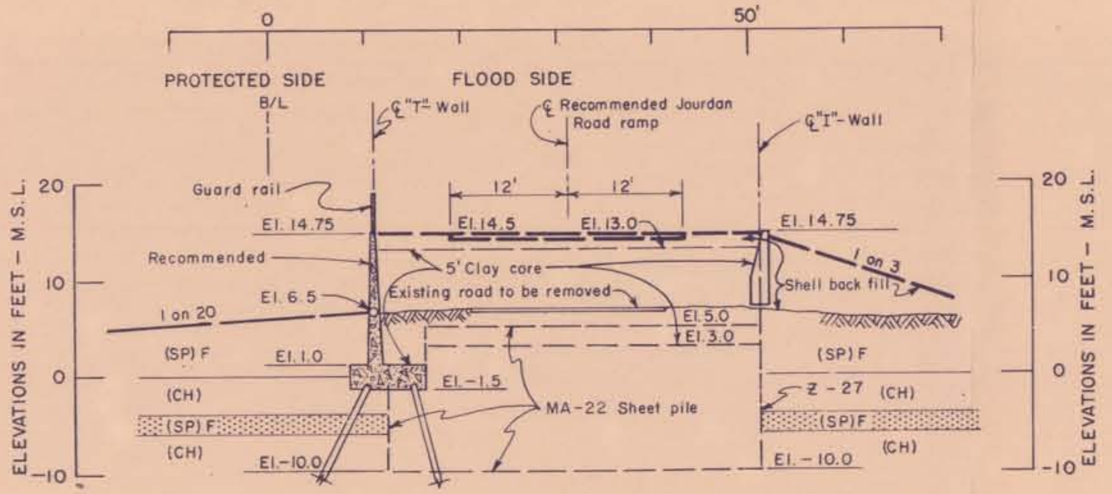


PLAN

SCALE IN FEET



PROFILE



RAMP SECTION

(WALL STATION 85+05)

GENERAL NOTES

γ = Unit weight of soil - water system.

γ' = Submerged unit weight.

γ_w = Unit weight of water.

q = Surcharge unit load.

h = Thickness of stratum.

Φ = Angle of internal friction.

c = Unit cohesion.

K_a = Active coefficient

$0.55 = K_o$ = At rest coefficient for granular soils

$0.75 = K_o$ = At rest coefficient for clay soils

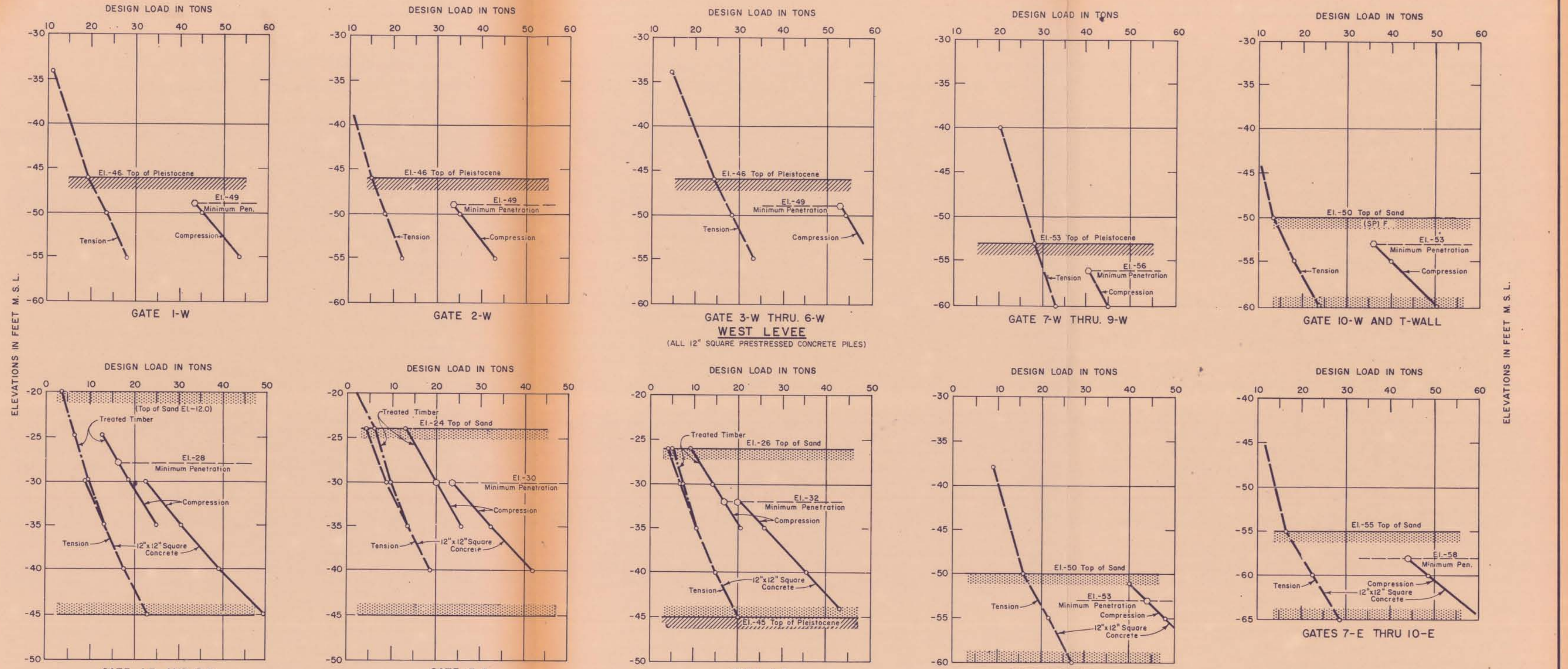
U = Assigned uplift conditions

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

"T"- WALL BULKHEAD
EAST LEVEE
JOURDAN ROAD RAMP

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

FEBRUARY 1968 FILE NO. H-2-24111



GATE 1-E AND 2-E

GATE 3-E

GATE 4-E

EAST LEVEE

GATE 5-E AND 6-E

GATES 7-E THRU 10-E

NOTE: Skin friction disregarded above bottom of marsh deposit and/or above upper one third of recent deposit.
Applied factors of safety: 1.75 in compression and 2.0 in tension.
Applied conjucate stress ratios: K=1.00 in compression and 0.7 in tension.
(S) Case governed
(S) Strengths in recent clays: ϕ=23°, c=0; in pleistocene clays: ϕ=25°, c=0; in sand: ϕ=35°, c=0.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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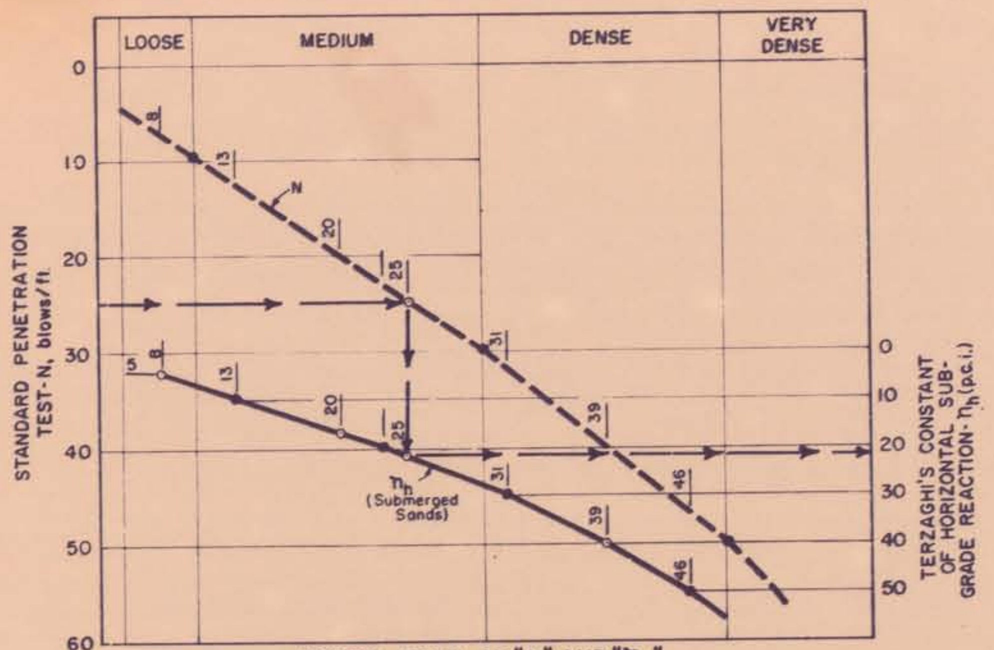
IHNC REMAINING LEVEES

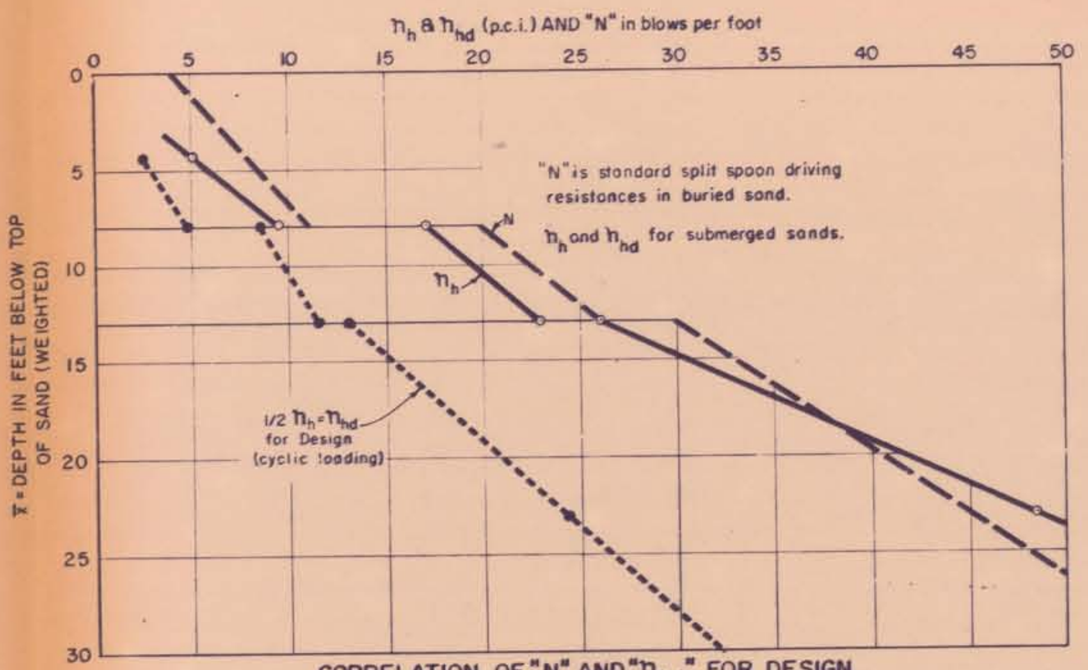
PILE DESIGN LOAD VS TIP ELEVATION
(S) CASE

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

FEBRUARY 1968 FILE NO. H-2-24111



CORRELATION OF "N" AND "n_h"



CORRELATION OF "N" AND "n_{hd}" FOR DESIGN

COHESIONLESS SANDS

$K_h = n_h \cdot X$, $K_{hd} = n_{hd} \times d/b$ (DESIGN)

K_h = Subgrade modulus (p.s.i.)

n_h = Constant of horizontal subgrade reaction for submerged sands. (p.c.i.)

x = Depth below top of sand. (in.)

d = Projected diameter of pile. (in.)

b = 12" = Unit conversion factor. (in.)

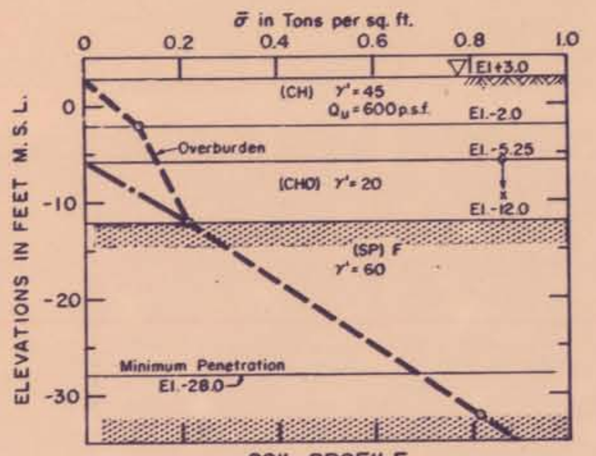
Sub "d" denotes design.

COHESIVE CLAYS

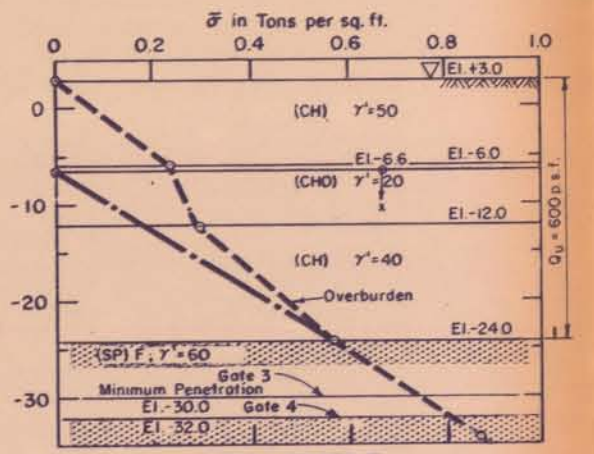
$K_o = 80 \cdot Q_u$ (p.s.f.) $= 0.5555 \cdot Q_u$ (p.s.i.)

$K_{hd} = 0.4 \cdot K_o \cdot d/b = 0.2222 \cdot Q_u \cdot d/b$ (p.s.i.) (DESIGN)

COHESIONLESS SANDS



SOIL PROFILE



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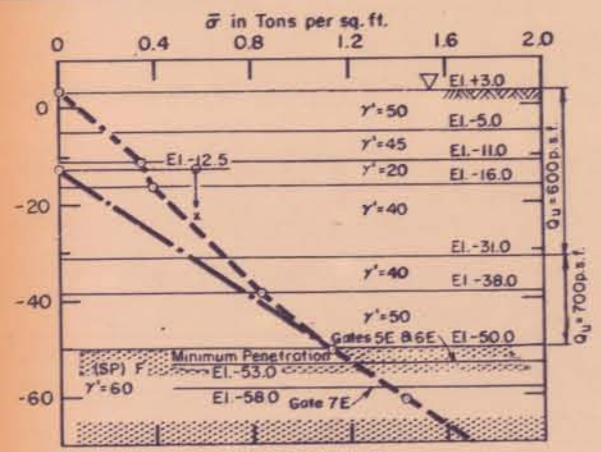
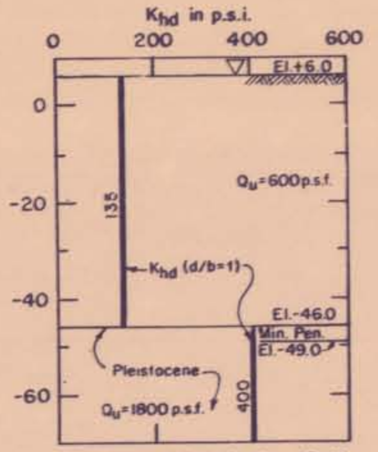
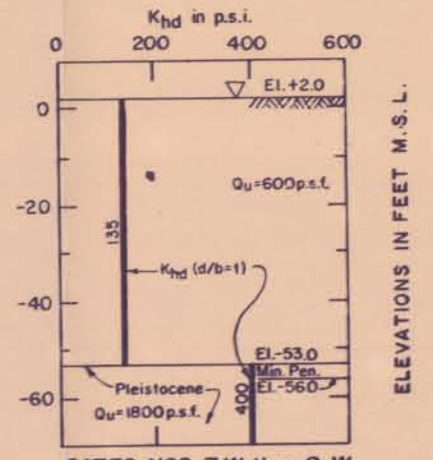


SOIL PROFILE



GATES NOS. 1-W thru 6-W



GATES NOS. 7-W thru 9-W

GENERAL NOTES

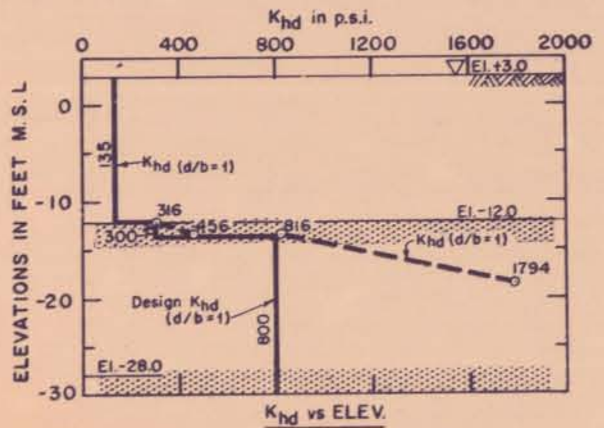
K_o and n_h values are those proposed by Karl Terzaghi in "Evaluation of Coefficients of Subgrade Reactions," *Geotechnique*, London, England, vol. V, 1955, pp. 297-326.

K_{hd} values include reduction factors for cyclic loading

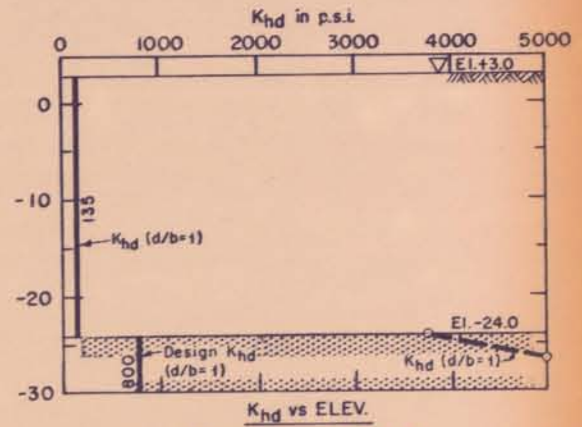
The cohesive overburden, above the buried sand, was converted to a "weighted" thickness of material with a unit weight equal to that of the submerged sand and this thickness was used in determining x in the cohesionless sand expression for approximating K_{hd}. Design K_{hd} values are assigned, for purposes of conservatism in the sands.

Qu = Unconfined compression shear test in p.s.f.

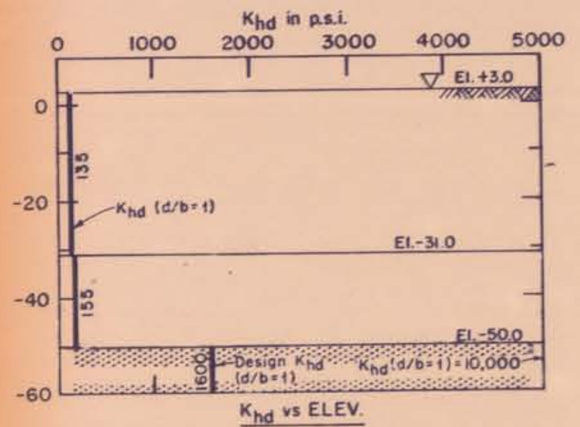
$\bar{\sigma}$ = Normal Stress



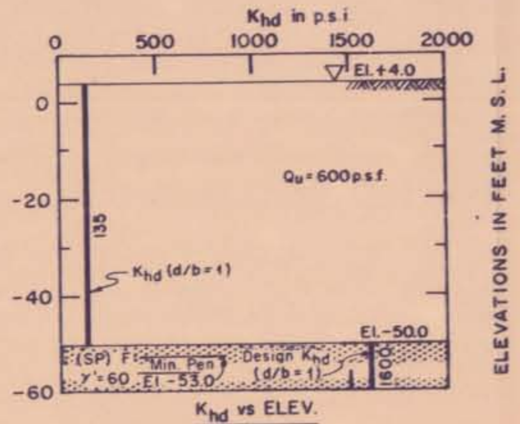
GATES NOS. 1-E & 2-E



GATES NOS. 3-E & 4-E



GATES NOS. 5-E, 6-E & 7-E



GATE NO. 10-W AND T-WALL

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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IHNC REMAINING LEVEES

BEARING PILES SUBGRADE MODULI ASSIGNED FOR DESIGN

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

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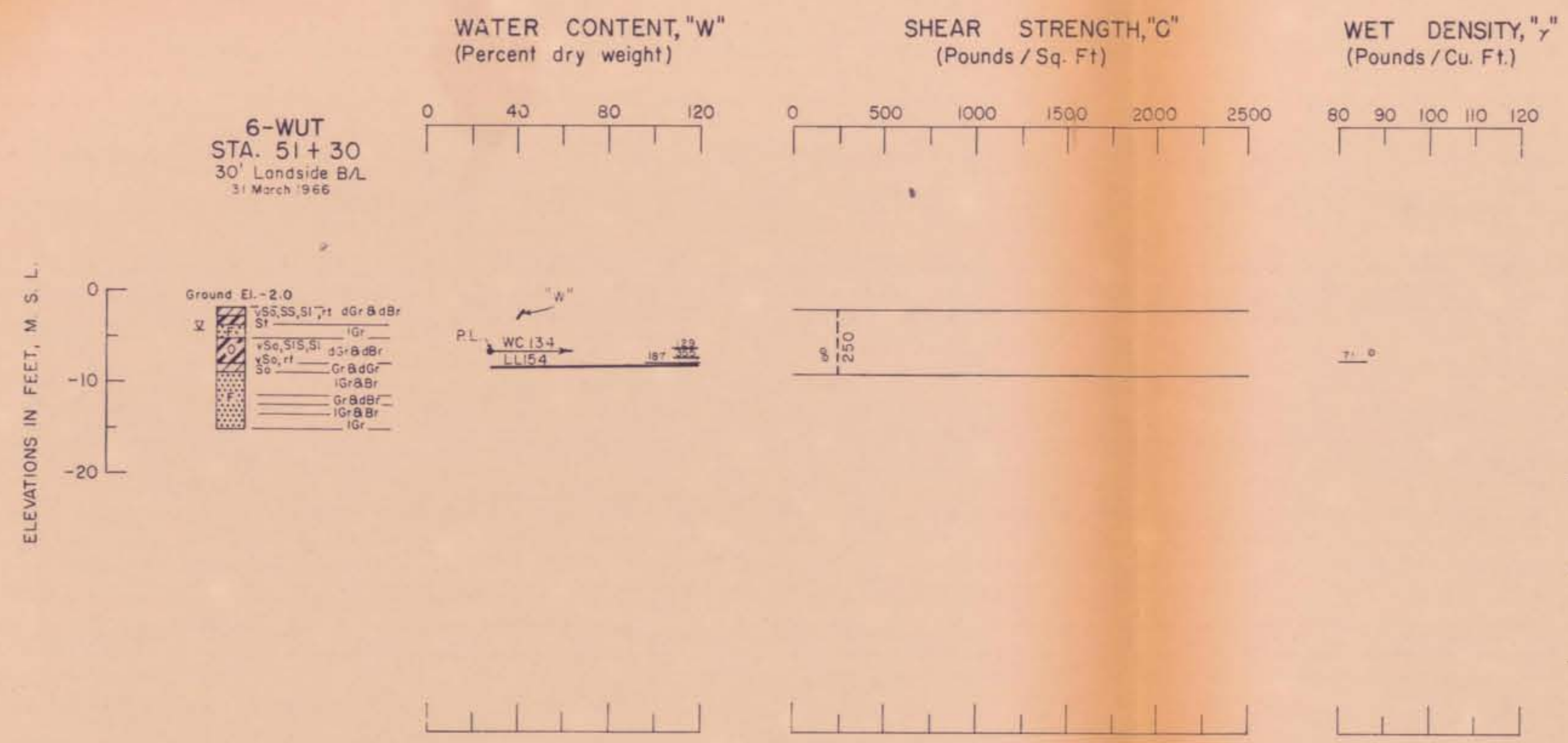

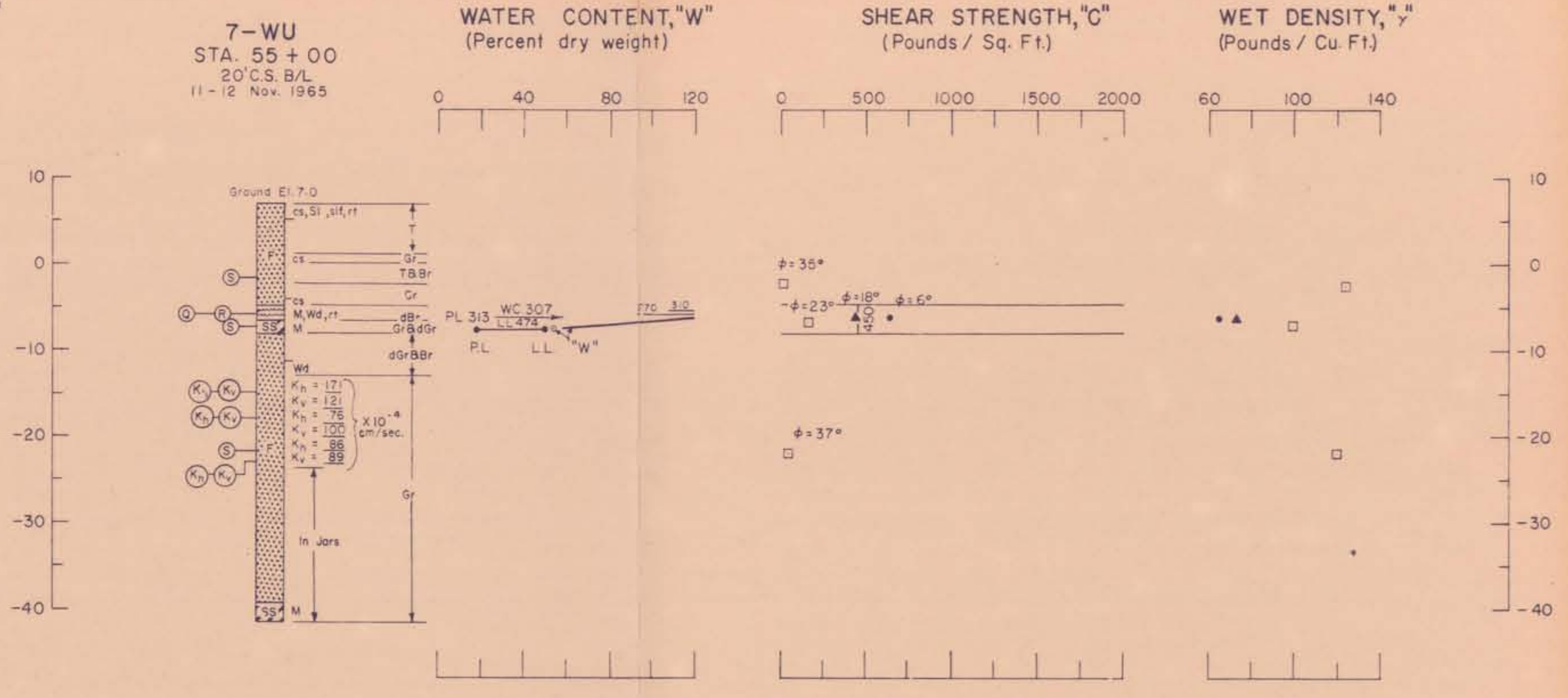

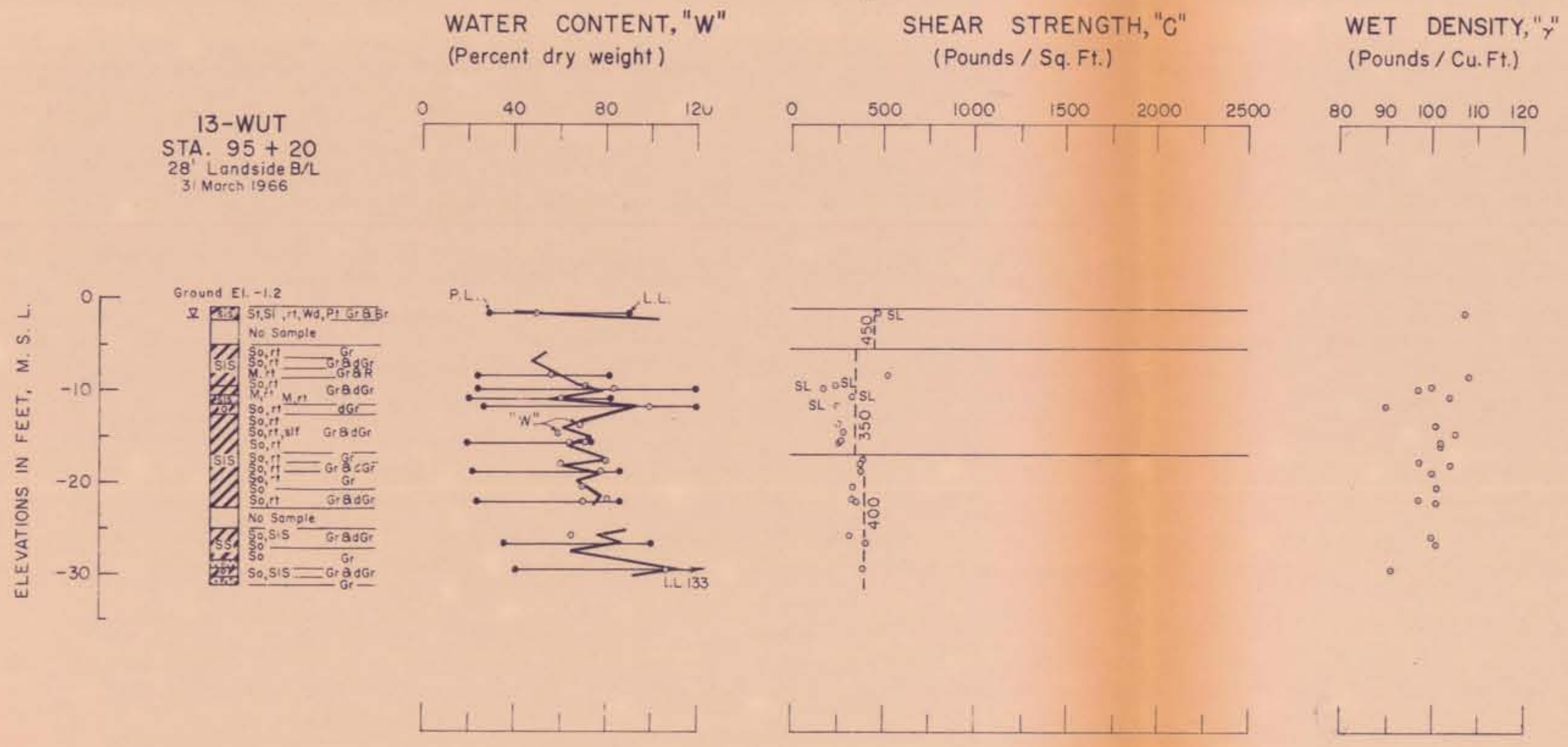

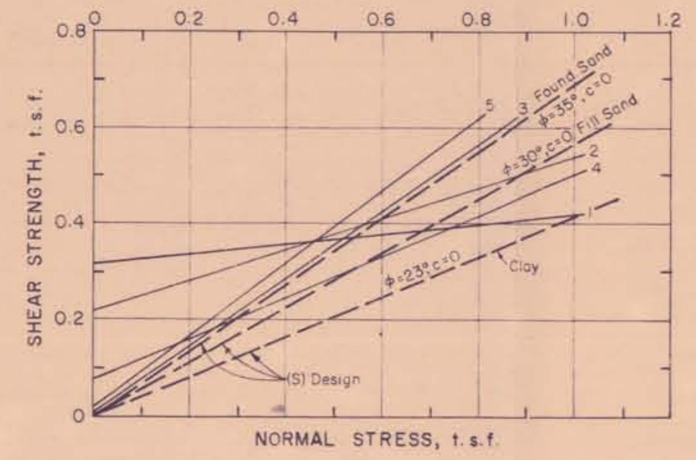

ENVELOPE No.	ENVELOPE El	TYPE	STRENGTH φ	STRENGTH c (t.s.f.)	CLASS
1	-6.1	Q	6	0.32	PT
2	-6.1	R	18	0.22	PT
3	-2.4		35	0.01	SP
4	-6.9	S	23	0.08	CL
5	-22.0		37	0.02	SP

SHEAR STRENGTH DATA

For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-57
For locations of borings see plates IV-3 & IV-6

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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IHNC REMAINING LEVEES

UNDISTURBED BORINGS 6-WUT, 13-WUT, AND 7-WU DATA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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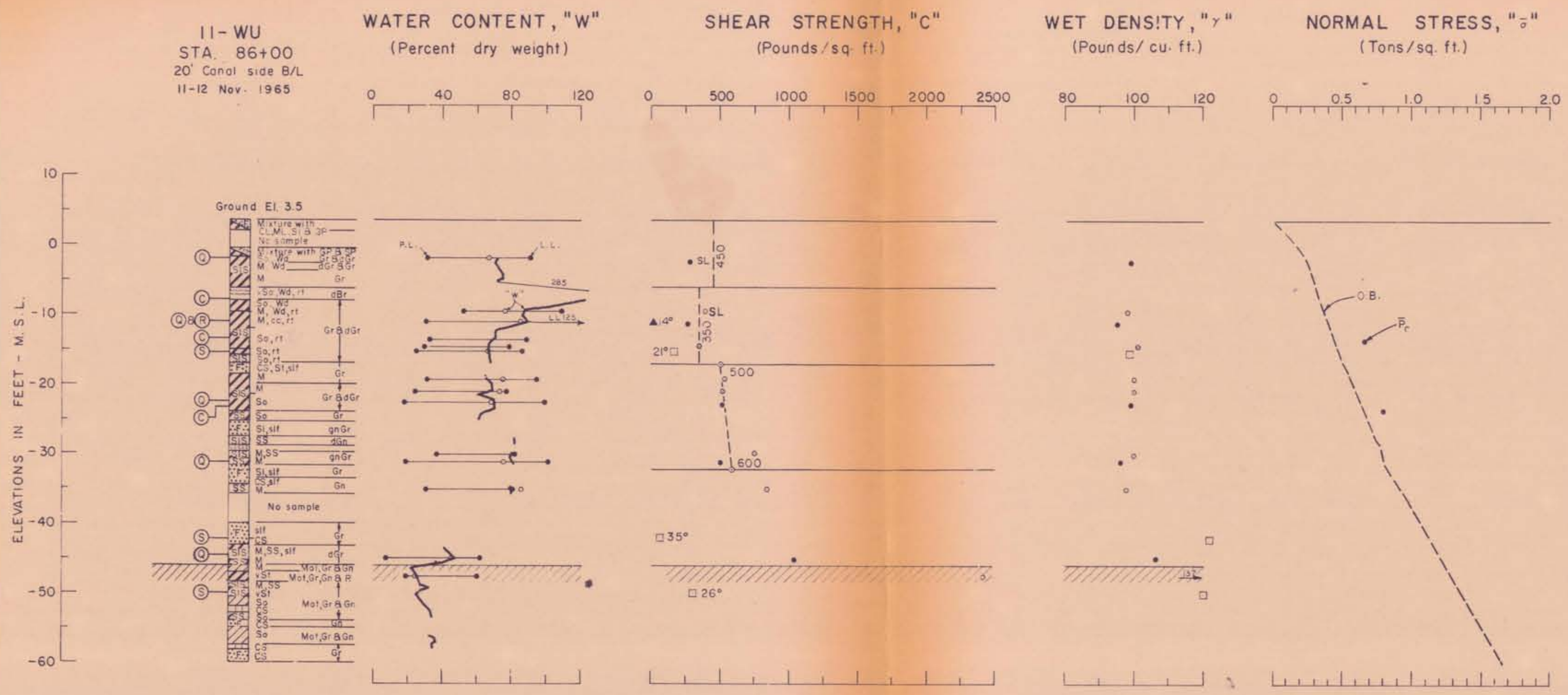
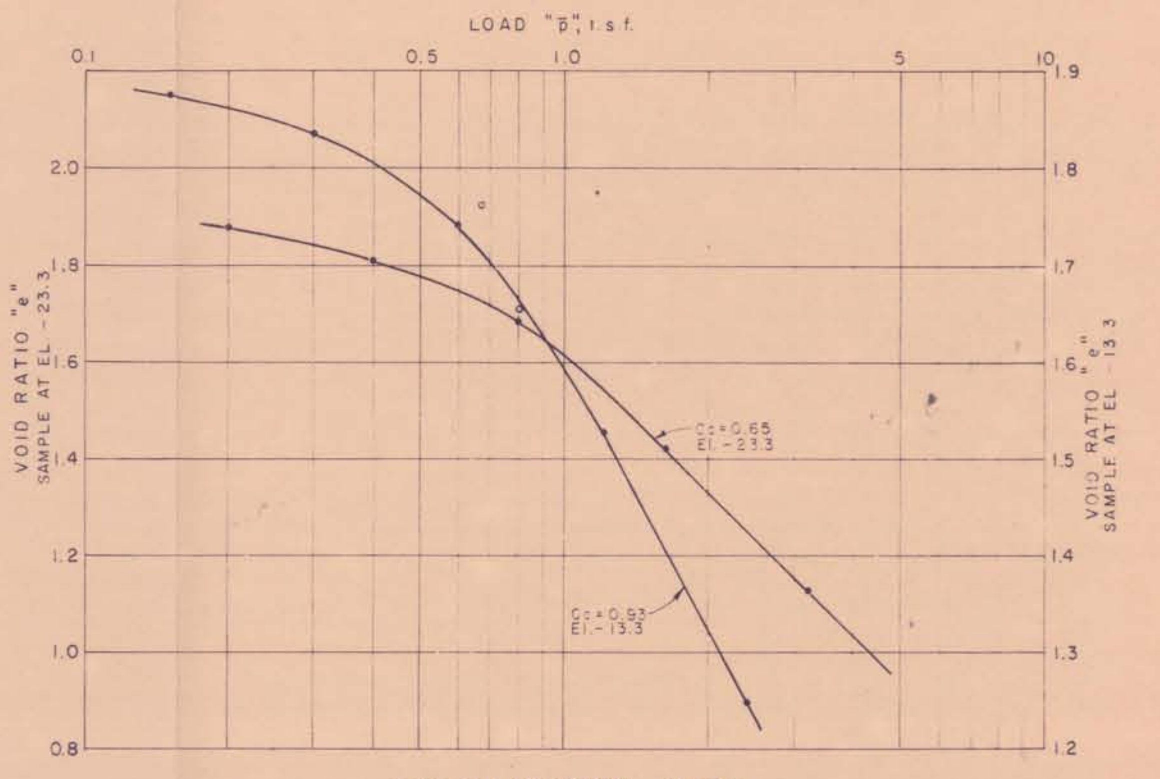
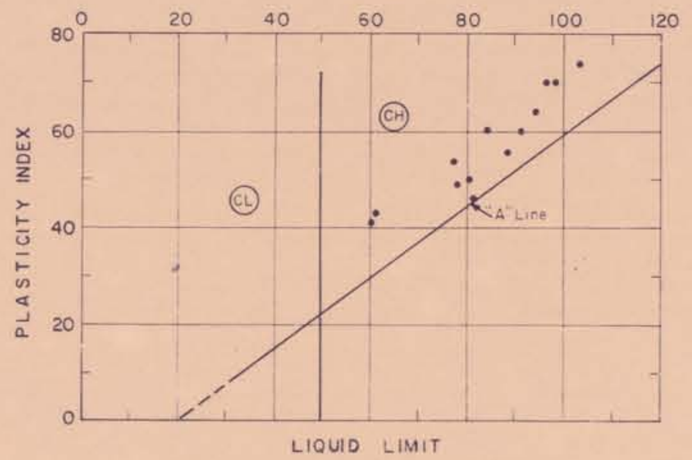
FEBRUARY 1968 FILE NO H-2-24111

PLATE III-46

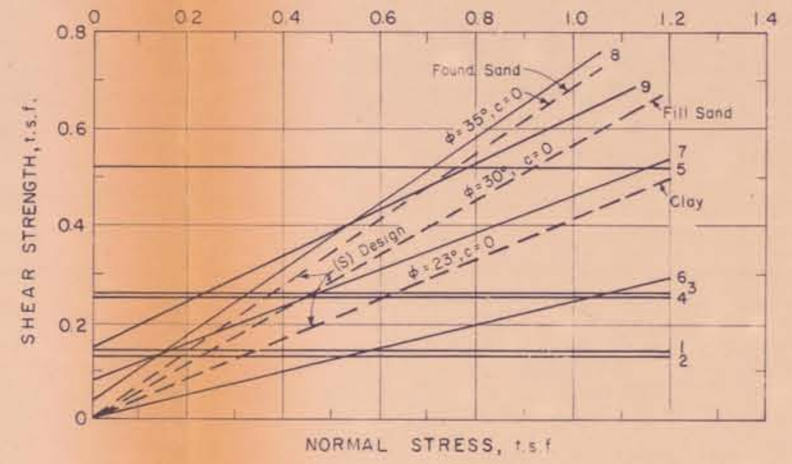




CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
No.	El		φ°	c (t.s.f.)	
1	-2.0	Q	0	0.14	CH
2	-11.1	Q	0	0.13	CH
3	-22.7	Q	0	0.26	CH
4	-31.3	Q	0	0.25	CH
5	-44.9	Q	0	0.52	CH
6	-11.1	R	14	0.0	CH
7	-15.3	S	21	0.08	CH
8	-42.1	S	35	0.03	SP
9	-50.0	S	26	0.15	CH

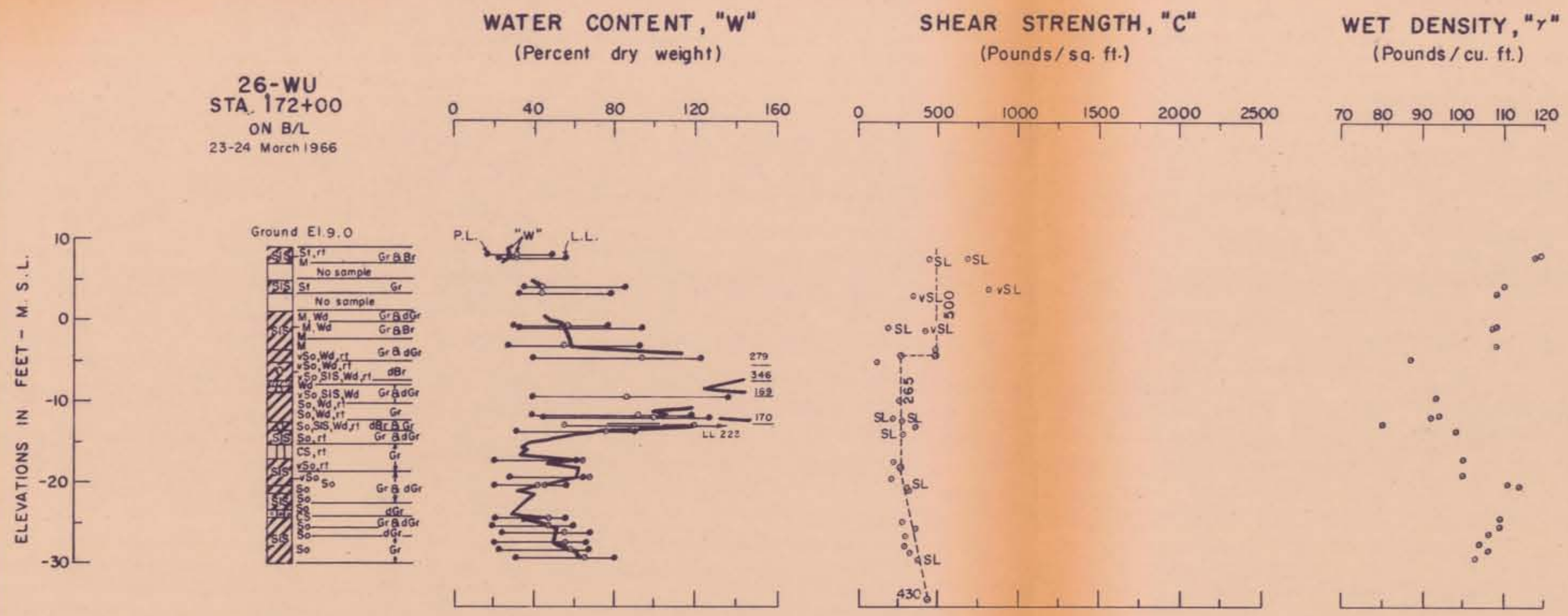
For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-57
For location of boring see plate IV-6

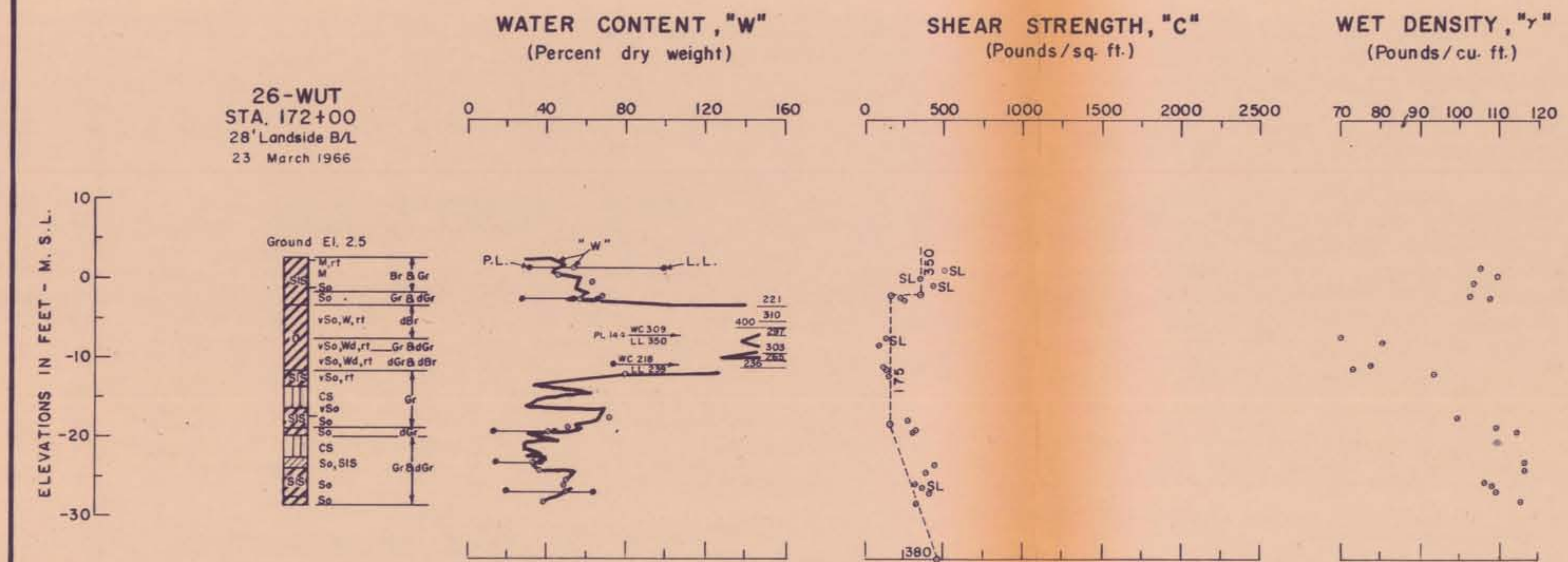
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORING 11-WU DATA

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

FEBRUARY 1968 — FILE NO. H-2-24111





GENERAL NOTES

- ∘ UC – Unconfined compression shear
- • Ⓠ – Unconsolidated undrained triaxial shear
- ▲ Ⓡ – Consolidated undrained triaxial shear
- ▫ Ⓢ – Consolidated drained direct shear
- Ⓒ – Consolidation test
- W – Natural water content
- L.L. – Liquid limit
- P.L. – Plastic limit
- c – Unit cohesion
- ϕ – Angle of friction
- γ – Unit weight of soil-water system
- $\bar{\sigma}$ – Normal stress
- P_c – Preconsolidation pressure
- e – Void ratio
- C_c – Compression index
- O.B. – Overburden

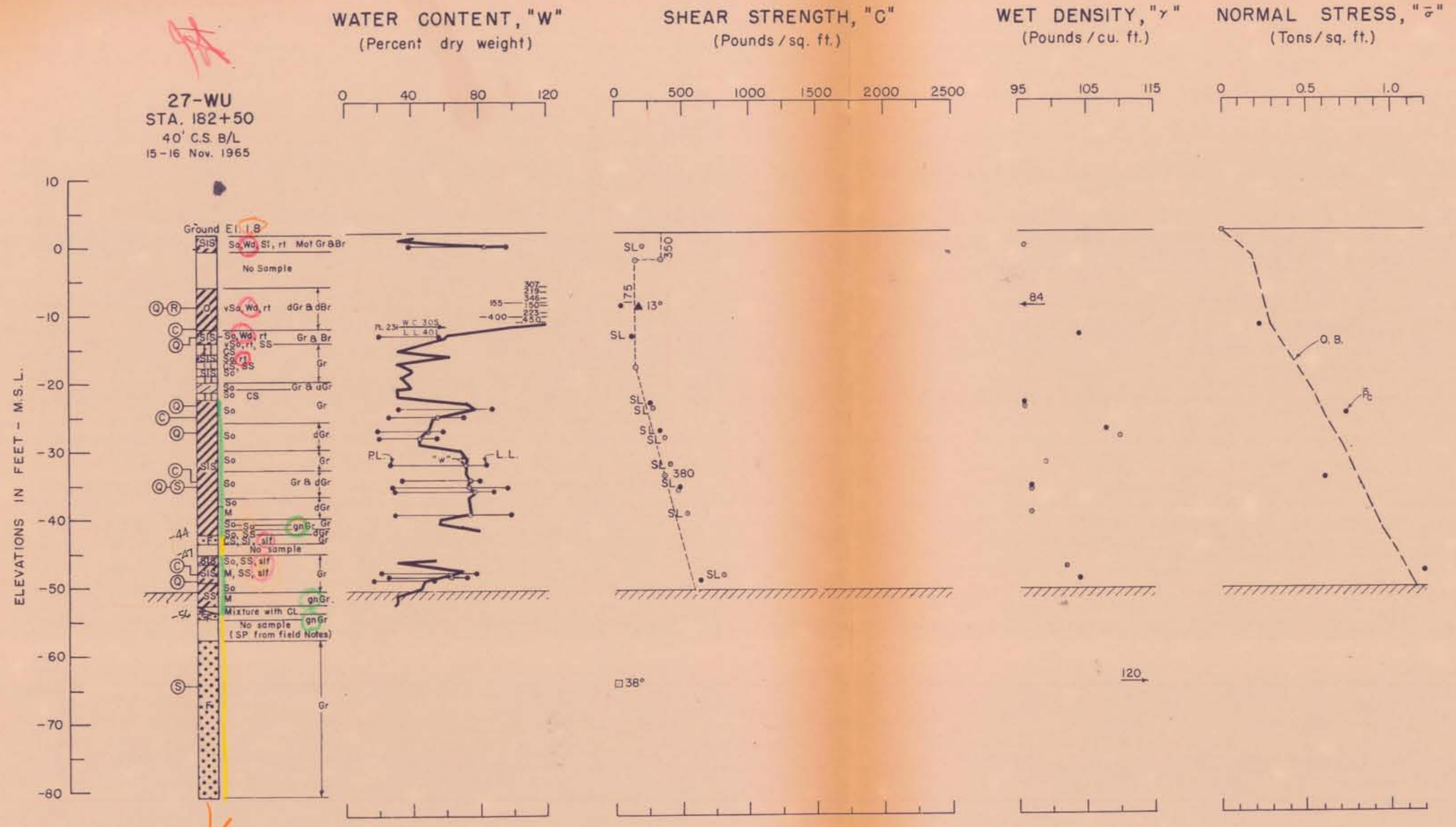
See Plate A for soil boring legend.
See Plate IV-13 for locations of borings.

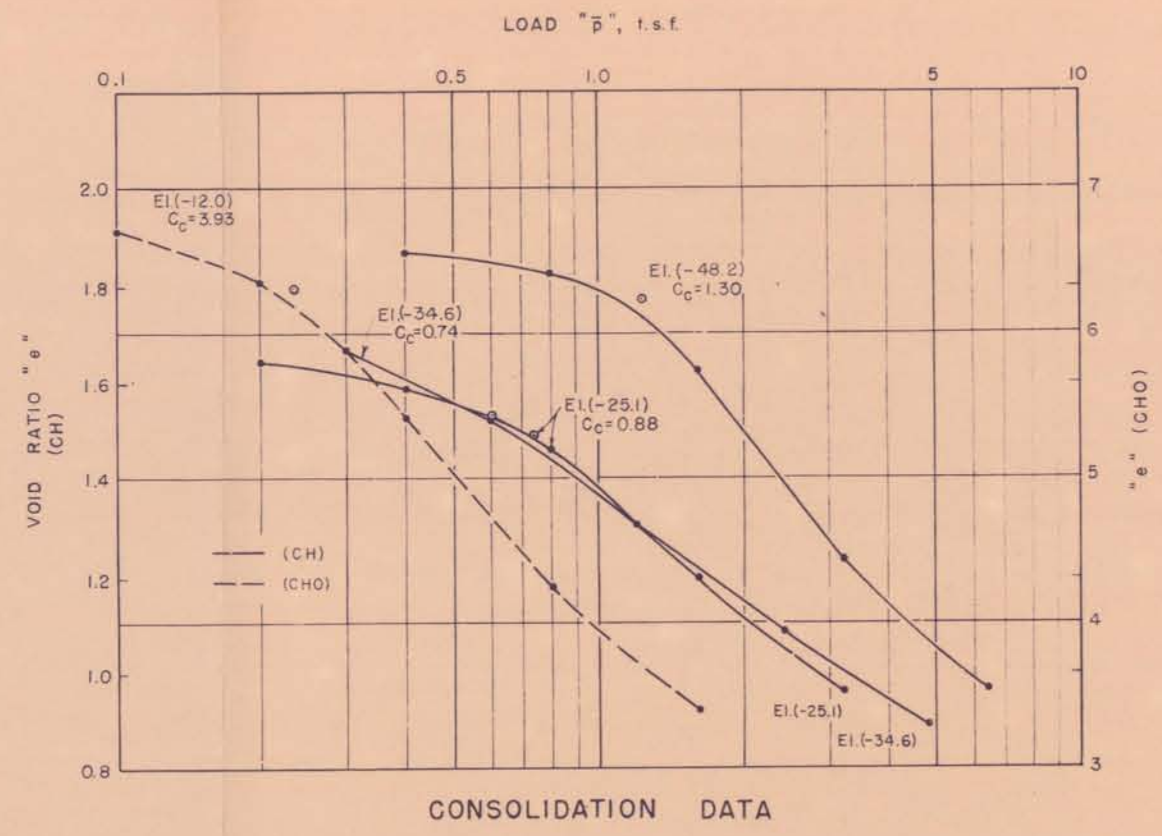
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORINGS 26-WU AND 26-WUT DATA

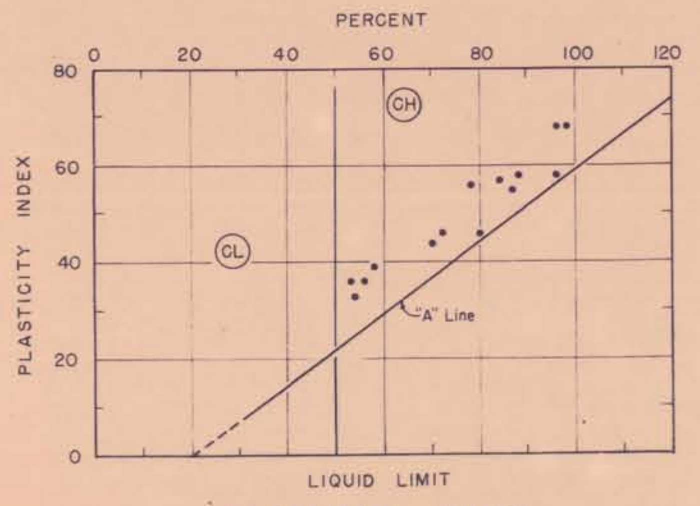
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

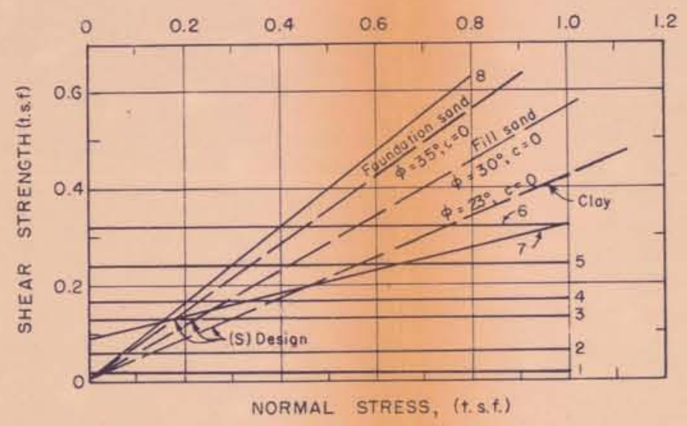




CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE No.	ENVELOPE El.	TYPE	STRENGTH φ°	STRENGTH c (t.s.f.)	CLASS
1	-8.9			0.02	CH
2	-13.2			0.06	CH
3	-23.2			0.13	CH
4	-27.2	Q	0	0.17	CH
5	-35.5			0.24	CH
6	-49.2			0.32	CH
7	-8.9	R	13	0.09	CH
8	-64.4	S	38	0.01	SM

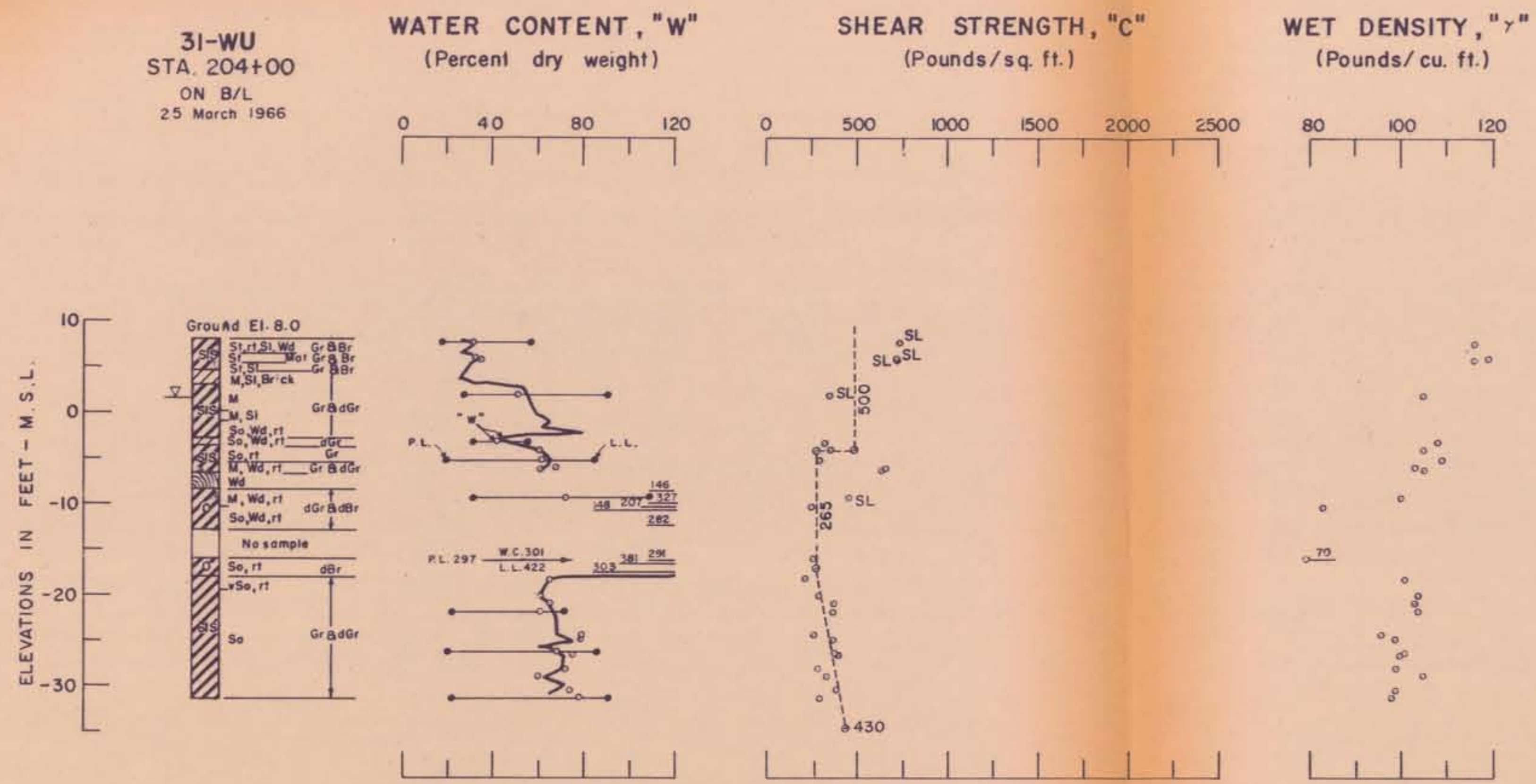
For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-58
For location of boring see plate IV-13

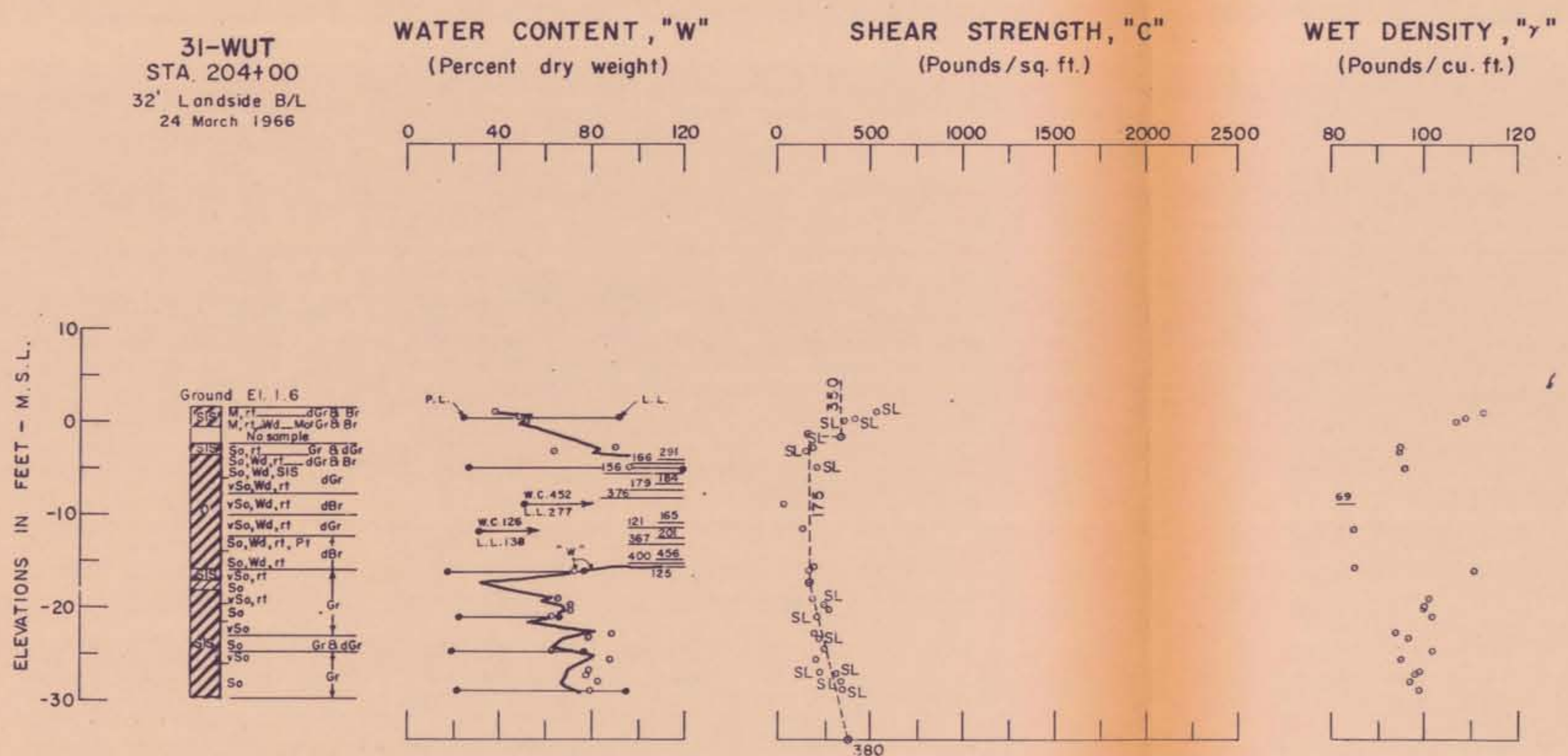
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORING 27-WU DATA

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

FEBRUARY 1968 FILE NO. H-2-24111





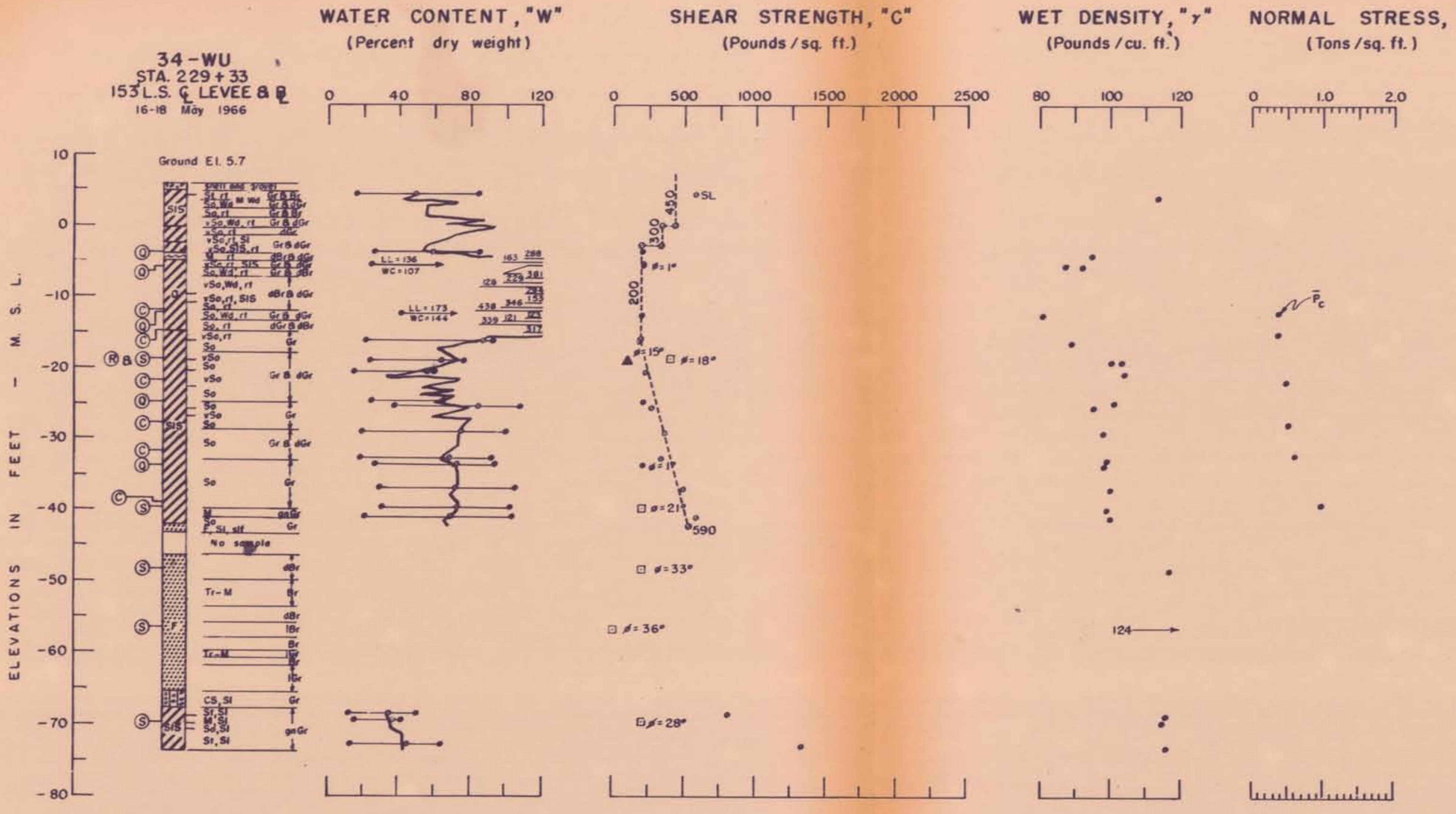
See plate A for soil boring legend
See plate III-48 for general notes
See plate IV-15 for locations of borings.

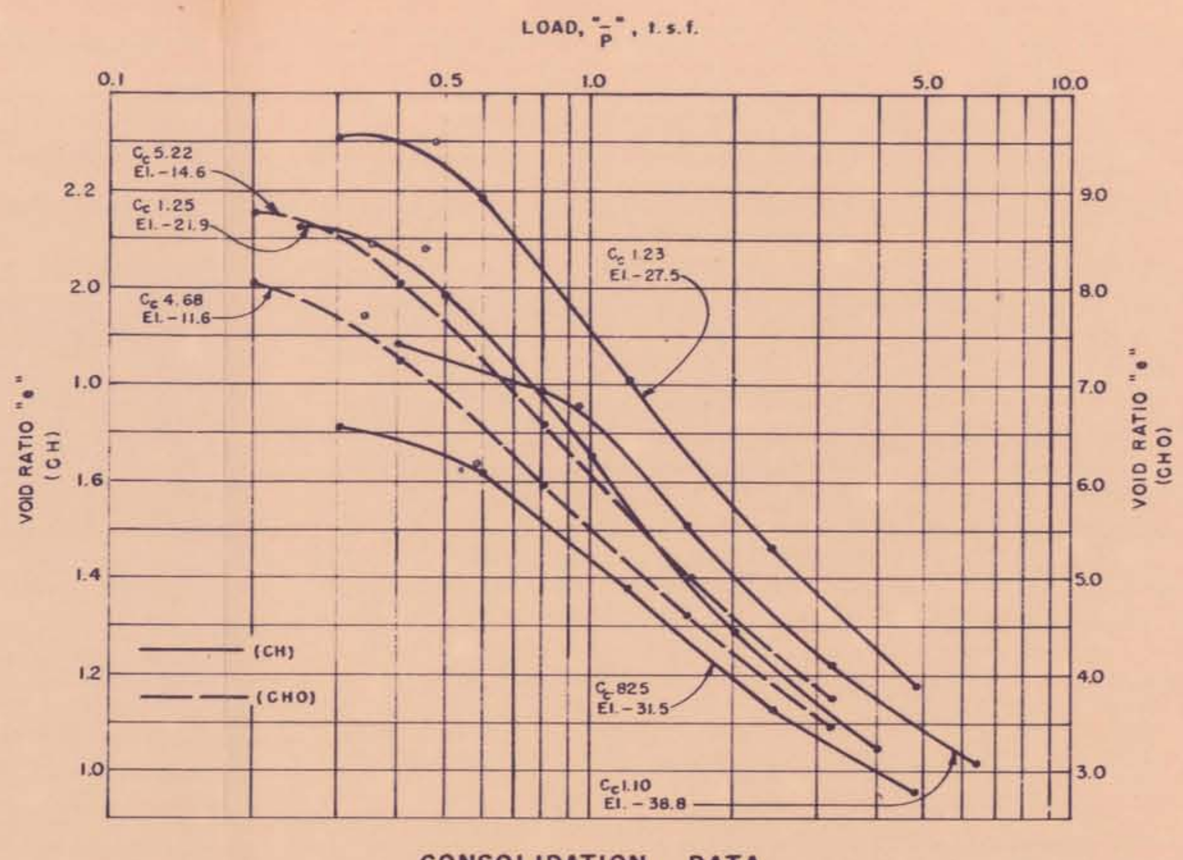
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORINGS
31-WU AND 31-WUT DATA

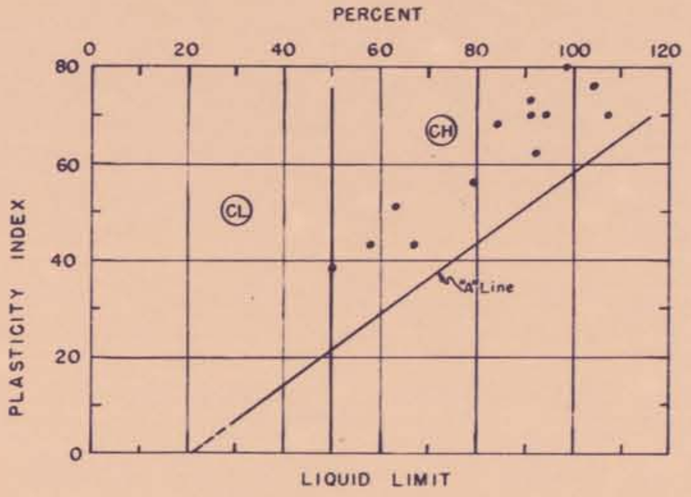
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 | FILE NO H-2-24111

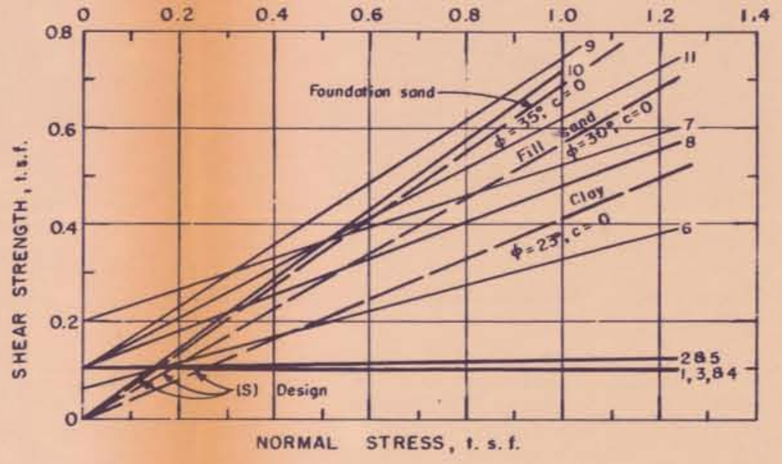




CONSOLIDATION DATA



PLASTICITY CHART



ENVELOPE		TYPE	STRENGTH		CLASS
No.	El.		φ°	c (t.s.f.)	
1	-3.4	Q	0	0.1	CH
2	-5.5		1	0.1	CH
3	-12.2		0	0.1	CH
4	-24.4		0	0.1	CH
5	-33.3		1	0.1	CH
6	-18.7	R̄	15	0.06	CH
7	-18.7	S	18	0.2	CH
8	-39.4		21	0.1	CH
9	-47.8		33	0.1	SM
10	-56.3		36	0.0	SM
11	-69.3		28	0.1	CL

SHEAR STRENGTH DATA

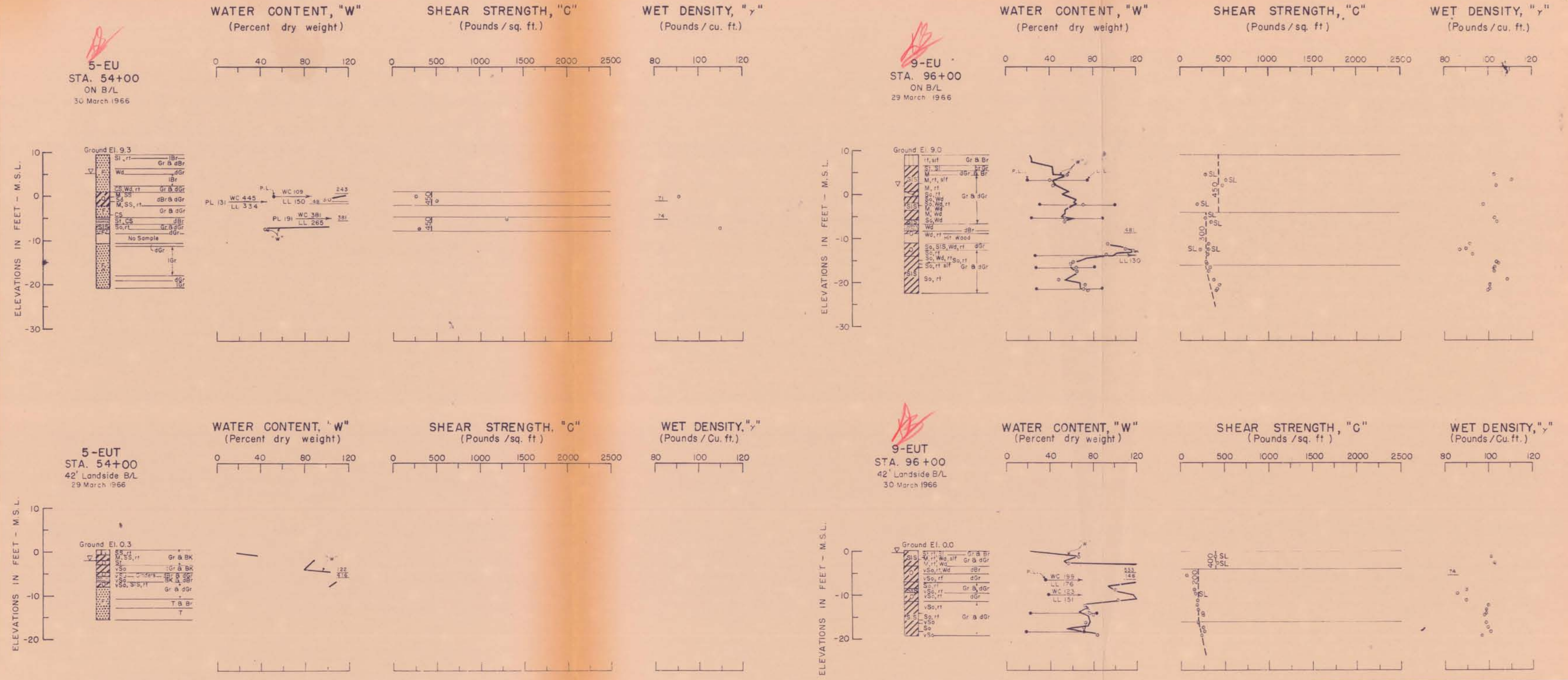
For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-58
For location of boring see plate IV-17

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORING 34-WU DATA

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

FEBRUARY 1968 FILE NO. H-2-24111



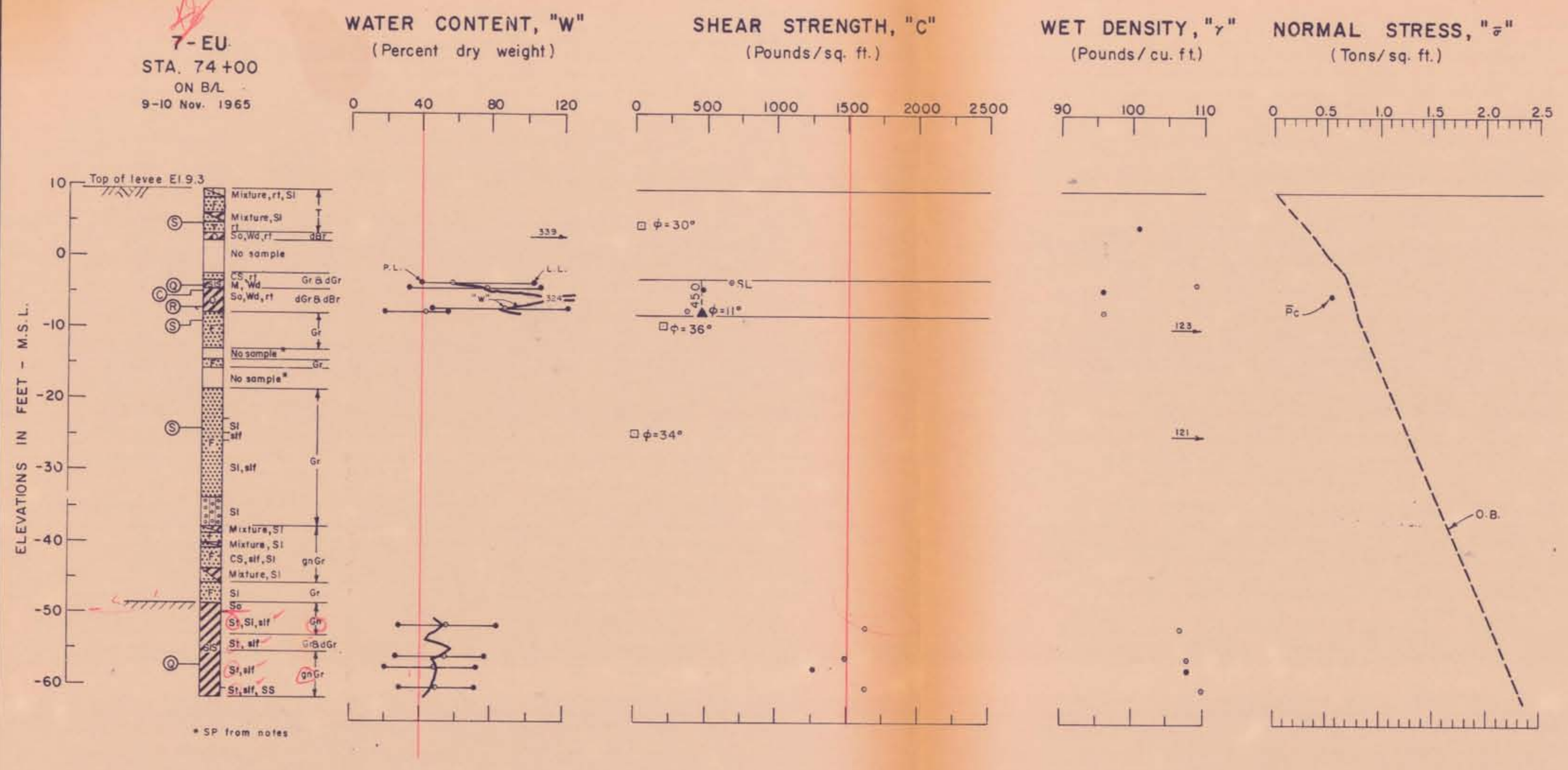
NOTE:
For soil boring legend see plate A
For general notes see plate III-48
For locations of borings see plates IV-19, & IV-23

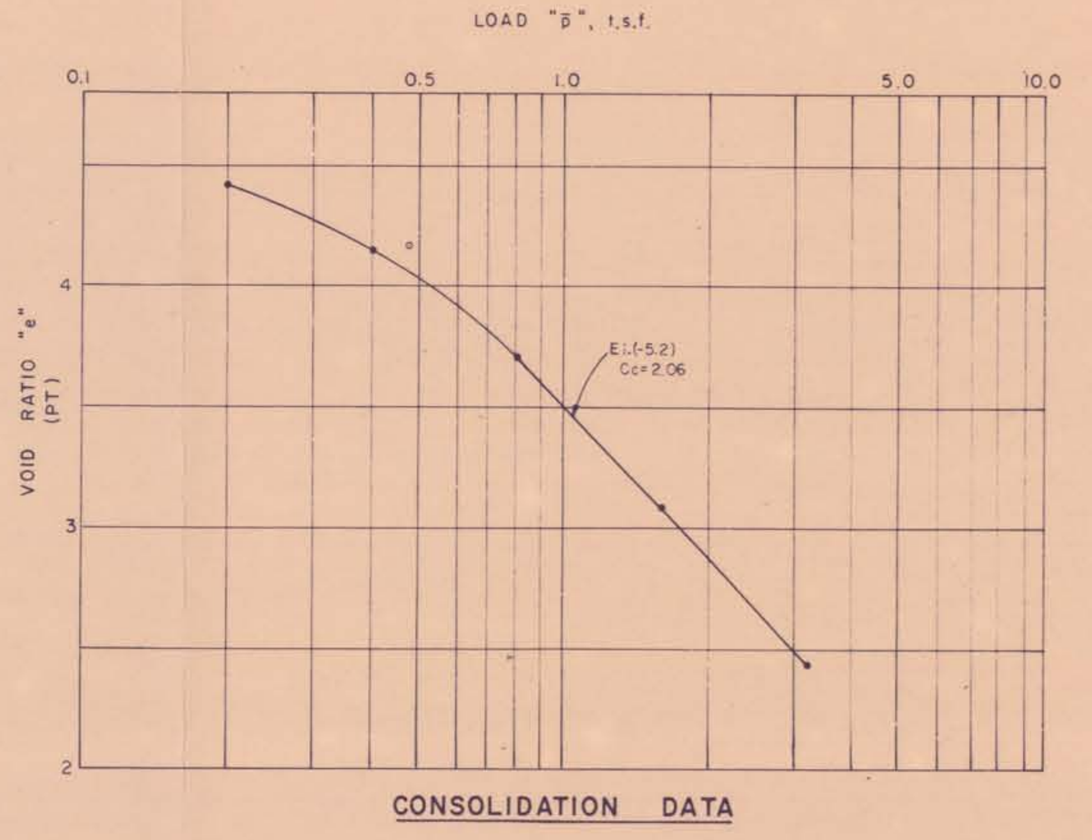
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORINGS
5-EU, 5-EUT, 9-EU, AND 9-EUT DATA

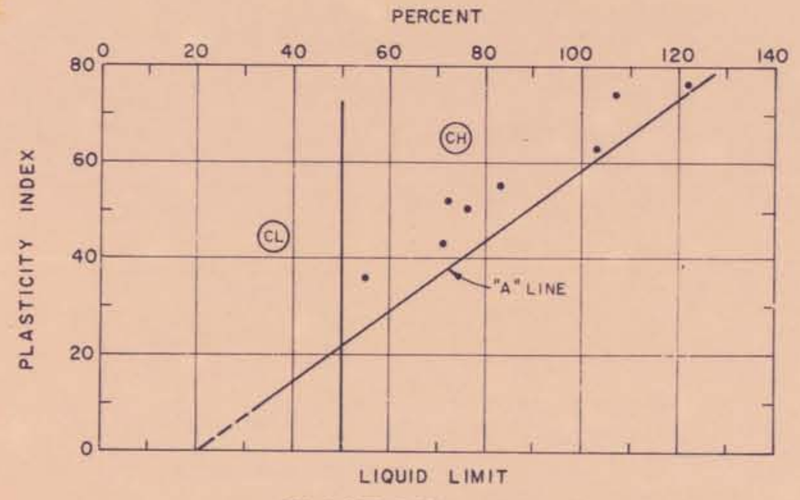
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

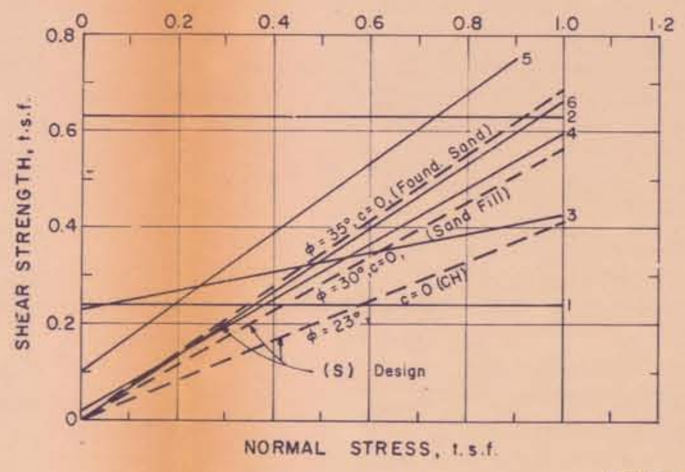




CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE No.	El.	TYPE	STRENGTH φ°	STRENGTH c (t.s.f.)	CLASS
1	-4.5	Q	0	0.24	CH
2	-57.6			0.63	CH
3	-7.7	R	11	0.23	CH
4	+4.3		30	0.02	SP
5	-9.5	S	36	0.10	SP
6	-24.7		34	0.00	SM

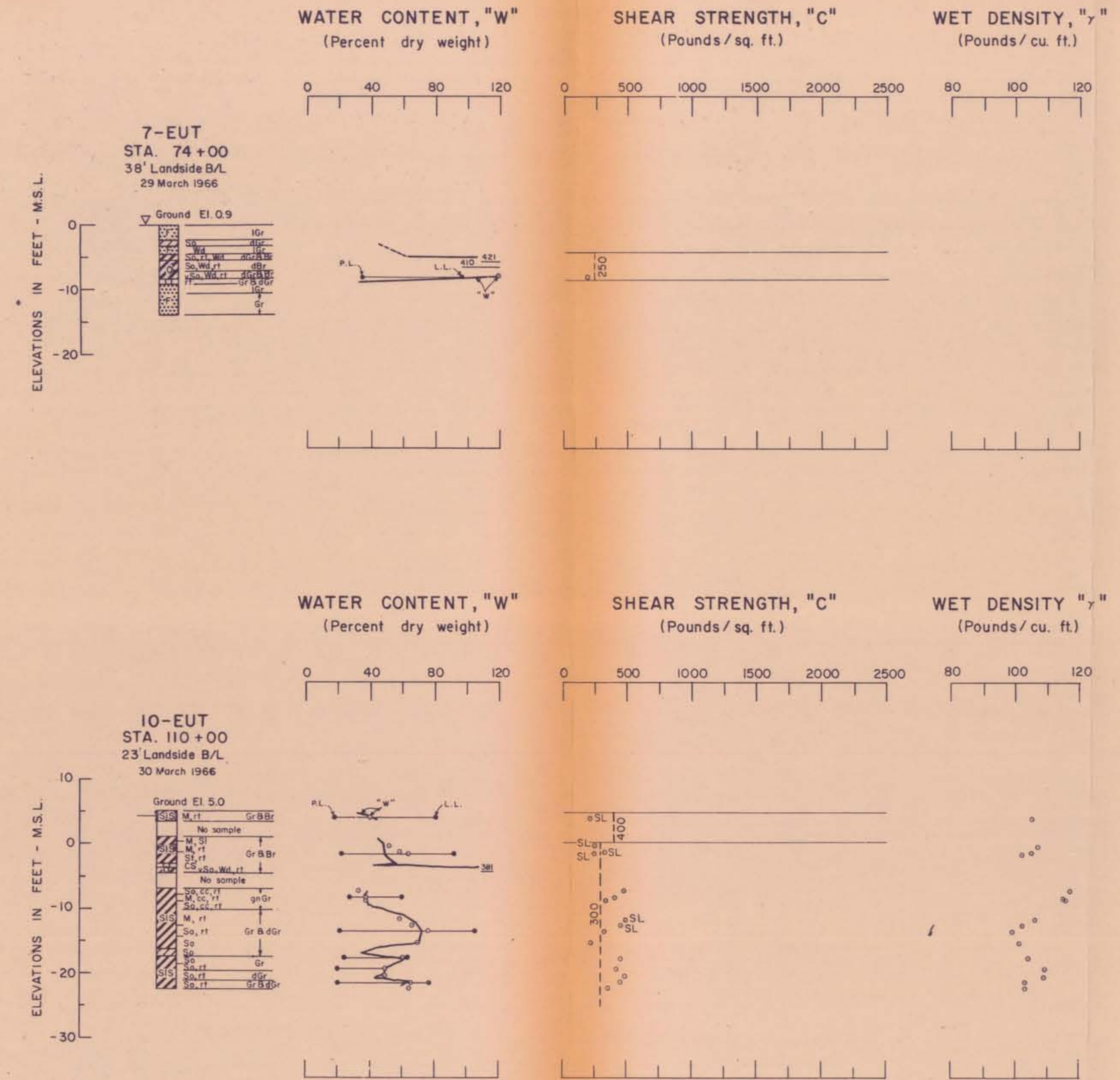
NOTE:
For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-59
For location of boring see plate IV-21

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORING 7-EU DATA

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

FEBRUARY 1968 FILE NO. H-2-24111



For soil boring legend see plate A
For general notes see plate III-48
For location of borings see plates IV-21 & IV-24

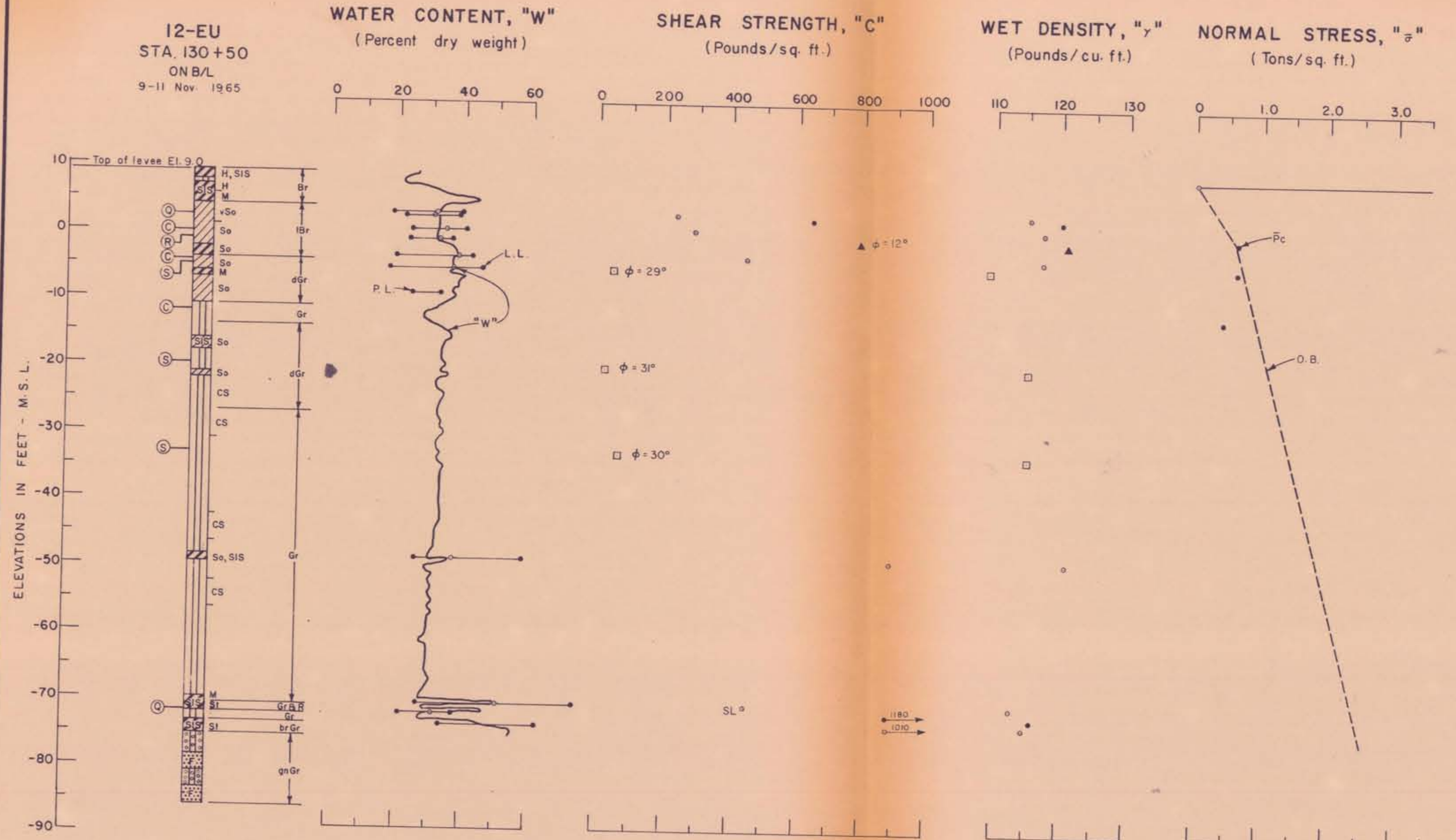
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

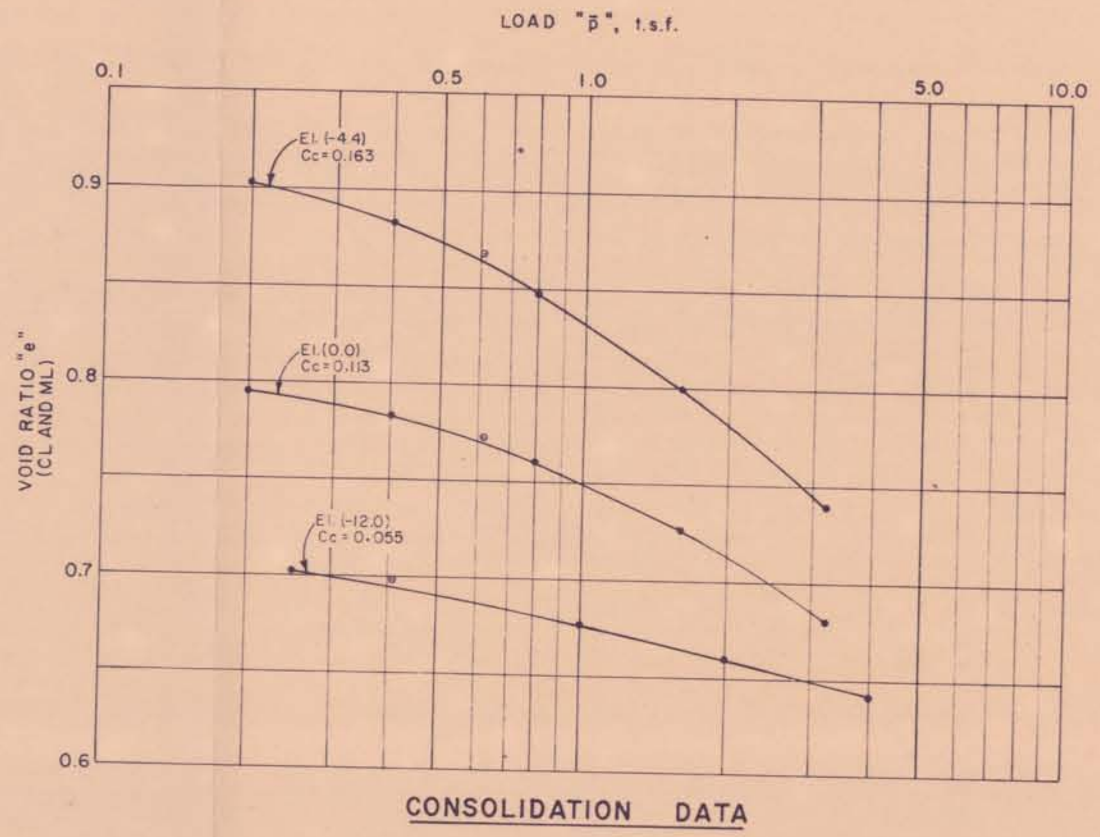
UNDISTURBED BORINGS
7-EUT AND 10-EUT DATA

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

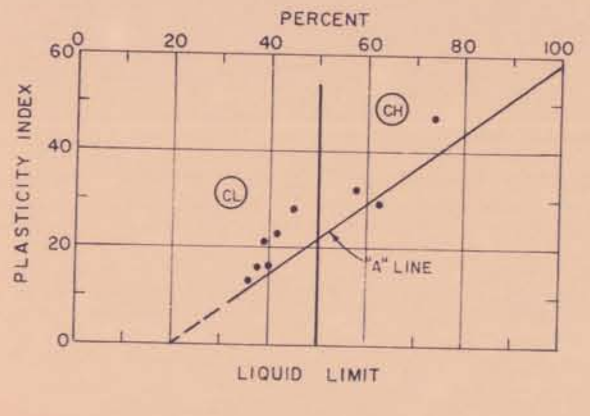
FEBRUARY 1968

FILE NO. H-2-24111

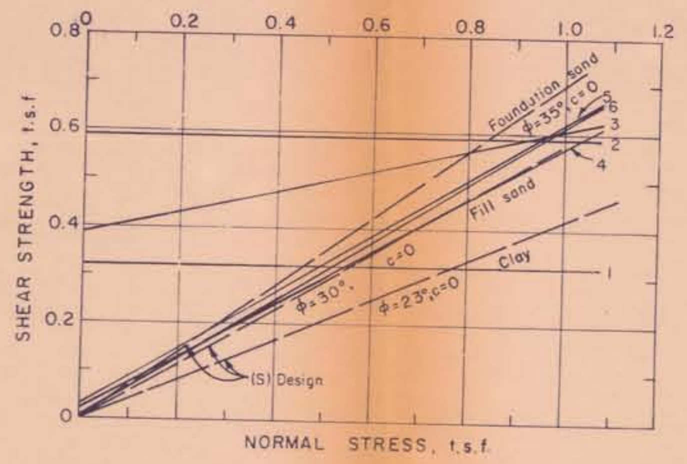




CONSOLIDATION DATA



PLASTICITY CHART



ENVELOPE		TYPE	STRENGTH		CLASS
No.	El.		φ°	c (t.s.f.)	
1	2.4	Q	0	0.32	CL
2	-72.0			0.59	CL
3	- 0.9	R	12	0.39	CL
4	- 5.2	S	29	0.02	CL
5	-20.0		31	0.01	ML
6	-33.0		30	0.03	ML

SHEAR STRENGTH DATA

See Plate A for soil boring legend
See Plate III-48 for general notes
See Plate III-59 for detail shear test data
See Plate IV-26 for location of boring

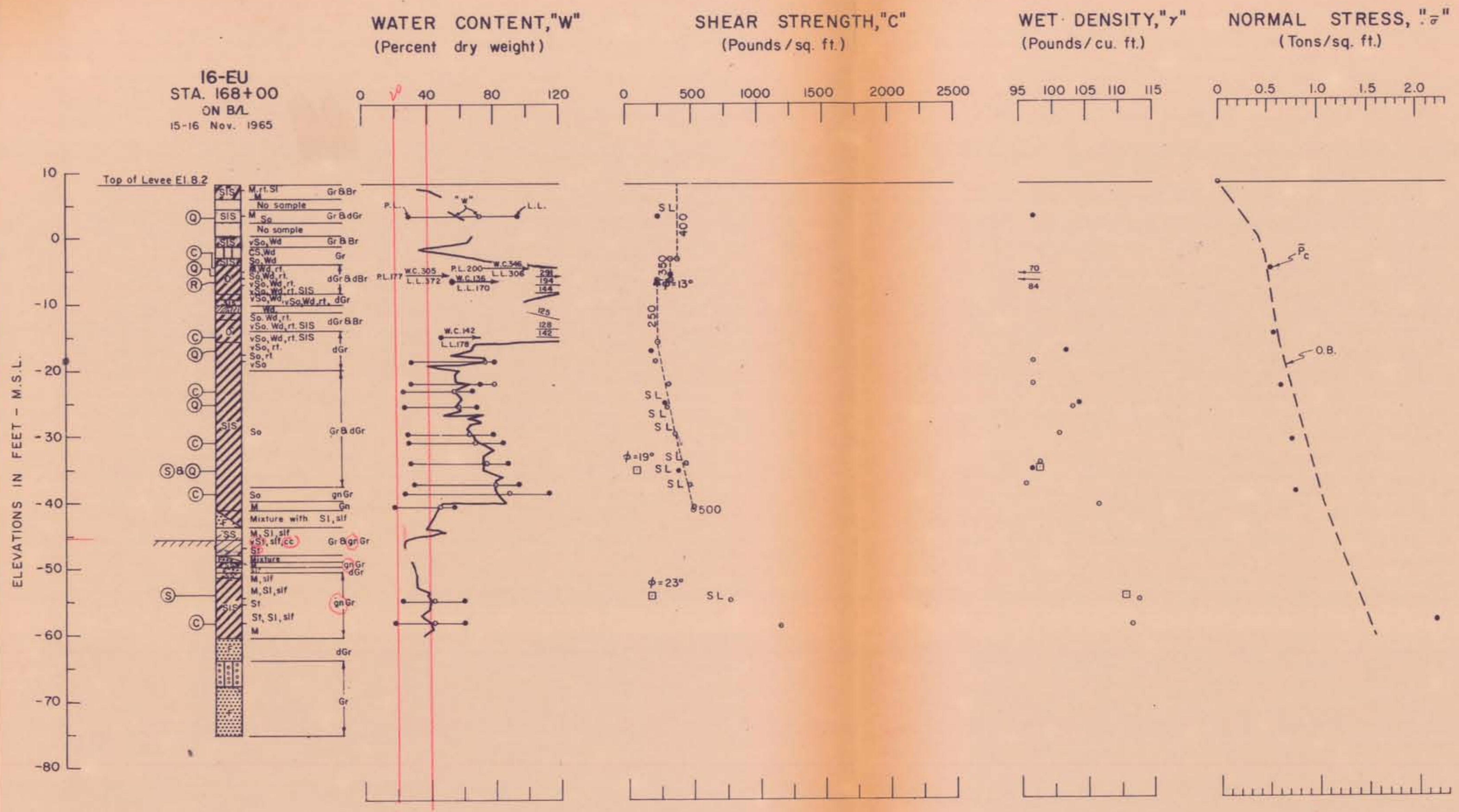
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

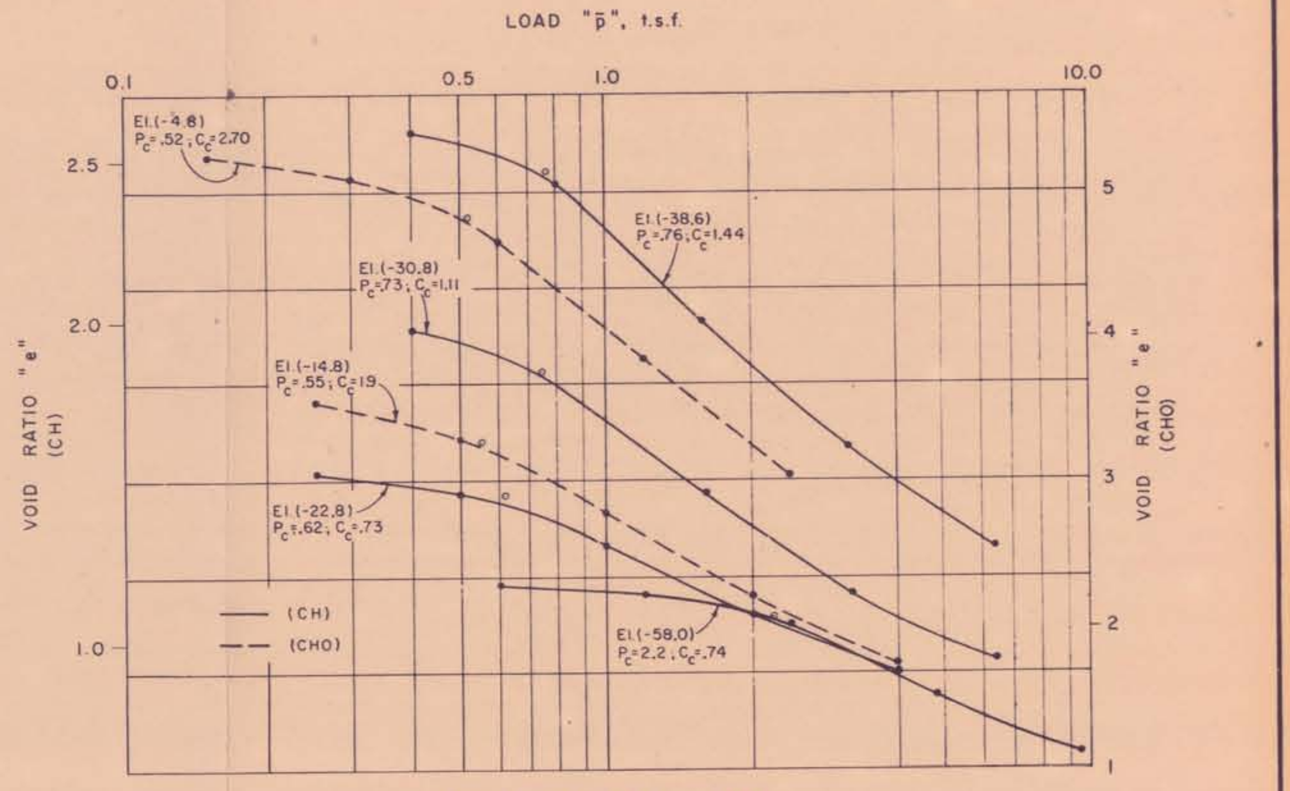
UNDISTURBED BORING 12-EU DATA

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

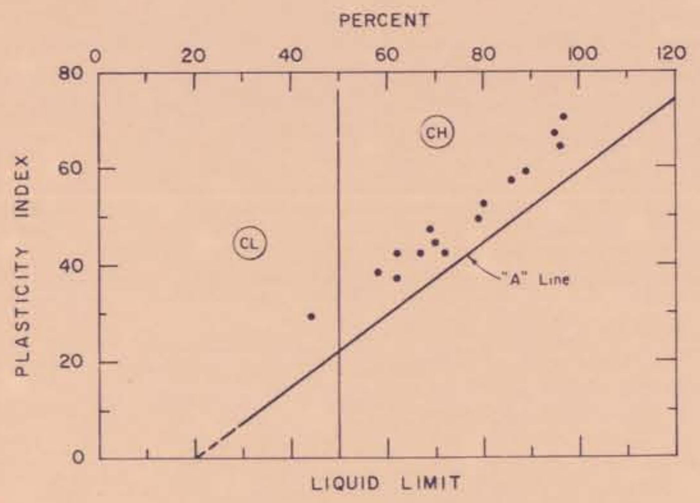
FEBRUARY 1968

FILE NO. H-2-24111

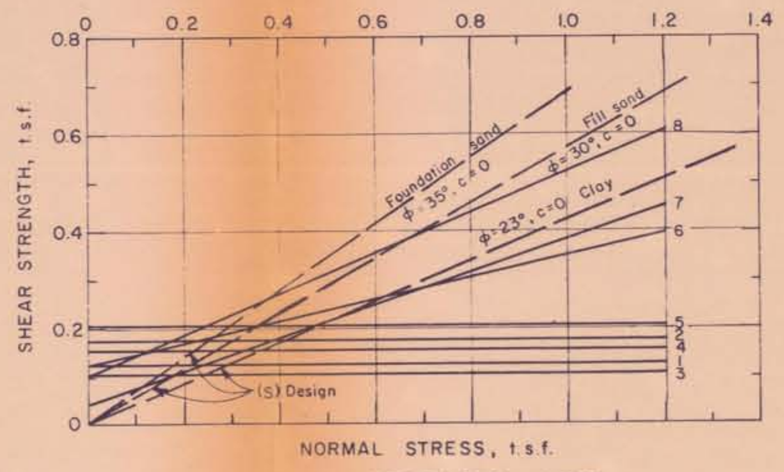




CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE		TYPE	STRENGTH		CLASS
No.	El.		$\phi°$	c (t.s.f.)	
1	+3.3	Q	0	0.12	CH
2	-5.5			0.17	PT
3	-16.9			0.10	CH
4	-24.9			0.15	CH
5	-34.8			0.20	CH
6	-6.5	R	13	0.12	CH
7	-34.8	S	19	0.04	CH
8	-53.9		23	0.10	CL

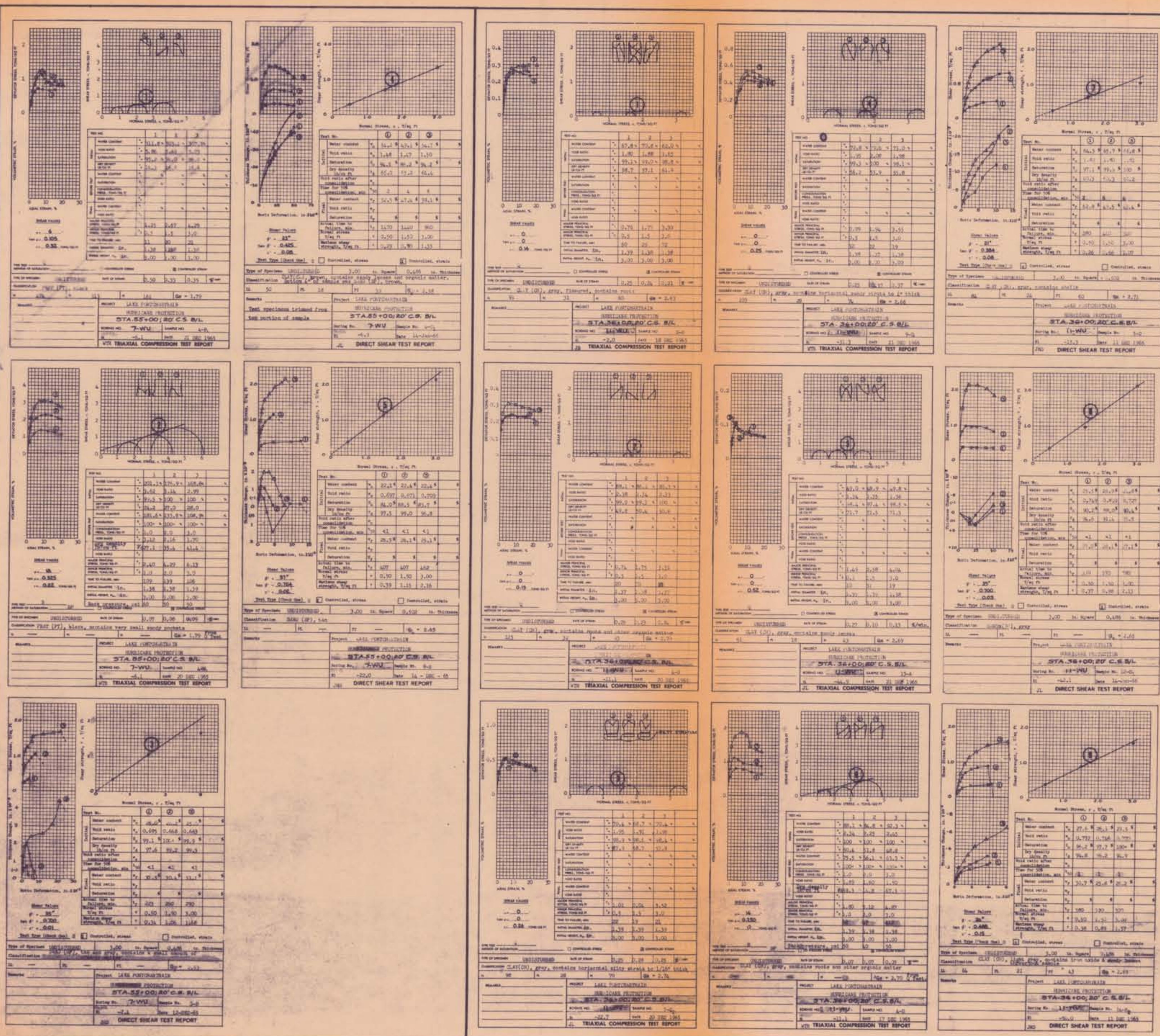
For soil boring legend see plate A
For general notes see plate III-48
For detail shear test data see plate III-59
For location of boring see plate IV-30

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UNDISTURBED BORING 16-EU DATA

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

FEBRUARY 1968 FILE NO. H-2-24111



NOTE:

1. Indicates reference number shown under sheai data on Plates III - 46, 47

(Q) - Unconsolidated - undrained triaxial compression test

(R) - Consolidated - undrained triaxial compression test

(S) - Consolidated - drained direct shear test

For undisturbed soil boring data see Plates III - 46, 47

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN

SUPPLEMENT NO. 8

I.H.N.C. REMAINING LEVEES

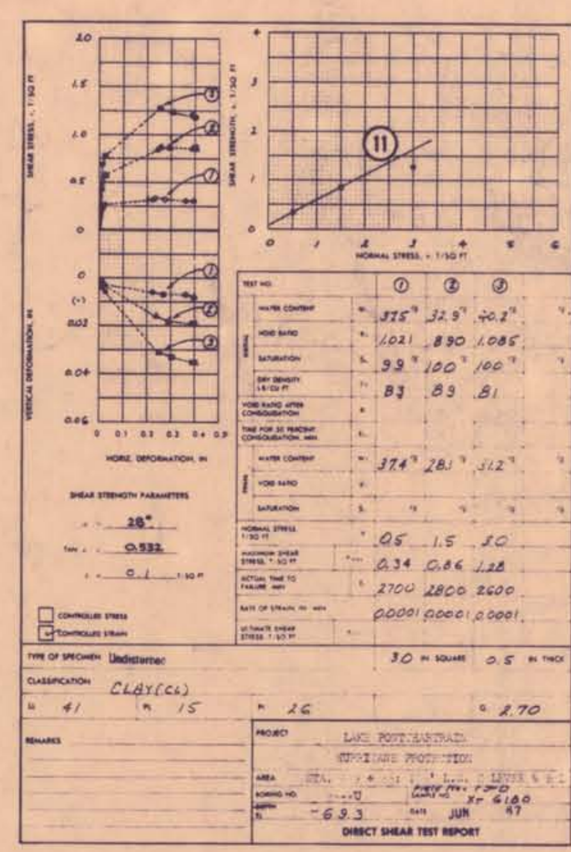
DETAIL SHEAR STRENGTH DATA BORINGS 7-WU AND 11-WU

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS

FEBRUARY 1968

FILE NO. H-2-24111



NOTES:

(1) Indicates reference number shown under shear data on plates III - 49 & III - 51

(Q) - Unconsolidated-undrained triaxial compression test.

(R) - Consolidated-undrained triaxial compression test.

(S) - Consolidated-drained direct shear test.

For undisturbed soil boring data see plates III-49 & III-51

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN SUPPLEMENT NO. 8

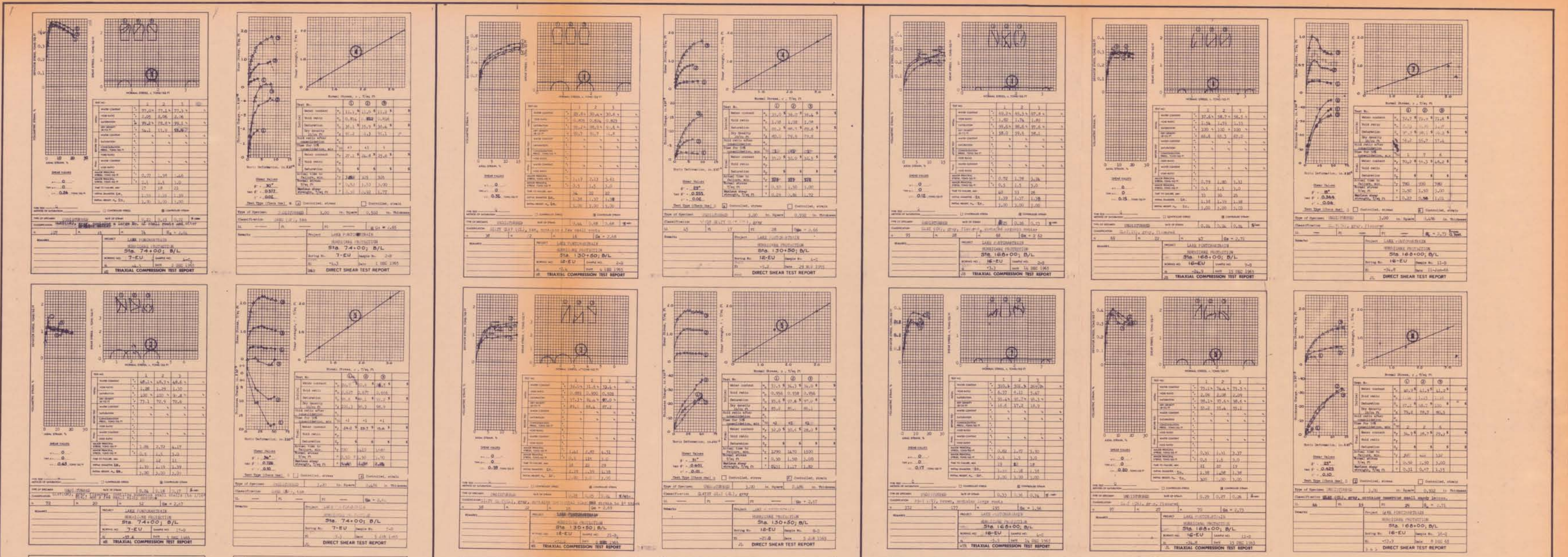
I.H.N.C. REMAINING LEVEES

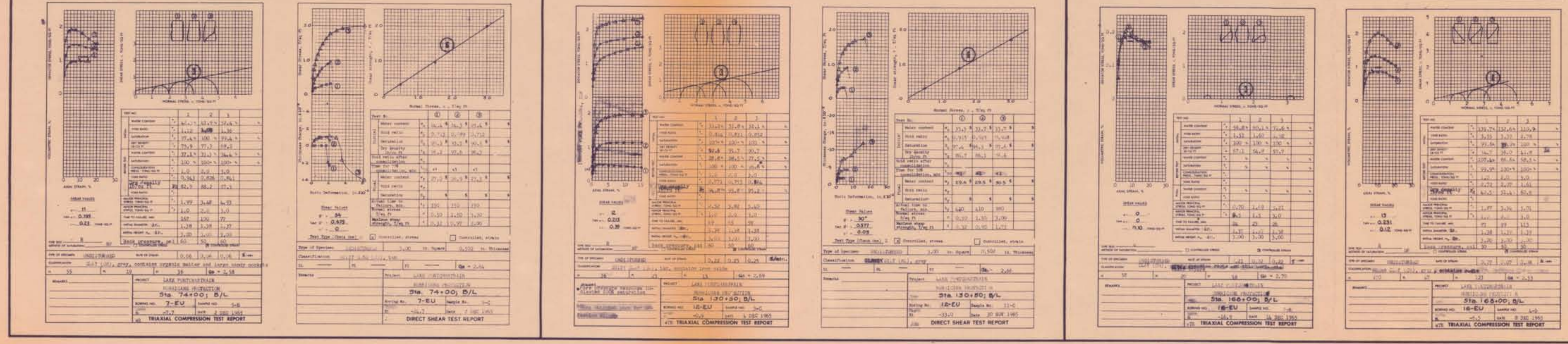
DETAIL SHEAR STRENGTH DATA BORINGS 27-WU AND 34-WU

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE III - 58





NOTE:

(1) Indicates reference number shown under shear data on plates III-53, 55, 56.

(Q) - Unconsolidated-undrained triaxial compression test

(R) - Consolidated-undrained triaxial compression test

(S) - Consolidated-drained direct shear test

For undisturbed soil boring data see plates III-53, 55, 56.

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN

SUPPLEMENT NO. 8

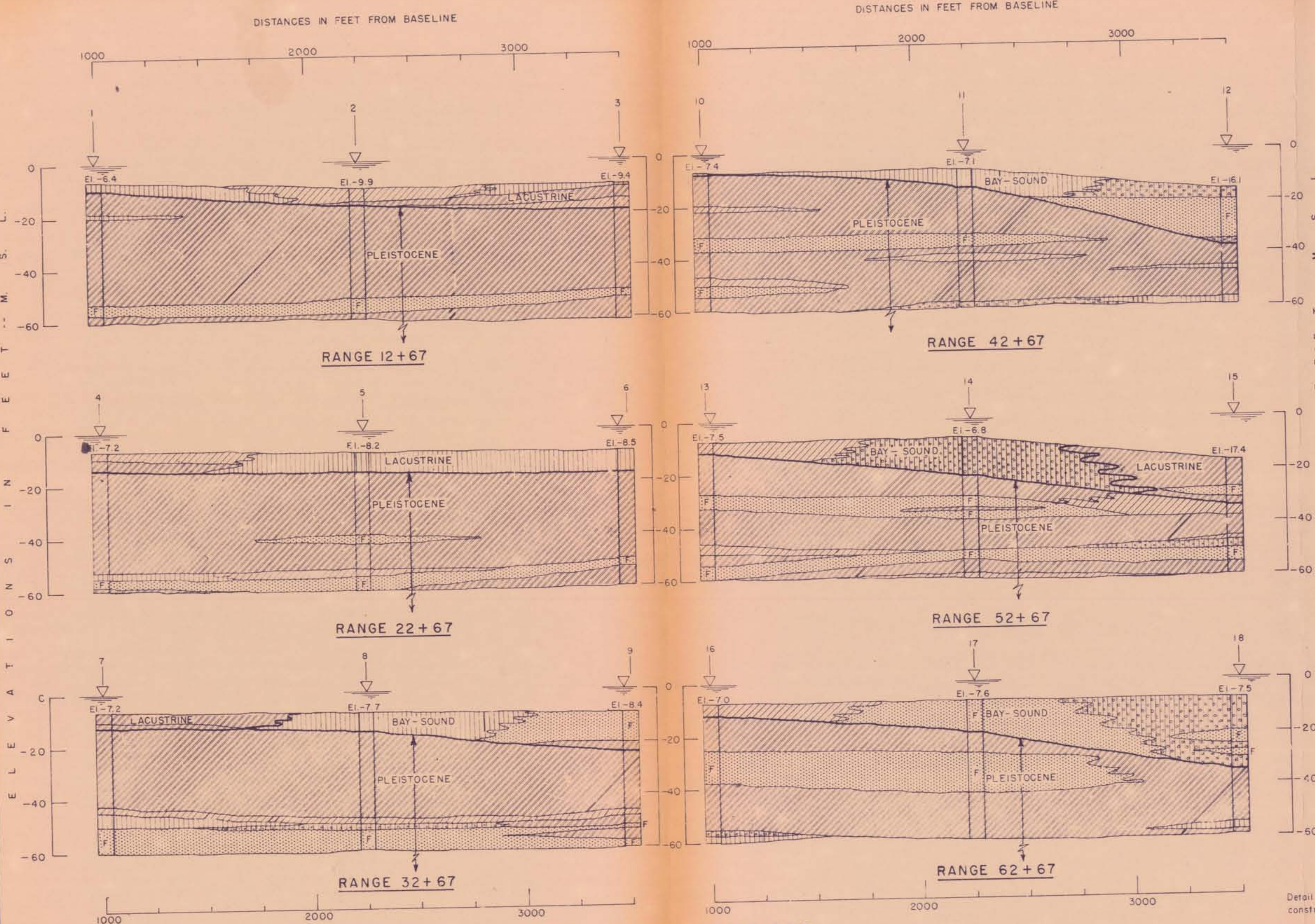
I.H.N.C. REMAINING LEVEES

DETAIL SHEAR STRENGTH DATA BORINGS 7-EU, 12-EU AND 16-EU

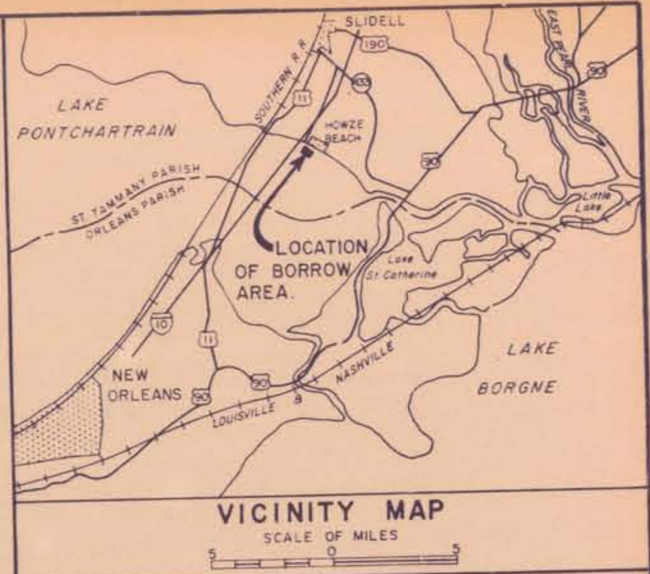
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS

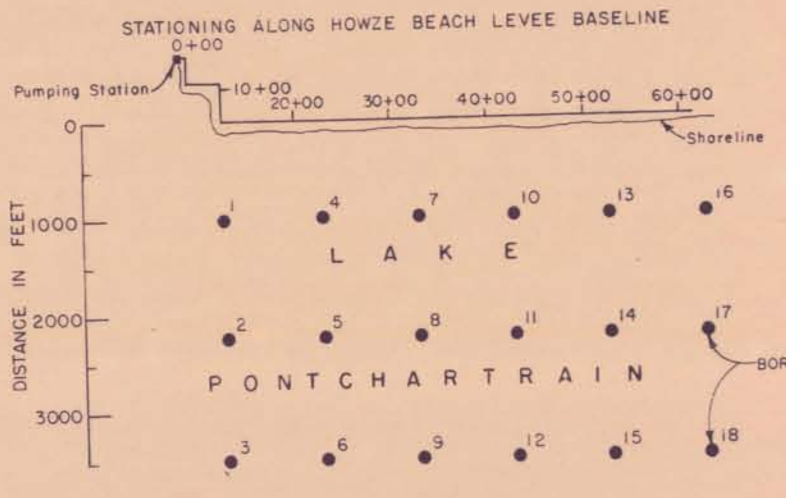
FEBRUARY 1968 | FILE NO. H-2-24111



SOIL BORING SECTIONS



VICINITY MAP



LOCATION PLAN

LEGEND

CH - Fat Clay	
CL - Lean Clay	
ML - Silt	
SM - Silty Sand	
SP - Fine Sand	

RECENT — Lacustrine - soft to very soft lean clay and fat clay with silty sand and sand, and with shell and shell fragments.
Bay-Sound - silt, silty sand and sand with shell and shell fragments.

PLEISTOCENE — stiff to very stiff clays with layers and lenses silt and sand

GENERAL NOTES

Detail logs of soil borings will appear in the construction drawings.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

BORROW DATA

PIT AREA IN LAKE PONTCHARTRAIN
ALONG NORTH SHORE

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE III-60

SECTION IV - STRUCTURAL DESIGN

CRITERIA FOR STRUCTURAL DESIGN

1. General. Structural design has been accomplished in accordance with standard engineering practice and criteria set forth in Engineering Manuals for Civil Works Construction published by the Office, Chief of Engineers. The floodwall and levee design is similar to the design of the floodwall from the lock to Florida Avenue on the west side of the IHNC. (See Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General, Advance Supplement, Inner Harbor Navigation Canal West Levee, Florida Avenue to IHNC Lock, dated March 1967 and approved 13 May 1967).

2. Basic data. Maximum wind tide levels along the IHNC resulting from the design hurricane vary from elevation 11.4 at Seabrook to 12.9 at the L&N Railroad Bridge and then to 13.0 at the IHNC Lock. Water elevations landside of the floodwall vary from elevation zero to elevation -3.0. Basin data relevant to the design of the protective works are as follows:

a. The elevation of the top of an I-type wall in a levee will be 2.0 feet above the wind tide level. The elevation of the top of an I-type wall in natural ground will be 1.5 feet above the wind tide level. The elevation of the top of T-type walls and gates will be 1.0 foot above the wind tide level.

b. Unit weights.

Item	Lb. per cu. ft.
Water	62.5
Concrete	150
Steel	490
Earth	See plates III-12 through III-42

c. Design loads.

(1) Earth pressures (lateral). See figures 4-1 through 4-19.

(2) Water loads.

(a) No wave forces will occur.

(b) One foot freeboard.

(3) Wind loads.

(a) On walls 30 p.s.f.

(b) On overhead beams 50 p.s.f.

3. Allowable working stresses. The allowable working stresses for concrete and structural steel are in accordance with those recommended in "Working Stresses for Structural Design," EM 1110-1-2101, dated 1 November 1963. Concrete will be designated by a basic minimum strength of 3,000 p.s.i. except for prestressed concrete piling which shall be designated 5,000 p.s.i. concrete. Steel sheet piling meeting the requirements of ASTM A328-54, "Standard Specifications for Steel Sheet Piling," will be used. For convenient reference, pertinent allowable stresses are tabulated below:

Reinforced concrete	Stress p.s.i.
f'_c	3,000
f_c	1,050
v (without web reinforcement)	60
v (with web reinforcement)	274
f_s (reinforcing steel)	20,000
Minimum tensile steel	0.0025 bd
Shrinkage and temperature steel	0.0020bt

Structural steel (ASTM A-36)	Stress p.s.i.
Basic stress	18,000

DESIGN OF STRUCTURES

4. General. The floodwall will be constructed along the east and west banks of the IHNC. The alignment will follow the existing levee system except for a small area on the west side between U. S. Highway 90 and France Road where it will be more economical to follow an alignment closer to the IHNC. The alignment will not pass through any congested or industrial areas but will be located in an easily accessible area.

5. West alignment. The protective works along west bank alignment will be constructed beginning at a point approximately 400 feet south of Hayne Boulevard and approximately 10 feet west of France Road and extend south on or close to an existing levee for a distance of approximately 7,500 feet. Here the floodwall will turn east and tie into a ramp over France Road, then continue south on the east side of France Road to the

north side of U. S. Highway 90. The floodwall will then turn east and follow along the north side of U. S. Highway 90 approximately 700 feet, then turn south again and tie into the north embankment of U. S. Highway 90. The floodwall will begin again on the south embankment of U. S. Highway 90, continue for 20 feet, turn west for approximately 160 feet then turn south for approximately 1,300 feet. Here the floodwall will turn west for approximately 400 feet, then south across Old Gentilly Road and the L&N Railroad tracks and tie into the existing ramp at Almonaster Avenue. On the south side of Almonaster the floodwall will continue southeasterly to France Road then south along the east side of France Road and tie into the ramp at France Road. On the west side of the ramp at France Road, a levee will continue westerly for approximately 250 feet then turn south and continue with a floodwall in an existing levee for approximately 6,200 feet. At this point the floodwall will turn east and tie into a ramp at France Road. From here a levee will continue on an easterly course for about 1,500 feet to the IHNC, and then turn south again with a floodwall for about 850 feet which will be the terminus of work presented herein for the hurricane protection system on the west side of IHNC. This alignment is shown on plates IV-2 through IV-17.

6. East alignment. The protective works along east bank alignment will be constructed beginning at a point approximately 400 feet south of Hayne Boulevard and approximately 30 feet east of Jourdan Road and extend south along an existing levee to a point just south of the U. S. Gypsum Plant. At this point, the floodwall will sufficiently deviate from the existing levee alignment to provide a railroad gate and then return on to the existing levee and continue for approximately 2,500 feet. Here the floodwall will tie into a ramp at Jourdan Road and after crossing Jourdan Road turn south for about 120 feet, then turn west again for approximately 600 feet to the IHNC. At this point, the floodwall will turn south along an existing levee and continue along the IHNC until it ties into the north embankment of U. S. Highway 90. The floodwall alignment will begin again in the south embankment of U. S. Highway 90, continue south approximately 775 feet along an existing levee, and tie into a new earth levee and continue for approximately 525 feet. From here a floodwall will begin and cross Old Gentilly Highway and the L&N Railroad tracks to Almonaster Avenue, continue for approximately 225 feet to the high point of the existing ramp, cross the ramp and follow east along the south side of Almonaster Avenue with a levee for approximately 500 feet then turn south. From here a levee will continue south along the west side of Jourdan Road for approximately 3,050 feet then turn east for approximately 200 feet and tie into the Citrus Back Levee which will terminate the protective works presented herein on the east side of the IHNC. This alignment is shown on plates IV-18 through IV-31.

7. Foundation. The results of subsurface explcrations, soils tests, and foundation studies are presented in Section III. Locations of general type borings are shown on plates IV-1 through IV-31, and III-60, and the general type boring logs are shown on plates IV-32 through IV-34. The undisturbed boring data are shown on plates III-46 through III-58.

8. Selection of wall type. The type of wall to be constructed will depend on the height of wall required which, inturn, will depend on the elevation of the ground surface. Acantilever I-type wall will be constructed where floodwall heights above ground are not in excess of 10 feet and deflection of the wall will not be a problem.

9. Investigations were made of a number of types of floodwalls to be used where the height of the wall above ground will exceed 10 feet. The results of these investigations indicated that a bearing pile supported inverted T-type wall would be the most suitable and economical.

10. I-type floodwall. Most of the floodwall will be an I-type wall constructed in an existing levee, which will be reshaped, and to a lesser extent in a new levee. Bending moments and deflections for structural design of sheet pile are based on a factor of safety of 1.5 applied to the soils. It should be noted that the sheet pile penetrations shown on the design analysis sheets are design penetrations and not necessarily the final penetration which are shown on the plan and profile plates. The plan and profiles of the wall and levees are shown on plates IV-1 through IV-31 and design sections on plates IV-35 through IV-38. The strength of the wall was checked for the case with water at the top of the wall, as initially constructed, and found to be adequate as shown on figures 4-1 through 4-19. Where possible, expansion joints in I-type walls will be spaced 30 feet apart. Where I-type walls join T-type walls, a special seal located in a notch in the I-type wall will prevent water from passing through the expansion joints when the wall is deflected. The seal detail is shown on plate IV-40.

11. T-type wall.

a. General. On the west side of the IHNC between stations 136+10 and 136+27, 210+10 and 210+75, 226+60 and 235+77 and at all gate monoliths, a bearing pile supported T-type floodwall will be constructed. The above structures are presented in plan and profile on plates IV-10, IV-15 and IV-17. Gates 1W through 10W are discussed in paragraph 12.

b. On the east side of the IHNC between stations 60+60 and 63+61, 83+45.5 and 85+07 and at all gate monoliths, a bearing pile supported T-type floodwall will be constructed. These structures are presented in plan and profile on plates IV-20 and IV-22 and a typical detail shown on plate IV-39. Gates 1E through 10E are discussed in paragraph 12. Between stations 85+05 and 85+58 a T-type wall will be built to act as a retaining wall for a portion of the Jourdan Road ramp.

c. Type of piling. Factors considered in the selection of the type of piling include availability, economy, resistance to decay, resistance to corrosive soil and water conditions, and fitness for driving. In general, the above considerations indicate that 12-inch by 12-inch square, precast, prestressed concrete piles are the most suitable. The prestressed concrete piles will meet the requirements of the Joint AASHO and PCI Committee Standard Specifications for "Square Concrete Prestressed Piles."

d. Allowable pile loads. Allowable pile loads for various reaches are shown on plate III-44. The required lengths to support these loads will be determined from test piles.

e. Design of T-type wall for west levee. The T-type floodwalls for the west levee were designed for the following conditions:

Case 1 - Water at elevation 14.0 on the floodside and elevation zero on the protected side. Steel sheet pile cutoff impervious. Uplift with full head on floodside of cutoff and tailwater on the protected side. Earth fill to elevation 5.0.

Case 2 - Same as Case 1 except steel sheet pile cutoff pervious. Uplift varies uniformly from full head on floodside to tail-water on the protected side.

Case 3 - Water at elevation 11.0 on floodside and water at elevation zero on protected side. Impervious cutoff. Uplift as in Case 1.

Case 4 - Same as Case 3 except cutoff pervious and up-lift as in Case 2.

Case 5 - Water at elevation 10.0 on floodside and at elevation zero on protected side. Impervious cutoff. Uplift as in Case 1.

Case 6 - Same as Case 5 except cutoff pervious and up-lift as in Case 2.

In all cases, the at rest earth pressure was assumed to be 75% of the submerged unit weight of earth (55#/cu.ft.) on the floodside and cracked section assumed on protected side.

f. Design of T-type wall for east levee. The T-type floodwalls for the east levee were designed for the following typical conditions:

Case 1 - Water at elevation 13.25 on floodside and at bottom of base (elevation 2.5) on protected side. Steel sheet pile cutoff at center of base and impervious. Uplift with full head on floodside of cutoff and tailwater on the protected side. No earth load.

Case 2 - Same as Case 1 except steel sheet pile cutoff pervious. Uplift varies uniformly from full head on floodside to tailwater on the protected side.

Case 3 - Water at elevation 11.0 on floodside and at the bottom of the base on protected side. Impervious cutoff. Uplift as in Case 1. No earth load.

Case 4 - Same as Case 3 except cutoff pervious and uplift as in Case 2.

Case 5 - Water at elevation 10.5 on floodside and at the bottom of the base on protected side. Impervious cutoff. Uplift as in Case 1. No earth load.

Case 6 - Same as Case 5 except cutoff pervious and uplift as in Case 2.

g. Figures 4-20 through 4-31 show computations for the design of the T-type wall between stations 226+34 and 235+77 of the west levee. The method of computation is also typical for the other reaches of T-type wall of the east levee where different conditions obtain; i.e., when the applied loads are different,when the allowable pile loads are different; and when the top of the base is not at elevation 1.0,and when the pile batters and lengths are different. Figures 4-20, 4-21, and 4-22 show the loading conditions, the horizontal and vertical loads, and the moments obtained for the 6 cases described previously in this paragraph. Figure 4-23 shows the allowable axial and transverse pile loads and the computed pile loads obtained using Hrennikoff's method. Case 1 produced maximum axial pile loads and Case 2 produced maximum transverse pile loads. In the determination of the allowable transverse loads, the soil was considered to have a constant modulus of subgrade reaction (K) with depth. Curves of actual and allowable transverse and axial loads for various values of K are shown on figure 4-24. A comparision of these curves indicates that, for soils having a K value greater than 50 p.s.i., the actual transverse loads are considerably less than the allowable values and do not govern the design of the pile foundation. Determination of concrete and reinforcement requirements is shown on figures 4-24 through 4-31. Transverse and logitudinal reinforcement will be provided to distribute the concentrated forces and moments induced by gate posts, irregular pile spacing, and changes in direction of the wall. Where possible, expansion joints in the T-type wall will be spaced 60 feet apart. Figure 4-32 lists a tabulation of the transverse and axial loads of the pile supporting the

T-type floodwall for a typical 60-foot monolith on the east levee.

12. Gates.

a. General. Twenty gaps, ten on the east side and ten on the west side of the IHNC, will be left in the wall at street, access roads, and railroad crossings. Gates at these sites will be used to close the gaps when required. Two major requirements governed the design of the gates: (1) the need for rapid closure of the gates; and (2) the need for closure of the gates without special equipment; i.e., cranes or lift trucks. To meet these requirements, it was determined that either overhead roller or swing-type gates should be employed. The base of the gaps are designed to distribute the surcharge load resulting from a Cooper E-60 loading at railroad crossings and H-20 loading for street crossings. To resist water forces when the gates are closed, the base slab will be supported, in general, by piles having a similar spacing as the example shown on figure 4-42 plus an additional row of piles at each gate post. The gates are shown in plan and profile on plates IV-47 through IV-52.

b. Overhead roller gates. Fifteen overhead roller gates will be constructed since storage areas adjacent to the gaps are available. Ten gates will be used to close street openings and five to close gaps at railroad crossings. The overhead beam and rail of the street gates will be removable to provide unlimited vertical clearance with the gates open. The clear opening of the overhead gates will vary from 15 feet to 35 feet horizontally. Design of the 30-foot gate (gate 7W), located at Old Gentilly Road, is shown on figures 4-33 through 4-45. A plan, elevation, and section of this gate is shown on plate IV-47, as well as a gate schedule for all overhead gates. Details of the overhead roller gate, including the type of trolley used and the bottom and side seals, are shown on plates IV-47 and IV-49.

c. Swing gates. Five swing gates will be constructed at railroad crossings and access roads. The gates, in the closed position, will be slightly tilted towards the protected side to provide additional clearance between the railroad tracks and the sills of the gates when opening and closing the gates. Adjustment of the gates in a vertical direction will be made by raising or lowering the hinges. Provisions will be made for adjusting the vertical seal and block in a horizontal direction and the bottom seal in a vertical direction. The design of a typical swing gate is shown on figures 4-46 through 4-51. Typical plan, elevation, section, and gate schedule are shown on plate IV-50. Swing gate seals and hinge details are shown on plates IV-51 and IV-52.

13. Utility crossings. Details of water, sewer, gas pipelines, and cable crossings are shown on plate IV-41.

14. Protective measures against corrosion. Based on instructions contained in the 2d and 3d indorsements to LMNED-PP letter dated 13 March 1967, subject "Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2, General Advance Supplement, IHNC West Levee - IHNC Lock to Florida Avenue," a corrosion survey has been initiated to establish the nature and extent of the cathodic protection required. Upon completion of the survey and evaluation of the data obtained, a report embodying recommendations relative to corrosion control will be submitted for approval.

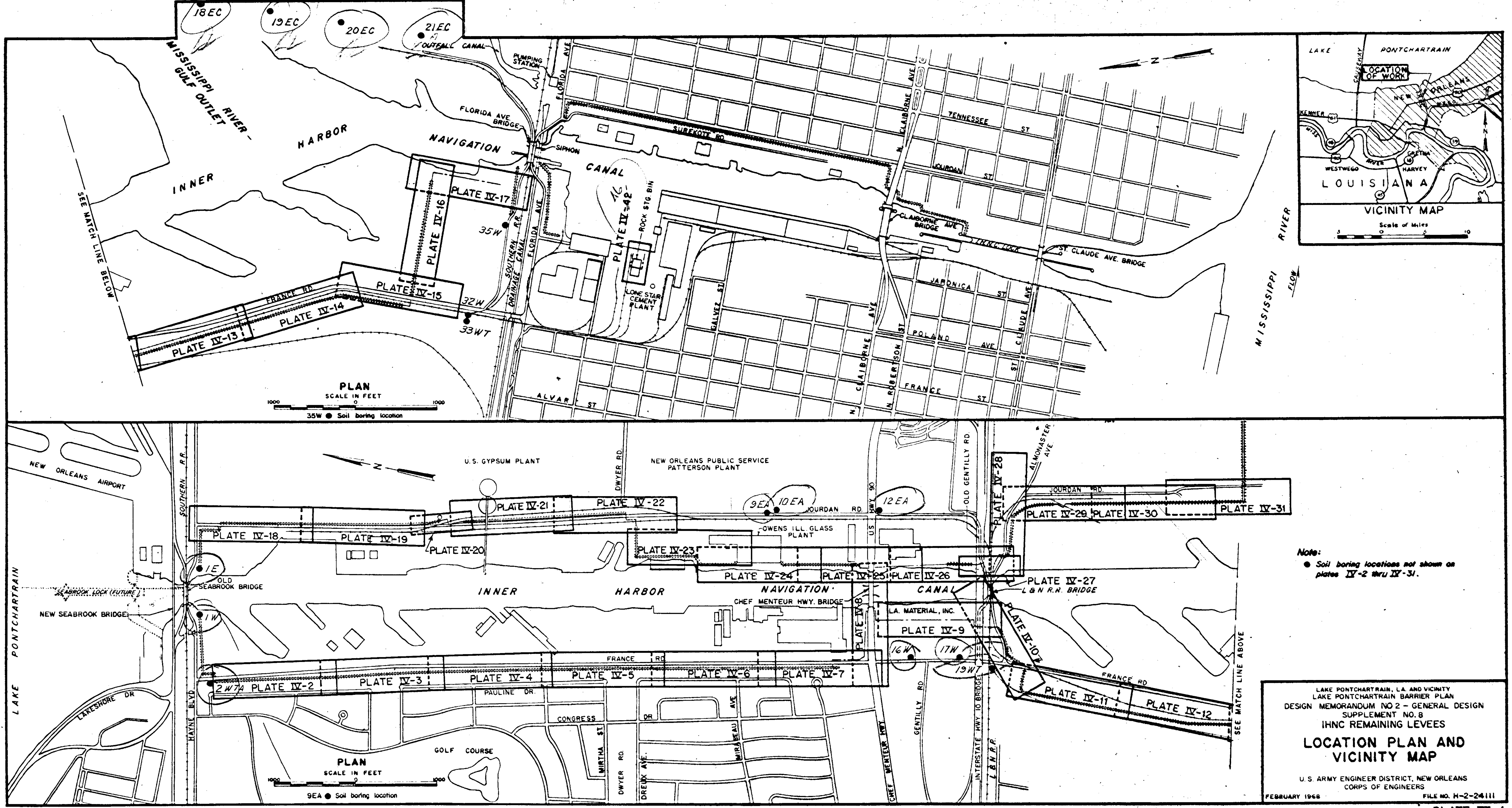
15. Interim hurricane protection. In the interest of providing interim hurricane protection to areas of the City of New Orleans hardest hit during Hurricane Betsy, 17 September 1965, local interests, the Orleans Levee District, have constructed levees and driven steel sheet piling along segments of this project alignment. Construction accomplished by local interests is described as follows:

a. East side. An earth levee to elevation 15.0 from station 141+75 to the south end of the project at station 179+47. The portions of this levee where the gates are proposed were not constructed to elevation 15.0 in order to provide access to the industrial sites along the IHNC. This levee alignment is shown on plate IV-28 through IV-31.

b. West levee. A levee to elevation 15.0 from station 137+72 to station 141+90, thence a levee to elevation 9.0 to station 143+85. Steel sheet piling was driven with top elevation at 11.5 from station 141+62 to station 145+39, thence a ramp at France Road, thence a levee to elevation 15.0 to station 148+30, thence steel sheet piling with the top elevation at 11.5 in an existing levee to station 211+46, thence a ramp at France Road, thence a levee to elevation 14.0 to station 226+44, thence steel sheet piling to the end of the project at station 235+77. Cross sections of the ramps at France Road are shown on plate IV-42, plan and profile are shown on plates IV-10 through IV-17.

16. Relief wells. There will be thirty-seven relief wells installed on the east side of the IHNC and forty-seven relief wells installed on the west side. The relief wells will be full penetrating wells drilled with the bottom of the wood screen four feet above the bottom of the sand aquifer. See plates IV-35 and IV-37 for sections showing these relief wells. On the east side, water from relief wells numbered one through twenty-two will drain into an existing open drainage ditch, and water from relief wells numbered 23 through 37 will drain into a collector pipe which will drain into an open ditch. The relief wells on the west side will drain into a ditch at the foot of the new levee, which drains into the subsurface drainage system for the City of New Orleans. The locations of the wells on the west side are shown on plates IV-2 through IV-6 and on the east side on plates IV-18 through IV-22.

17. Rock storage bin. "Design Memorandum No. 2 - General, Advance Supplement, Inner Harbor Navigation Canal West Levee, Florida Avenue to IHNC Lock," presented the design of the protective works from Florida Avenue to the IHNC Lock, except for the floodwall in the rock storage bin located at the Lone Star Cement plant, the design of which is presented in this memorandum. The floodwall consists of an I-type wall beginning and tying into the existing I-type floodwall at the northeast corner of the rock storage bin and extending west along the north side of the bin to the center of the middle bay, thence a T-type floodwall extending south through the middle bay to the other side of the bin, thence an I-type floodwall extending east along the south side of the bin and tying into the existing I-type floodwall. Consideration was given to constructing the floodwall through the first bay, but because of the prestressed reinforcing rods, it was decided to pass the floodwall through the second bay. The shape of the floodwall is such that the clam bucket will not be able to grab the floodwall. The top will also be capped with 1/2" plate steel to prevent the bucket from chipping away the concrete. Only those steel sheet piling which will interfere with driving of the new piling will be removed. The material in the rock storage bin is a fine clayey mixture of clay and limestone with a weight of 112 pounds per cubic foot, according to the plant superintendent. Because of the plastic consistence of the material, it can be stored to a height of 38' above the storage bin slab. Design computations are shown in figures 4-52 through 4-70.



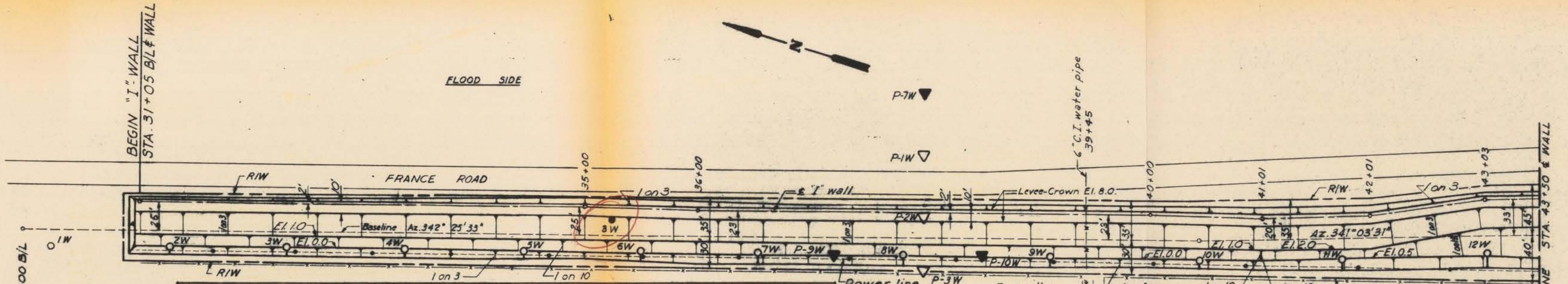
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

LOCATION PLAN AND VICINITY MAP

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-1



NUMBER ▽ EXISTING	NUMBER ▼ NEW	B/L STATION	LOCATION	TIP ELEV. M.S.L.	TOP OF PIPE	NUMBER ▽ EXISTING	NUMBER ▼ NEW	B/L STATION	LOCATION	TIP ELEV. M.S.L.	TOP OF PIPE
P-1W		38+00	75' Lft. B/L	-20.48			P-11W	76+00	140' Lft. B/L	-12.00	8.0
P-2W			20' Lft. B/L	-20.29	(9.0)		P-12W	70+97	130' Rt. B/L		FLUSH
P-3W			28' Rt. B/L	-17.12			P-13W	77+45	17' Rt. B/L		1.5
P-4W		76+00	75' Lft. B/L	-9.83			P-14W	61+88	190' Rt. B/L	-15.00	FLUSH
P-5W			20' Lft. B/L	-10.09	(10.0)		P-15W	58+00	140' Lft. B/L		8.0
P-6W			35' Rt. B/L	-9.71			P-16W		75' Lft. B/L		7.0
	P-7W	38+00	130' Lft. B/L	-20.00	5.0		P-17W		25' Lft. B/L		7.0
	P-8W	39+50	130' Rt. B/L	-17.00	FLUSH		P-18W		44' Rt. B/L		1.5
	P-9W	37+20	16' Rt. B/L	-17.00	1.0	-	P-19W		80' Rt. B/L		1.0
	P-10W	38+50	16' Rt. B/L	-17.00	1.0		P-20W	59+30	45' Rt. B/L		1.5

PIEZOMETER SCHEDULE

PLAN

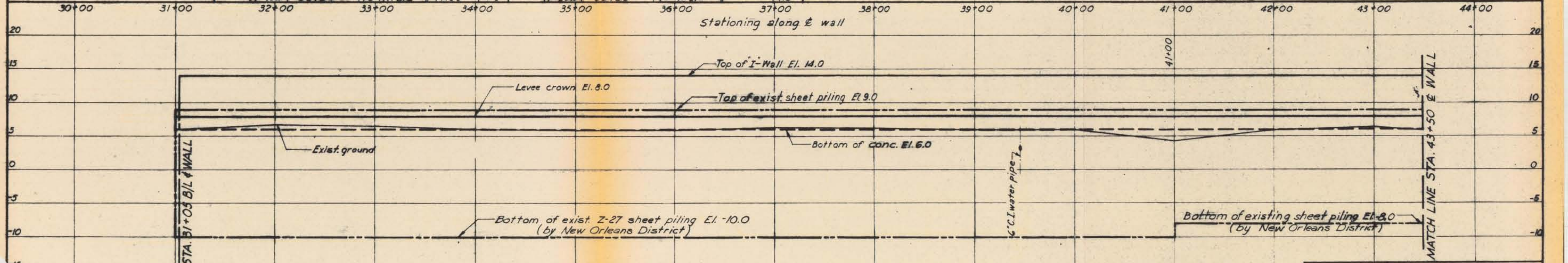
Scale in feet: 40 0 40 80

5W ○ Relief well location.
3W ● Soil boring location.

Note:
For locations of borings 1W and 2WTA, see plate IV-1.
Place extension with cap, on exist. riser pipes for piezometers with top of pipe at elevations shown.
All piezometers are to be protected from damage during construction.

REFERENCE PLATES

Piezometer detail	IV - 18
Soil borings	IV - 32
Design sections	IV - 35



PROFILE

Note: Elevations are in feet M.S.L.
All utility crossings thru exist. sheet piling completed by New Orleans District.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

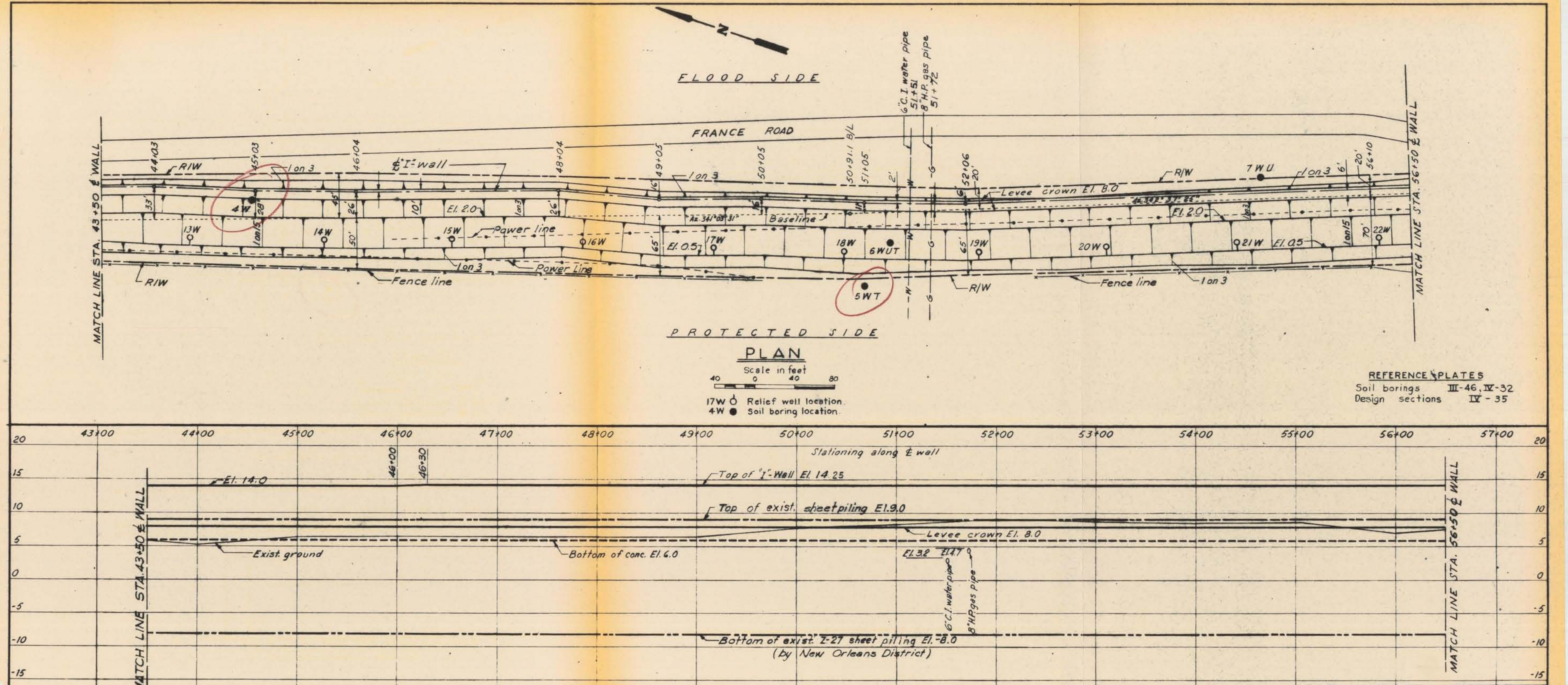
PLAN AND PROFILE

WEST LEVEE

STA. 31+00 TO STA. 43+50

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

FEBRUARY 1968 FILE NO. H-2-24111



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

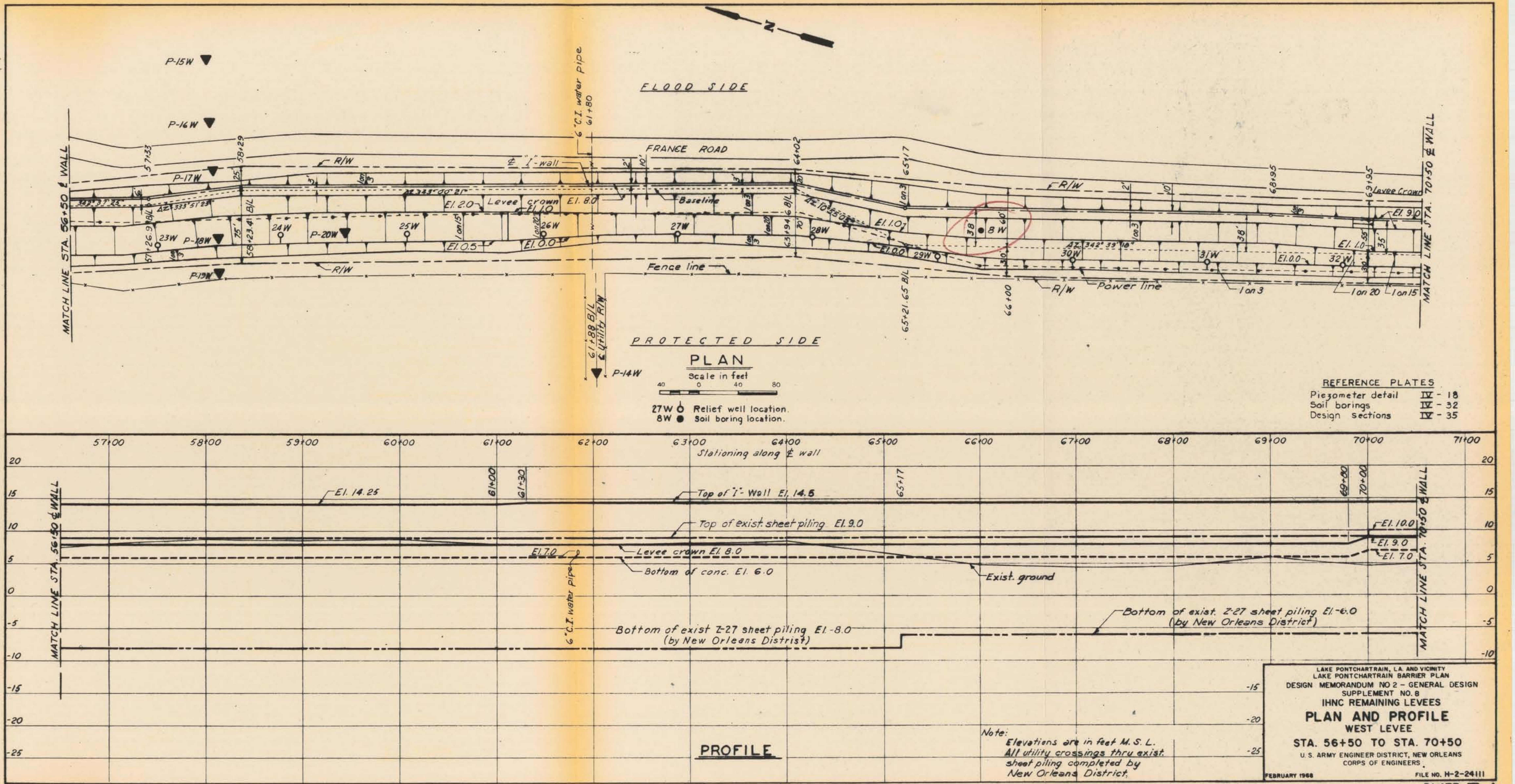
WEST LEVEE

STA. 43+50 TO STA. 56+50

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-3



REFERENCE PLATES

Piezometer detail	IV - 18
Soil borings	IV - 32
Design sections	IV - 35

Note:
Elevations are in feet M. S. L.
All utility crossings thru exist. sheet piling completed by New Orleans District.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

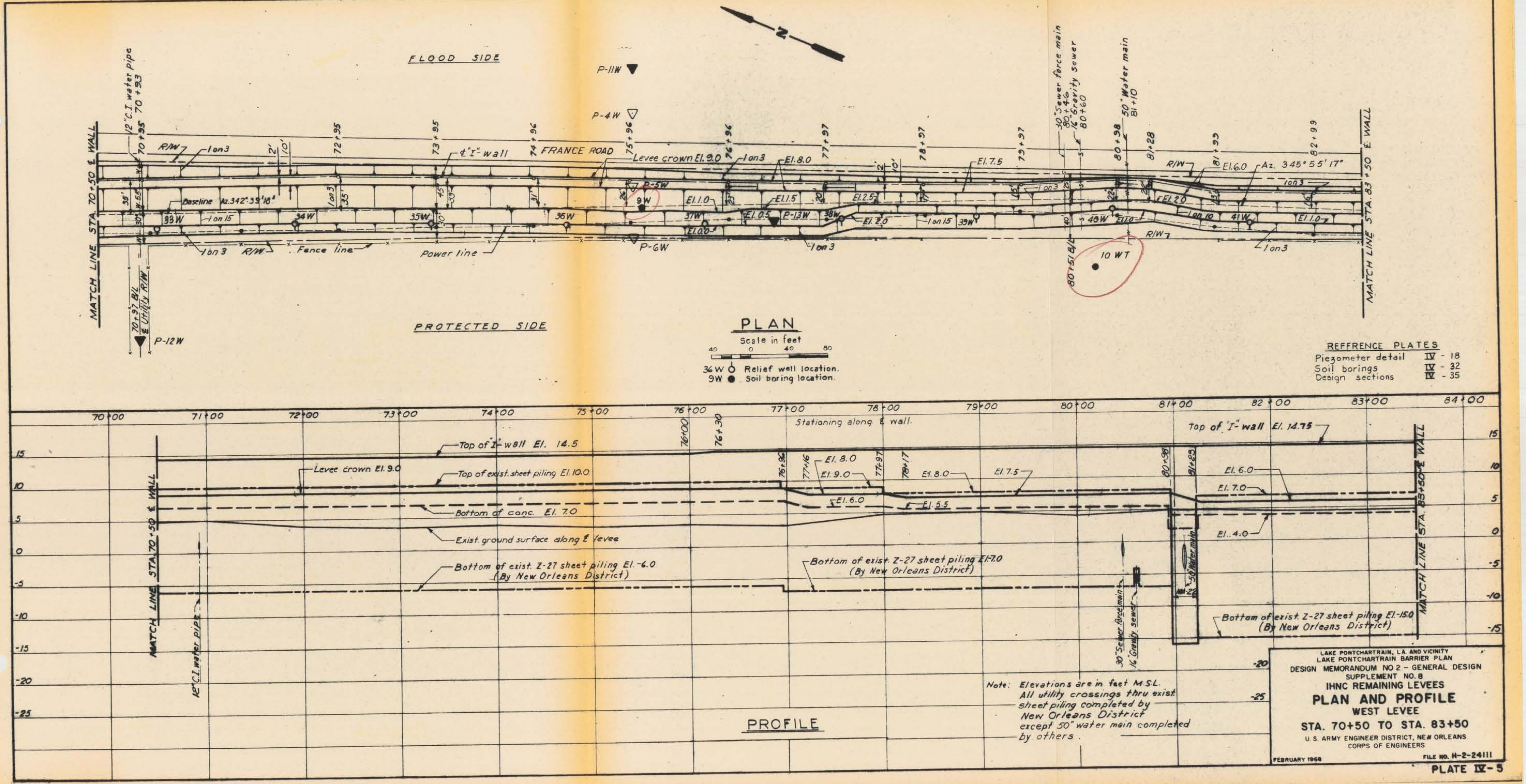
WEST LEVEE
STA. 56+50 TO STA. 70+50

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

FEBRUARY 1968

FILE NO. H-2-24111

PLATE IV-4



Note: Elevations are in feet M.S.L.
All utility crossings thru exist. sheet piling completed by New Orleans District except 50" water main completed by others.

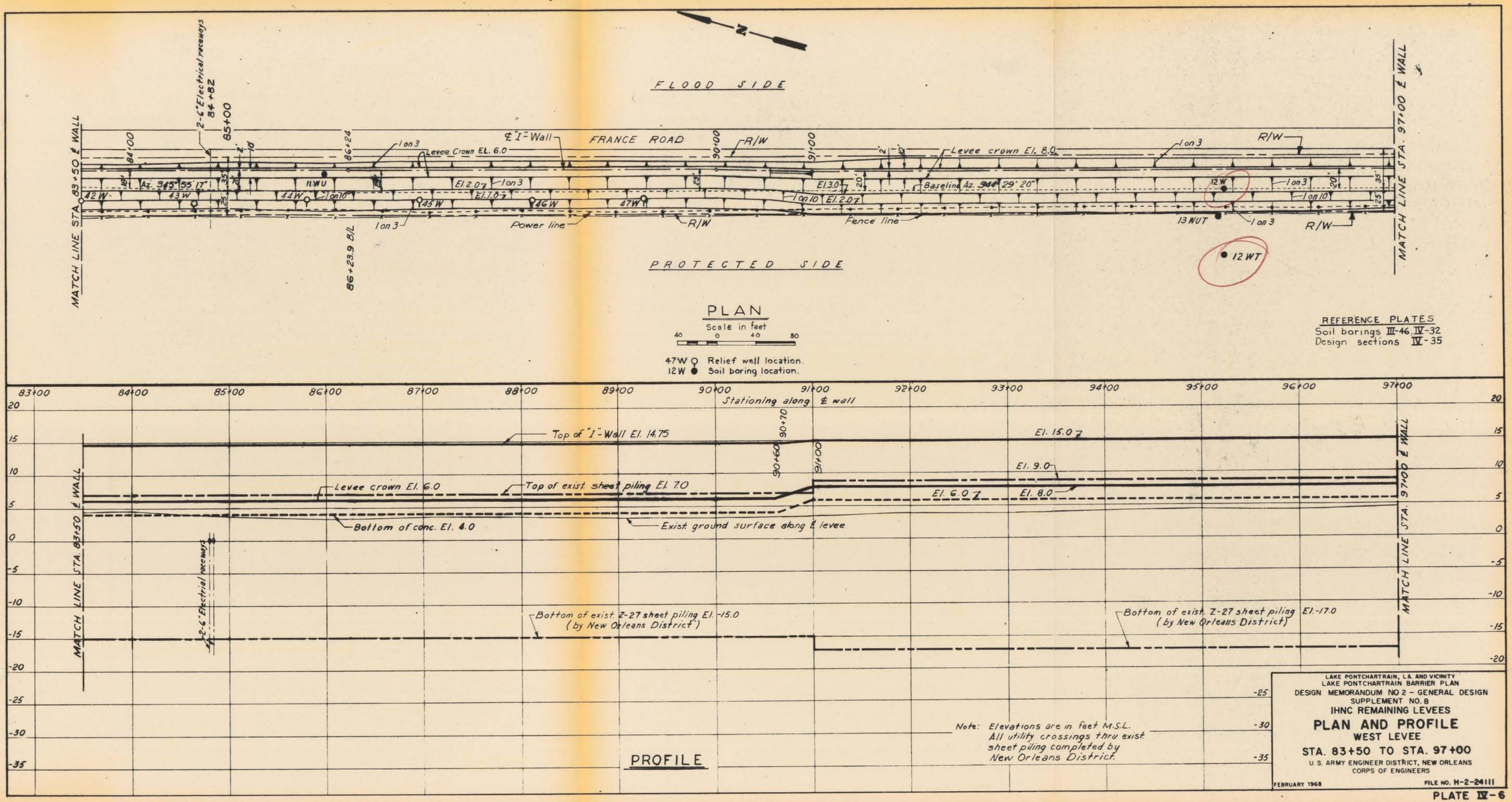
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE
WEST LEVEE
STA. 70+50 TO STA. 83+50

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

FEBRUARY 1968
FILE NO. H-2-24111

PLATE IV-5



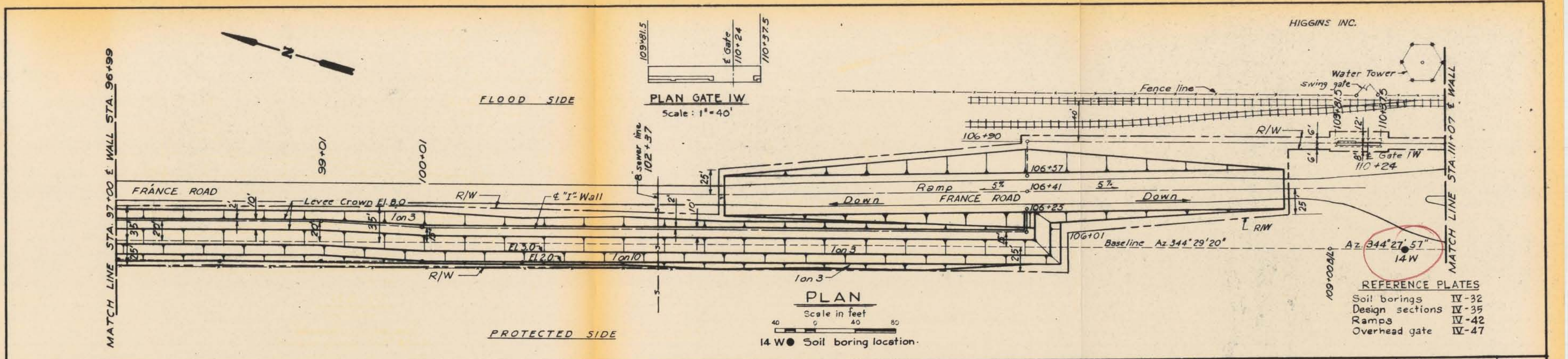
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE
WEST LEVEE
STA. 83+50 TO STA. 97+00

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

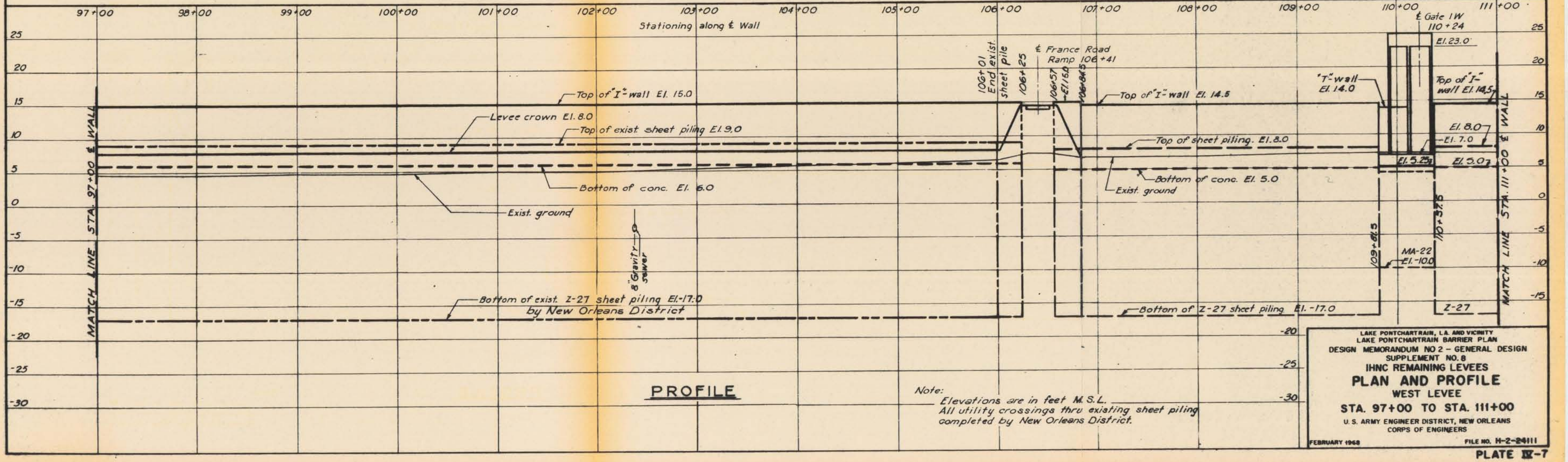
FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-6



REFERENCE PLATES

Soil borings	IV-32
Design sections	IV-35
Ramps	IV-42
Overhead gate	IV-47



Note:
Elevations are in feet M.S.L.
All utility crossings thru existing sheet piling completed by New Orleans District.

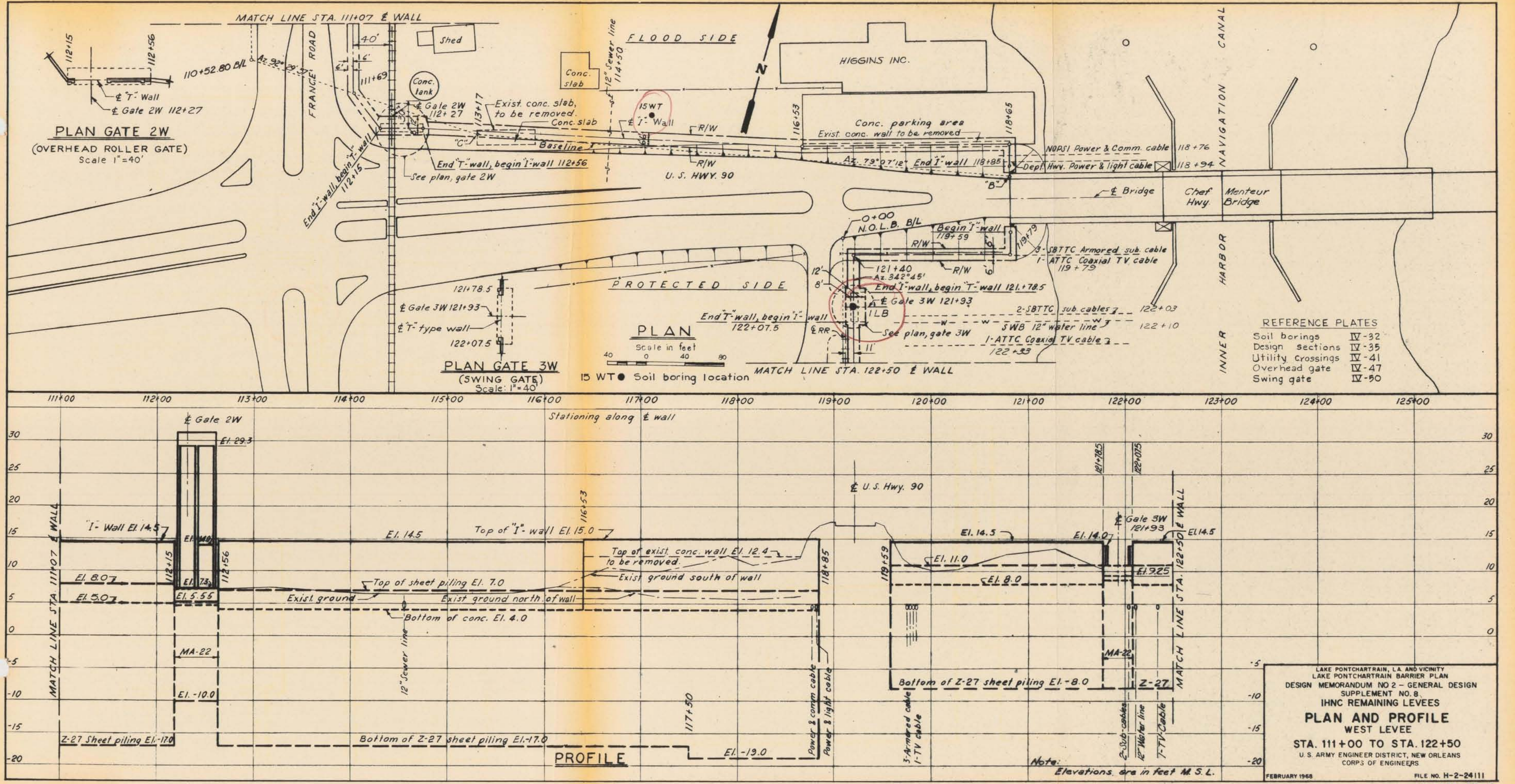
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

WEST LEVEE
STA. 97+00 TO STA. 111+00

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

FEBRUARY 1968 FILE NO. H-2-24111



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

WEST LEVEE

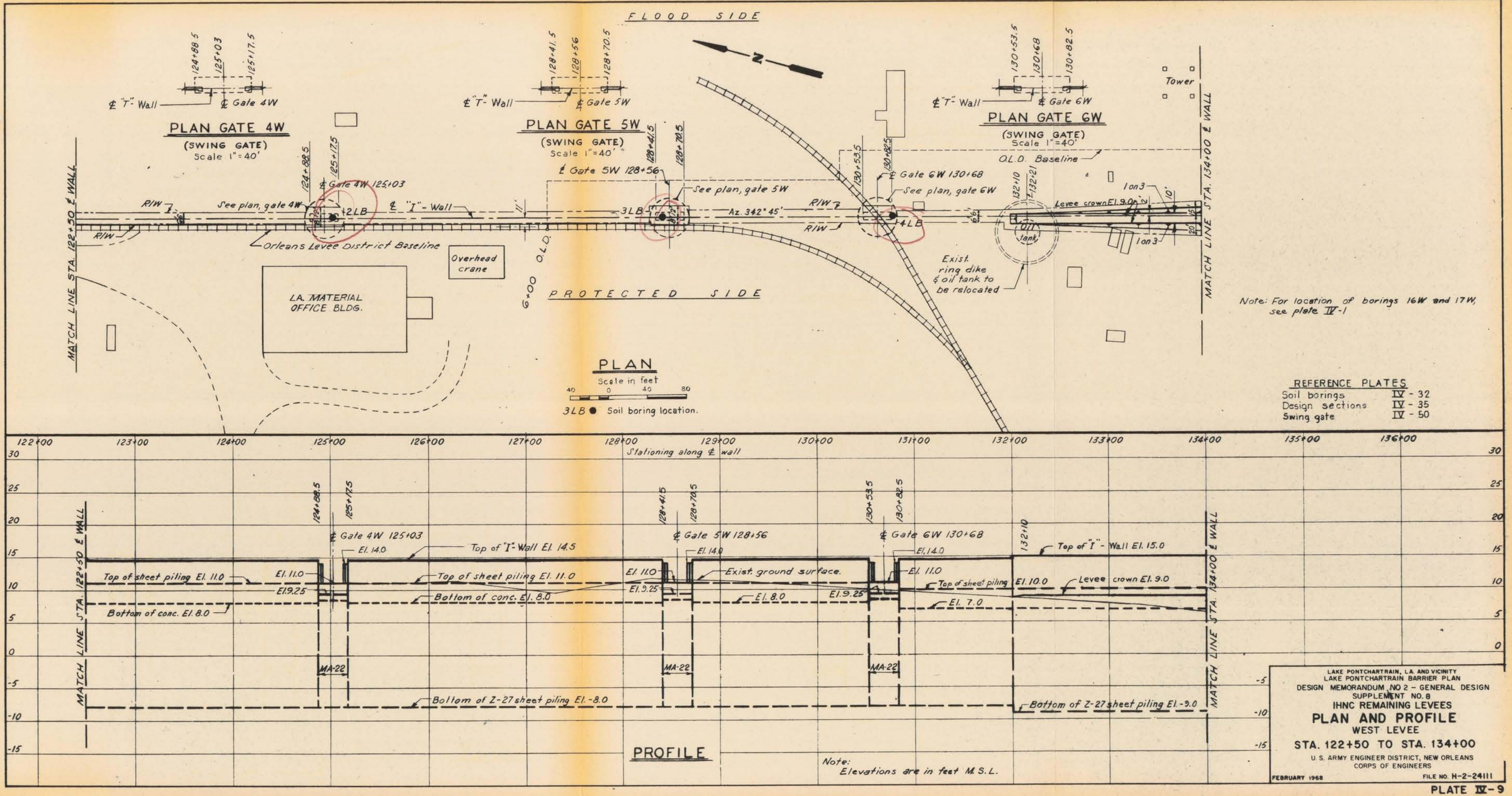
STA. 111+00 TO STA. 122+50

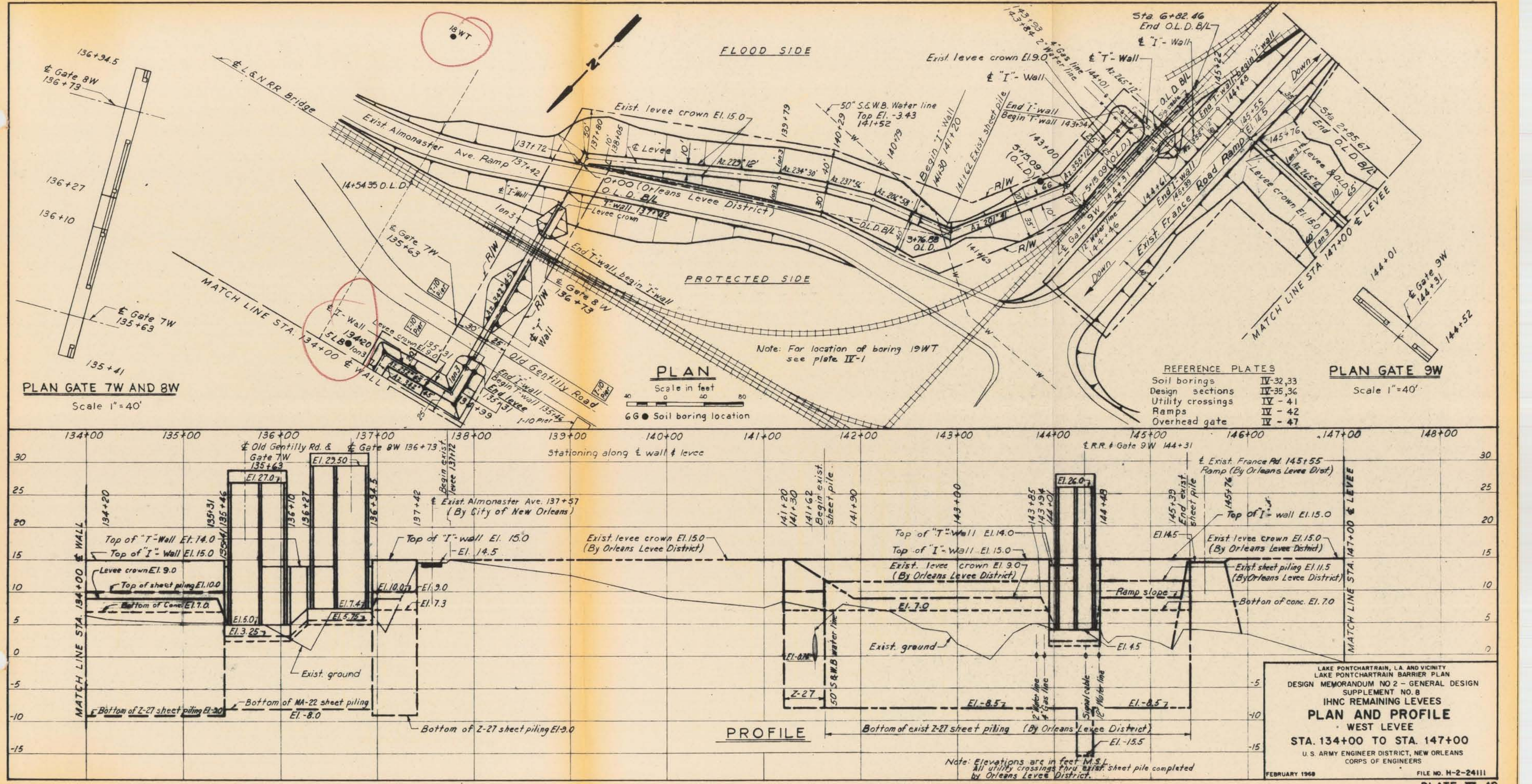
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968

FILE NO. H-2-24111

PLATE IV-8


FLOOD SIDE
PROTECTED SIDE
N
PLAN GATE 4W
(SWING GATE)
Scale 1"=40'
PLAN GATE 5W
(SWING GATE)
Scale 1"=40'
PLAN GATE 6W
(SWING GATE)
Scale 1"=40'
℄ "T"- Wall
℄ Gate 4W
℄ Gate 5W
℄ Gate 6W
124+88.5
125+03
125+17.5
128+41.5
128+56
128+70.5
130+53.5
130+68
130+82.5
Tower
O.L.D. Baseline
℄ Gate 4W 125+03
℄ Gate 5W 128+56
℄ Gate 6W 130+68
See plan, gate 4W
See plan, gate 5W
See plan, gate 6W
℄ "I" - Wall
Az. 342° 45'
R/W
Orleans Levee District Baseline
Levee crown El. 9.0
1 on 3
132+10
132+21
Oil tank
Exist. ring dike & oil tank to be relocated
Overhead crane
LA. MATERIAL OFFICE BLDG.
O.L.D.
6+00
MATCH LINE STA. 122+50 ℄ WALL
MATCH LINE STA. 134+00 ℄ WALL
Note: For location of borings 16W and 17W, see plate IV-1
PLAN
Scale in feet
40 0 40 80
3LB ● Soil boring location.
REFERENCE PLATES
Soil borings IV - 32
Design sections IV - 35
Swing gate IV - 50
122+00 123+00 124+00 125+00 126+00 127+00 128+00 129+00 130+00 131+00 132+00 133+00 134+00 135+00 136+00
Stationing along ℄ wall
30 25 20 15 10 5 0 -5 -10 -15
℄ Gate 4W 125+03
℄ Gate 5W 128+56
℄ Gate 6W 130+68
El. 14.0
Top of "I"- Wall El. 14.5
Top of "I" - Wall El. 15.0
Top of sheet piling El. 11.0
El. 11.0
El. 9.25
Bottom of conc. El. 8.0
Exist. ground surface.
El. 8.0
El. 10.0
Levee crown El. 9.0
El. 7.0
MA-22
Bottom of Z-27 sheet piling El. -8.0
Bottom of Z-27 sheet piling El. -9.0
PROFILE
Note:
Elevations are in feet M.S.L.
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 122+50 TO STA. 134+00
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

WEST LEVEE

STA. 134+00 TO STA. 147+00

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-10

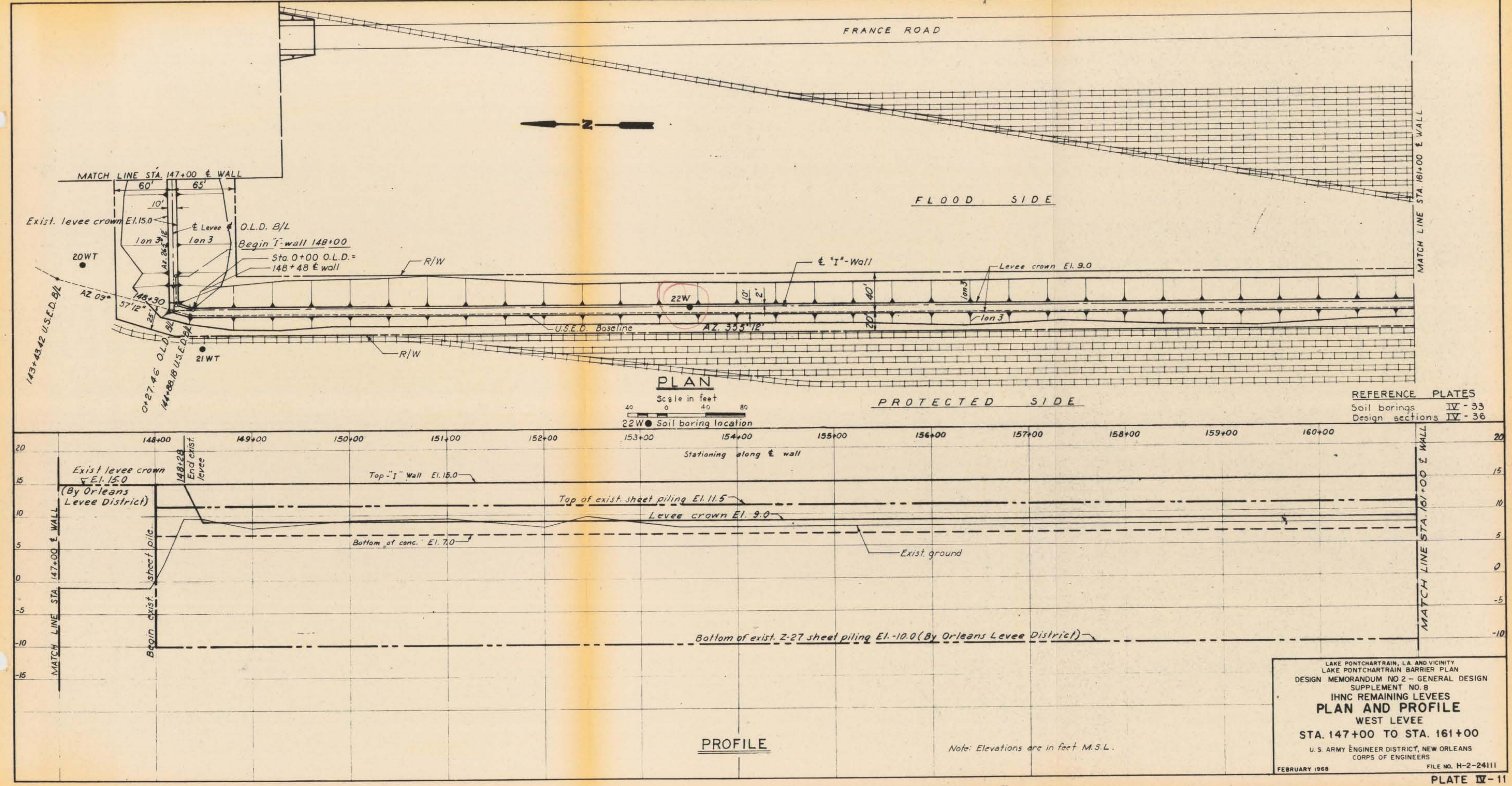
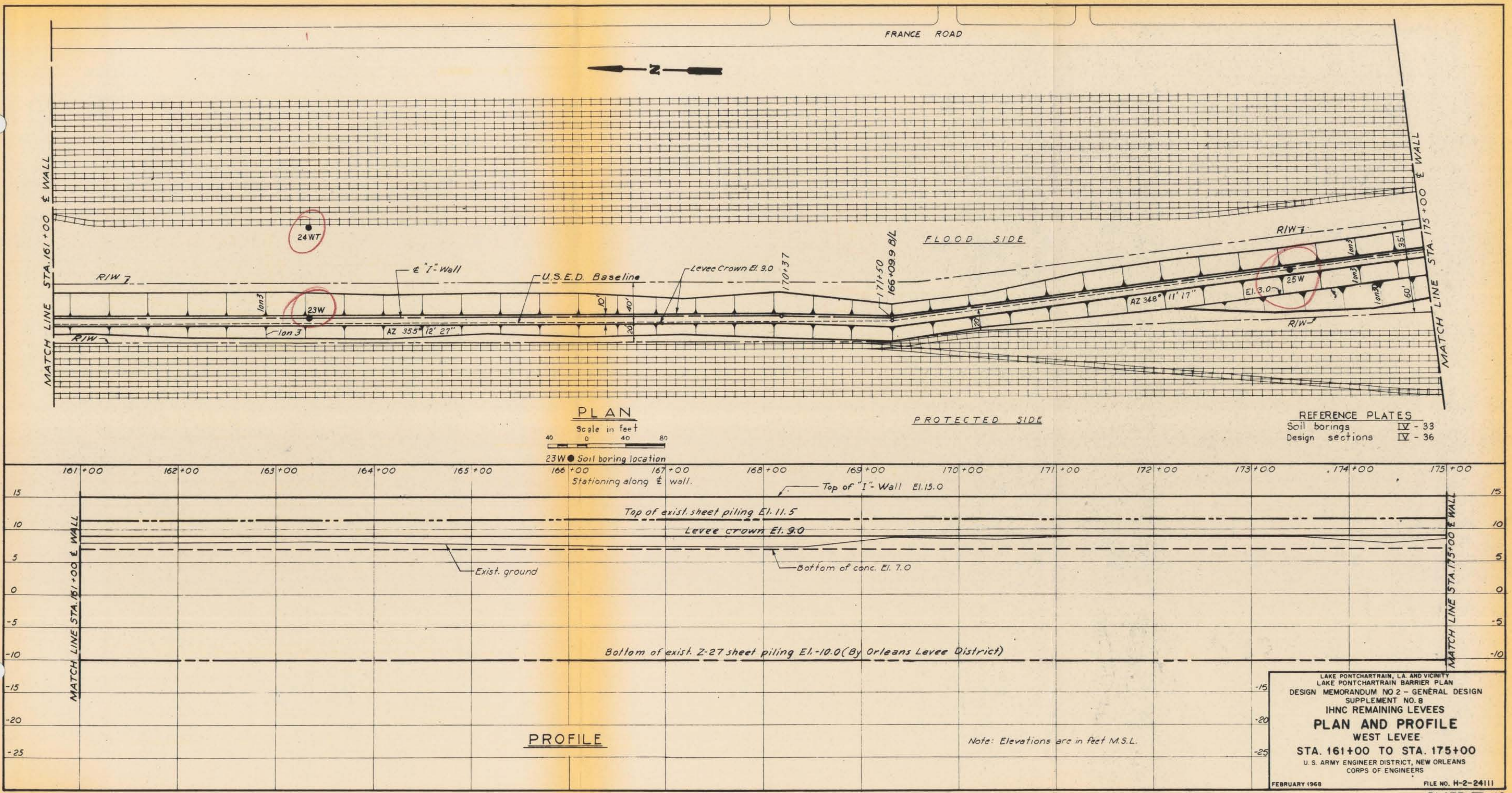

FRANCE ROAD
N
FLOOD SIDE
PROTECTED SIDE
MATCH LINE STA. 147+00 ℄ WALL
60'
65'
10'
Exist. levee crown El. 15.0
℄ Levee ℄ O.L.D. B/L
1 on 3
1 on 3
Begin "I"-wall 148+00
Sta. 0+00 O.L.D. =
148+48 ℄ wall
20WT
R/W
℄ "I"-Wall
Levee crown El. 9.0
22W
10'
2'
40'
20'
1 on 3
1 on 3
AZ 09° 57'12"
148+30
25'
U.S.E.D. Baseline
AZ. 355°12'
R/W
21WT
143+43.42 U.S.E.D. B/L
0+27.46 O.L.D. B/L
144+88.18 U.S.E.D. B/L
MATCH LINE STA. 161+00 ℄ WALL
PLAN
Scale in feet
40 0 40 80
22W ● Soil boring location
REFERENCE PLATES
Soil borings IV - 33
Design sections IV - 36
148+00
148+28 End exist. levee
149+00
150+00
151+00
152+00
153+00
154+00
155+00
156+00
157+00
158+00
159+00
160+00
Stationing along ℄ wall
20
15
10
5
0
-5
-10
-15
Exist levee crown El. 15.0 (By Orleans Levee District)
Top "I" Wall El. 15.0
Top of exist. sheet piling El. 11.5
Levee crown El. 9.0
Bottom of conc. El. 7.0
Exist. ground
Begin exist. sheet pile.
MATCH LINE STA. 147+00 ℄ WALL
MATCH LINE STA. 161+00 ℄ WALL
Bottom of exist. Z-27 sheet piling El. -10.0 (By Orleans Levee District)
PROFILE
Note: Elevations are in feet M.S.L.
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 147+00 TO STA. 161+00
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111

PLATE IV-11



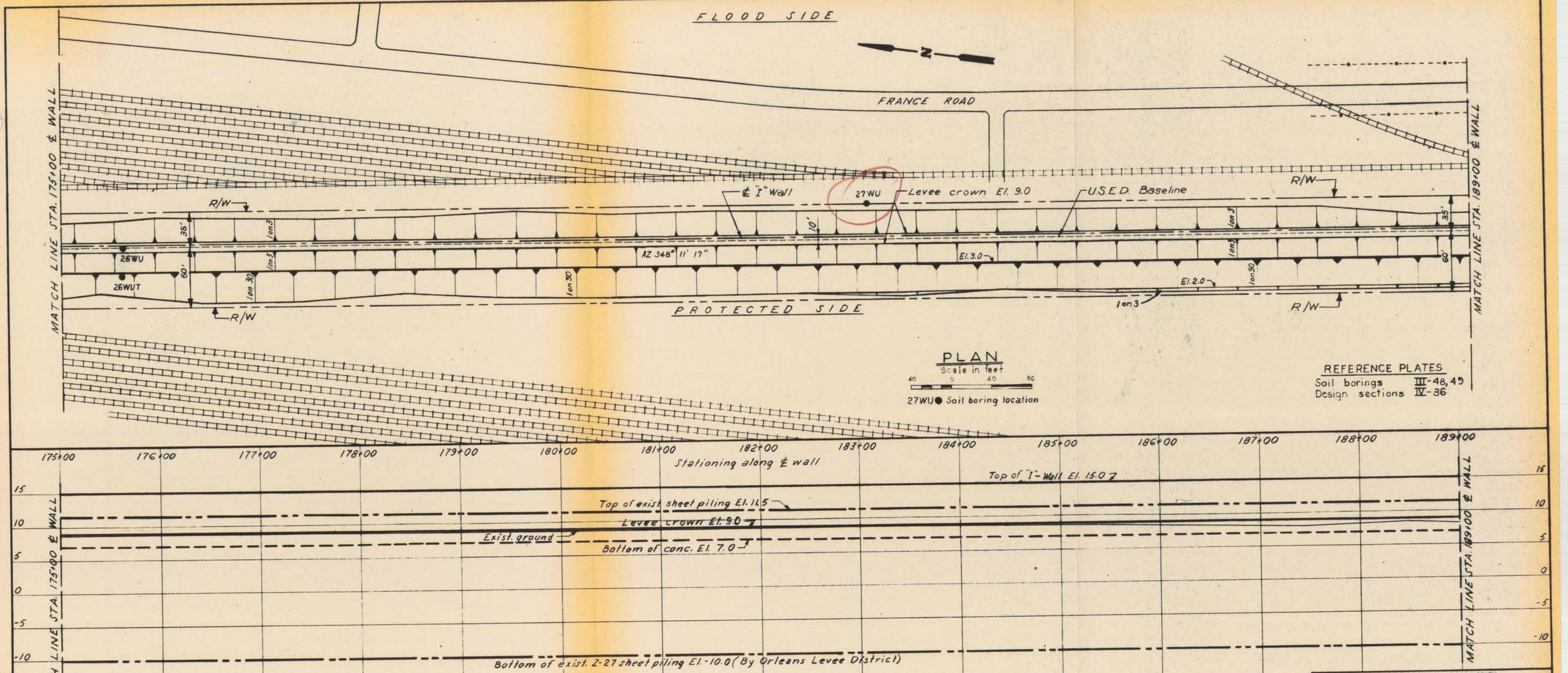
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE
WEST LEVEE
STA. 161+00 TO STA. 175+00

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

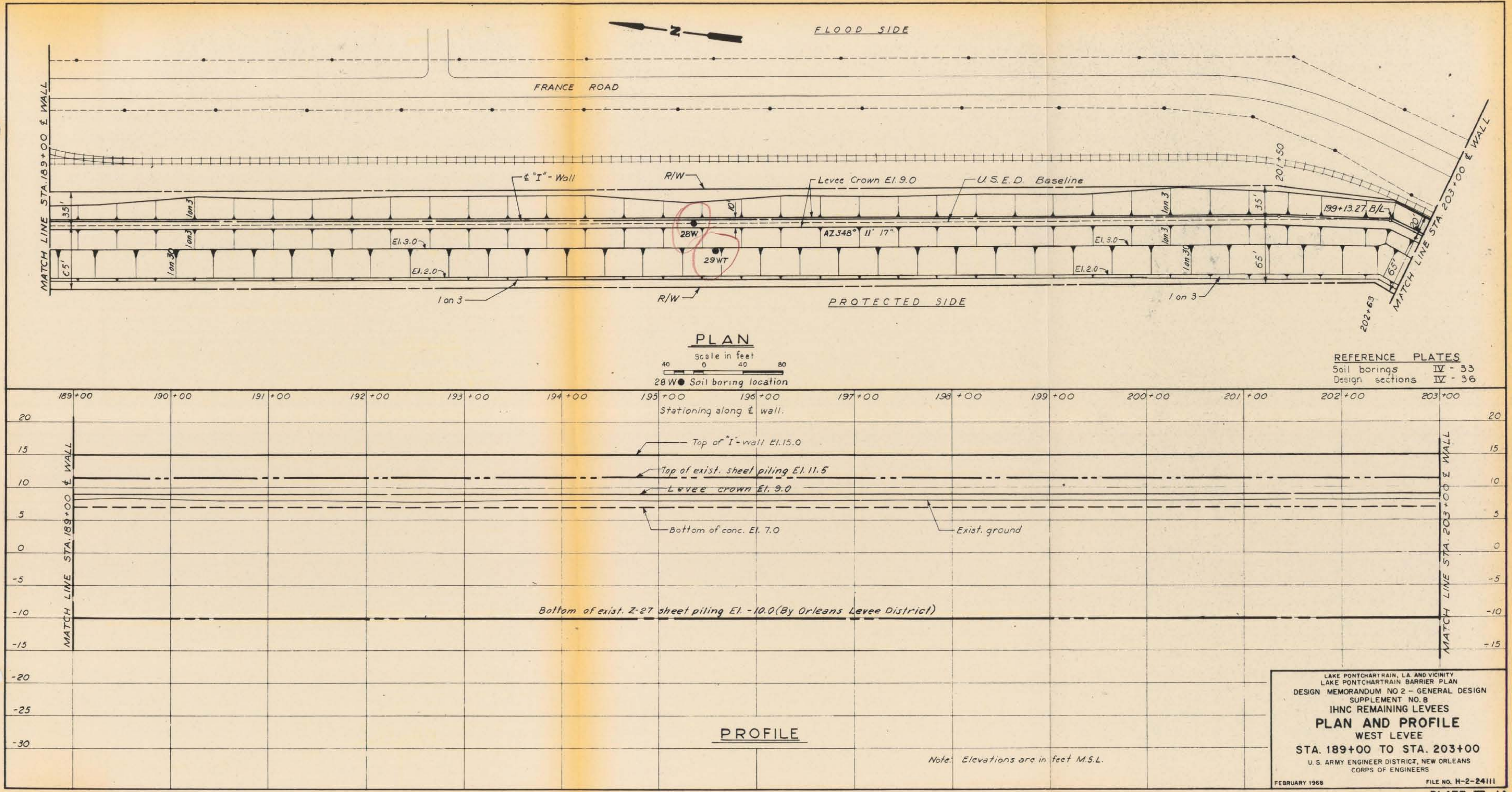
FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-12



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 175+00 TO STA. 189+00
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111

PLATE IV-13



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

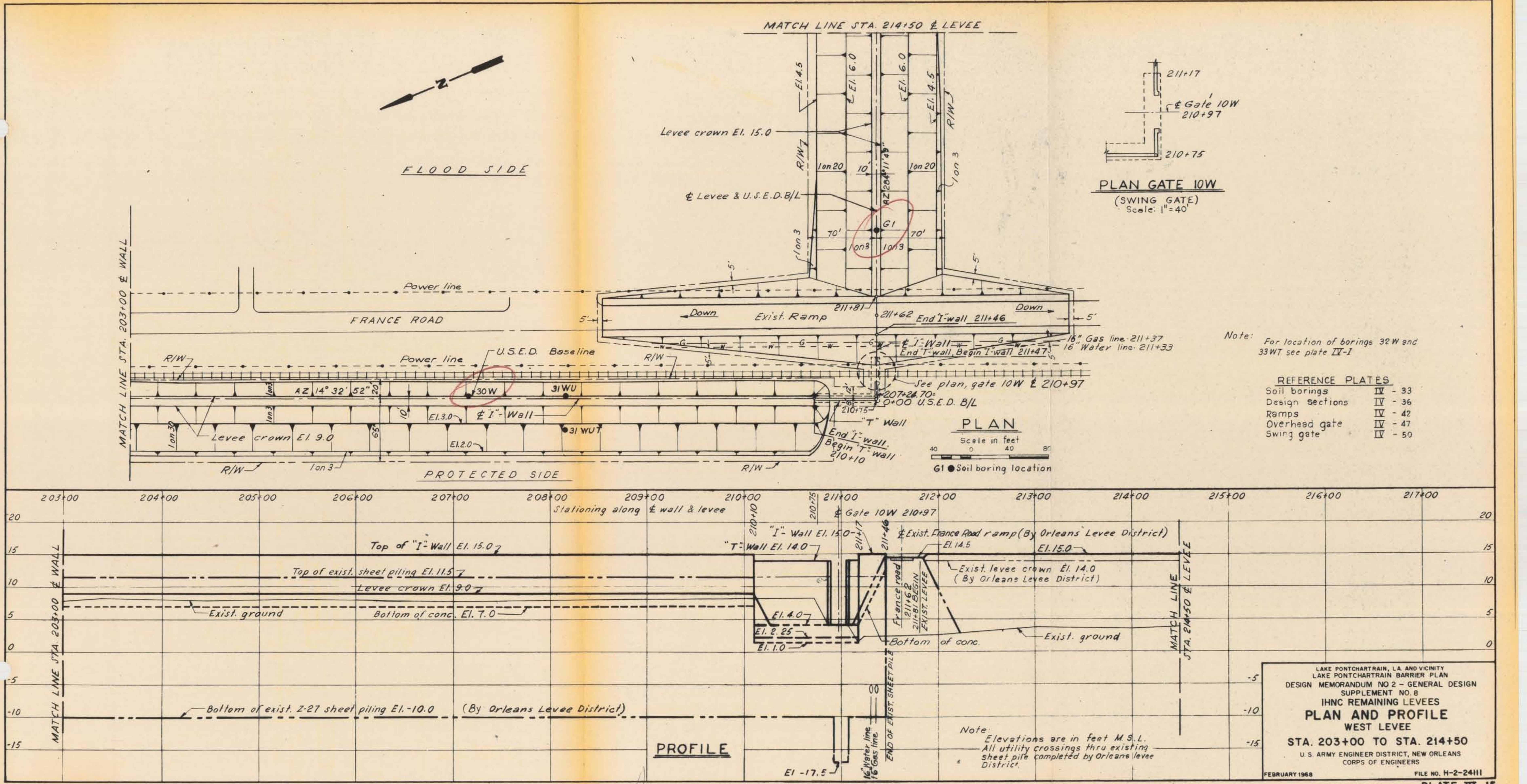
PLAN AND PROFILE

WEST LEVEE

STA. 189+00 TO STA. 203+00

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

FEBRUARY 1968 FILE NO. H-2-24111



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

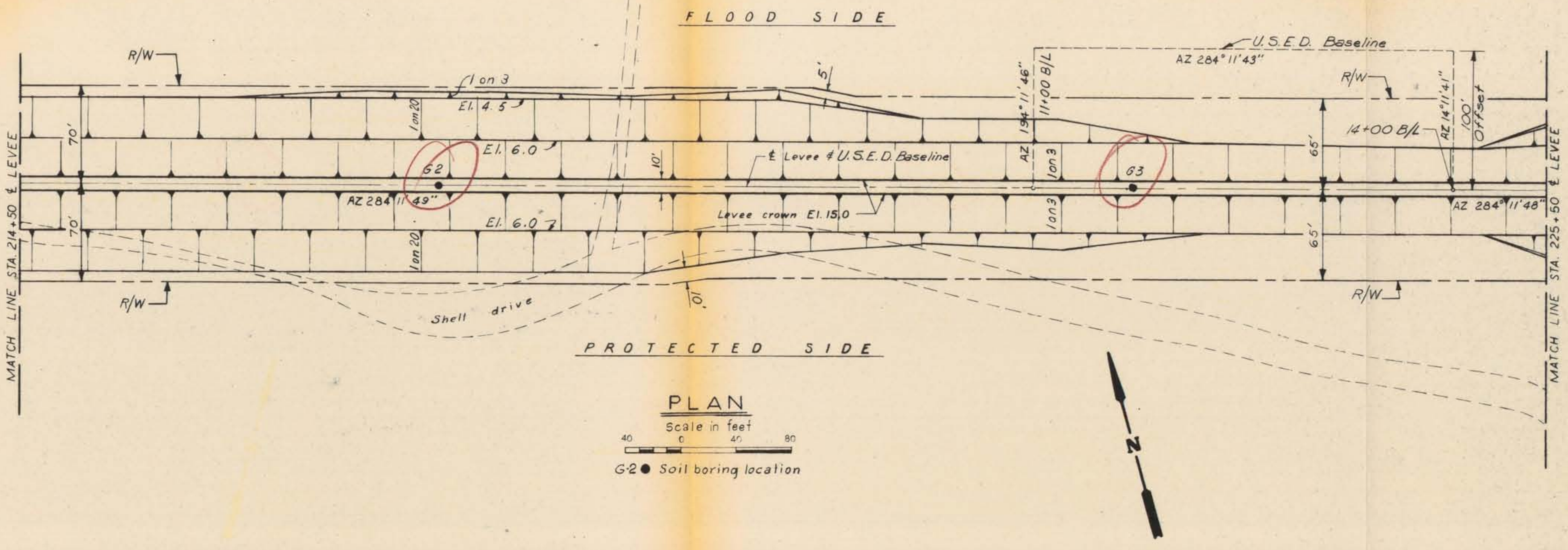
WEST LEVEE

STA. 203+00 TO STA. 214+50

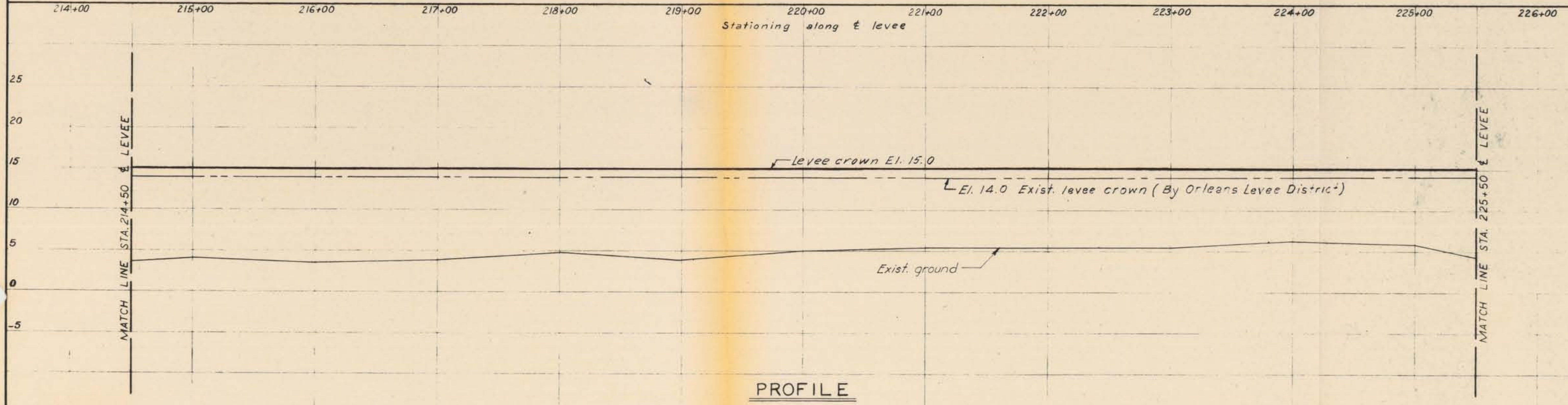
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-15



REFERENCE PLATES
Soil borings IV-33
Design sections IV-36



Note:
Elevations are in feet M.S.L.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

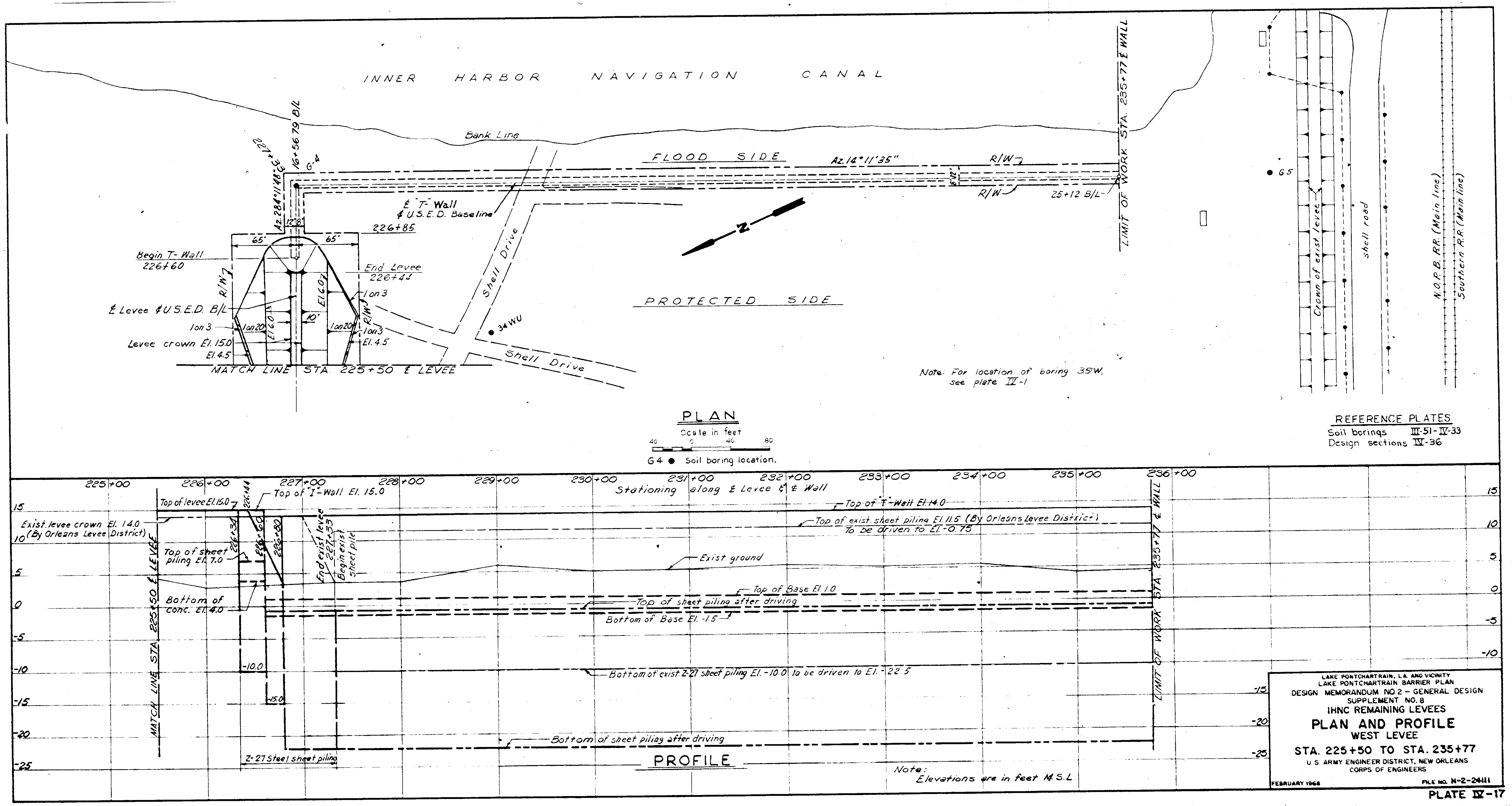
PLAN AND PROFILE
WEST LEVEE

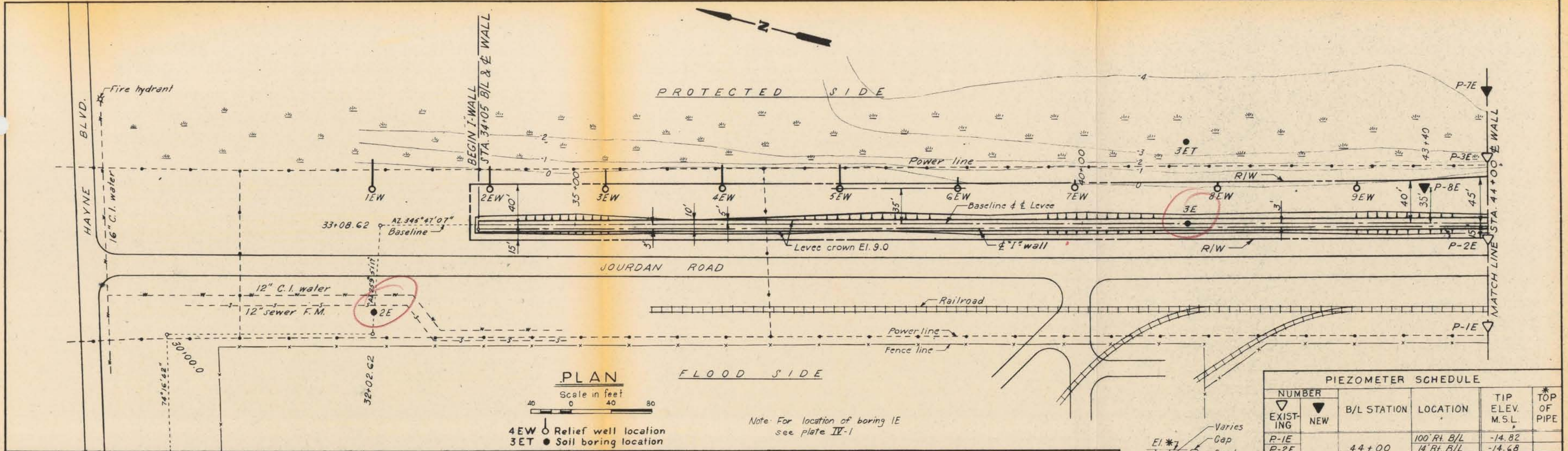
STA. 214+50 TO STA. 225+50

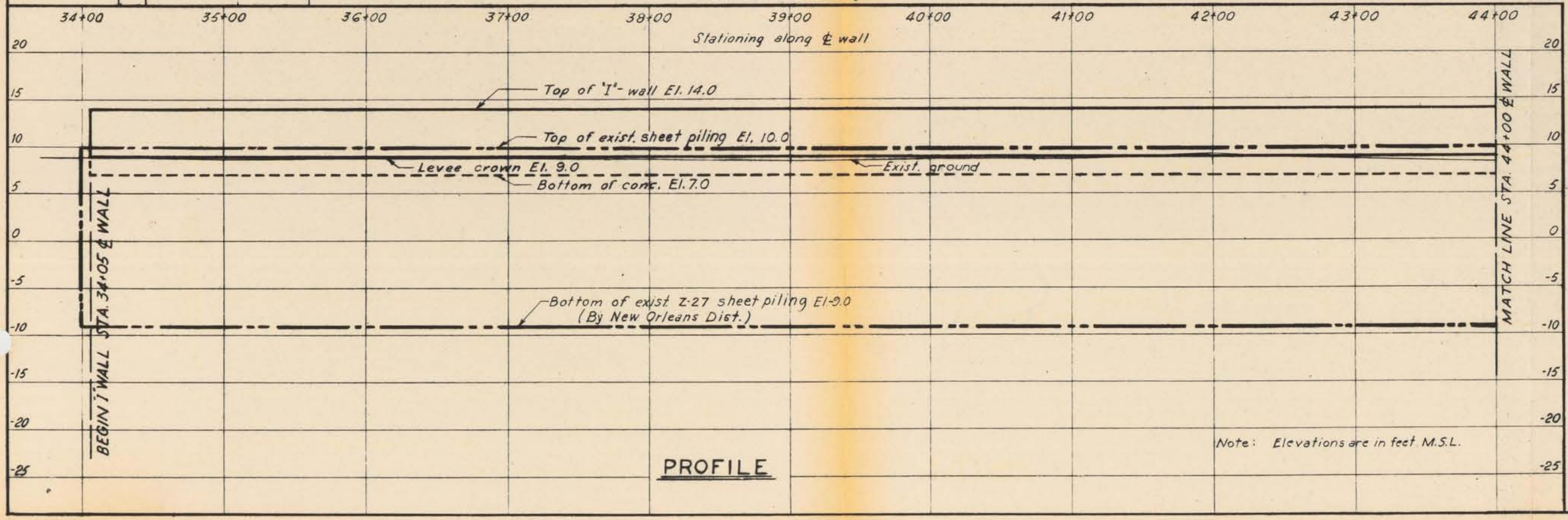
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

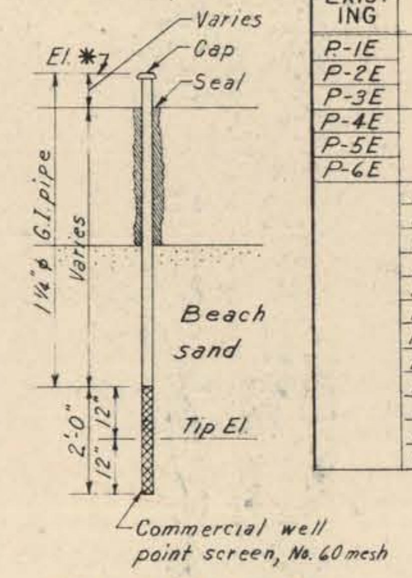
FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-16


INNER HARBOR NAVIGATION CANAL
Bank Line
FLOOD SIDE
Az.14°11'35"
R/W
PROTECTED SIDE
LIMIT OF WORK STA. 235+77 ℄ WALL
25+12 B/L
℄ "T" Wall
℄ U.S.E.D. Baseline
226+85
Begin T-Wall
226+60
End Levee
226+44
℄ Levee ℄ U.S.E.D. B/L
Levee crown El. 15.0
El. 4.5
1 on 3
1 on 20
MATCH LINE STA 225+50 ℄ LEVEE
Shell Drive
34 WU
G-4
G 5
Crown of exist. levee
shell road
N.O.P.B. R.R. (Main line)
Southern R.R. (Main line)
Note: For location of boring 35W, see plate IV-1
PLAN
Scale in feet
G 4 ● Soil boring location.
REFERENCE PLATES
Soil borings III-51-IV-33
Design sections IV-36
Stationing along ℄ Levee ℄ Wall
Top of levee El. 15.0
Top of "I"-Wall El. 15.0
Exist. levee crown El. 14.0 (By Orleans Levee District)
Top of "T"-Wall El. 14.0
Top of exist. sheet piling El. 11.5 (By Orleans Levee District) To be driven to El. -0.75
Top of sheet piling El. 7.0
End exist. levee 227+33
Begin exist. sheet pile
Exist ground
Top of Base El. 1.0
Top of sheet piling after driving
Bottom of conc. El. 4.0
Bottom of Base El. -1.5
Bottom of exist. Z-27 sheet piling El. -10.0 to be driven to El. -22.5
Bottom of sheet piling after driving
Z-27 Steel sheet piling
PROFILE
Note: Elevations are in feet M.S.L.
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
WEST LEVEE
STA. 225+50 TO STA. 235+77
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111
PLATE IV-17







PIEZOMETER DETAIL

PIEZOMETER SCHEDULE

NUMBER ▽ EXISTING	NUMBER ▼ NEW	B/L STATION	LOCATION	TIP ELEV. M.S.L.	* TOP OF PIPE
P-1E		44+00	100' Rt. B/L	-14.82	
P-2E			14' Rt. B/L	-14.68	
P-3E			65' Lft. B/L	-15.07	(1.0)
P-4E		74+00	120' Rt. B/L	-14.90	
P-5E			20' Rt. B/L	-11.40	
P-6E			65' Lft. B/L	-13.00	(1.0)
	P-7E	44+00	130' Lft. B/L	-15.00	1.0
	P-8E	43+40	35' Lft B/L	-15.00	3.0
	P-9E	44+80	35' Lft. B/L	-15.00	3.0
	P-10E	74+00	130' Lft. B/L	-13.00	3.0
	P-11E	73+40	35' Lft. B/L	-13.00	3.0
	P-12E	75+20	35' Lft. B/L	-13.00	3.0
	P-13E	59+00	70' Rt. B/L	-15.00	8.0
	P-14E		6' Rt. B/L	-15.00	10.0
	P-15E		45' Lft. B/L	-15.00	1.0
	P-16E		110' Lft. B/L	-15.00	1.0
	P-17E	57+60	45' Lft. B/L	-15.00	3.0
	P-18E	60+80	45' Lft B/L	-15.00	1.0

Note:

Place extension with cap, on exist. riser pipes for piezometers with top of pipe at elevations shown.

All piezometers are to be protected from damage during construction.

REFERENCE	PLATES
Soil borings	IV - 34
Design sections	IV - 37

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

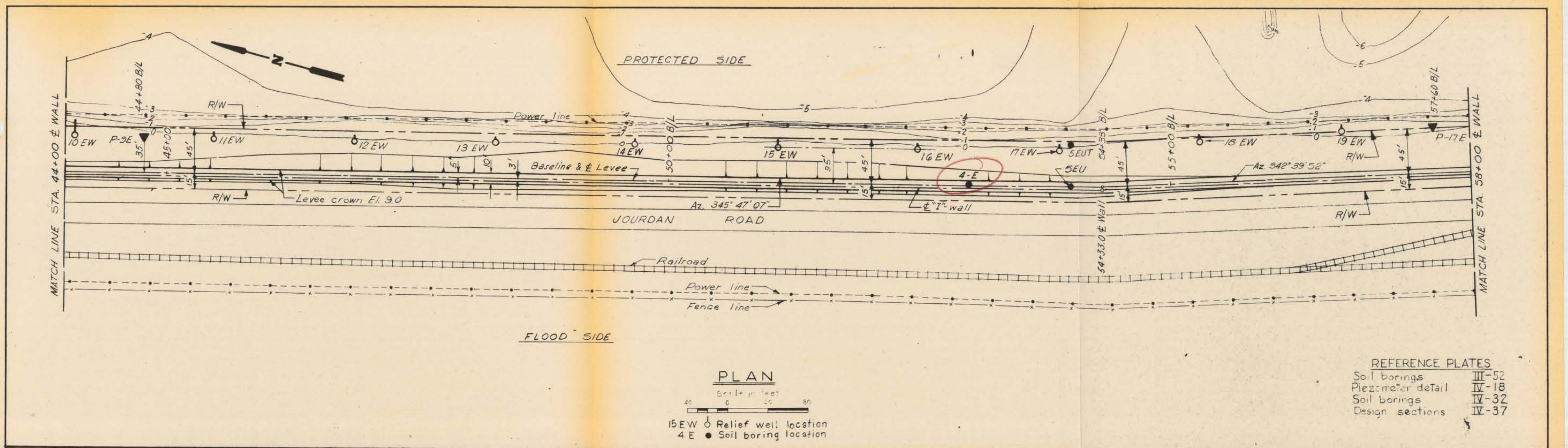
EAST LEVEE

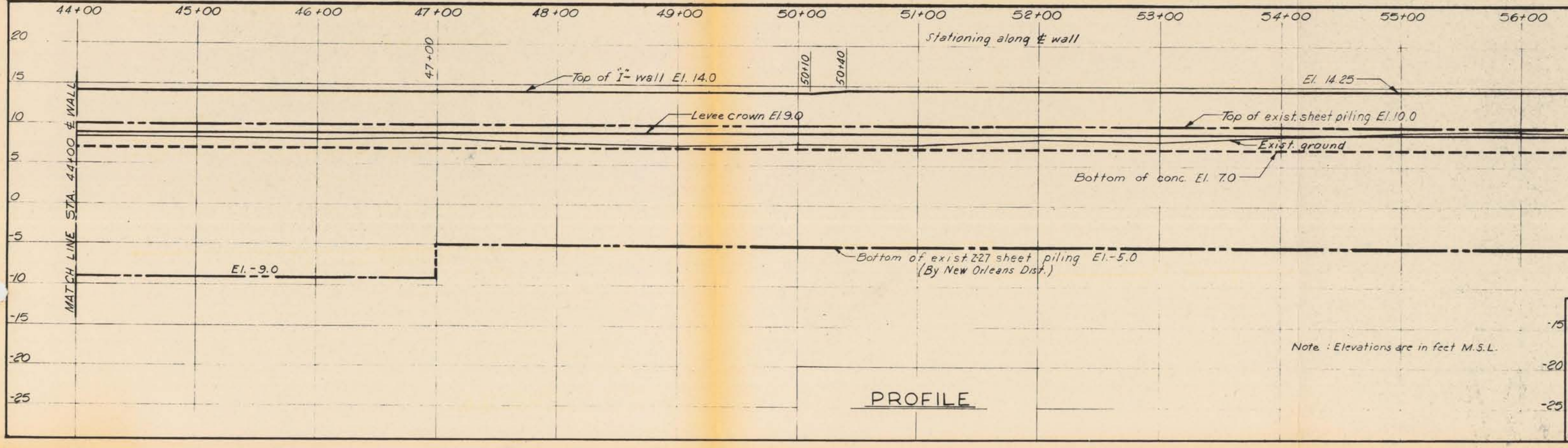
STA. 34+05 TO STA. 44+00

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

FEBRUARY 1968

FILE NO. H-2-24111





LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

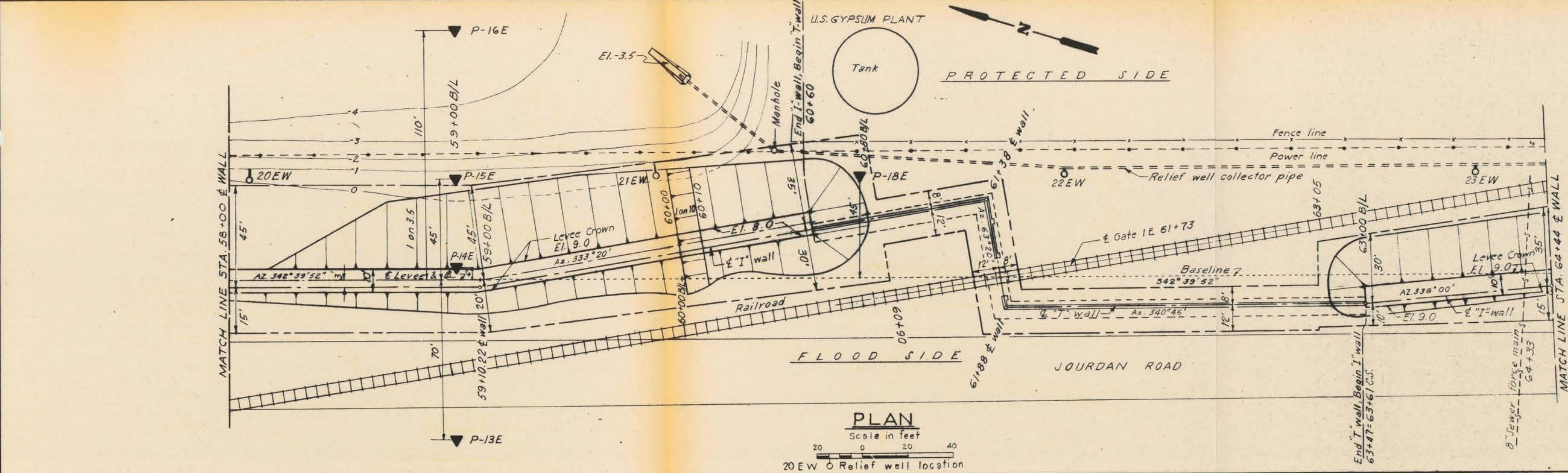
PLAN AND PROFILE

EAST LEVEE

STA. 44+00 TO STA. 58+00

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

FEBRUARY 1968 FILE NO. H-2-24111



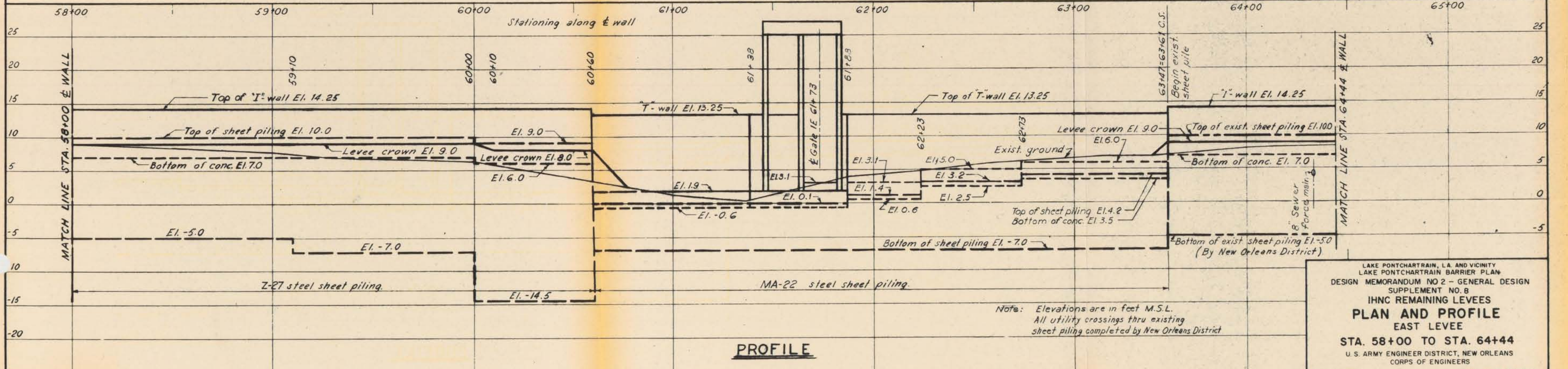
PLAN

Scale in feet

20 EW ○ Relief well location

REFERENCE PLATES

Piezometer detail	IV-18
Design sections	IV-37
Overhead gate "	IV-47



Note: Elevations are in feet M.S.L.
All utility crossings thru existing sheet piling completed by New Orleans District

PROFILE

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

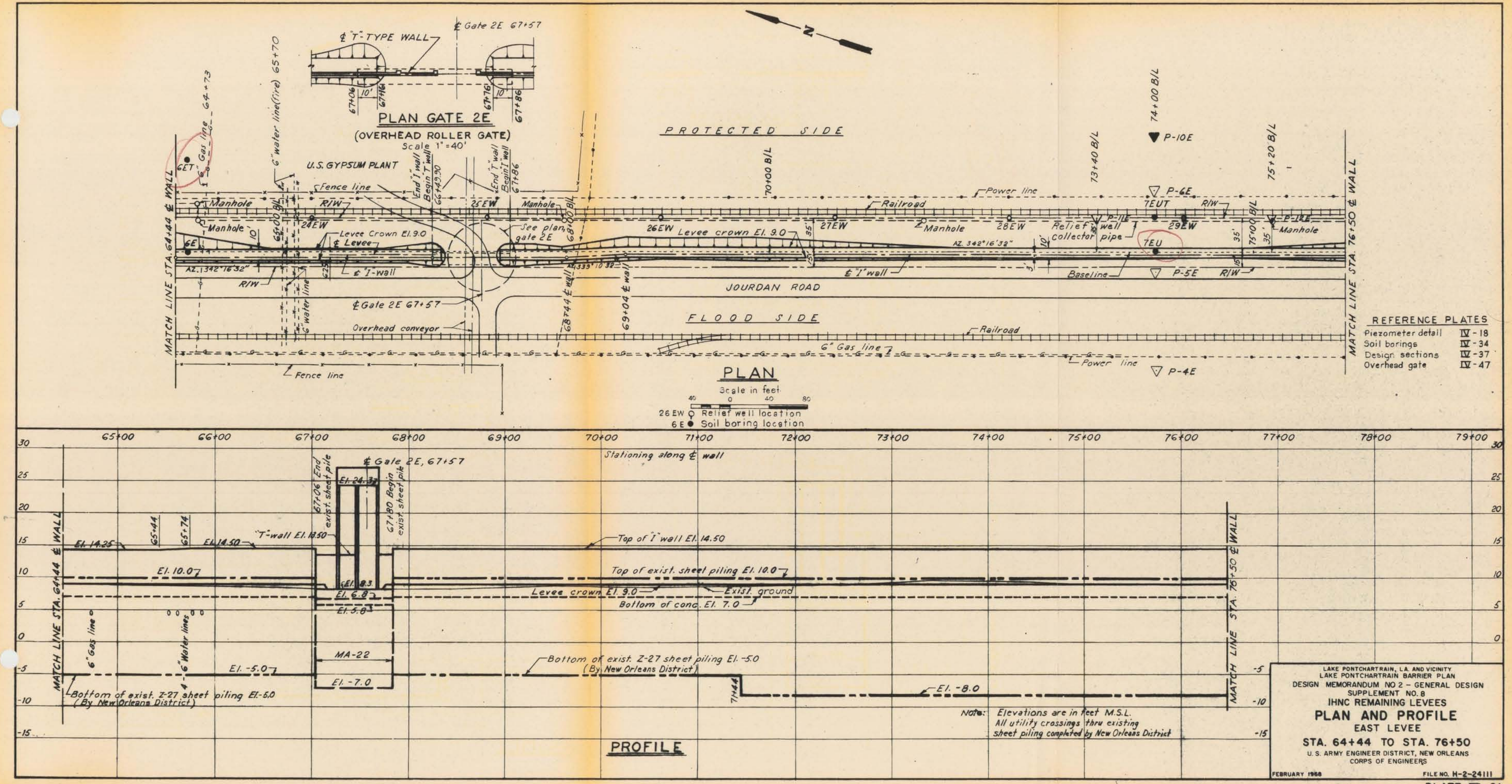
EAST LEVEE

STA. 58+00 TO STA. 64+44

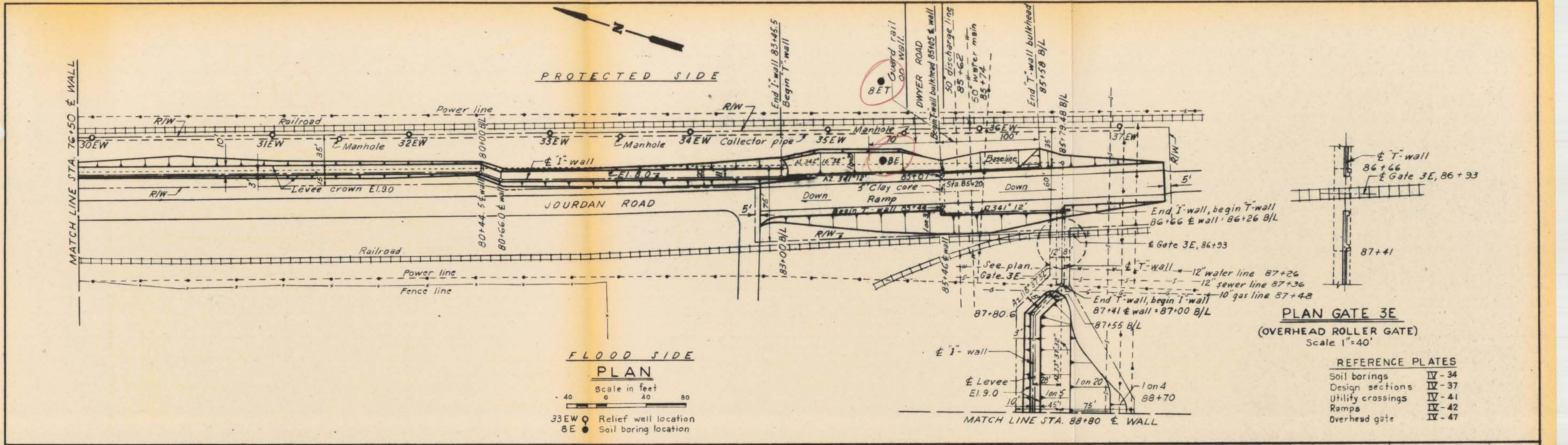
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

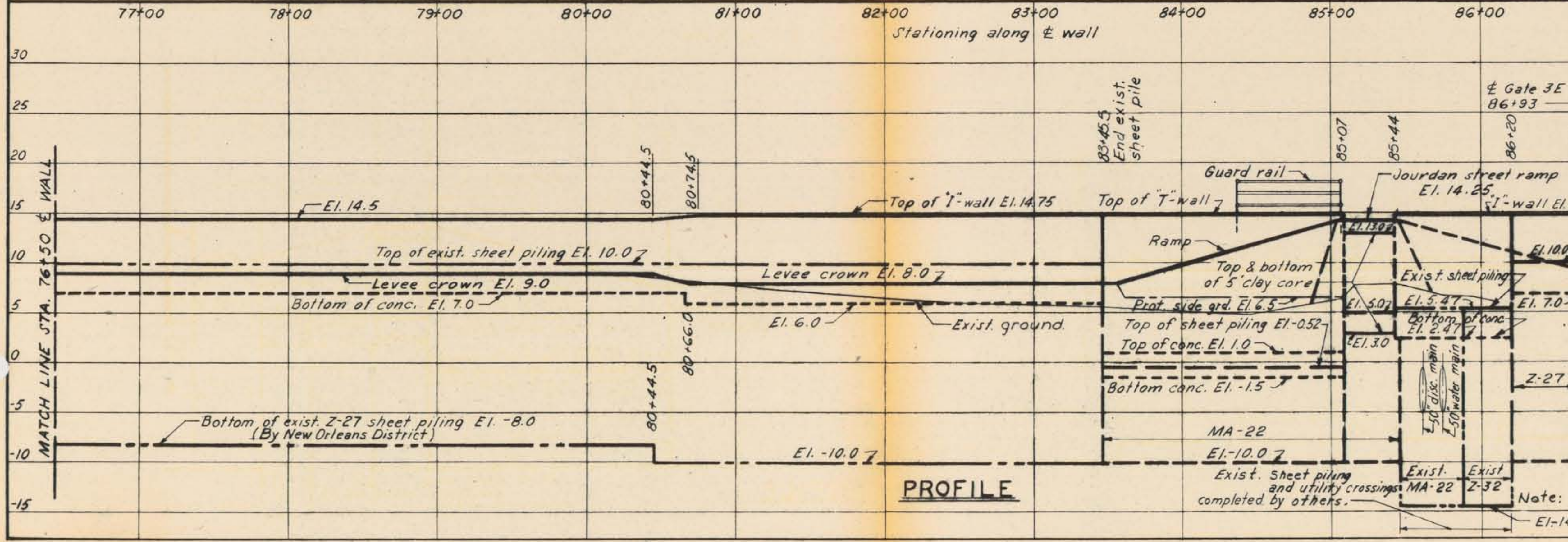
FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-20



PLAN GATE 2E
(OVERHEAD ROLLER GATE)
Scale 1"=40'
℄ "T"-TYPE WALL
℄ Gate 2E 67+57
PROTECTED SIDE
FLOOD SIDE
U.S. GYPSUM PLANT
JOURDAN ROAD
Levee crown El. 9.0
℄ "I" wall
Railroad
Power line
Fence line
6" Gas line
Overhead conveyor
Relief well collector pipe
Baseline
MATCH LINE STA. 64+44 ℄ WALL
MATCH LINE STA. 76+50 ℄ WALL
PLAN
Scale in feet
26 EW Relief well location
6 E Soil boring location
REFERENCE PLATES
Piezometer detail IV-18
Soil borings IV-34
Design sections IV-37
Overhead gate IV-47
Stationing along ℄ wall
Top of "I" wall El. 14.50
Top of exist. sheet piling El. 10.0
Levee crown El. 9.0
Exist. ground
Bottom of conc. El. 7.0
Bottom of exist. Z-27 sheet piling El. -5.0
(By New Orleans District)
El. -8.0
Note: Elevations are in feet M.S.L.
All utility crossings thru existing sheet piling completed by New Orleans District
PROFILE
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
PLAN AND PROFILE
EAST LEVEE
STA. 64+44 TO STA. 76+50
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968
FILE NO. H-2-24111





LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

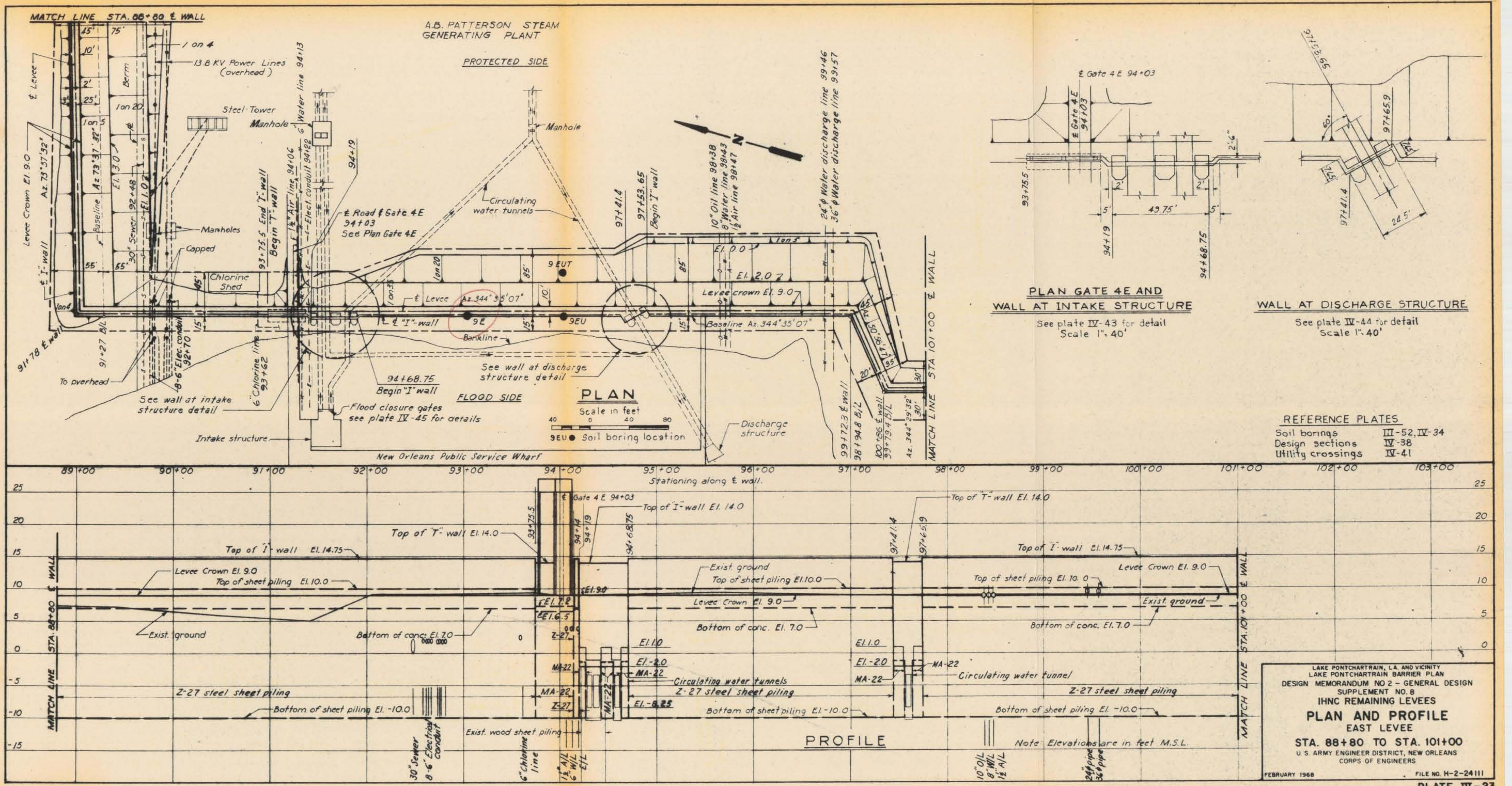
EAST LEVEE

STA. 76+50 TO STA. 88+80

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-22



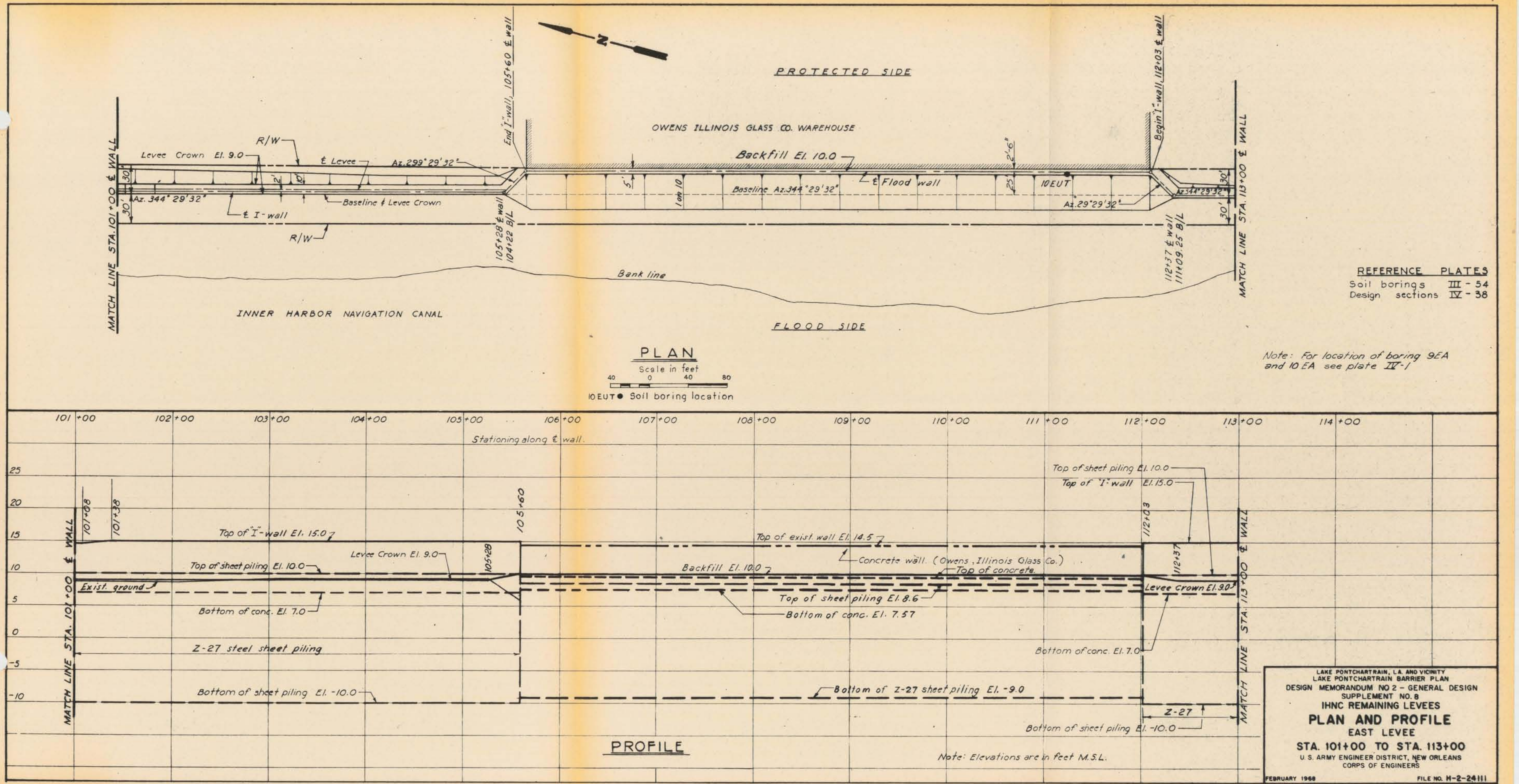
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE
EAST LEVEE
STA. 88+80 TO STA. 101+00

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-23



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

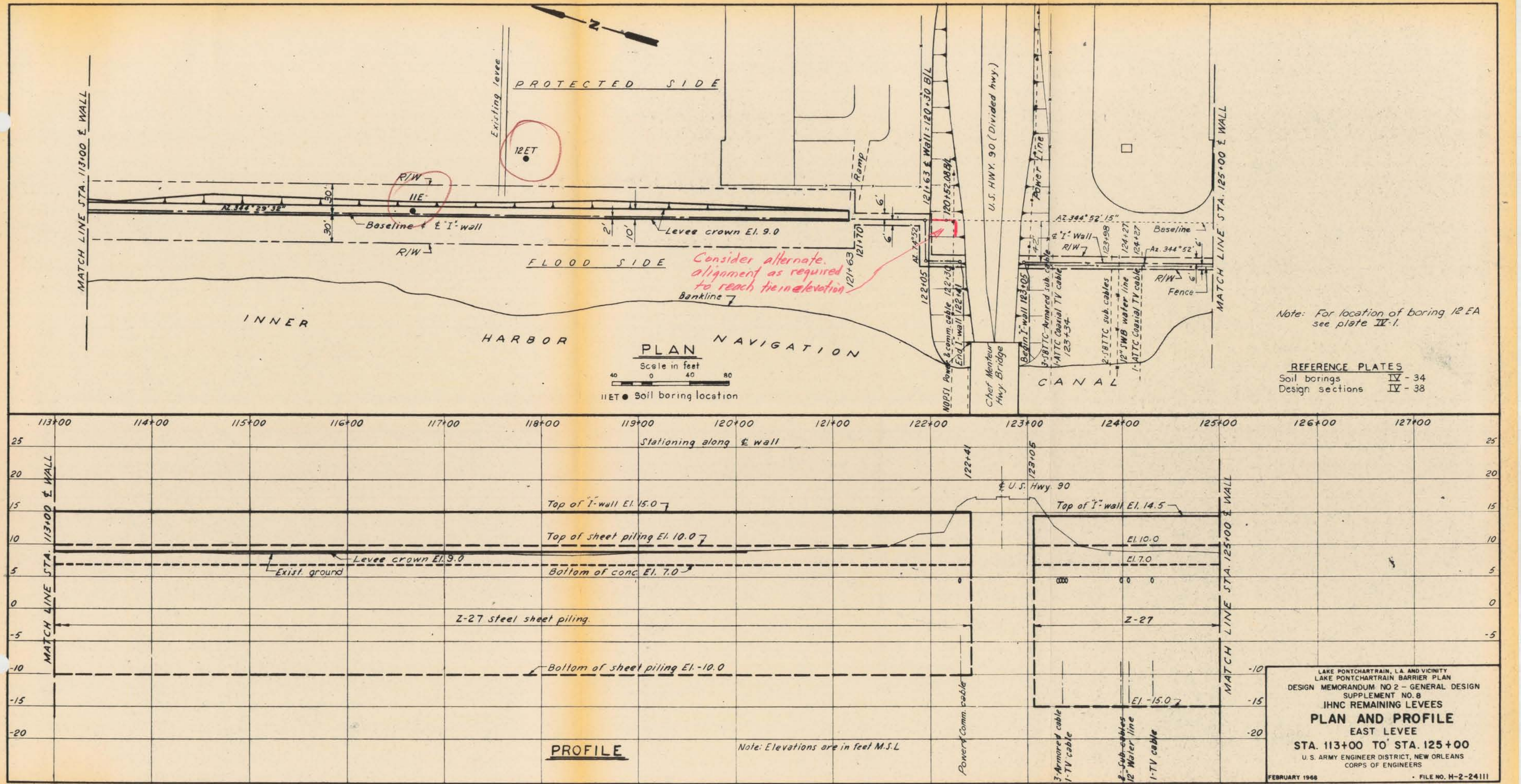
EAST LEVEE

STA. 101+00 TO STA. 113+00

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-24



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

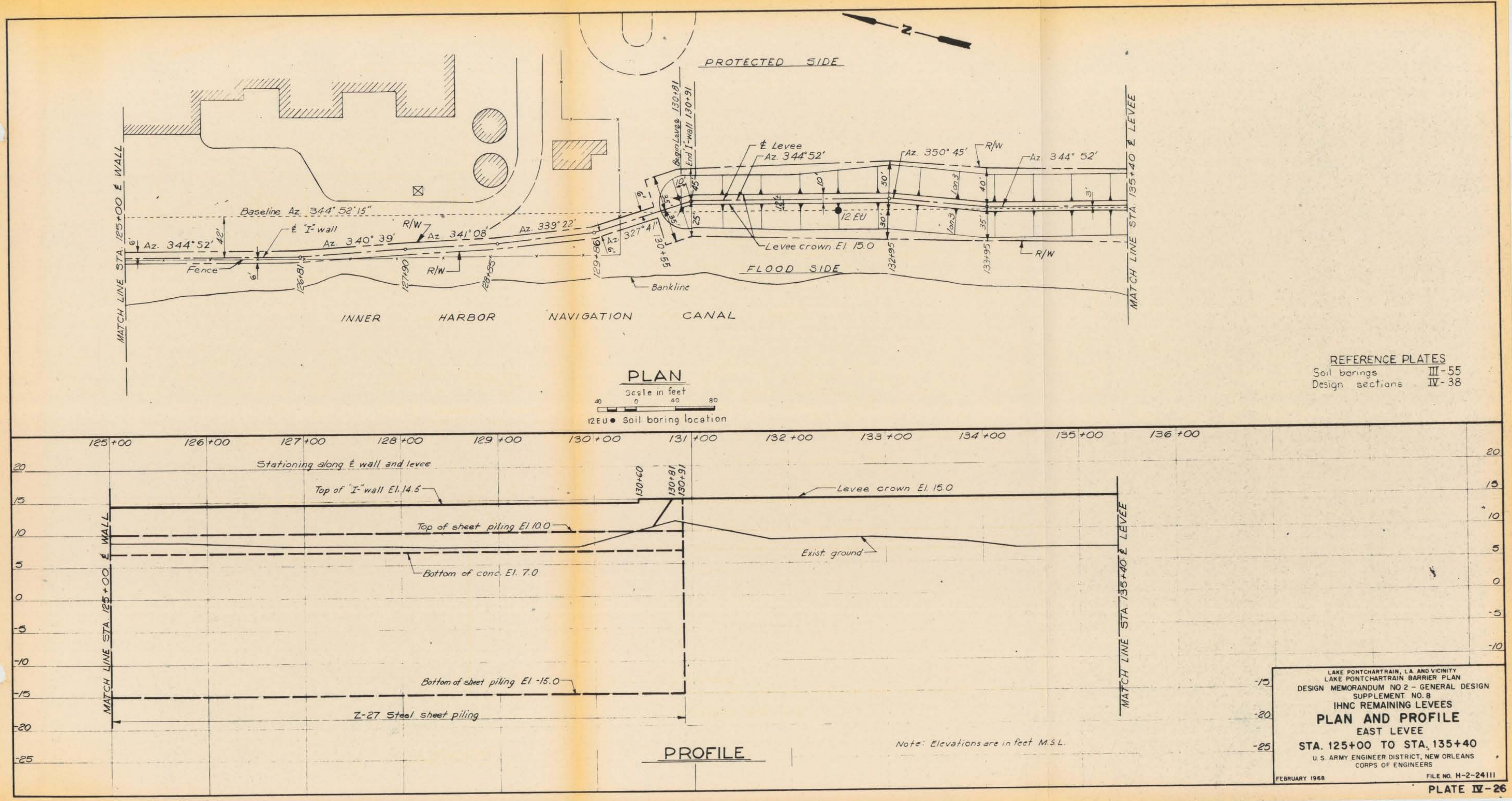
EAST LEVEE

STA. 113+00 TO STA. 125+00

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

FEBRUARY 1968 · FILE NO. H-2-24111

PLATE IV-25



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

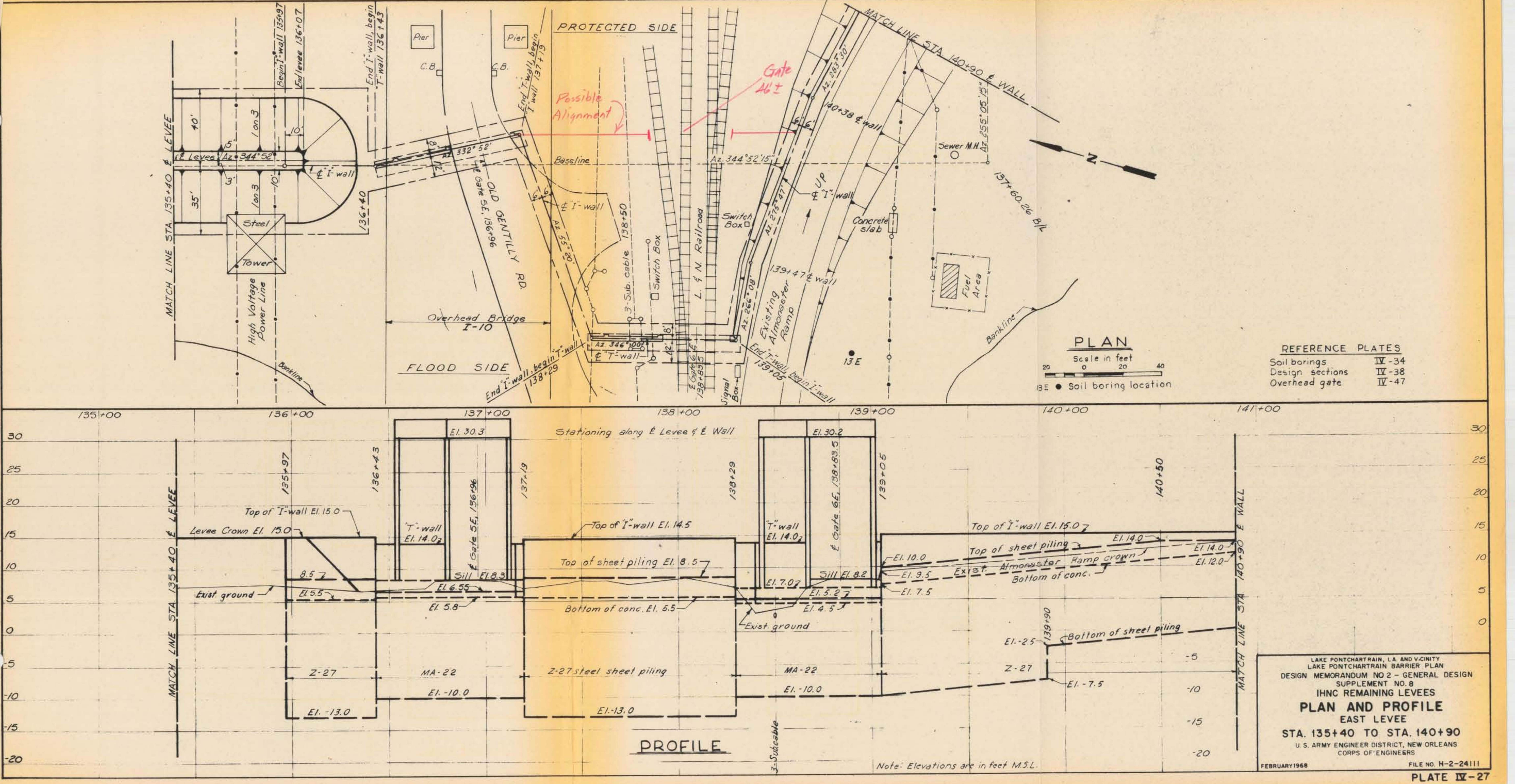
EAST LEVEE

STA. 125+00 TO STA. 135+40

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-26



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

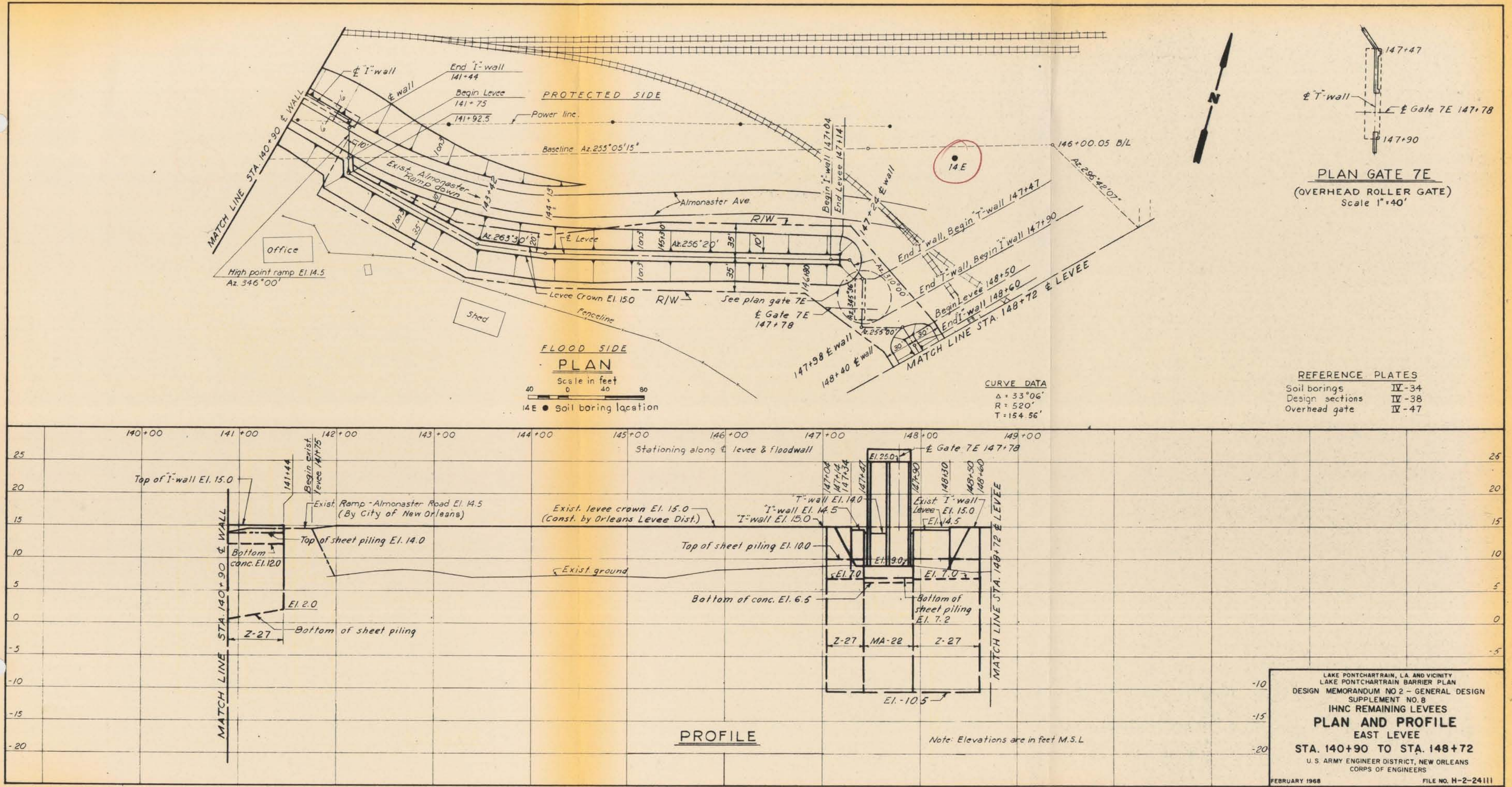
EAST LEVEE

STA. 135+40 TO STA. 140+90

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-27



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

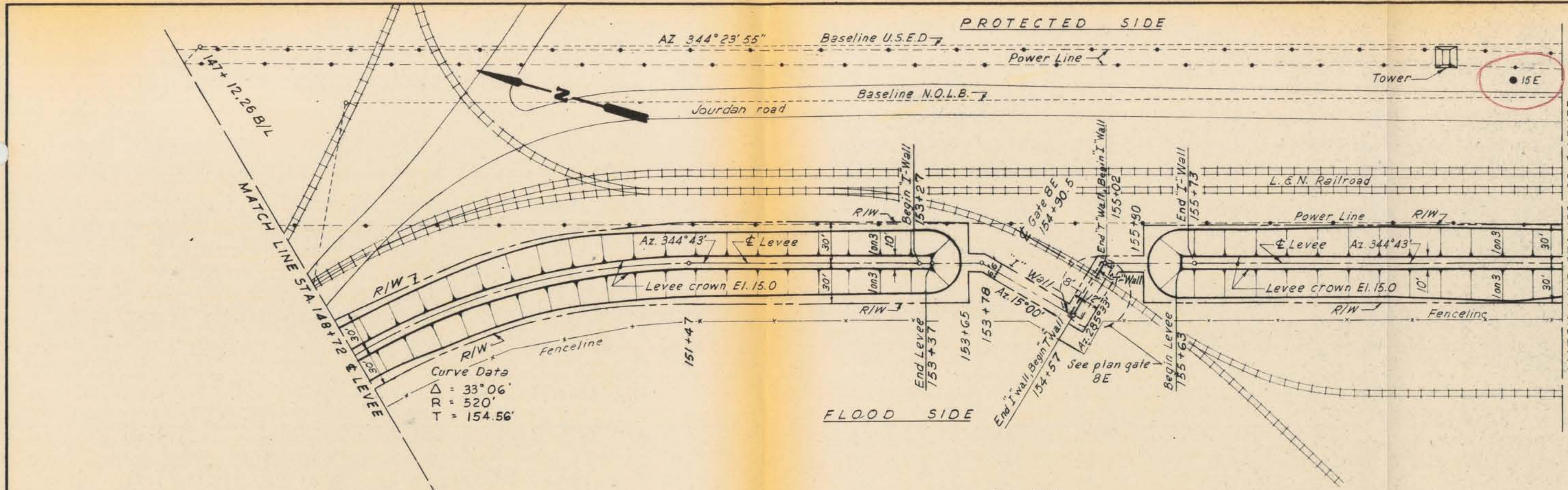
PLAN AND PROFILE

EAST LEVEE

STA. 140+90 TO STA. 148+72

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

FEBRUARY 1968 FILE NO. H-2-24111

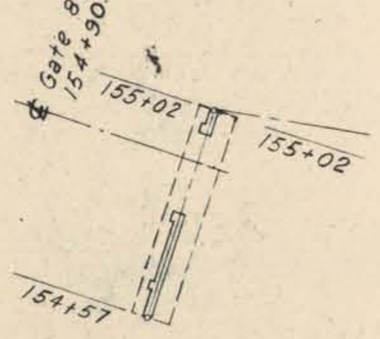


PLAN

Scale in feet

40 0 40 80

15E ● soil boring location



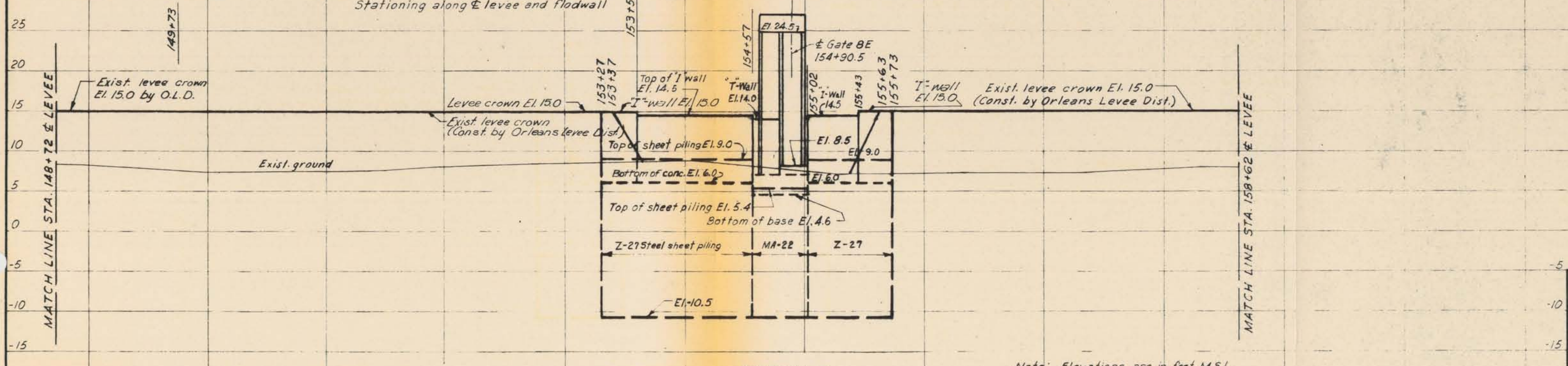
PLAN GATE 8E

(OVERHEAD ROLLER GATE)

Scale 1" = 40'

REFERENCE PLATES

Soil borings	IV-34
Design sections	IV-38
Overhead gate	IV-47



PROFILE

Note: Elevations are in feet M.S.L.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

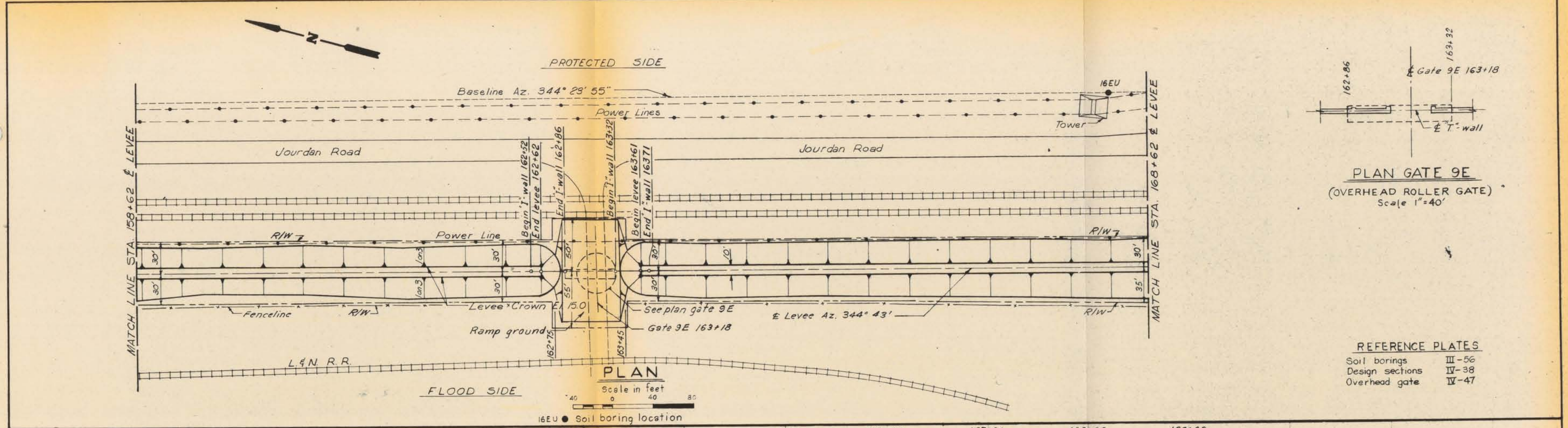
EAST LEVEE

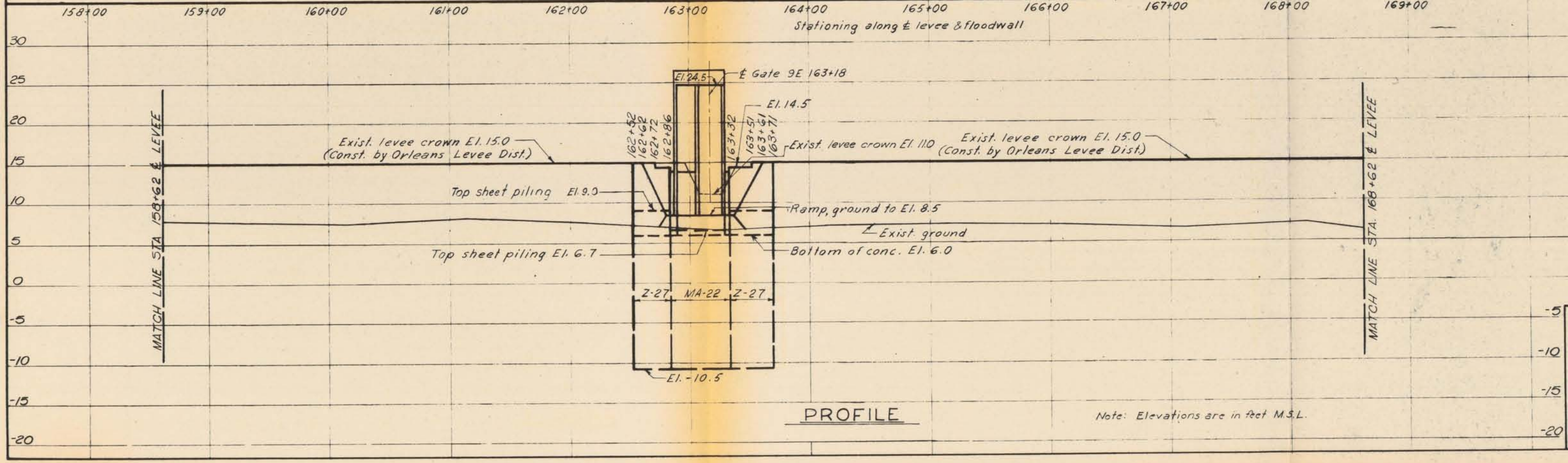
STA. 148+72 TO STA. 158+62

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-29





LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE

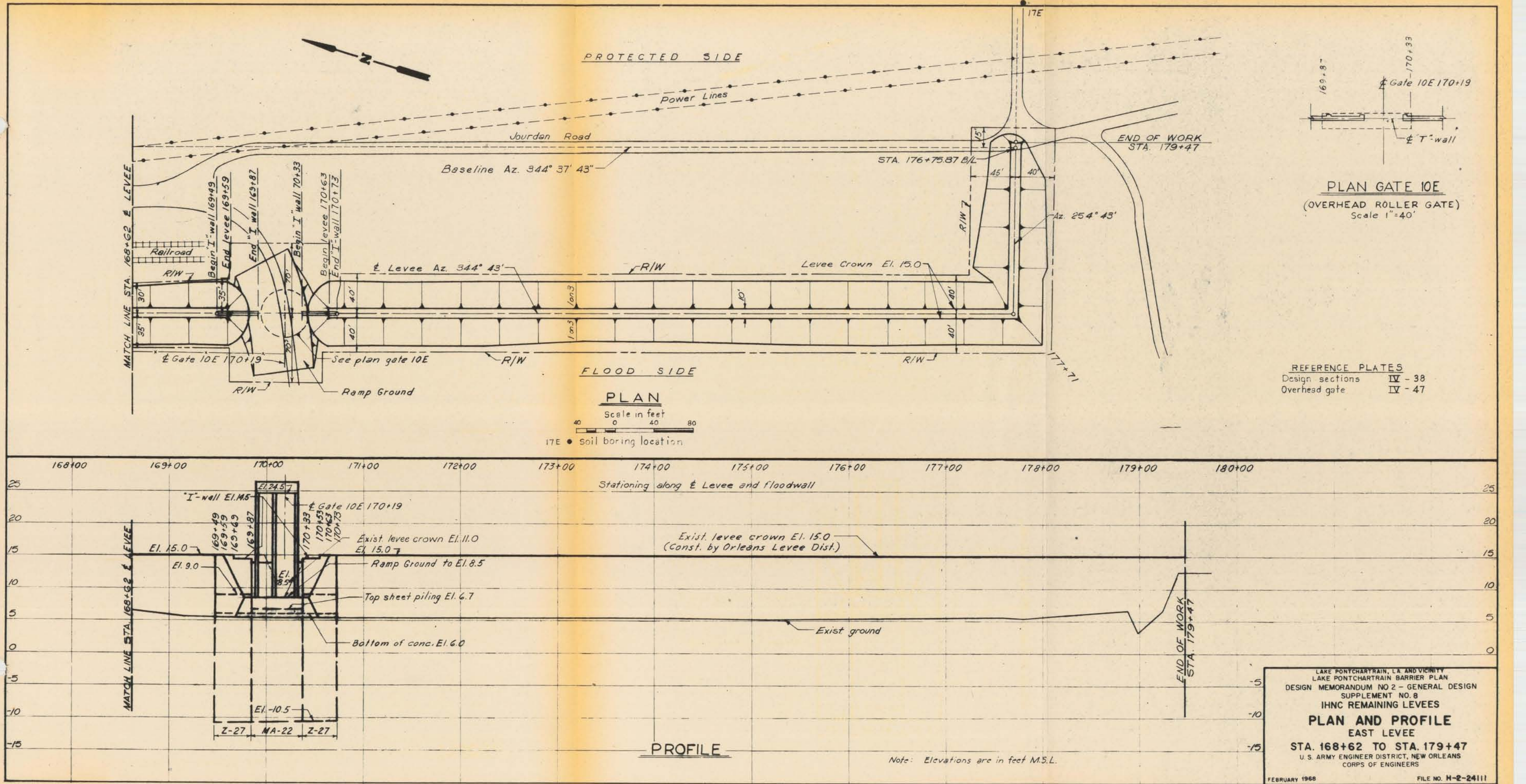
EAST LEVEE

STA. 158+62 TO STA. 168+62

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-30



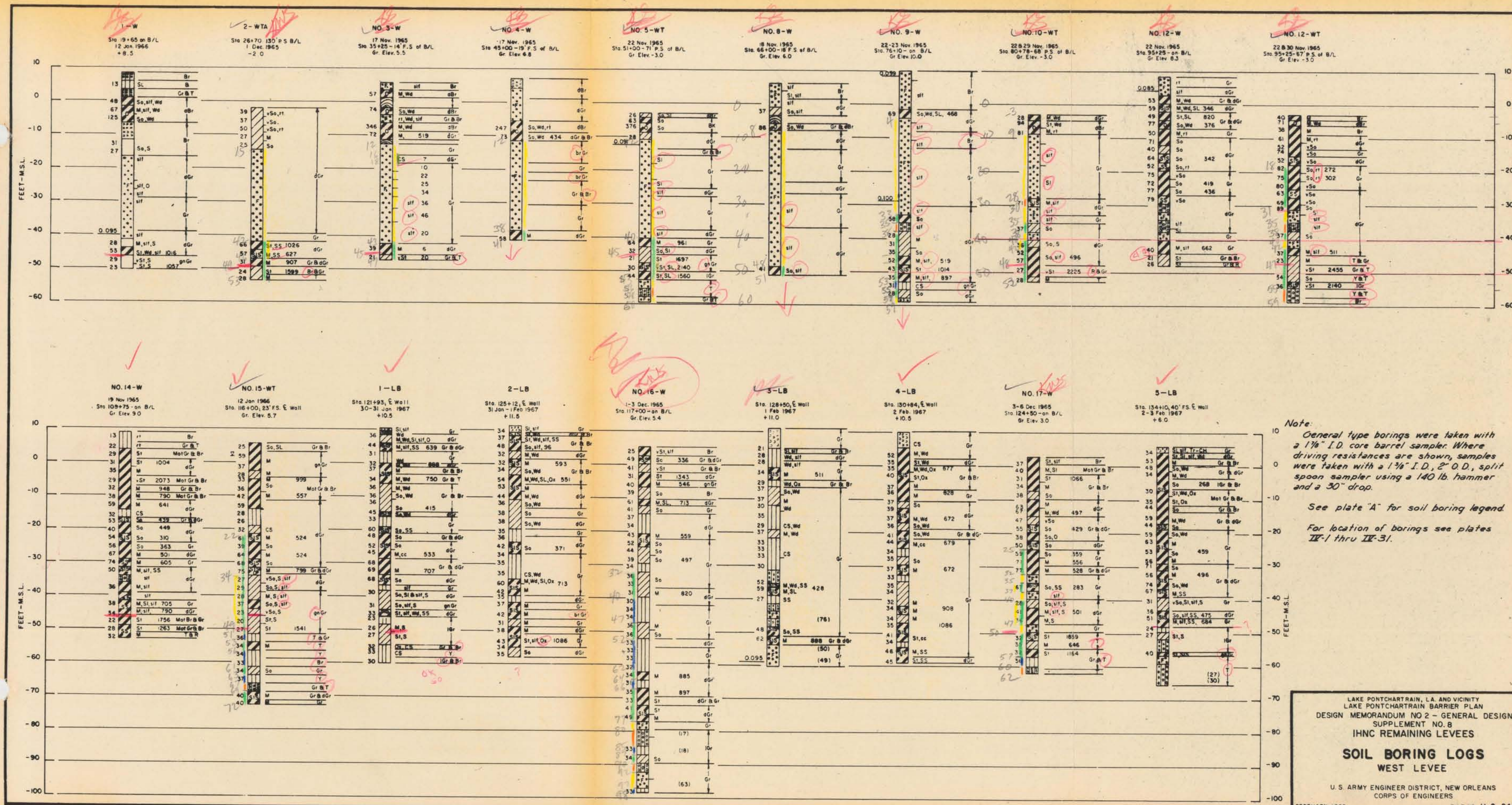
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

PLAN AND PROFILE
EAST LEVEE
STA. 168+62 TO STA. 179+47

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-31



Note:
General type borings were taken with a 1 7/8" I.D. core barrel sampler. Where driving resistances are shown, samples were taken with a 1 3/8" I.D., 2" O.D., split spoon sampler using a 140 lb. hammer and a 30" drop.

See plate "A" for soil boring legend.

For location of borings see plates IV-1 thru IV-31.

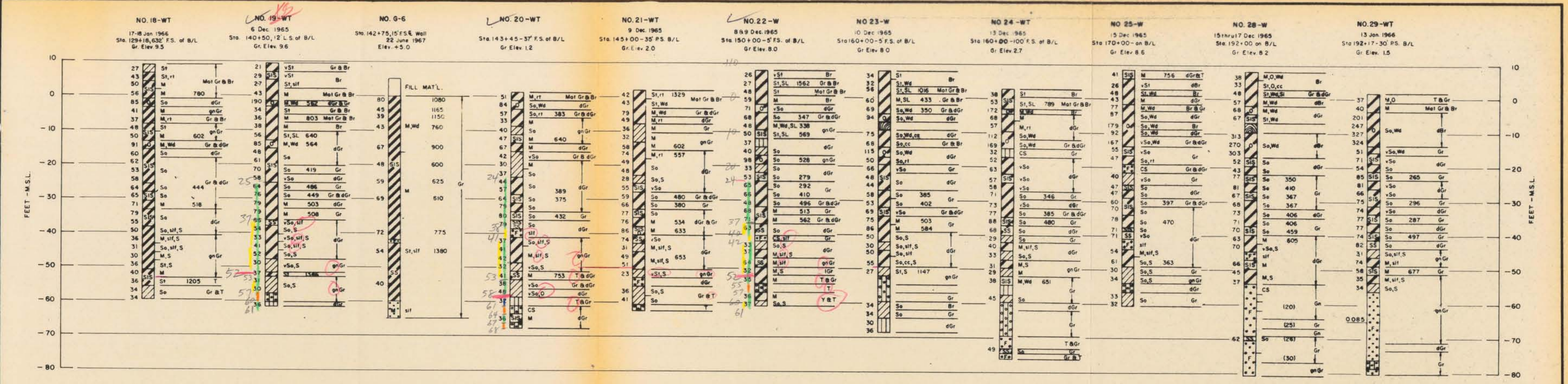
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

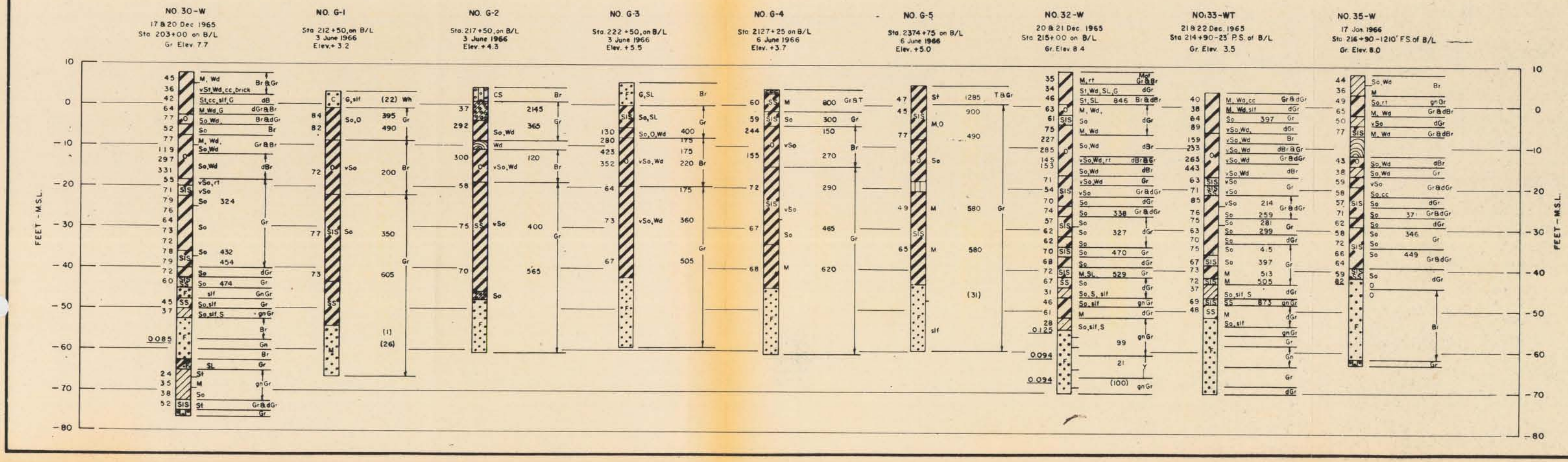
SOIL BORING LOGS
WEST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-32





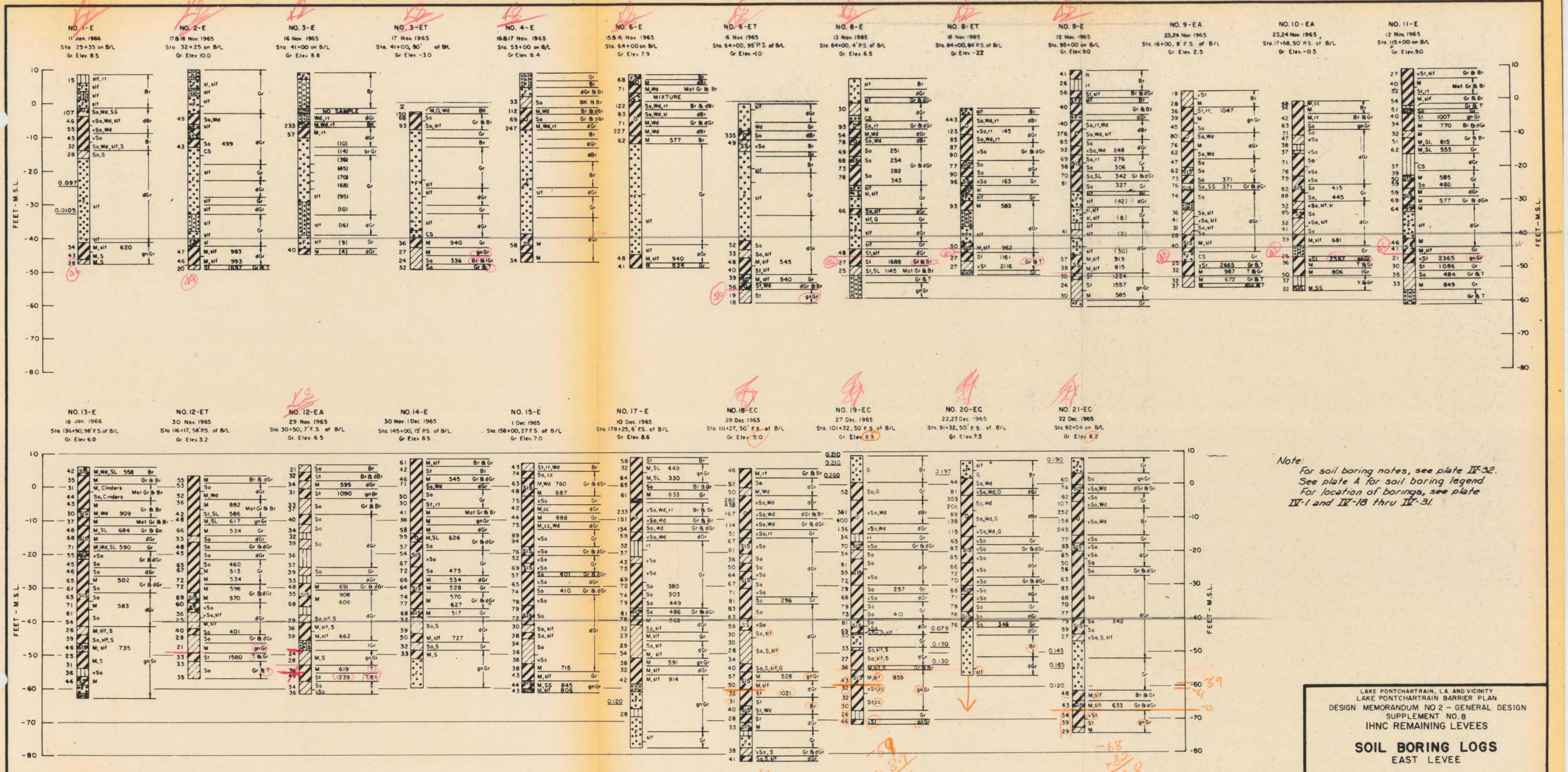
Note:
For soil boring notes, see plate IV-32
See plate A for soil boring legend.
For location of borings, see plate IV-1 thru IV-17.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

SOIL BORING LOGS
WEST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111



Note:
For soil boring notes, see plate IV-32.
See plate A for soil boring legend.
For location of borings, see plate IV-1 and IV-18 thru IV-31.

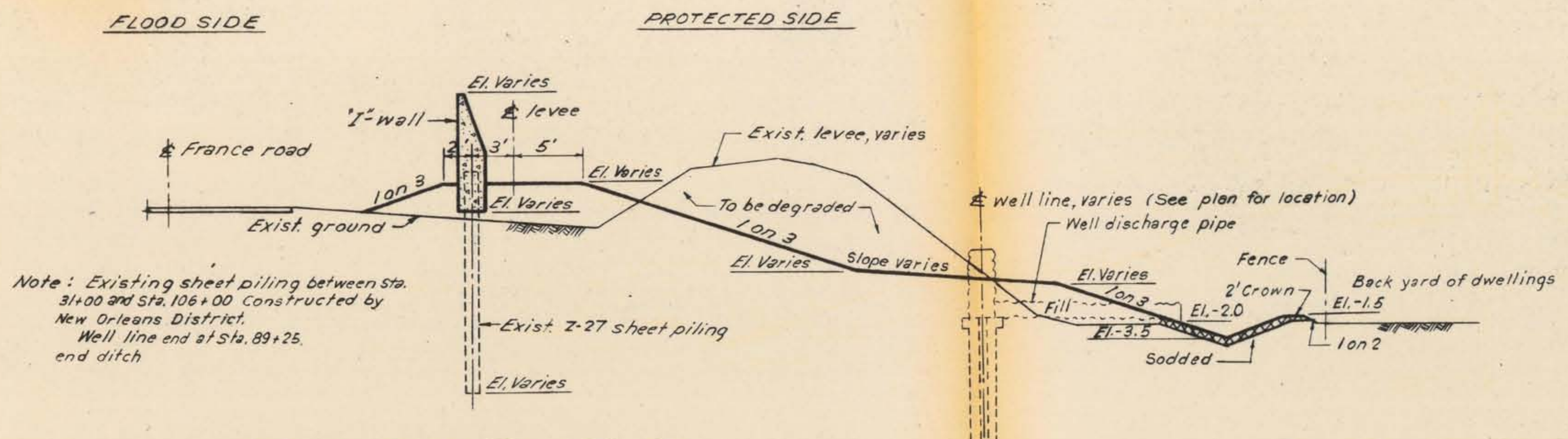
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

SOIL BORING LOGS
EAST LEVEE

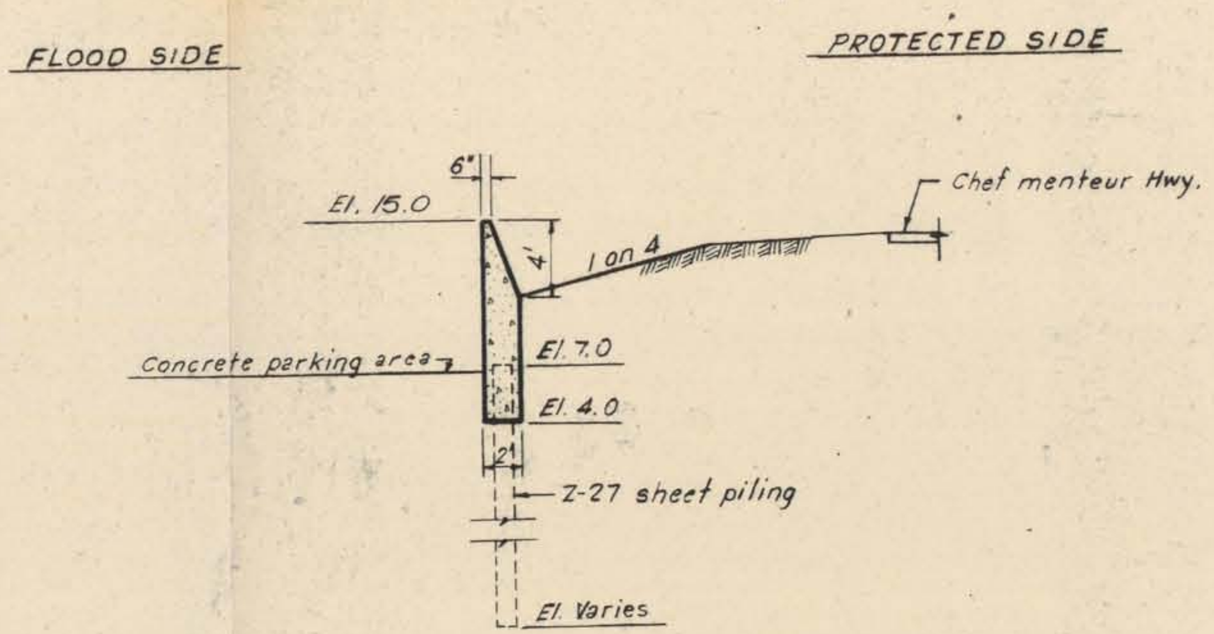
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-34



STA. 31+00 TO STA. 106+01



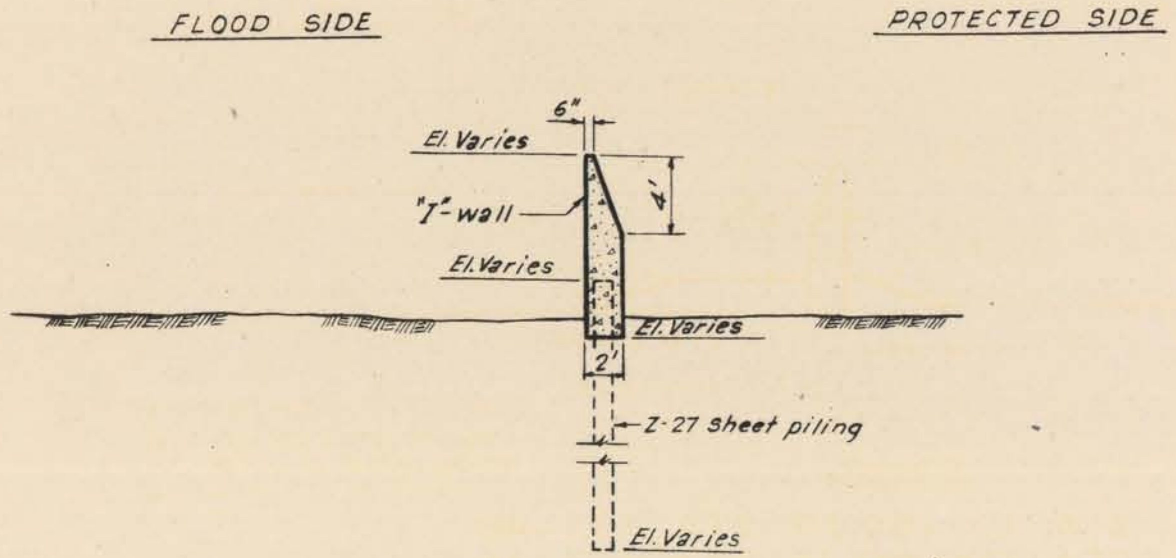
STA. 116+53 TO STA. 118+85

GATE MONOLITHS

STA. 109+81.5	TO	STA. 110+37.5
STA. 112+19	TO	STA. 112+62
STA. 121+78.5	TO	STA. 122+07.5
STA. 124+88.5	TO	STA. 125+17.5
STA. 128+41.5	TO	STA. 128+70.5
STA. 130+53.5	TO	STA. 130+82.5
STA. 135+46	TO	STA. 136+10
STA. 136+27	TO	STA. 136+94.5
STA. 143+76	TO	STA. 144+52
STA. 210+75	TO	STA. 211+17

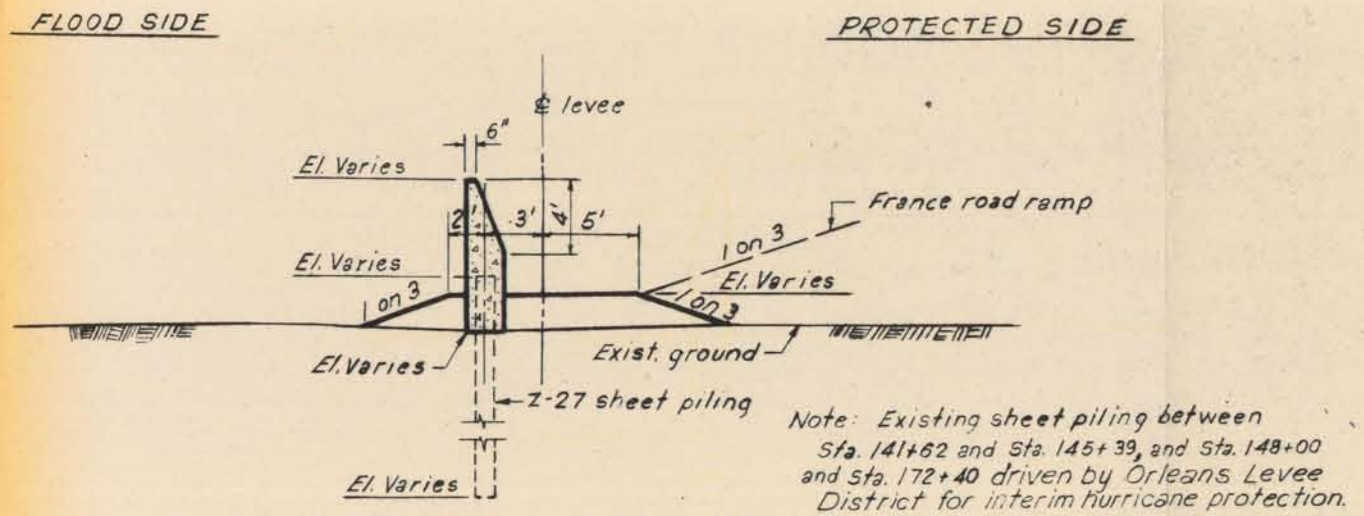
RAMP CROSSINGS

STA. 106+25	TO	STA. 106+57
STA. 145+39	TO	STA. 145+76
STA. 211+46	TO	STA. 211+81



STA. 106+84.5 TO STA. 109+81.5
STA. 110+37.5 TO STA. 112+19
STA. 112+62 TO STA. 116+53
STA. 119+59 TO STA. 121+78.5
STA. 122+07.5 TO STA. 124+88.5
STA. 125+17.5 TO STA. 128+41.5
STA. 128+70.5 TO STA. 130+53.5
STA. 130+82.5 TO STA. 132+00

Scale: 1" = 10'



STA. 132+00 TO STA. 135+46
STA. 136+94.5 TO STA. 137+42
STA. 141+20 TO STA. 143+76
STA. 144+52 TO STA. 145+39
STA. 148+00 TO STA. 172+40

REFERENCE	PLATE
Typical wall sections	IV - 39

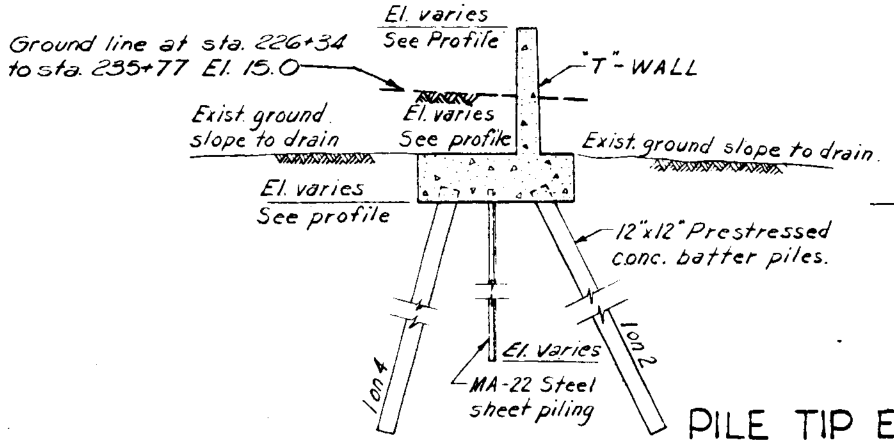
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

DESIGN SECTIONS
WEST LEVEE

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

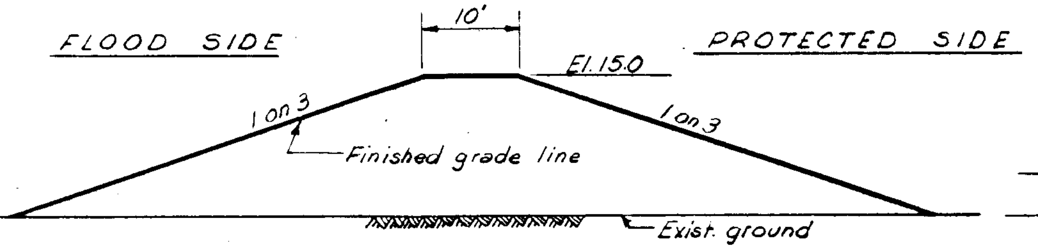
FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-35



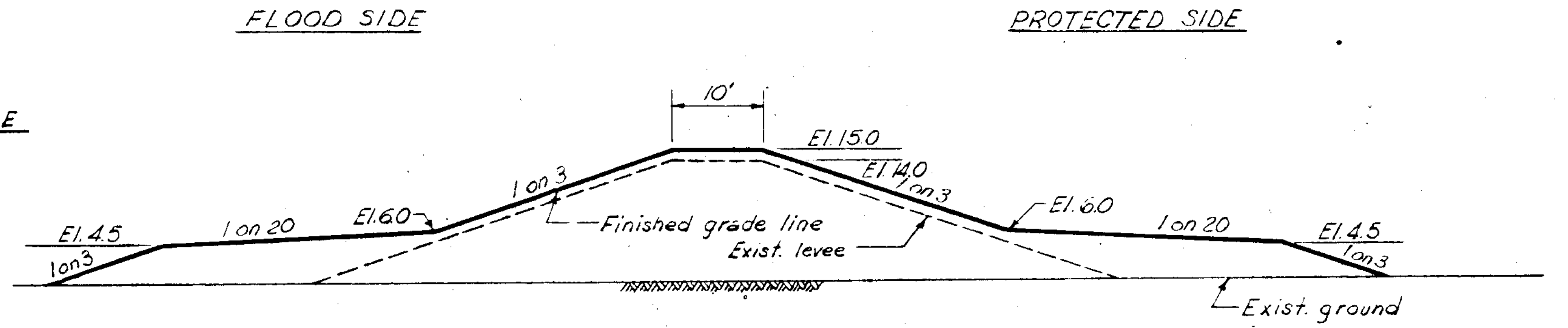
	PILE TIP ELEV. TENSION	PILE TIP ELEV. COMPRESSION
STA. 136+10 TO STA. 136+27	-40	-56
STA. 143+76 TO STA. 144+01	-40	-56
STA. 210+10 TO STA. 211+17	-45	-53
STA. 226+34 TO STA. 235+77	-56	-61

Scale: 1"=10'



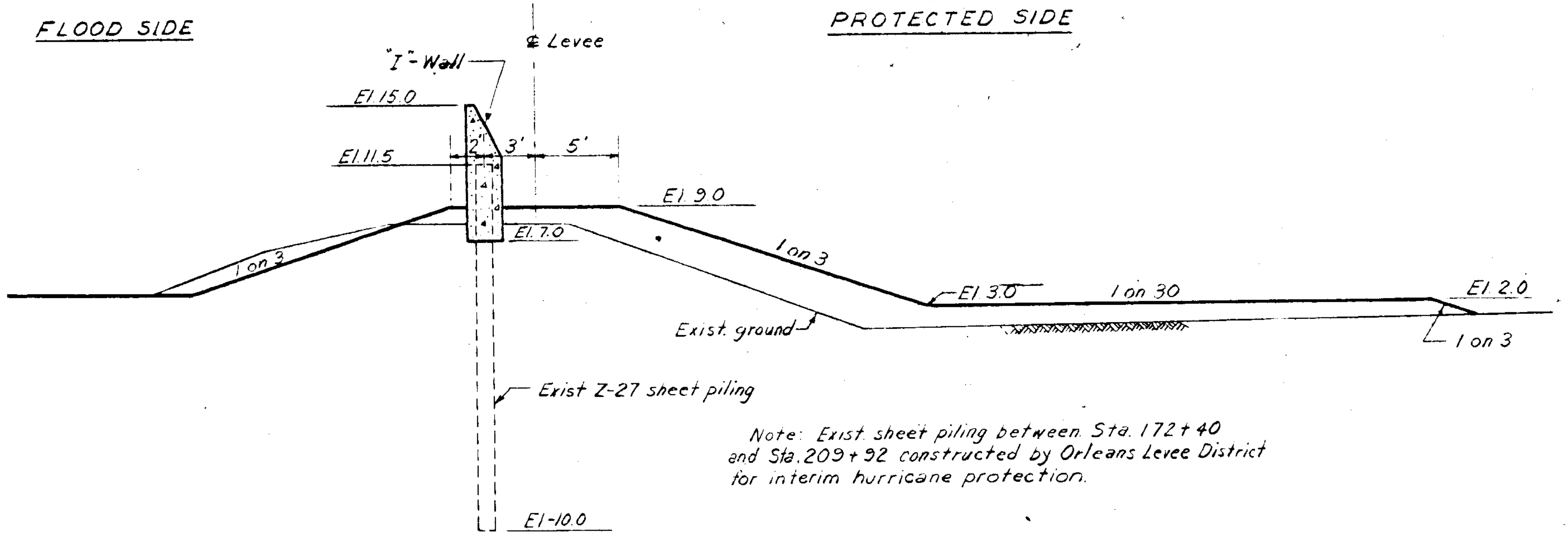
STA. 145+76 TO STA. 147+97

(Exist. levee constructed by Orleans Levee District for interim hurricane protection)
Scale: 1"=20'



STA. 211+81 TO STA. 226+44

(Exist. levee constructed by Orleans Levee District for interim hurricane protection)
Scale: 1"=20'

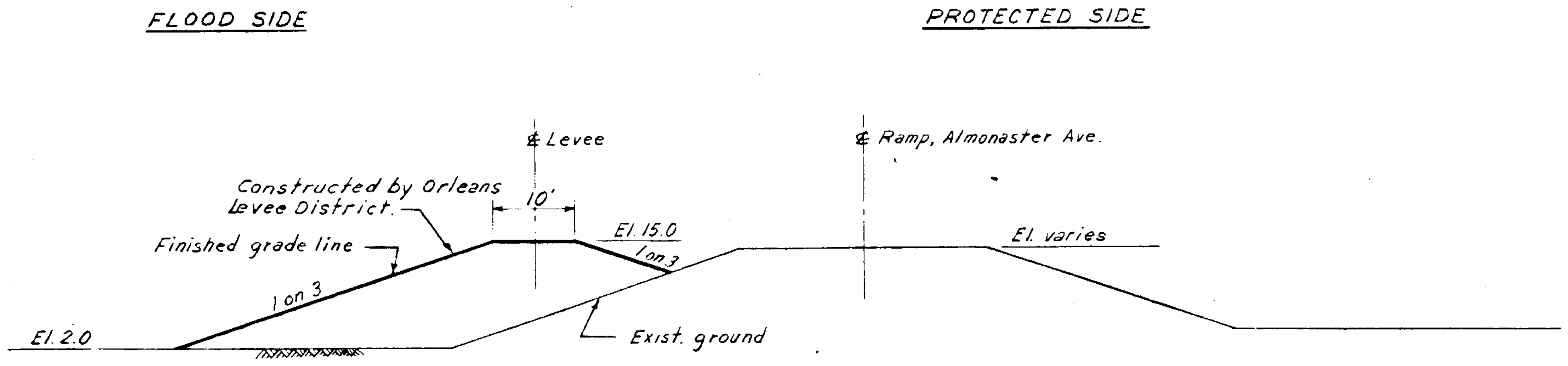


STA. 172+40 TO STA. 209+92

Scale: 1"=10'

REFERENCE PLATE

Typical wall sections IV-39



STA. 137+72 TO STA. 141+30

Scale: 1"=20'

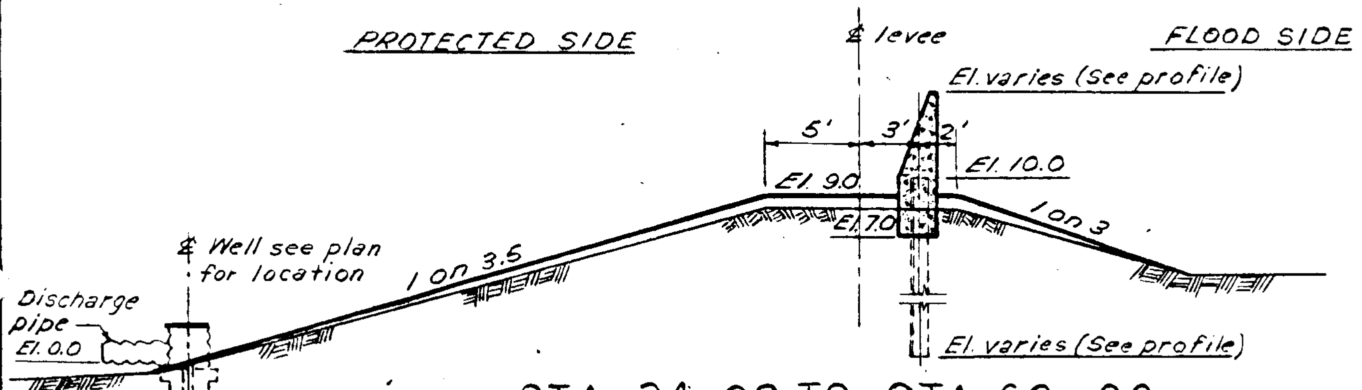
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

DESIGN SECTIONS
WEST LEVEE

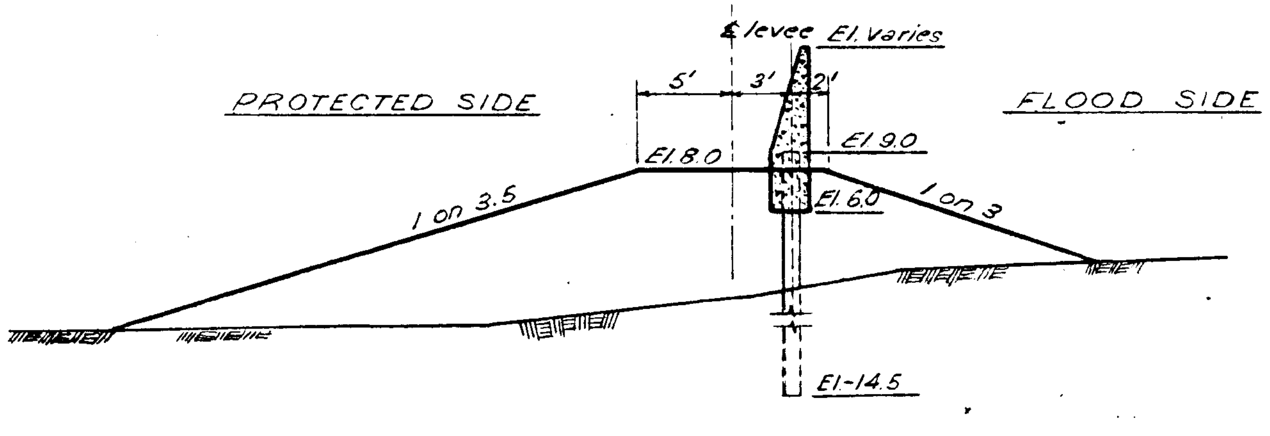
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

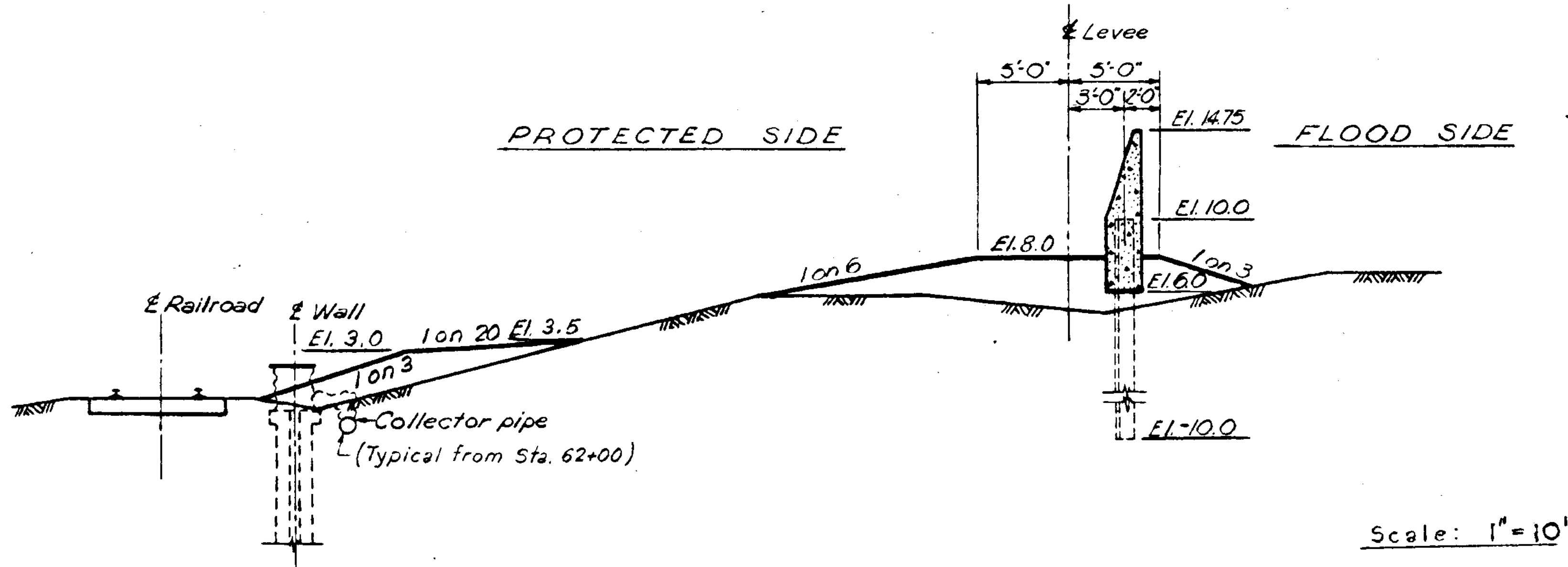
PLATE IV-36



STA. 34+00 TO STA. 60+00
STA. 63+61 TO STA. 67+06
STA. 67+86 TO STA. 80+44.5

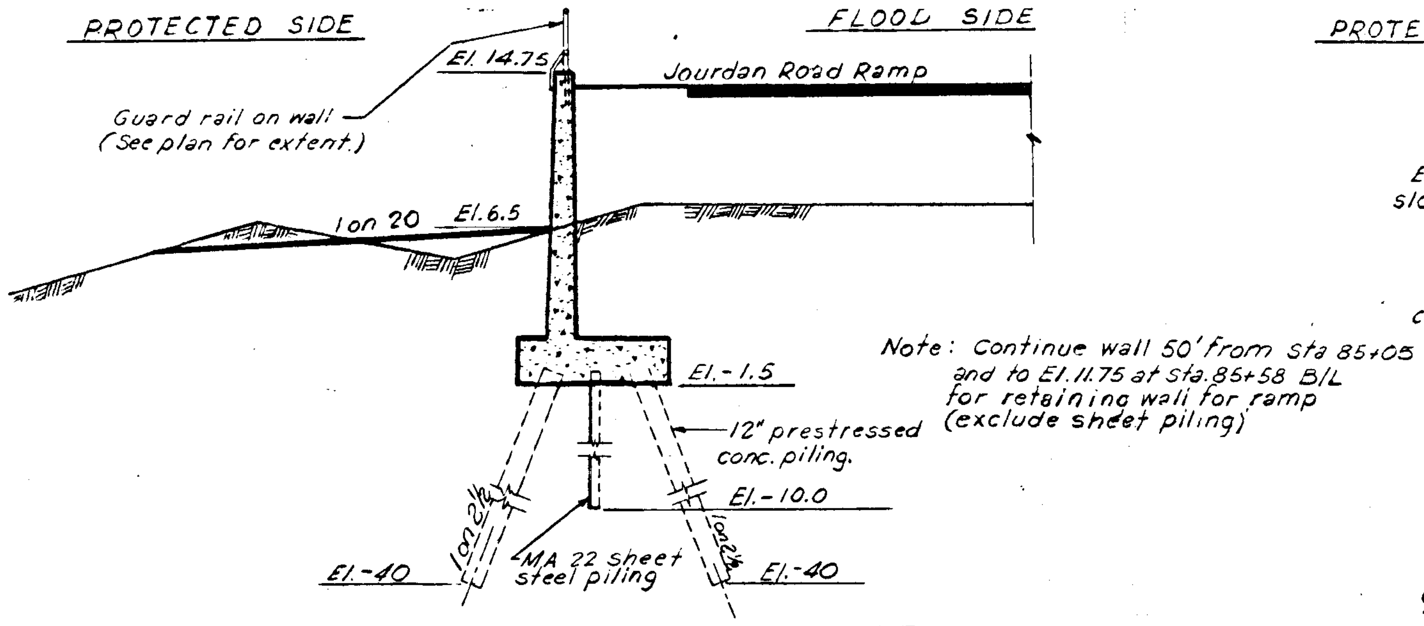


STA. 60+10 TO STA. 60+60



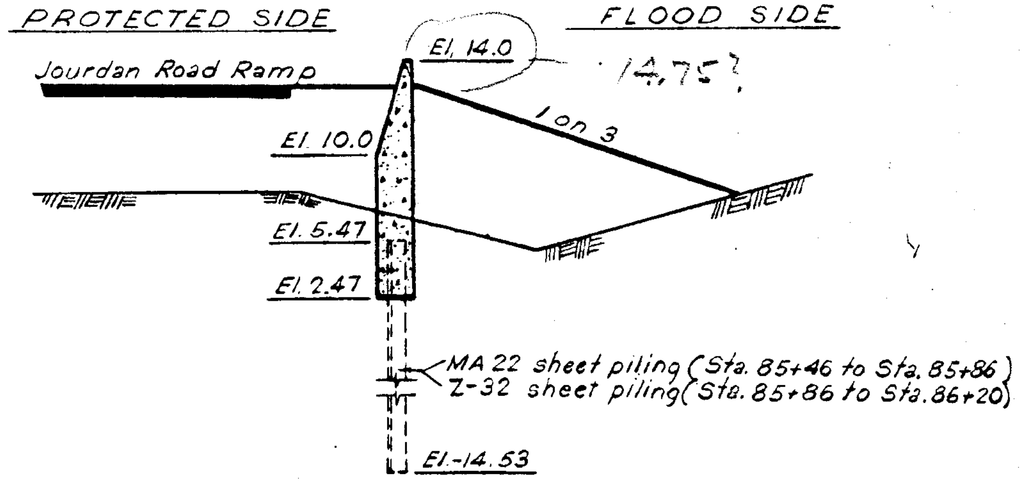
Scale: 1" = 10'

STA. 80+44.5 TO STA. 83+45.5

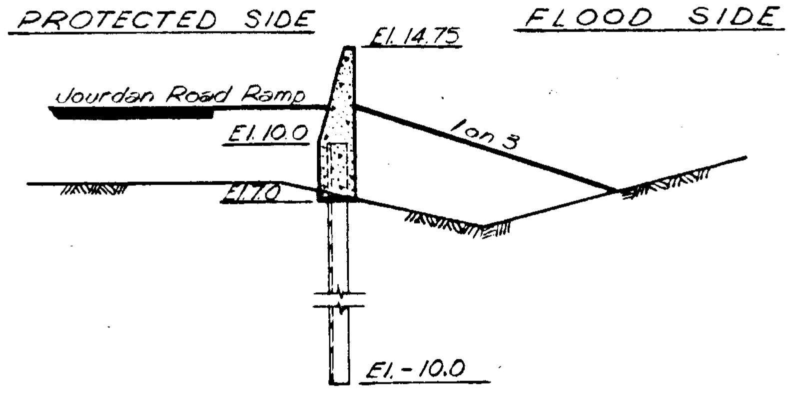


Note: Continue wall 50' from Sta 85+05 and to El. 11.75 at Sta. 85+58 B/L for retaining wall for ramp (exclude sheet piling)

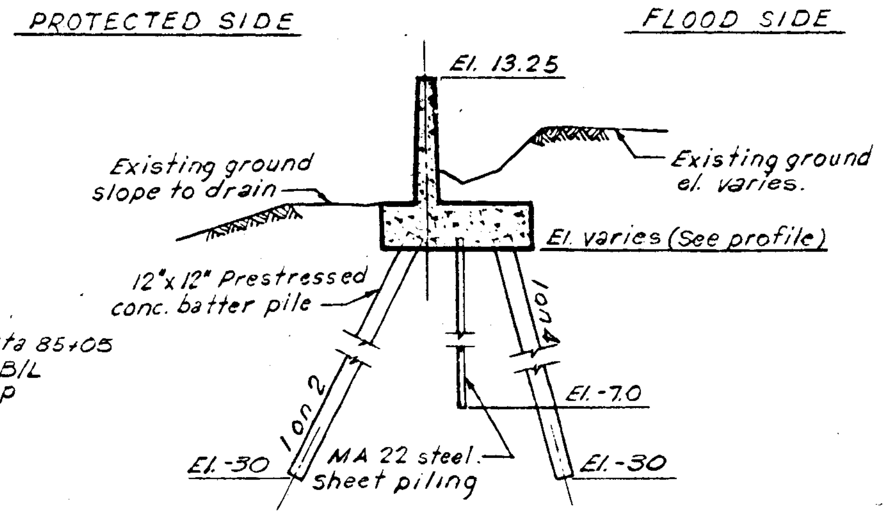
STA. 83+45.5 TO STA. 85+05



STA. 85+46 TO STA. 86+20



STA. 86+20 TO STA. 86+66



STA. 60+60 TO STA. 61+38
STA. 61+88 TO STA. 63+47 =
STA. 63+61 C.S.

GATE MONOLITHS

STA. 61+38 TO STA. 61+88
STA. 67+06 TO STA. 67+86
STA. 86+66 TO STA. 87+41
STA. 93+75.5 TO STA. 94+14
STA. 136+43 TO STA. 137+19
STA. 138+29 TO STA. 139+05
STA. 147+47 TO STA. 147+90
STA. 154+57 TO STA. 155+02
STA. 162+86 TO STA 163+32
STA. 169+87 TO STA. 170+33

RAMP CROSSINGS

STA. 85+05 TO STA. 85+46

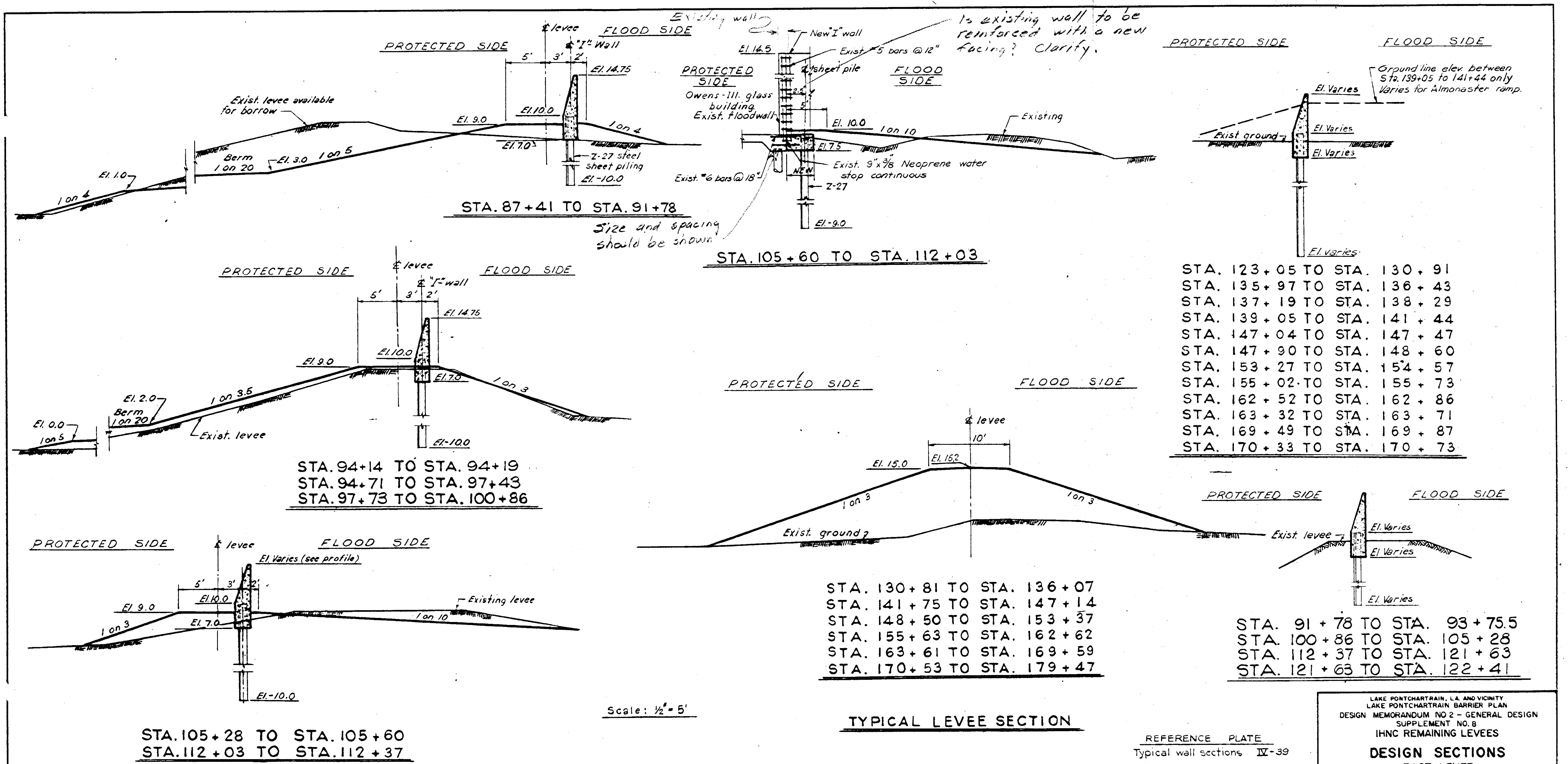
REFERENCE PLATE
Typical wall sections IV-39

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

DESIGN SECTIONS
EAST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

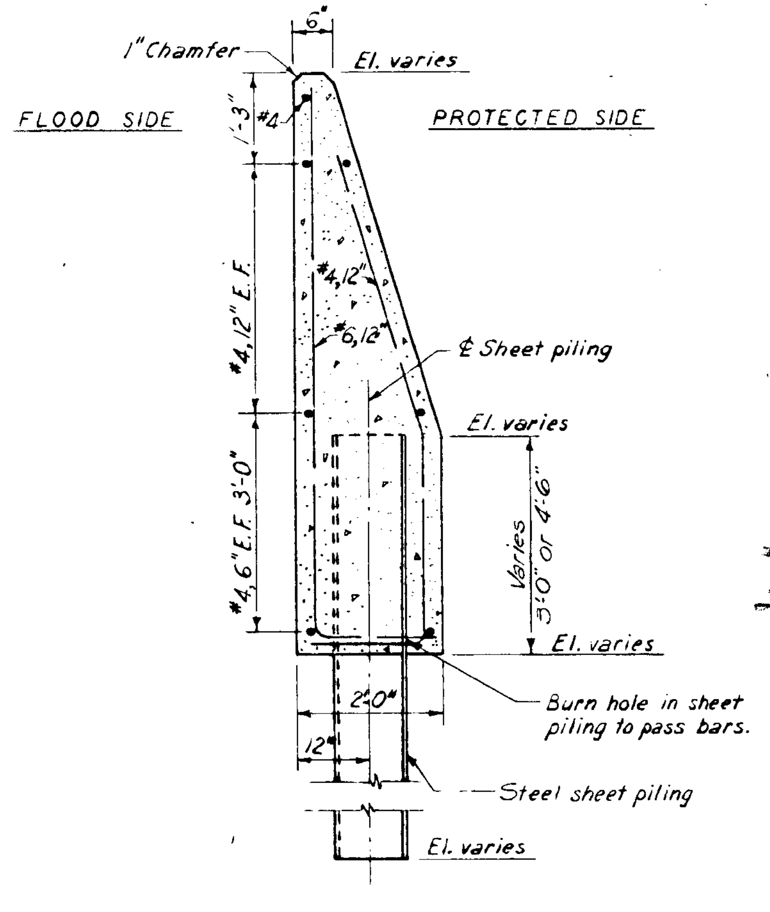


LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

DESIGN SECTIONS
EAST LEVEE

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

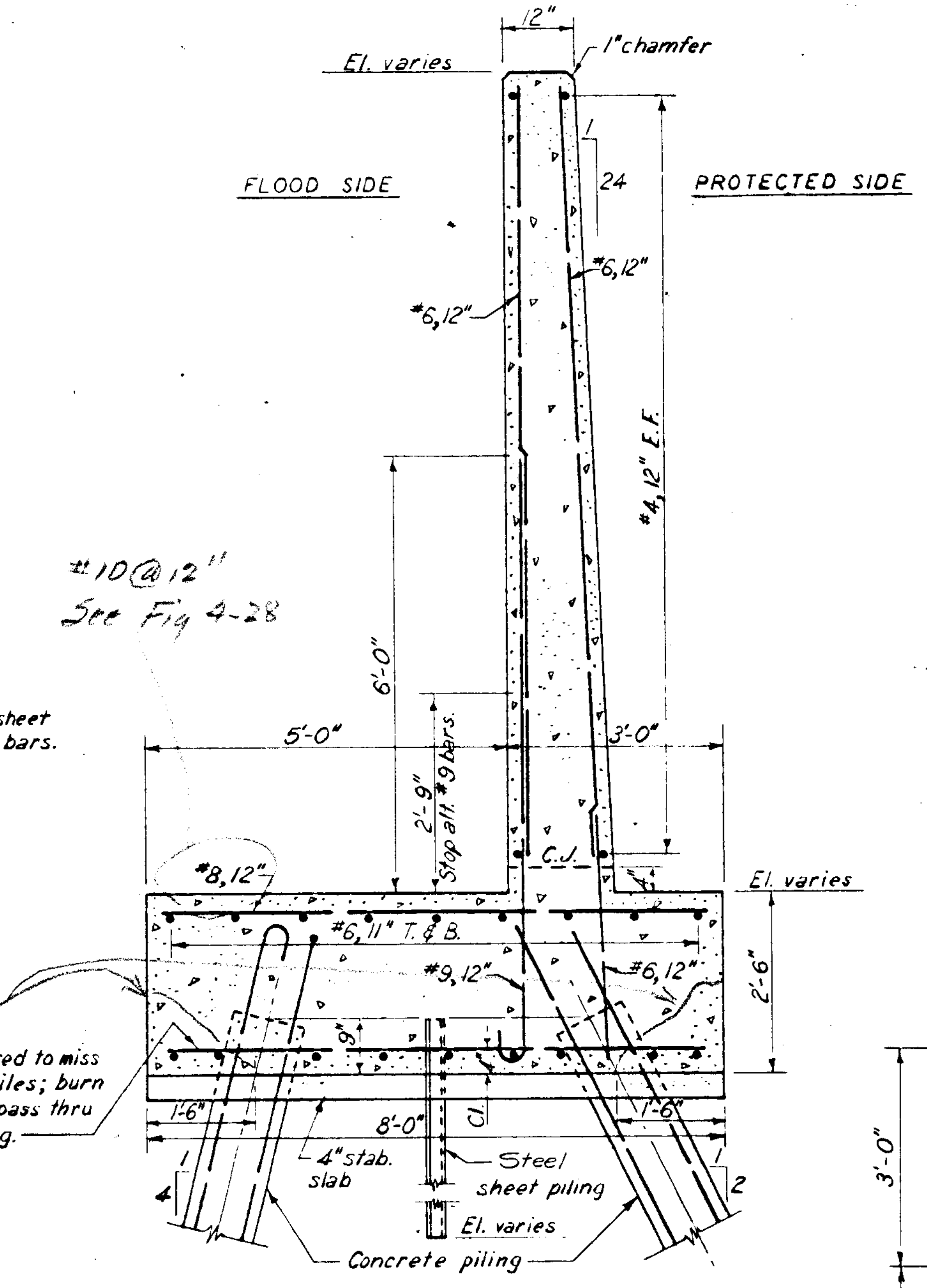
FEBRUARY 1968 — FILE NO. H-2-24111



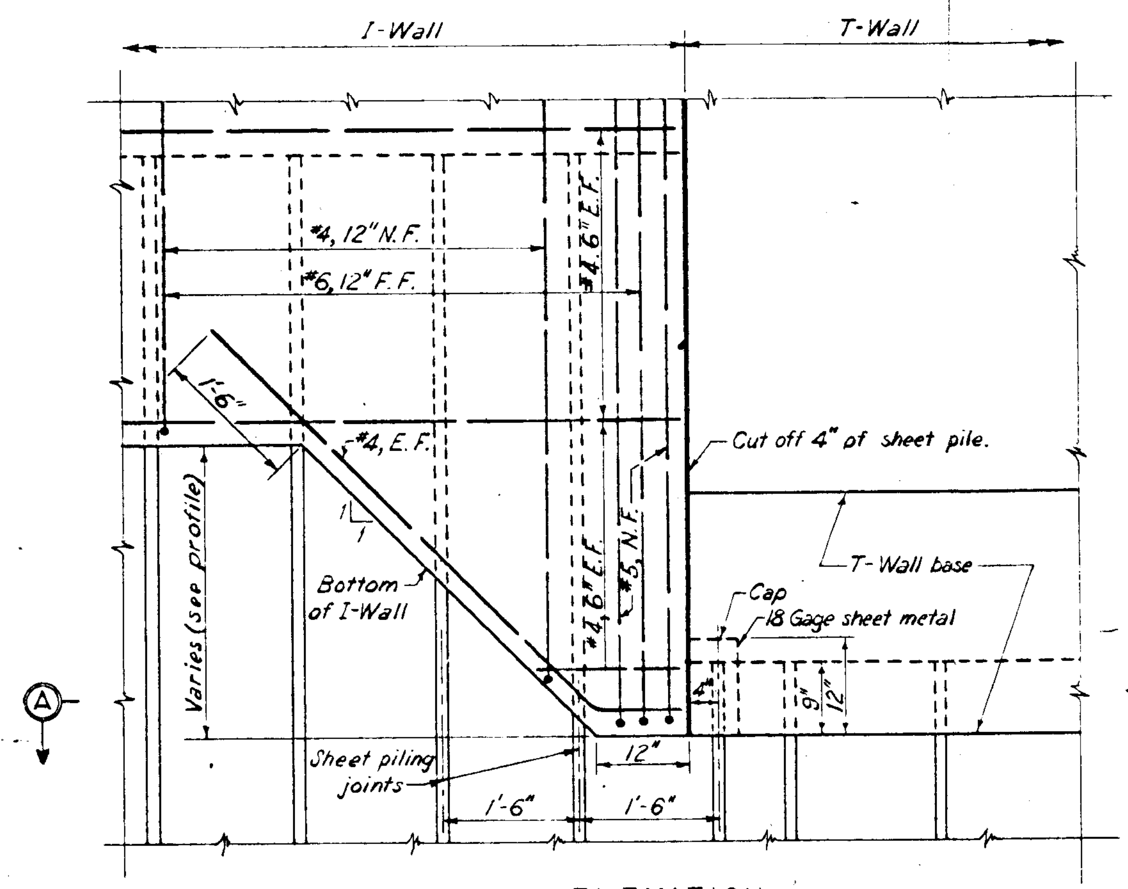
TYPICAL I-WALL SECTION
Scale: 3/8"=1'-0"

Bending moment in piles will tend to crack concrete. #6 @ 12" considered too light

#10 @ 12"
See Fig 4-28

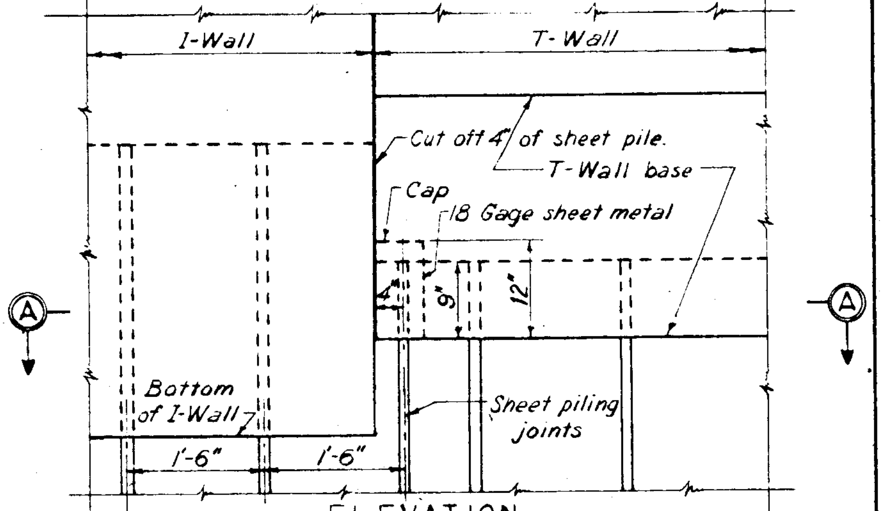


TYPICAL T-WALL SECTION
Scale: 3/8"=1'-0"



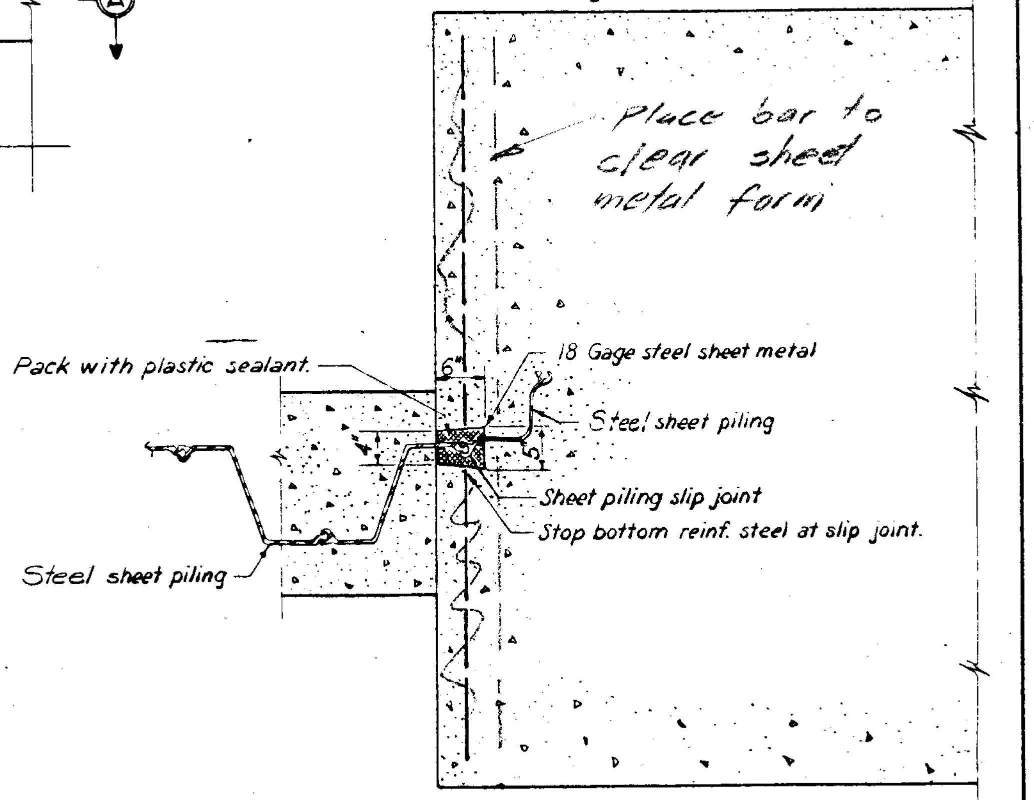
ELEVATION

TYPICAL DETAIL FOR I-WALL TO T-WALL WHERE I-WALL BASE IS HIGHER THAN BOTTOM OF T-WALL BASE
Scale: 1/2"=1'-0"

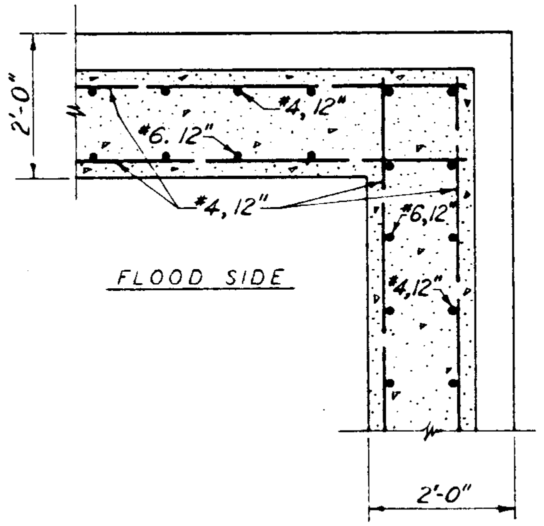


ELEVATION

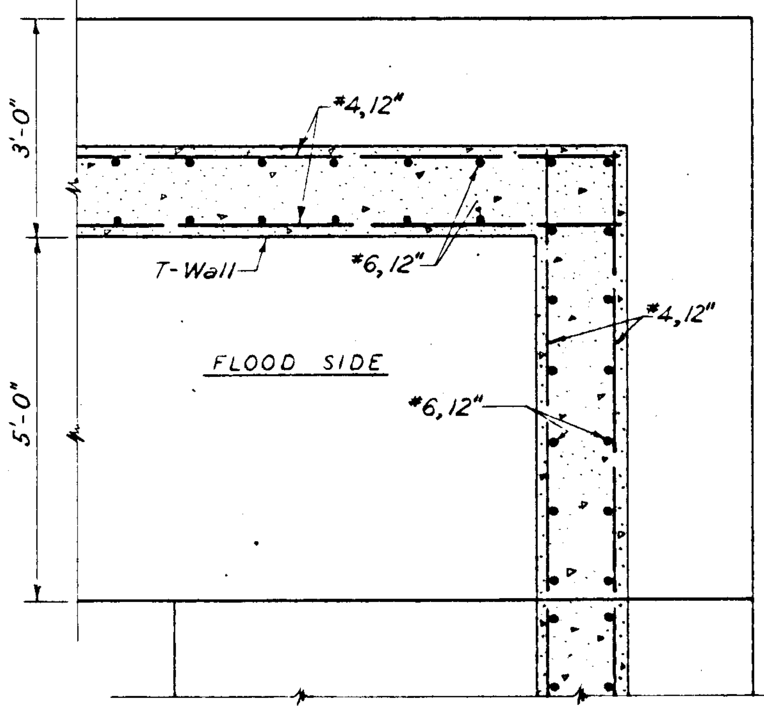
TYPICAL DETAIL FOR I-WALL TO T-WALL WHERE T-WALL BASE IS HIGHER THAN BOTTOM OF I-WALL BASE
Scale: 1/2"=1'-0"



SECTION A-A
Scale: 1/2"=1'-0"



TYPICAL I-WALL CORNER DETAIL
Scale: 3/8"=1'-0"



TYPICAL T-WALL CORNER DETAIL
Scale: 3/8"=1'-0"

REFERENCE PLATE
Seal and waterstop detail IV - 40

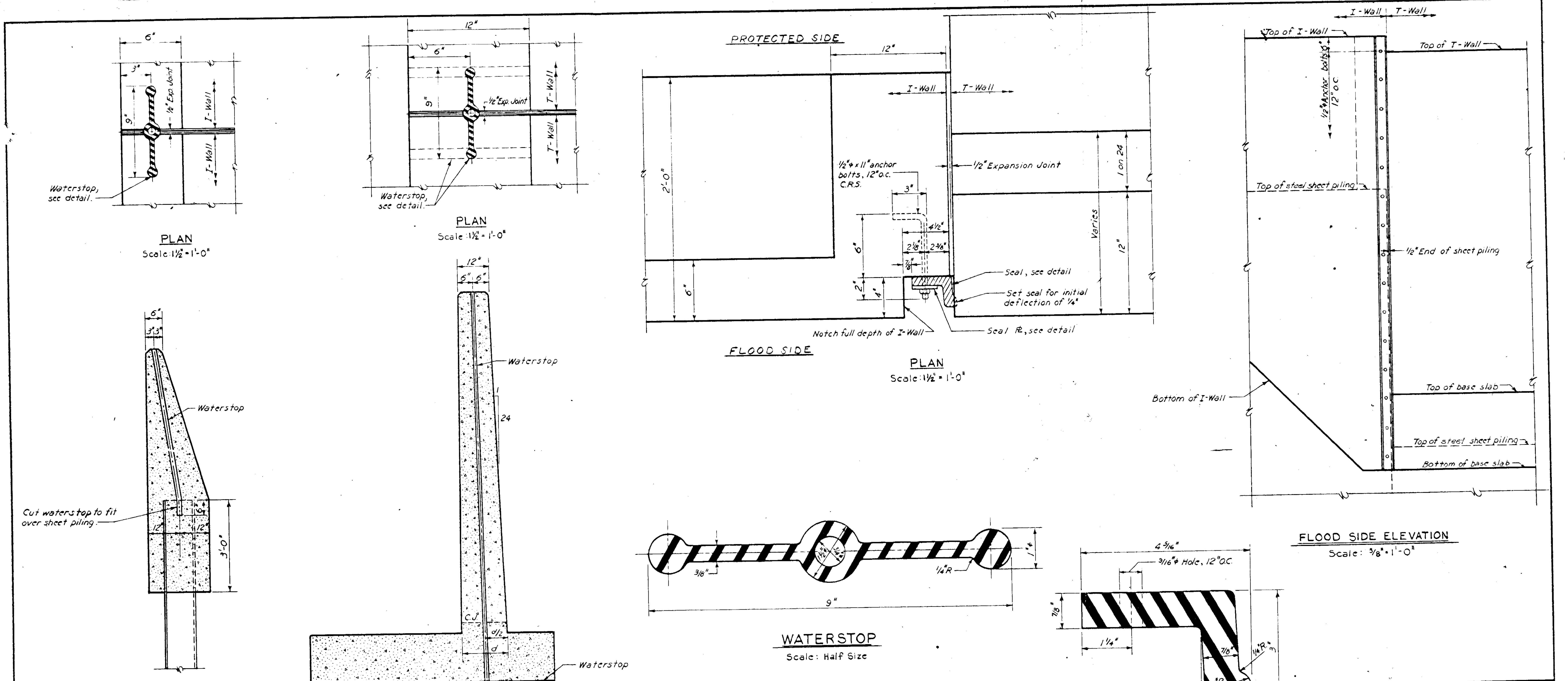
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

TYPICAL WALL SECTIONS
WEST AND EAST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV - 39



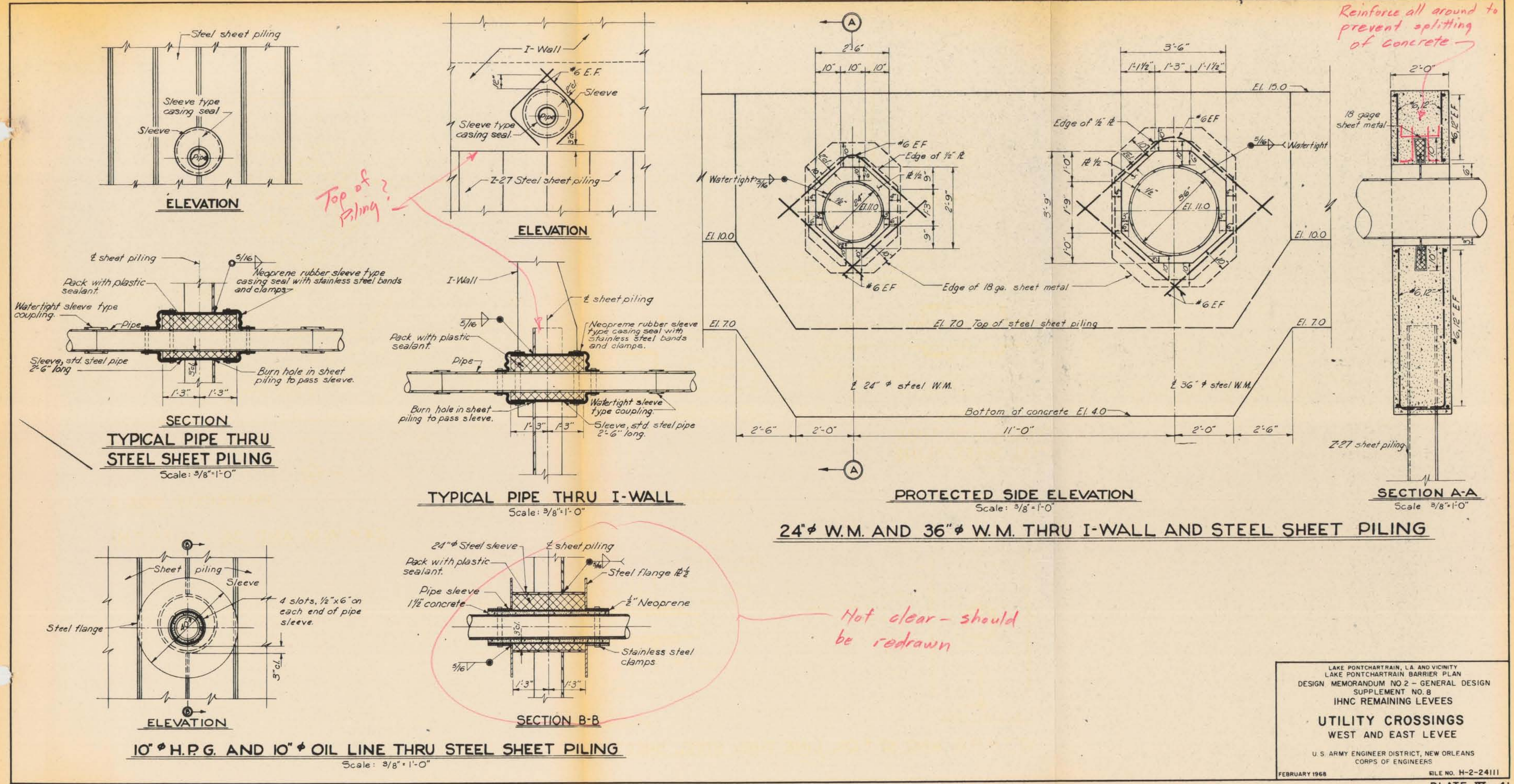
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

TYPICAL WALL SECTIONS
WEST AND EAST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-40



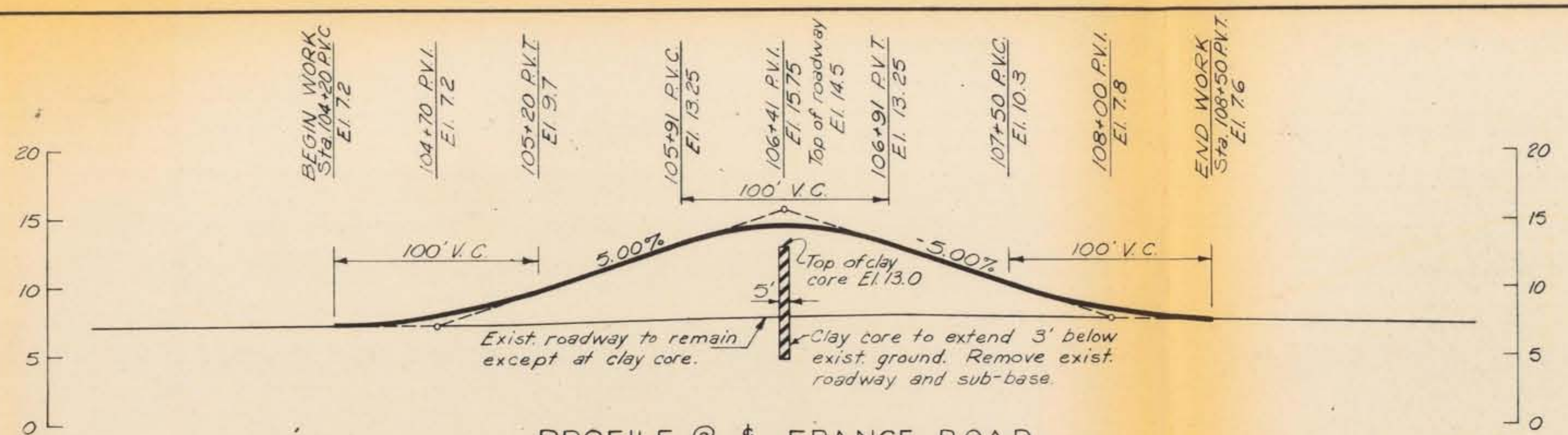
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

UTILITY CROSSINGS
WEST AND EAST LEVEE

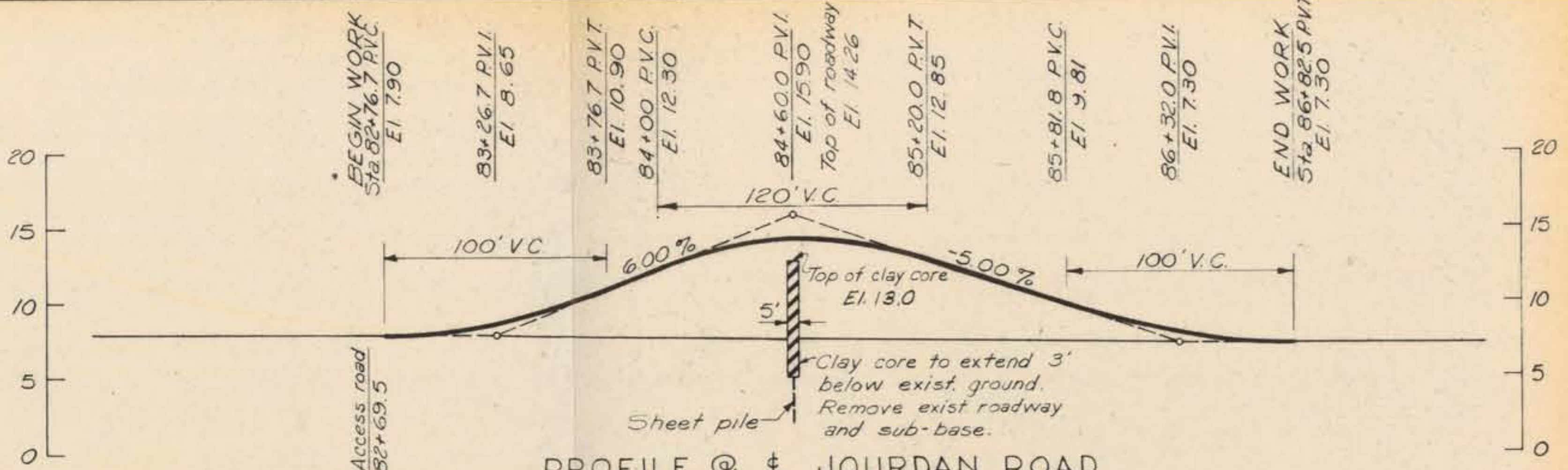
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-41



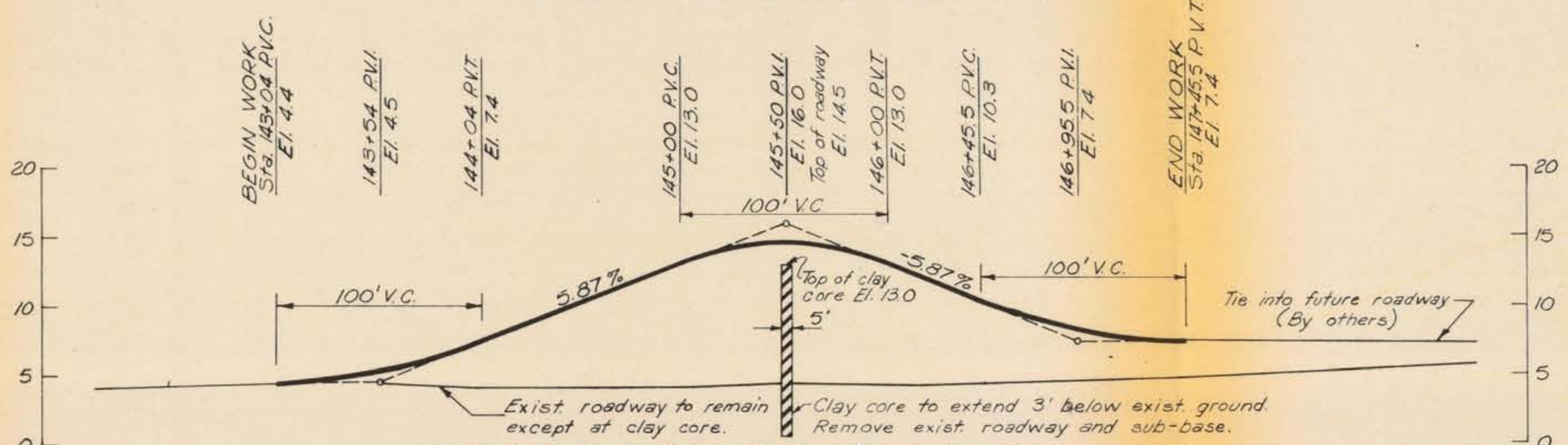
PROFILE @ ℄ FRANCE ROAD
NORTH OF HWY. 90 (VIC. HWY. 90)



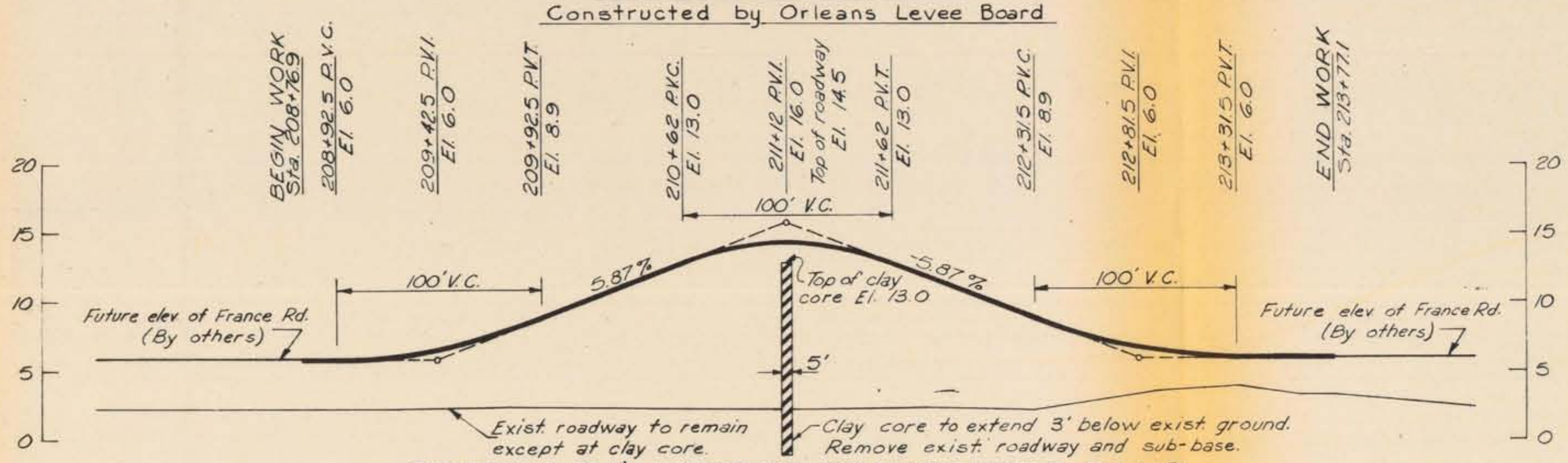
PROFILE @ ℄ JOURDAN ROAD

EAST SIDE

Scale: Hor. 1" = 80' Vert. 1" = 12'



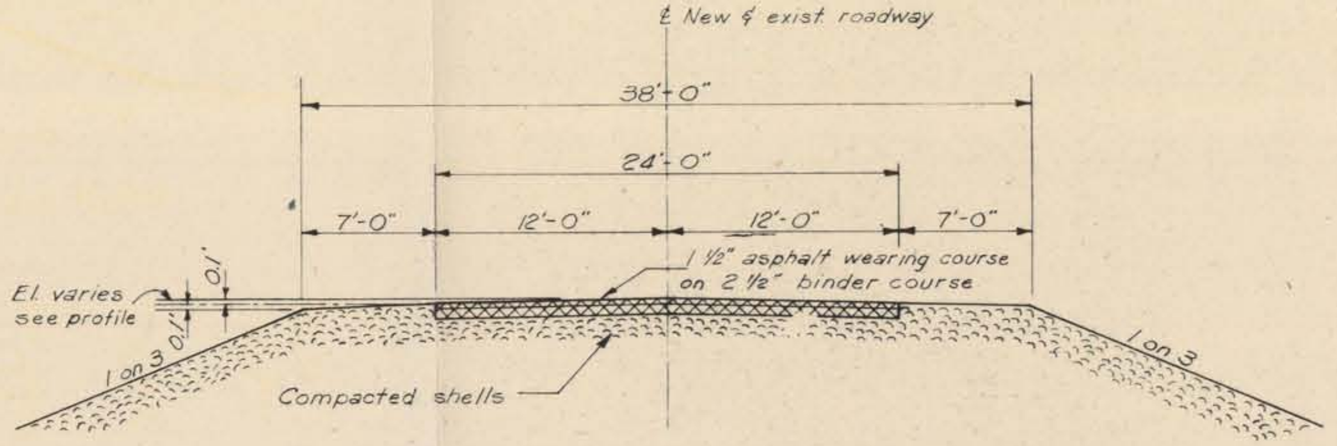
PROFILE @ ℄ EXISTING FRANCE ROAD RAMP
VIC. ALMONASTER EXT.
Constructed by Orleans Levee Board



PROFILE @ ℄ EXISTING FRANCE ROAD RAMP
VIC. FLA. AVE.
Constructed by Orleans Levee Board

WEST SIDE

Scale: Hor. 1" = 80' Vert. 1" = 12'



TYPICAL CROSS SECTION

Scale Hor. 1" = 10' Vert. 1" = 4'

Note:
Elevations are in feet M.S.L.

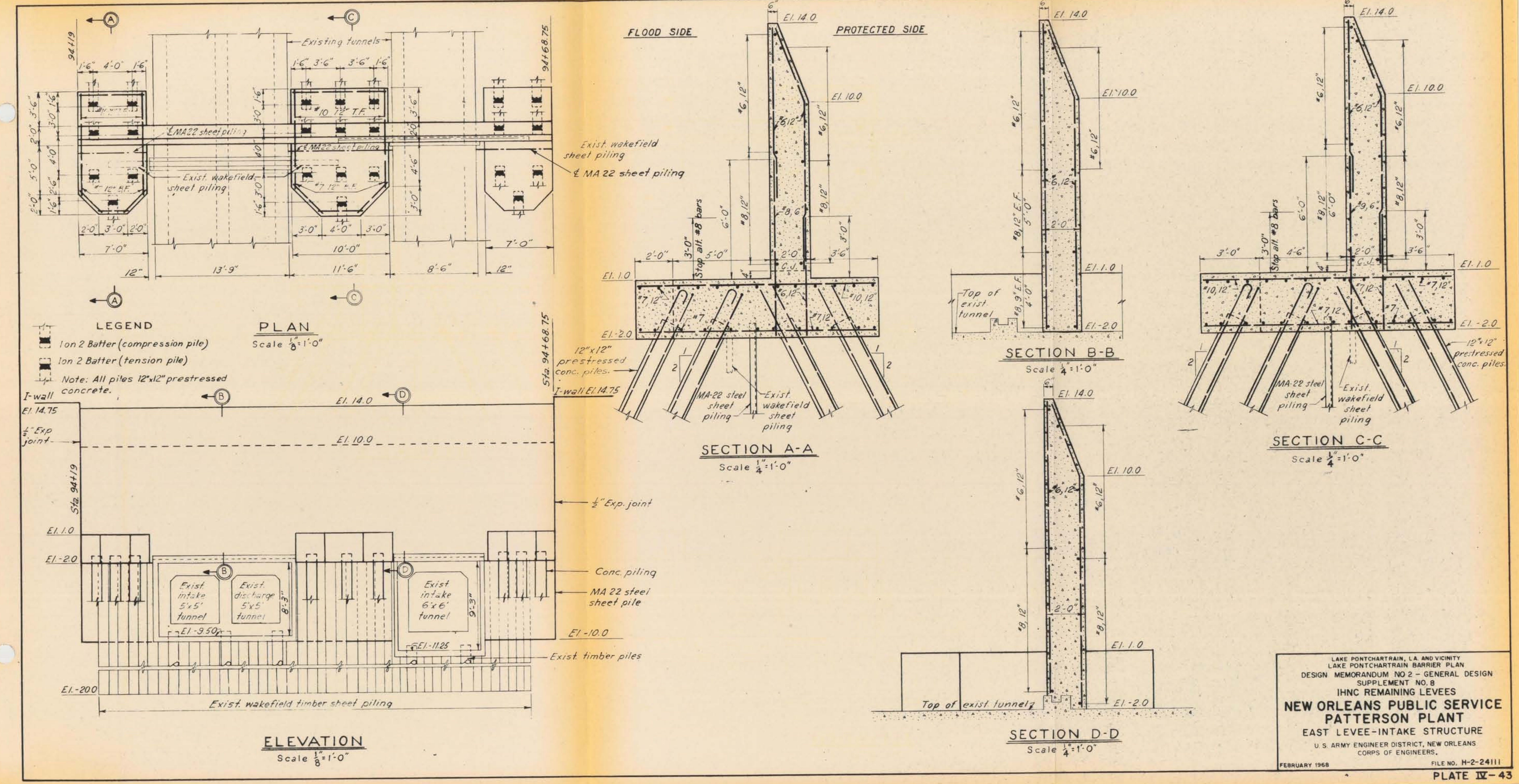
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

RAMPS
WEST AND EAST LEVEE

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

FEBRUARY 1968 FILE NO. H-2-24111

PLATE IV-42



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

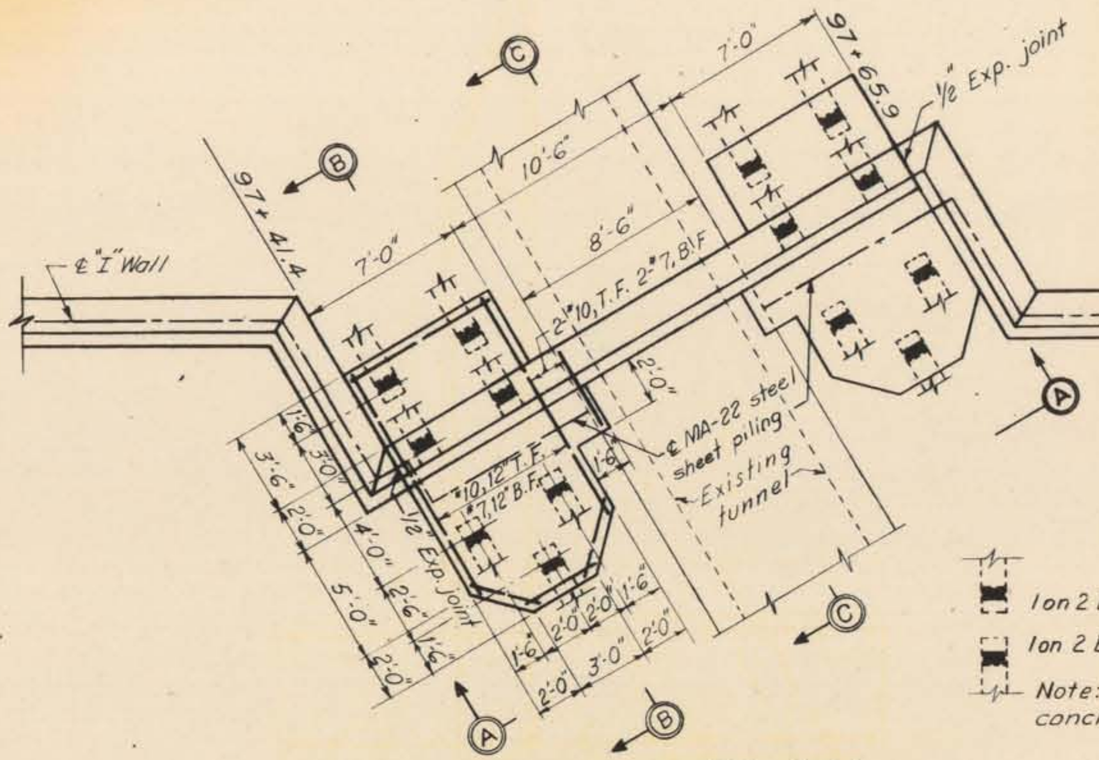
NEW ORLEANS PUBLIC SERVICE PATTERSON PLANT

EAST LEVEE-INTAKE STRUCTURE

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

FEBRUARY 1968

FILE NO. H-2-24111

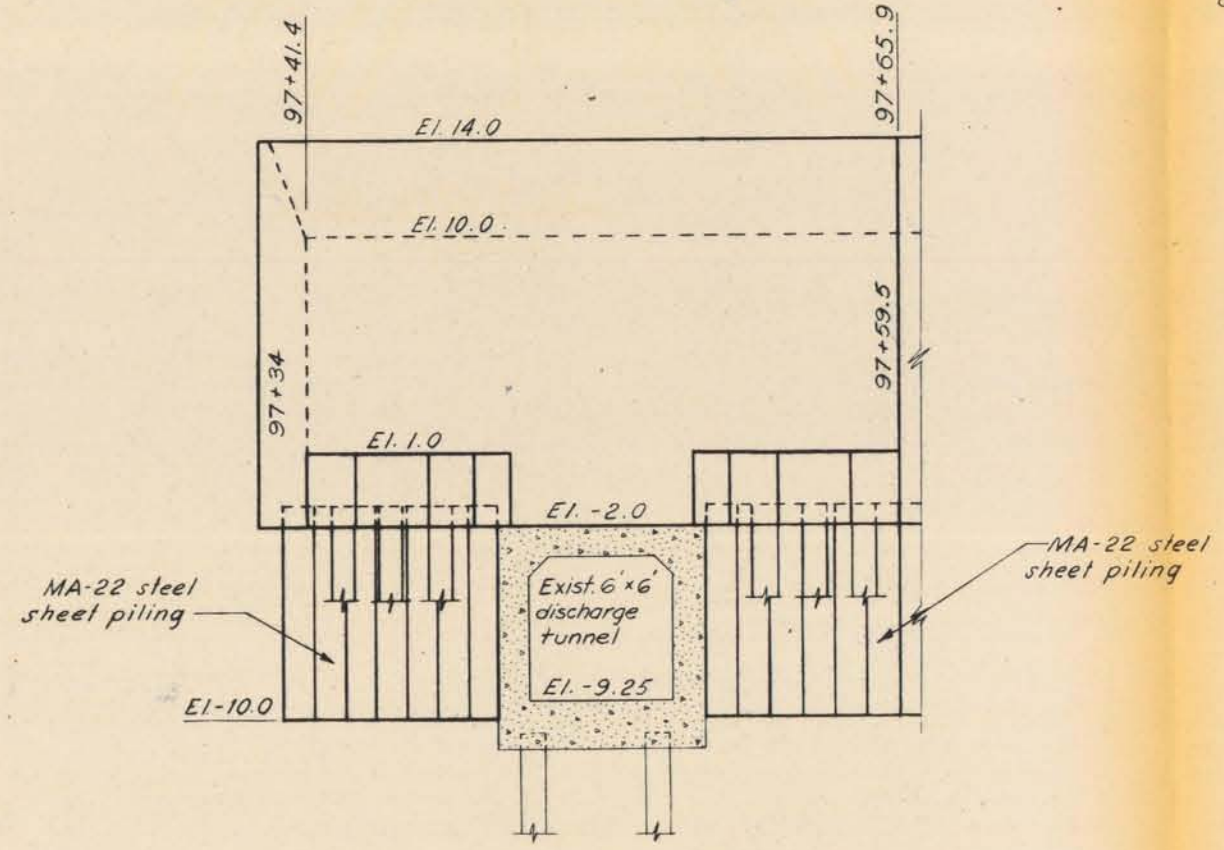


LEGEND

- 1 on 2 Batter (compression pile)
- 1 on 2 Batter (tension pile)
- Note: All piles 12"x12" prestressed concrete.

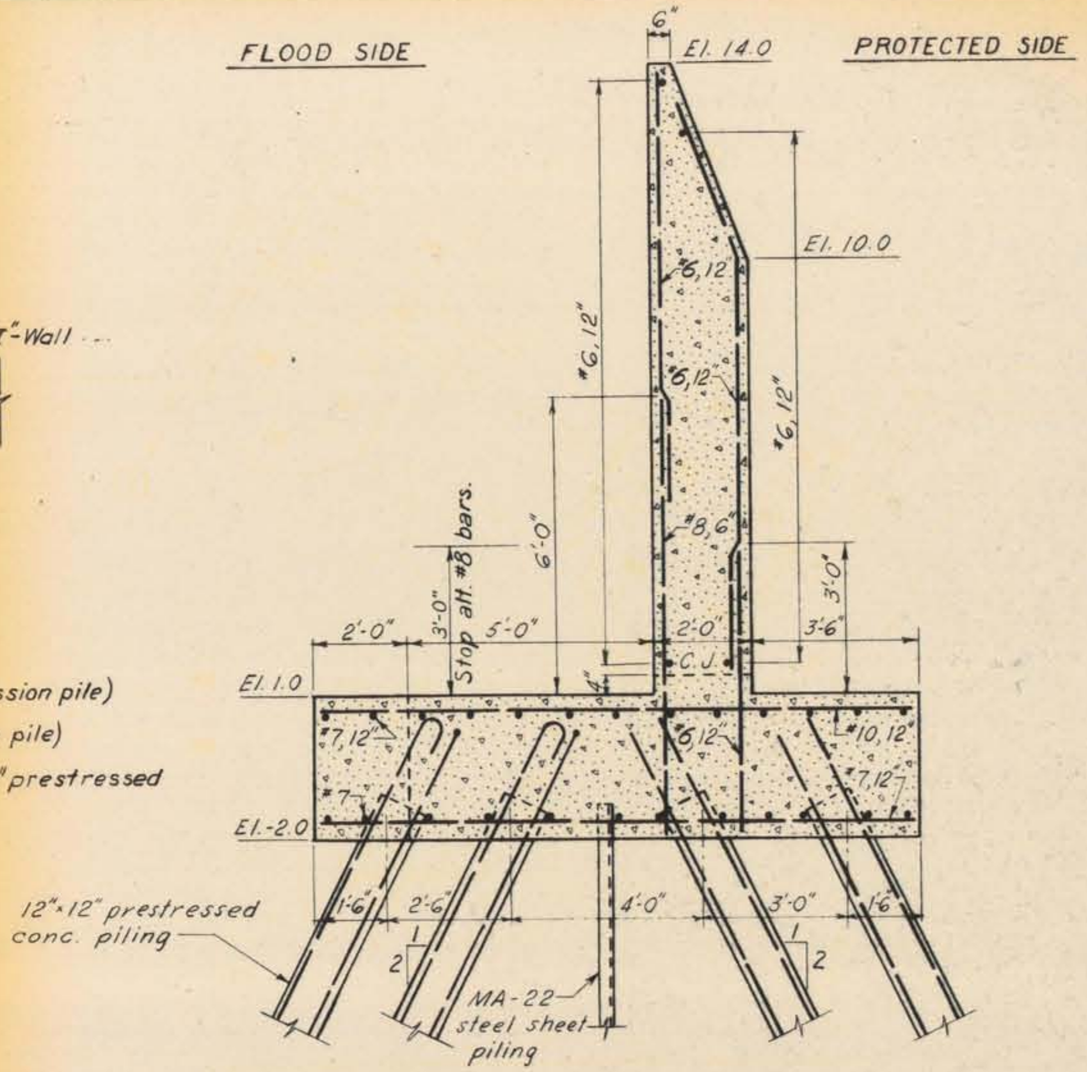
PLAN

Scale: 1/8"=1'-0"



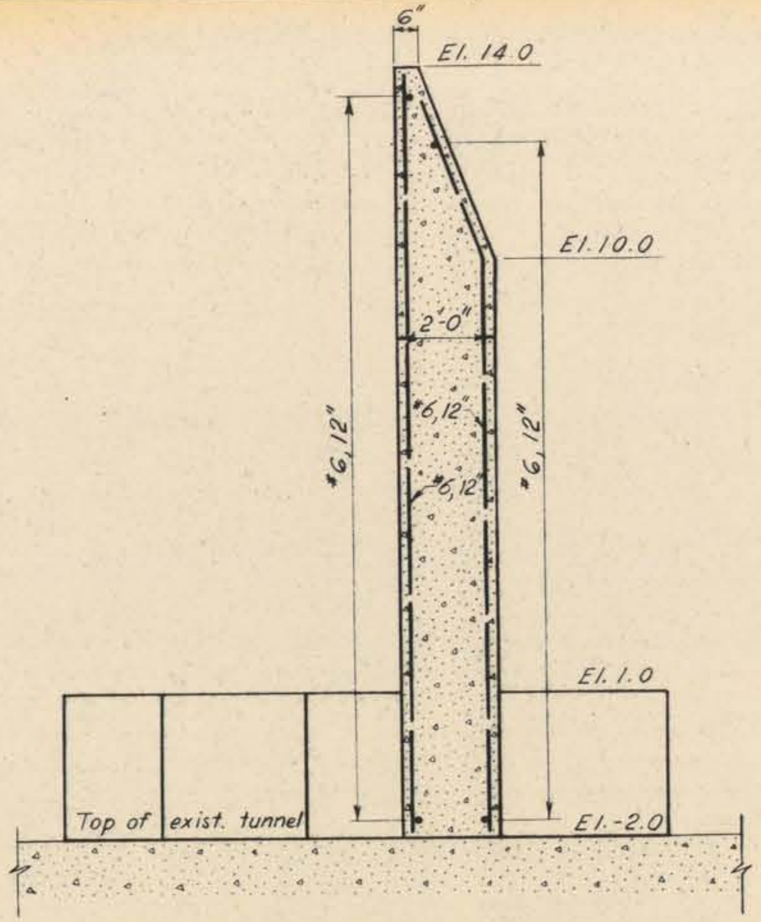
SECTION A-A

Scale 1/8"=1'-0"



SECTION B-B

Scale 1/4"=1'-0"



SECTION C-C

Scale 1/4"=1'-0"

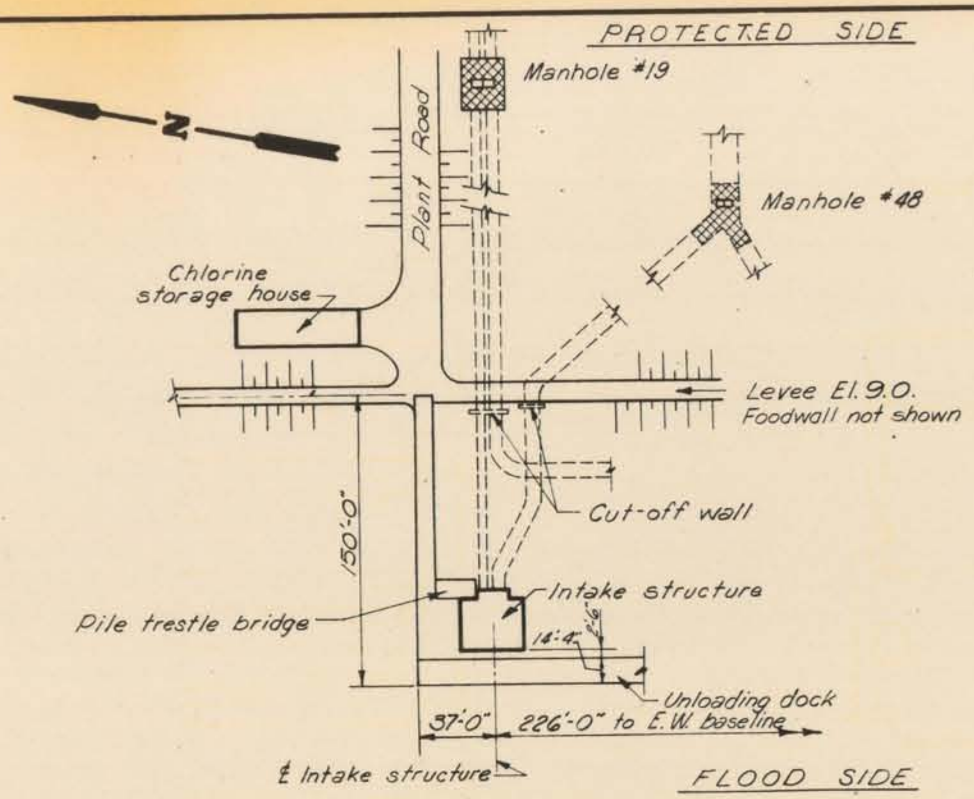
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

NEW ORLEANS PUBLIC SERVICE
PATTERSON PLANT
EAST LEVEE-DISCHARGE STRUCTURE

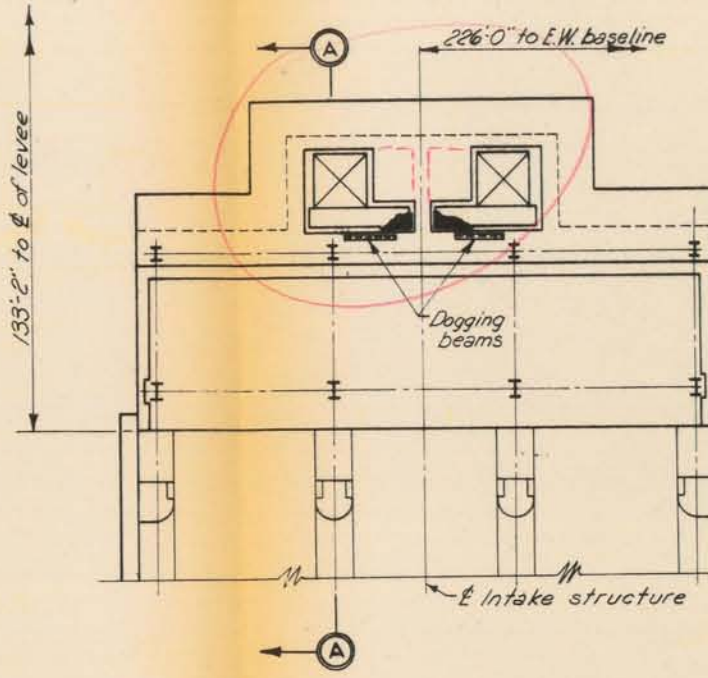
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111

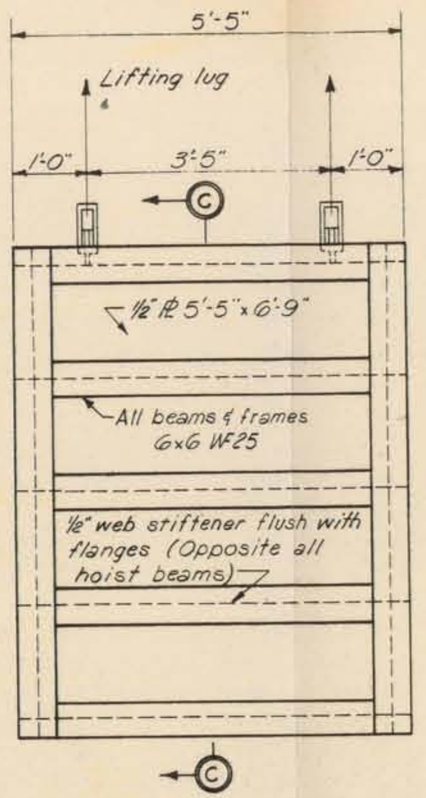
PLATE IV-44



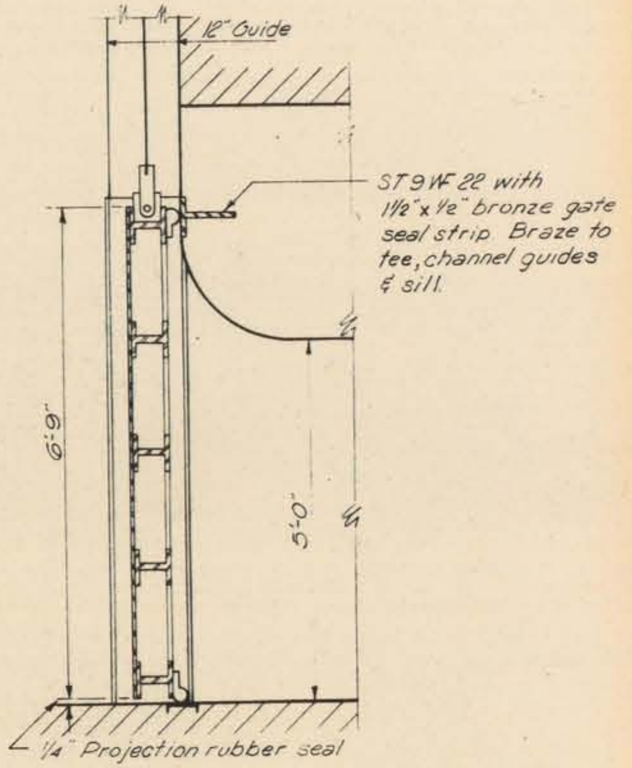
KEY PLAN
Scale: 1"=100'



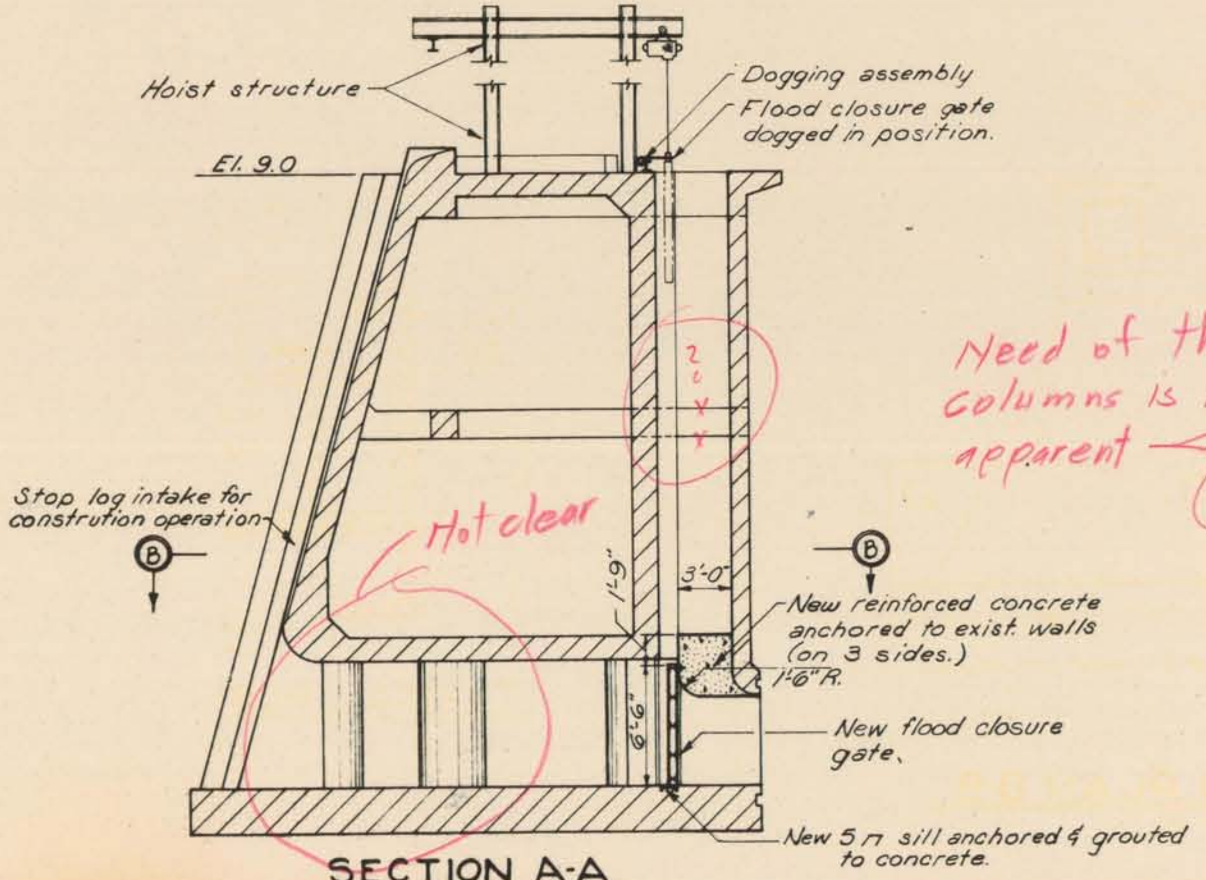
PLAN
Scale: 3/32"=1'-0"



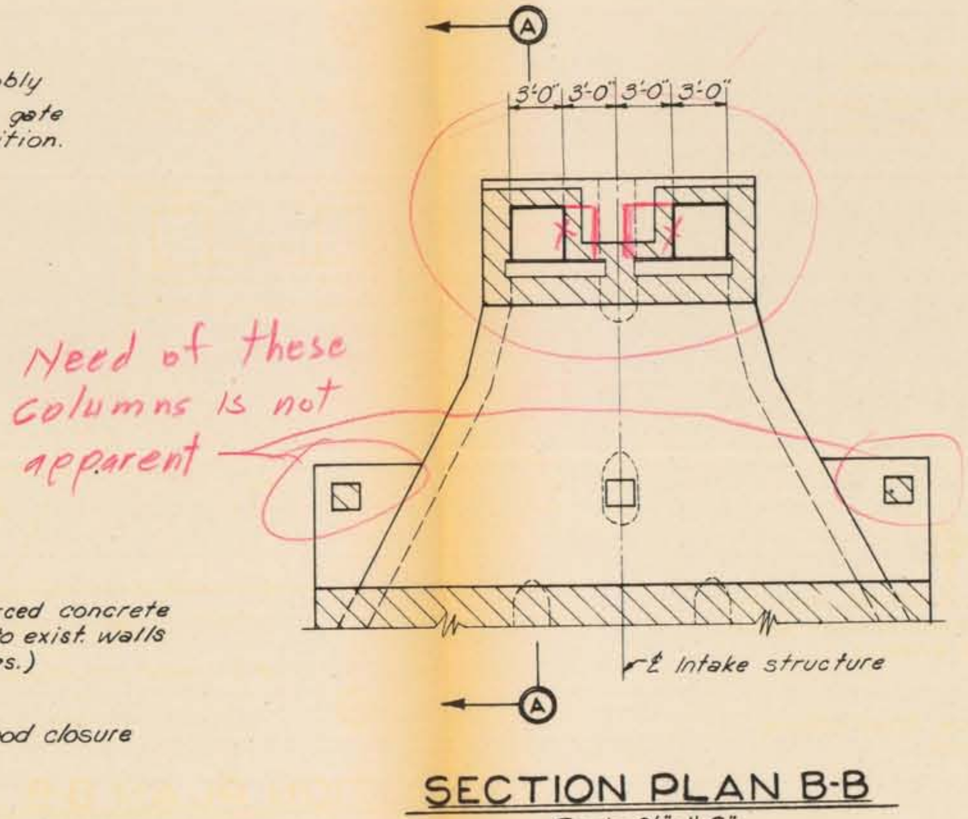
NEW FLOOD CLOSURE GATE ELEVATION
Scale: 3/8"=1'-0"



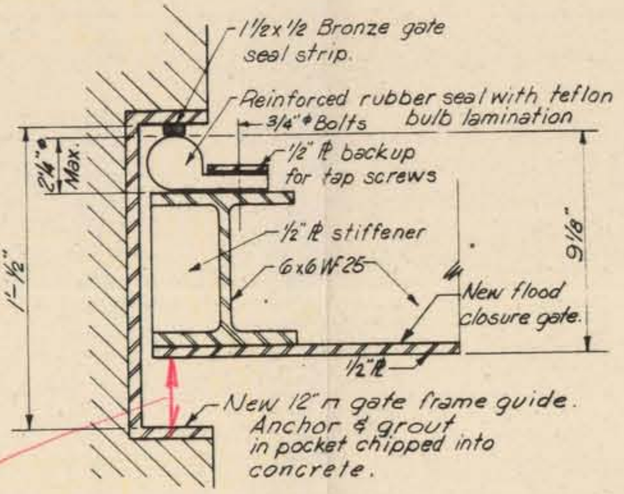
SECTION C-C
Scale: 3/8"=1'-0"



SECTION A-A
Scale: 3/32"=1'-0"



SECTION PLAN B-B
Scale: 3/32"=1'-0"



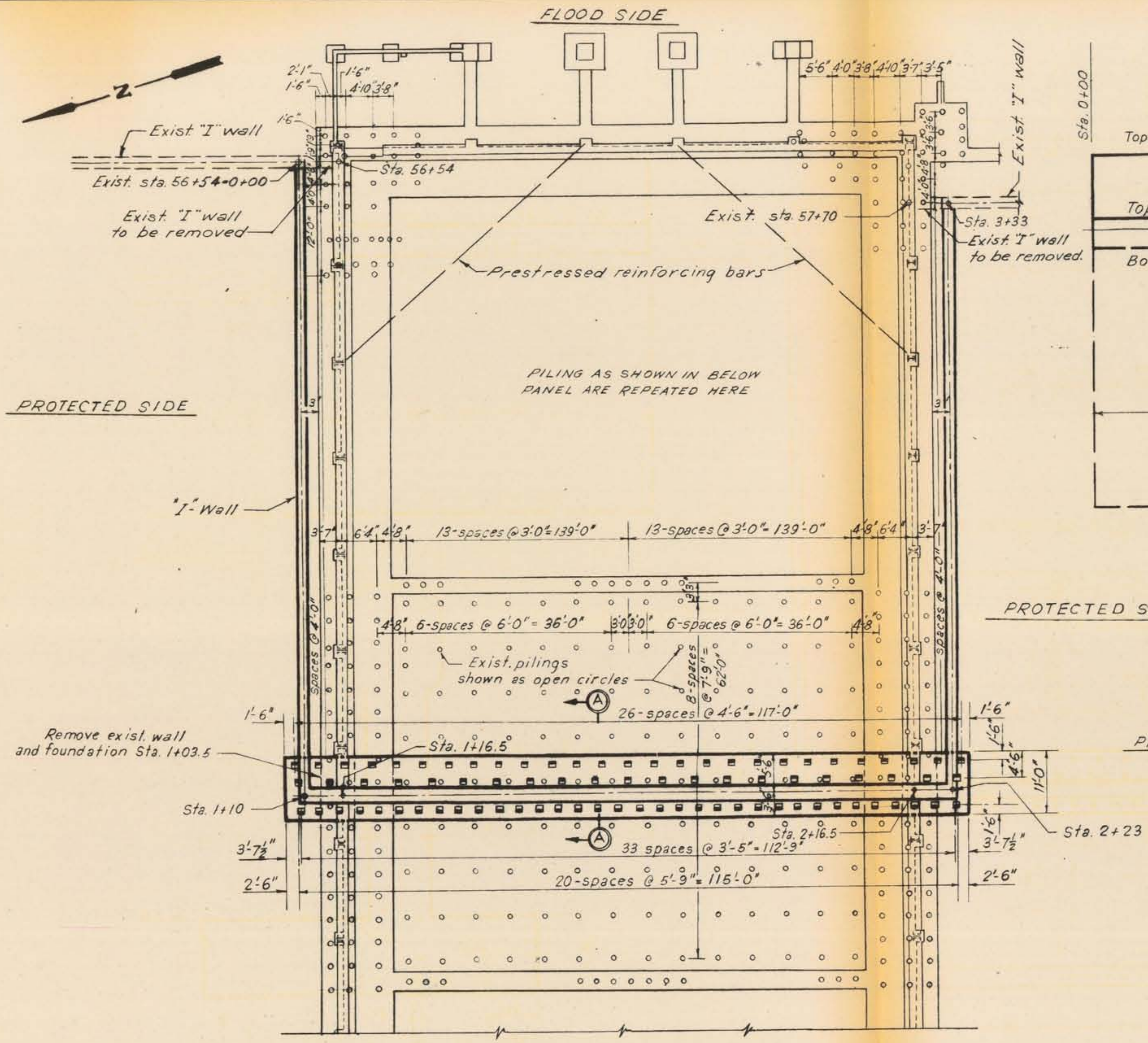
TYPICAL RUBBER SEAL DETAIL
Scale: 1 1/2"=1'-0"

Suggest less clearance

Note:
All structurial steel to be galvanized.
Manhole #19 and #48 in plant area to be gasketed and sealed watertight.
Flood closure gate operated under balanced pressure in still water.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
NEW ORLEANS PUBLIC SERVICE PATTERSON PLANT
EAST LEVEE-INTAKE STRUCTURE
FLOOD CLOSURE GATE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

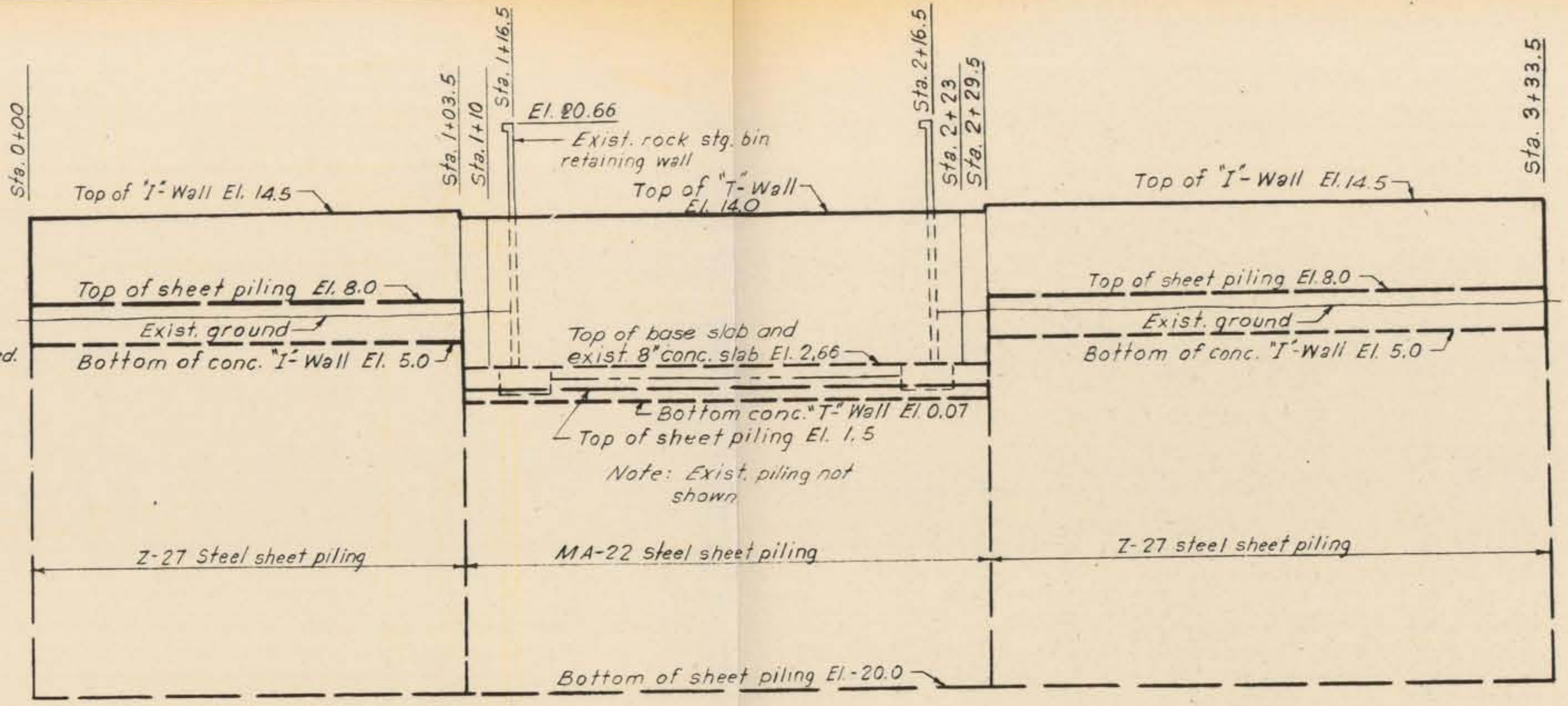
FEBRUARY 1968 FILE NO. H-2-24111



ROCK STORAGE BIN

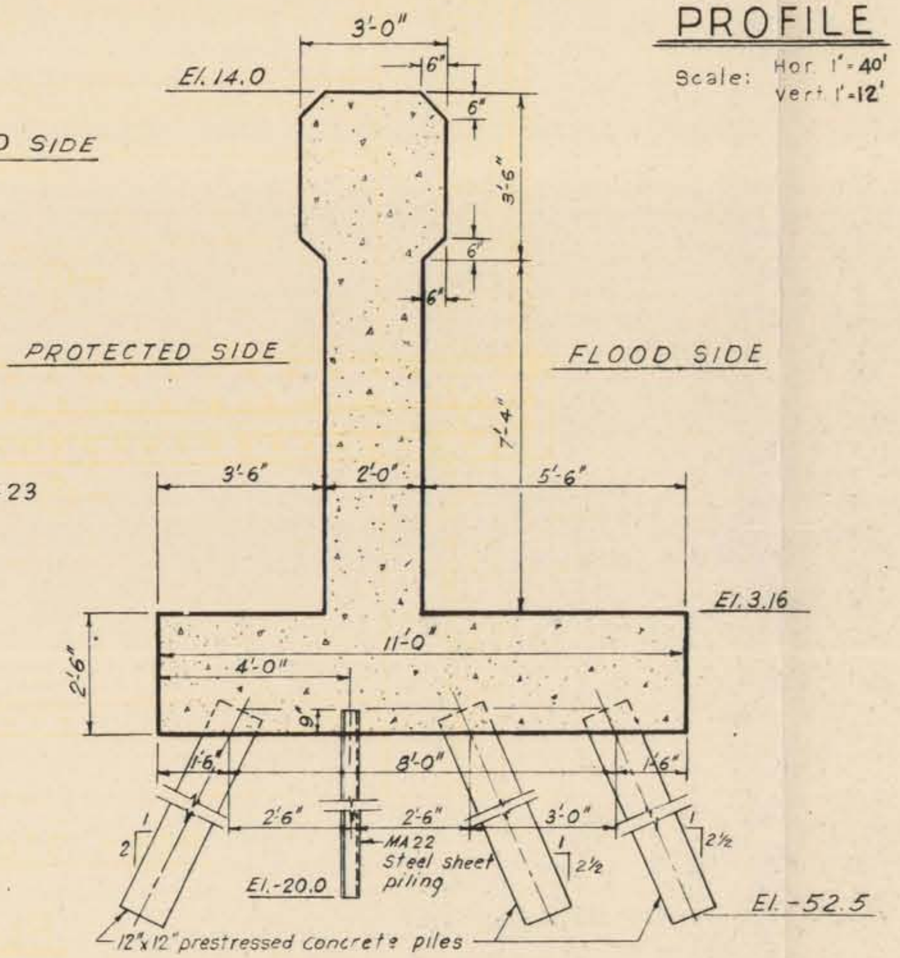
PLAN

Scale: 3/64" = 1'-0"



PROFILE

Scale: Hor. 1" = 40'
Vert. 1" = 12'



TYPICAL "T" WALL

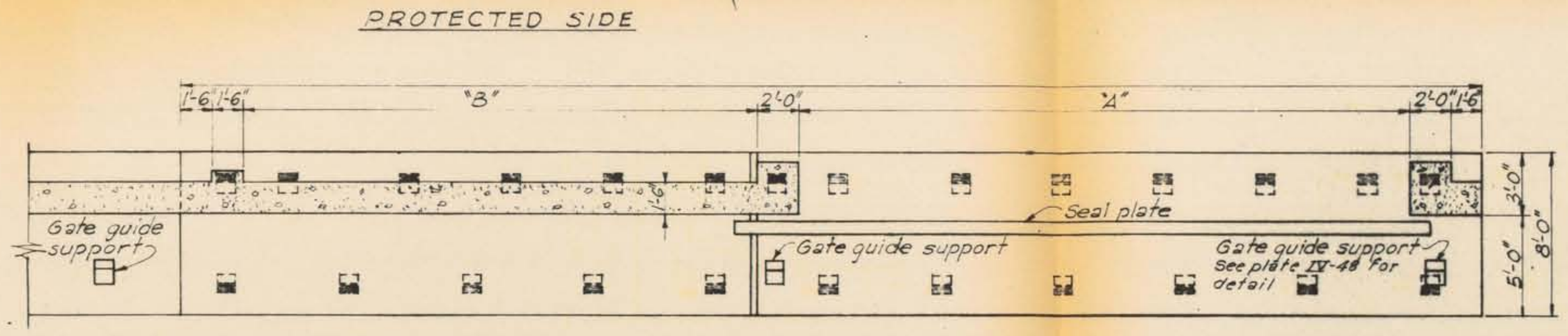
SECTION A-A

Scale: 1/4" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
LONE STAR CEMENT
WEST LEVEE
ROCK STORAGE BIN
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 | FILE NO. H-2-24111

PLATE IV-46

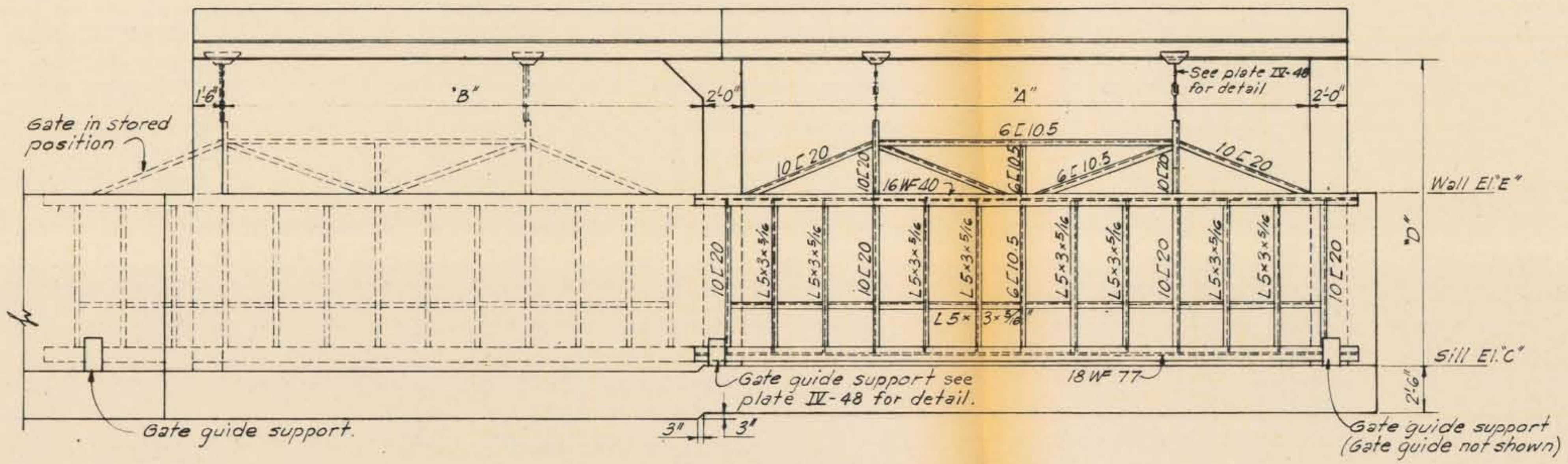


PLAN OF GATE MONOLITH

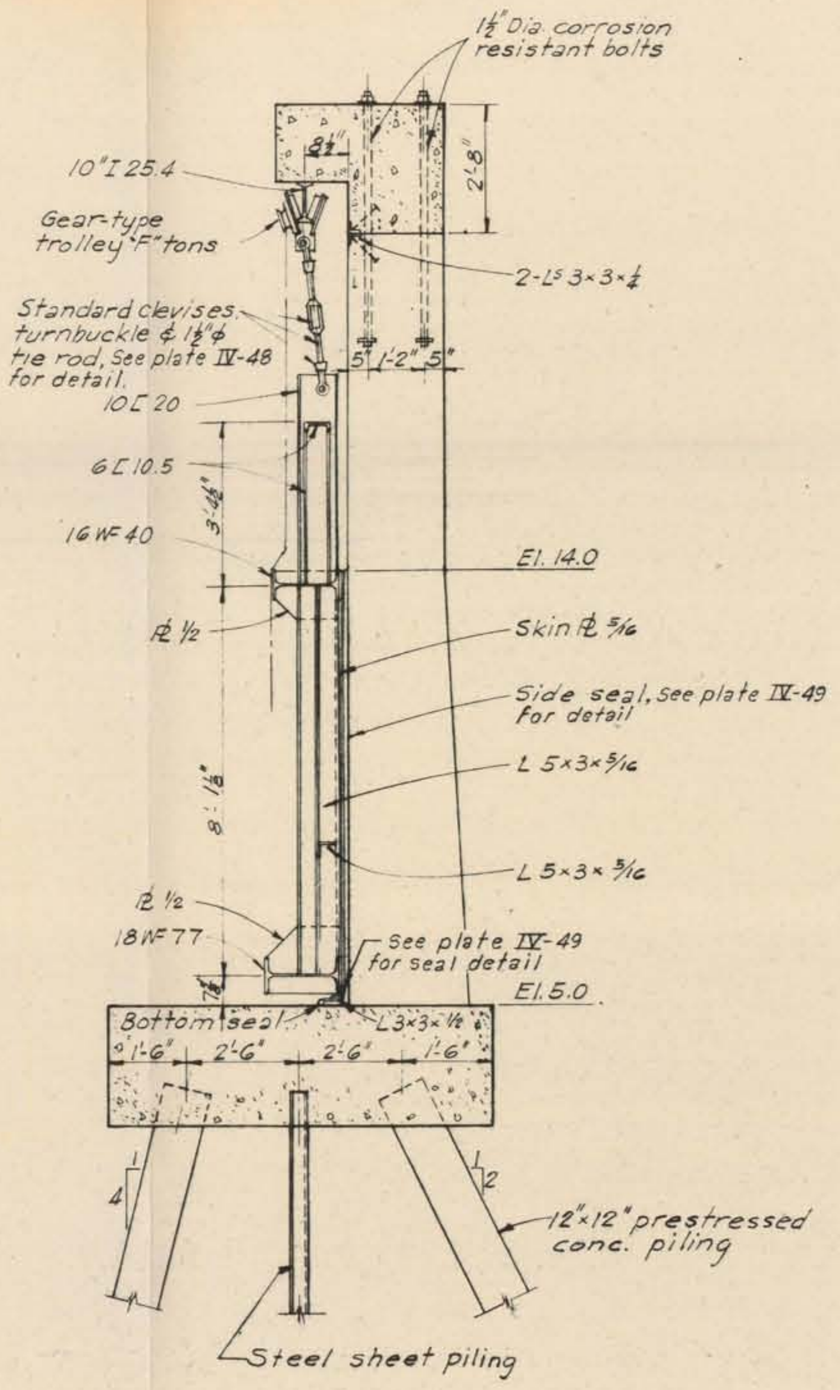
(GATE NOT SHOWN)
Scale 1/8" = 1'-0"

LEGEND

- 1 on 2 Batter (compression pile)
- 1 on 4 Batter (tension pile)
- Note: All piles 12"×12" prestressed concrete piles.



FLOOD SIDE ELEVATION GATE 7-W



SECTION

Scale 1/4" = 1'-0"

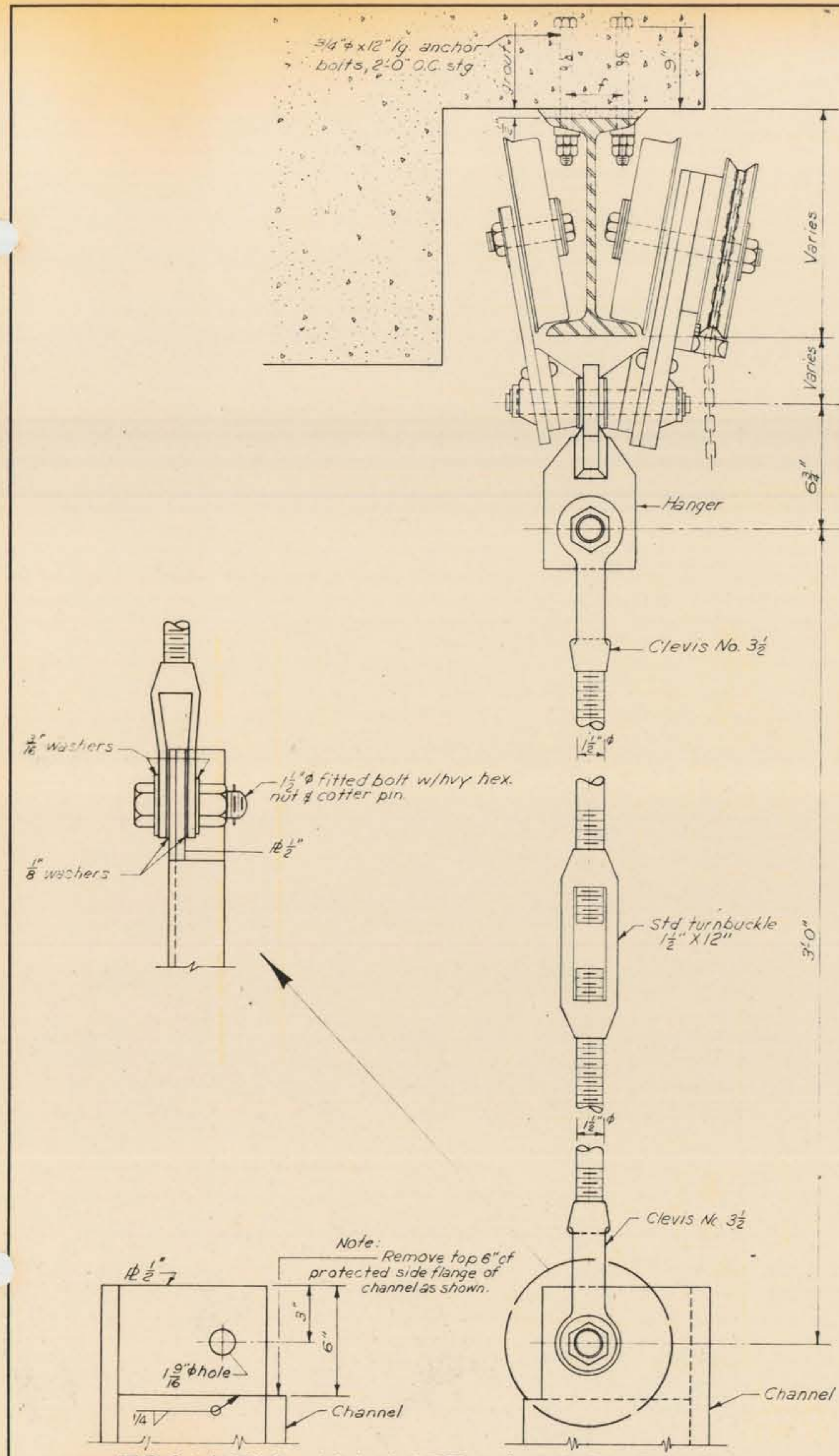
GATE SCHEDULE							
GATE	GAP CLOSURE	HOR. CL."A"	STORAGE BAY "B"	SILL EL."C"	VER. CL."D"	WALL EL."E"	TROLLEY "F" TONS
1-E	Railroad	17'-0"	15'-6"	3.1	22'-0"	13.25	2
2-E	Street	20'-0"	17'-1"	8.3	16'-0"	13.50	2
3-E	Railroad	17'-0"	15'-6"	6.0	22'-0"	13.75	2
4-E	Street	15'-0"	14'-10"	9.0	16'-0"	14.00	2
5-E	Street	30'-0"	25'-4"	8.3	22'-0"	14.00	3
6-E	Railroad	35'-0"	28'-6"	8.2	22'-0"	14.00	3
7-E	Street	20'-0"	17'-1"	9.0	16'-0"	14.00	2
8-E	Railroad	17'-0"	15'-6"	8.3	22'-0"	14.00	2
9-E	Street	20'-0"	17'-1"	8.5	16'-0"	14.50	2
10-E	Street	20'-0"	17'-1"	8.5	16'-0"	14.50	2
1W	Street	20'-0"	17'-1"	7.0	16'-0"	14.00	2
2W	Railroad	17'-0"	15'-6"	7.3	22'-0"	14.00	2
7W	Street	30'-0"	25'-4"	5.0	16'-0"	14.00	3
8W	Railroad	31'-0"	24'-5½"	7.5	22'-0"	14.00	3
9W	Railroad	17'-0"	15'-6"	4.5	22'-0"	14.00	3

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

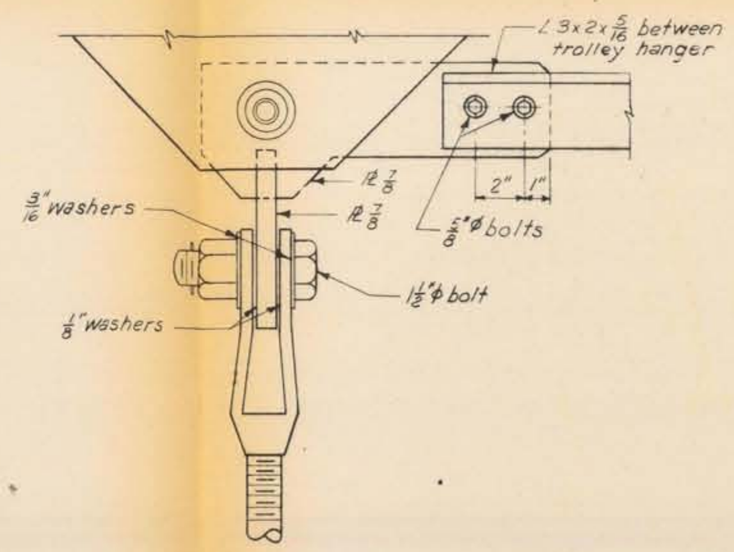
TYPICAL GAP CLOSURE
WEST AND EAST LEVEE
OVERHEAD ROLLER GATE

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

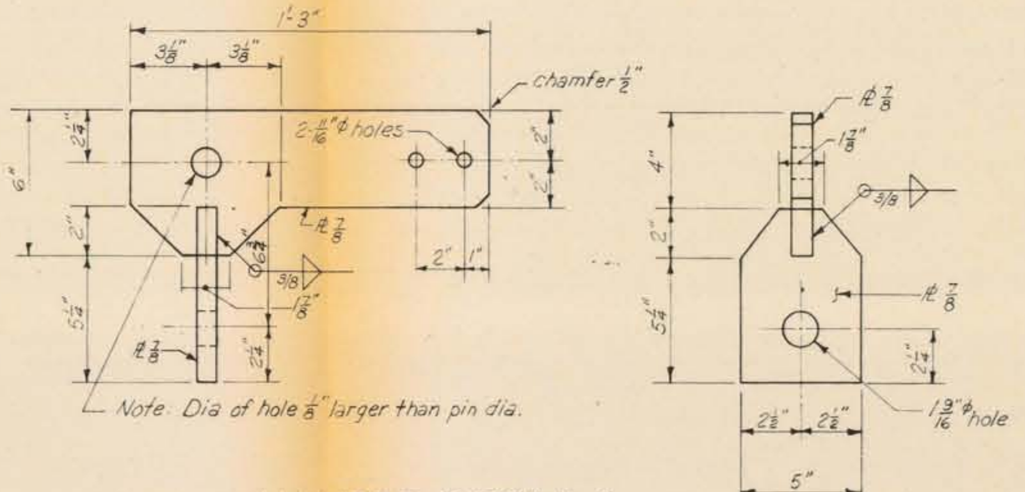
FEBRUARY 1968 FILE NO. H-2-24111



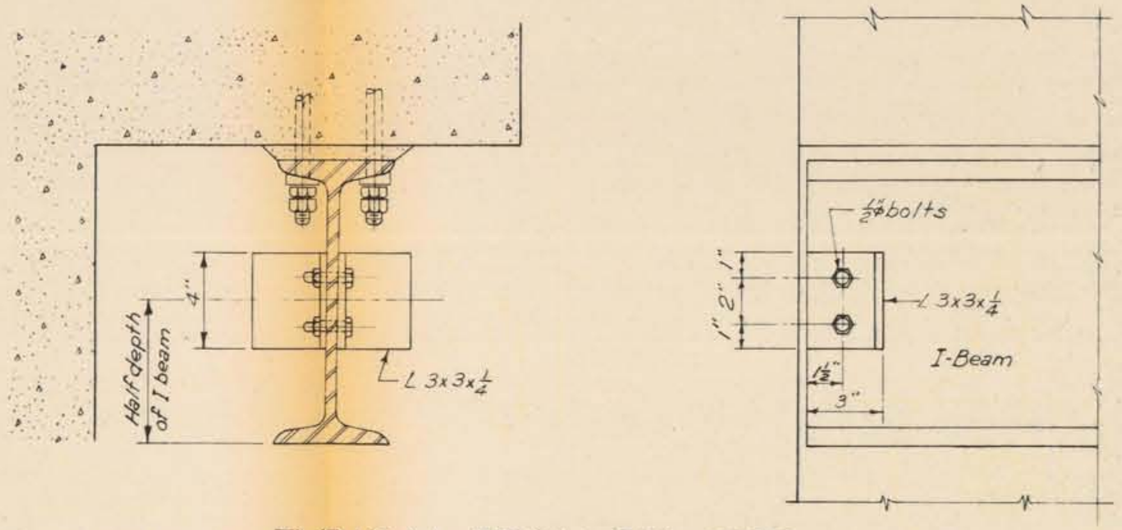
TROLLEY HANGER ASSEMBLY



FLOOD SIDE ELEVATION OF HANGER

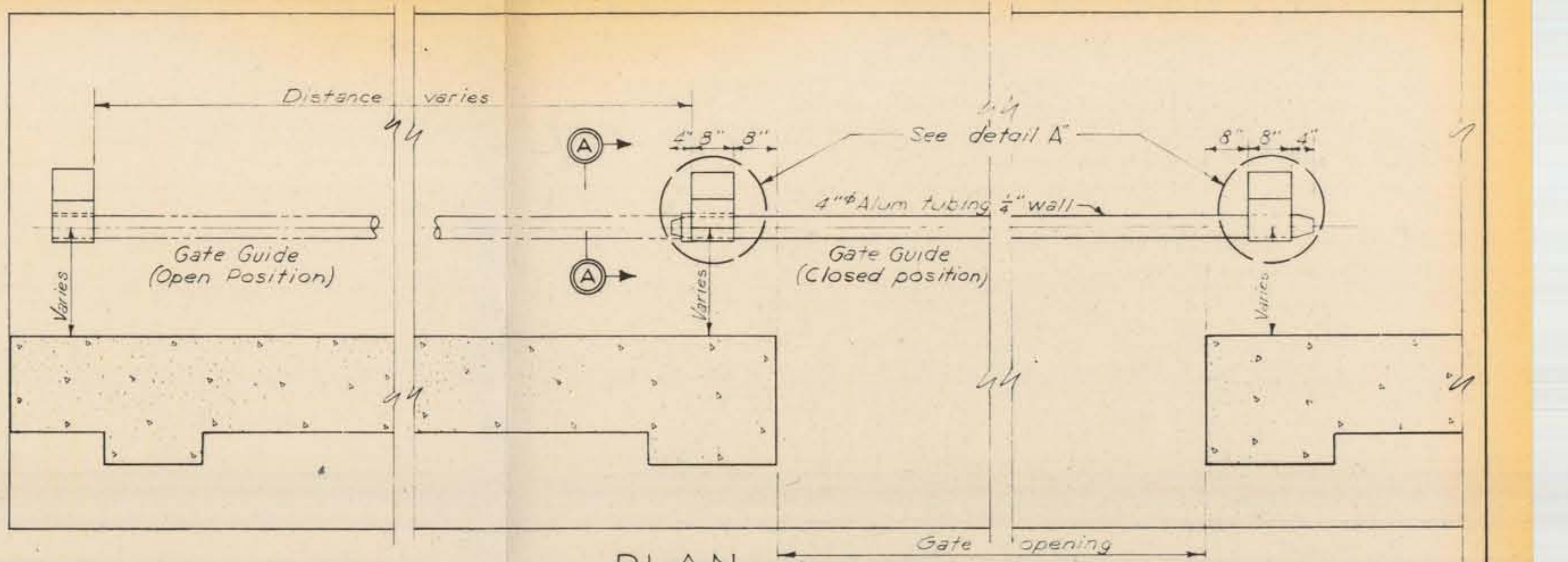


HANGER DETAILS

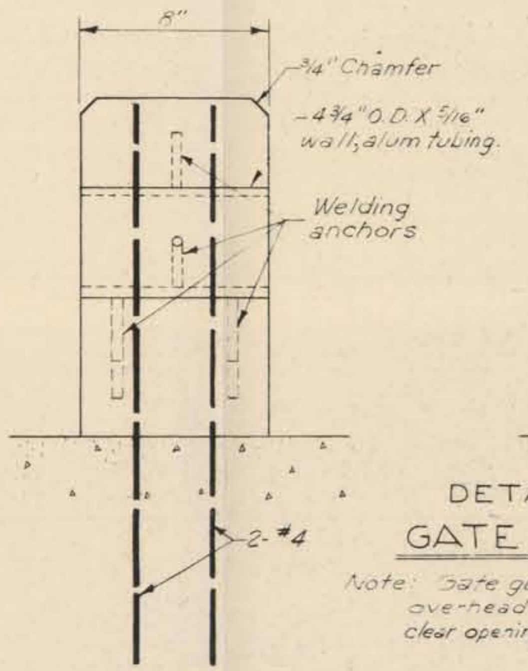


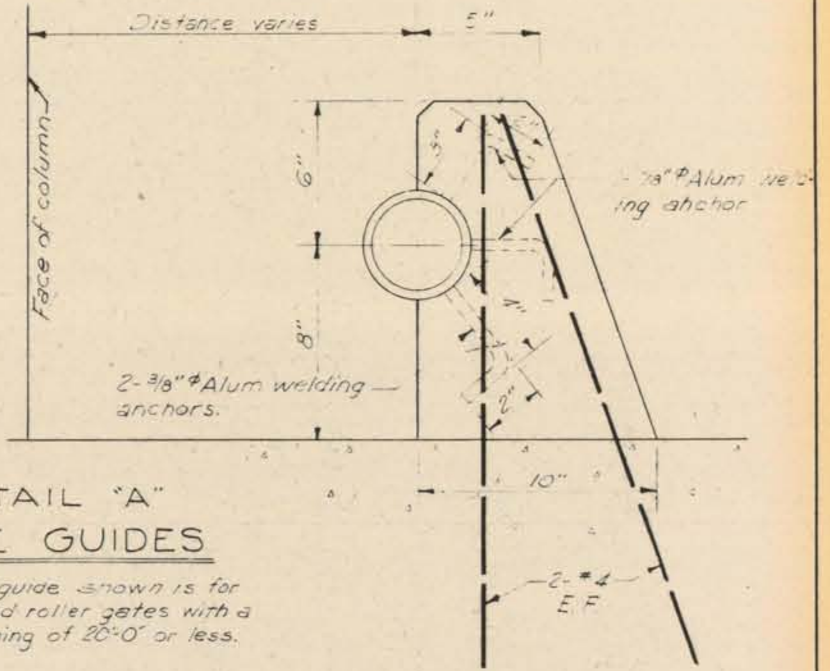
TYPICAL TROLLEY STOP
(STOP AT BOTH ENDS OF I-BEAMS)

Scale: 1½" = 1'-0"



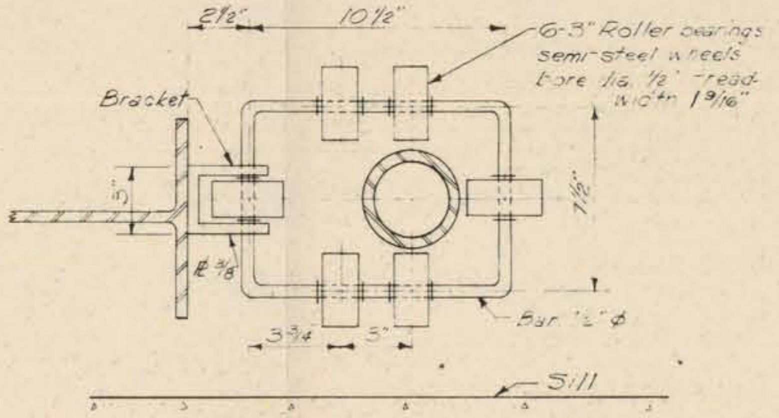
PLAN
Scale: 3/8" = 1'-0"





DETAIL "A"
GATE GUIDES

Note: Gate guide shown is for over-head roller gates with a clear opening of 20'-0" or less.



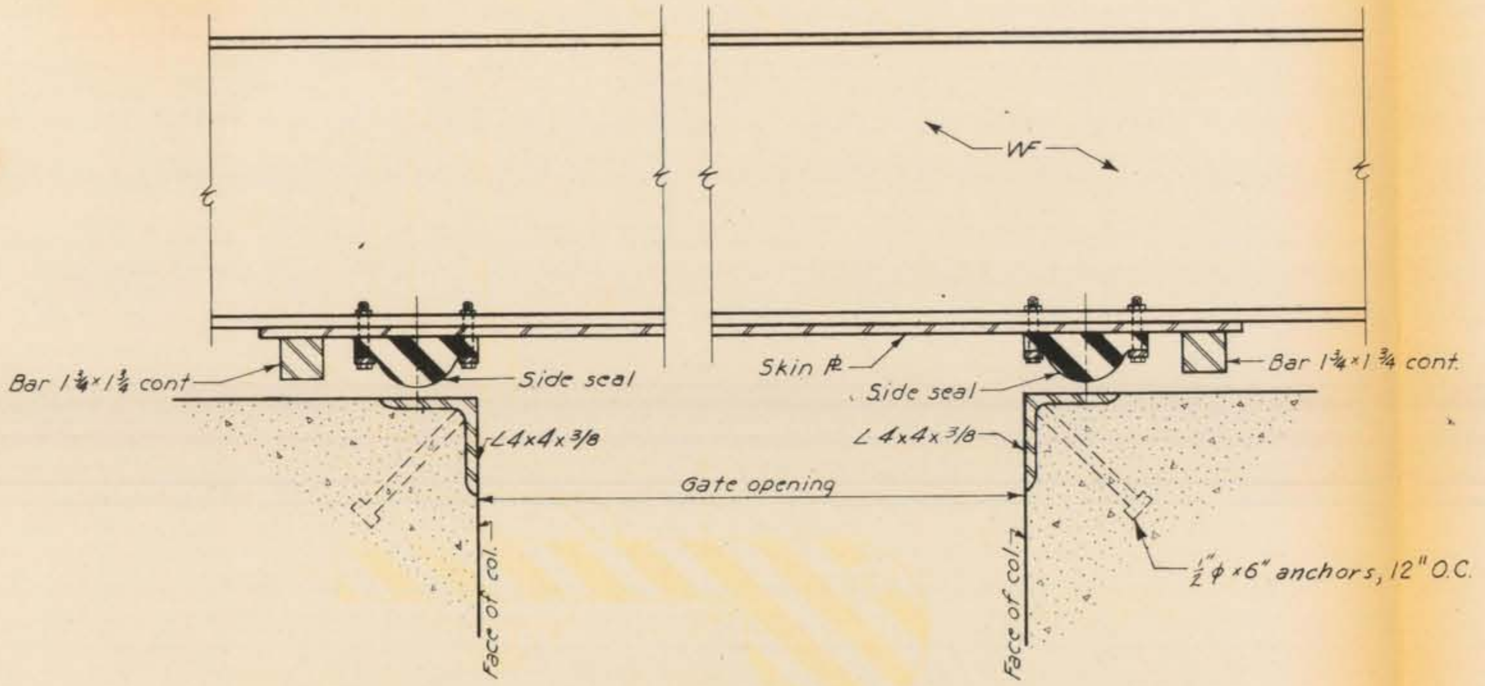
SECTION THRU GUIDE ROLLER
Scale: 1½" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

OVERHEAD ROLLER GATE
WEST AND EAST LEVEE
DETAILS

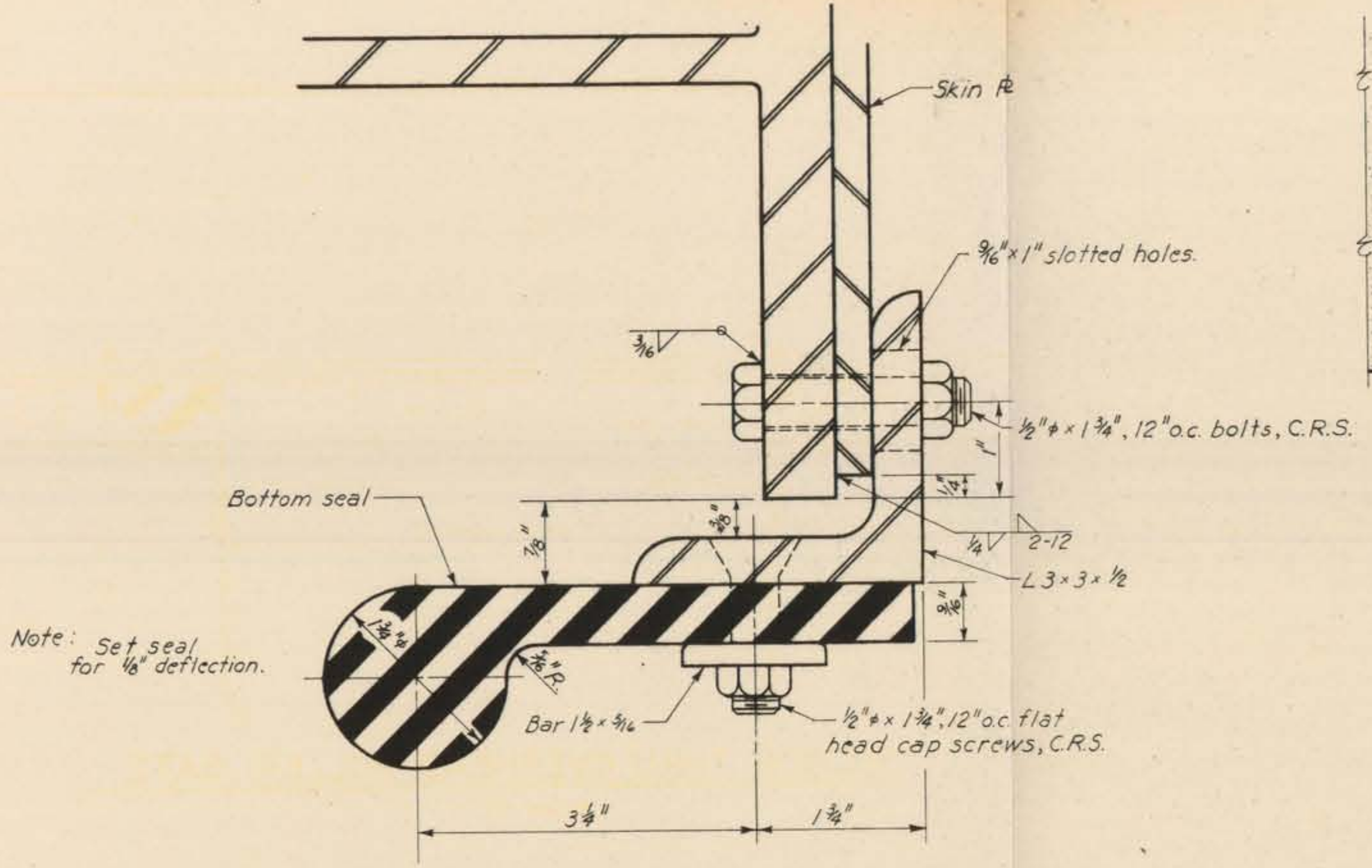
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1968 FILE NO. H-2-24111



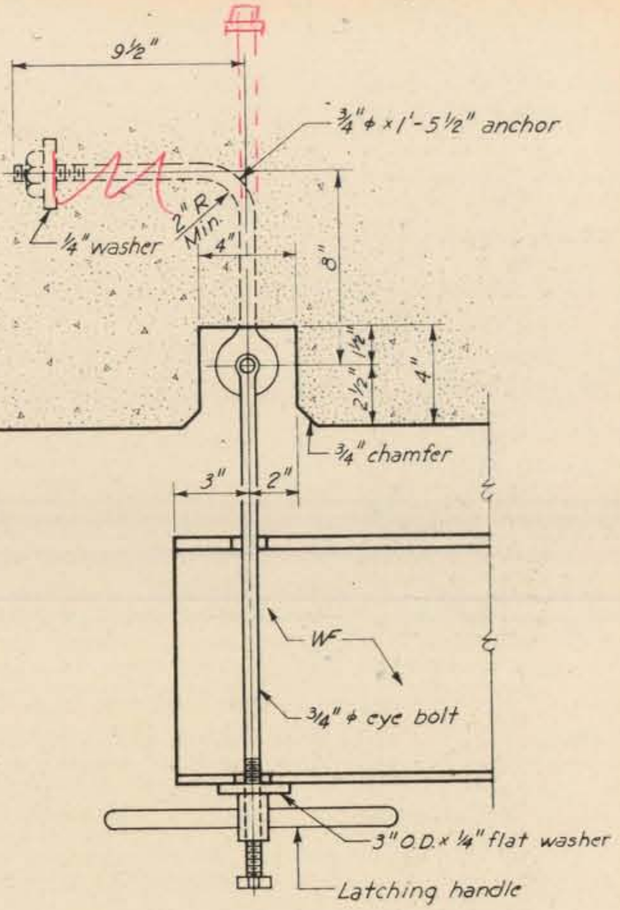
SECTION THRU OVERHEAD ROLLER GATE

Scale: 1½" = 1'-0"



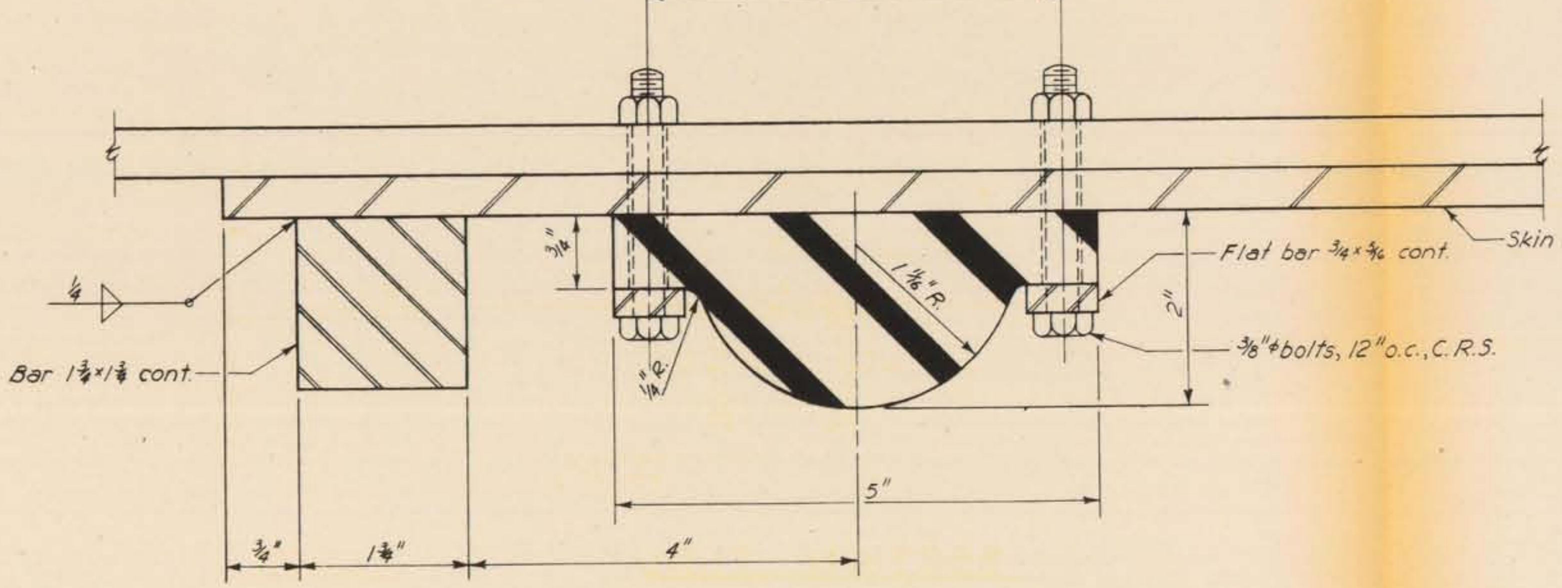
SECTION THRU BOTTOM SEAL

Scale: Half Size



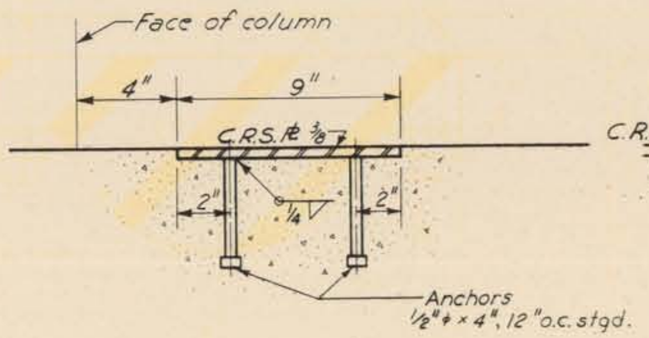
LATCHING ASSEMBLY

Scale: 1½" = 1'-0"



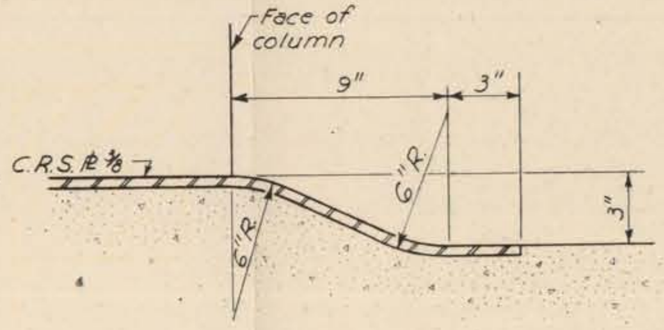
TYPICAL SIDE SEAL

Scale: Half Size



SECTION THRU SEAL PLATE

Scale: 1½" = 1'-0"



FLOOD SIDE ELEVATION OF SEAL PLATE TRANSITION

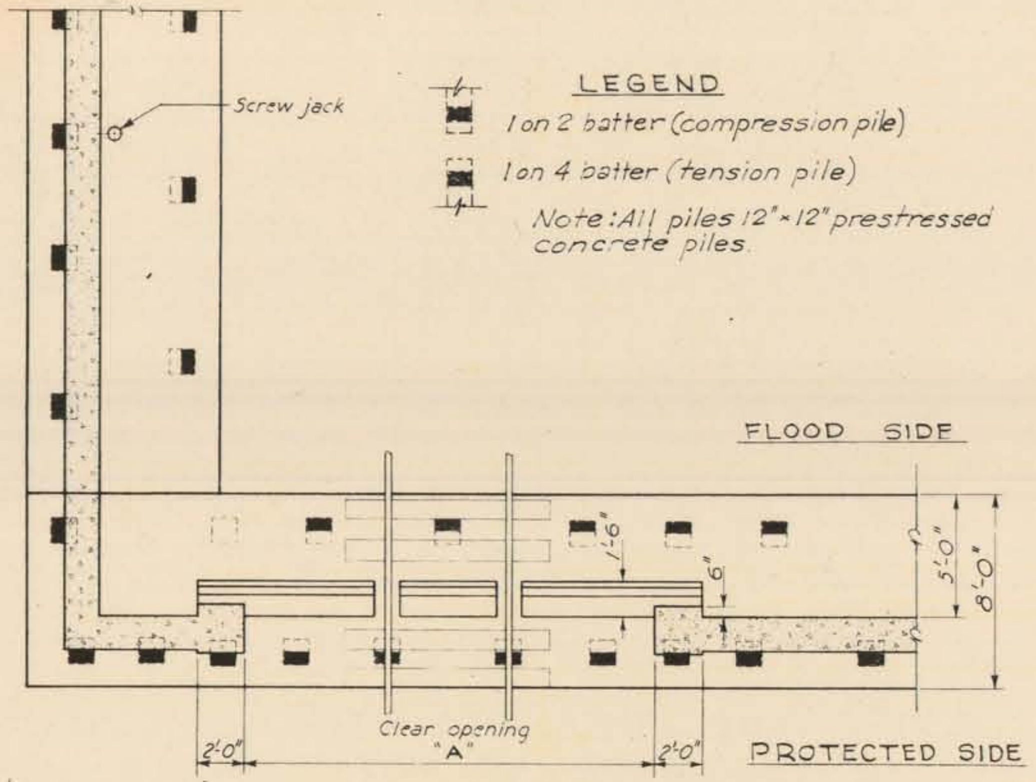
Scale: 1½" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

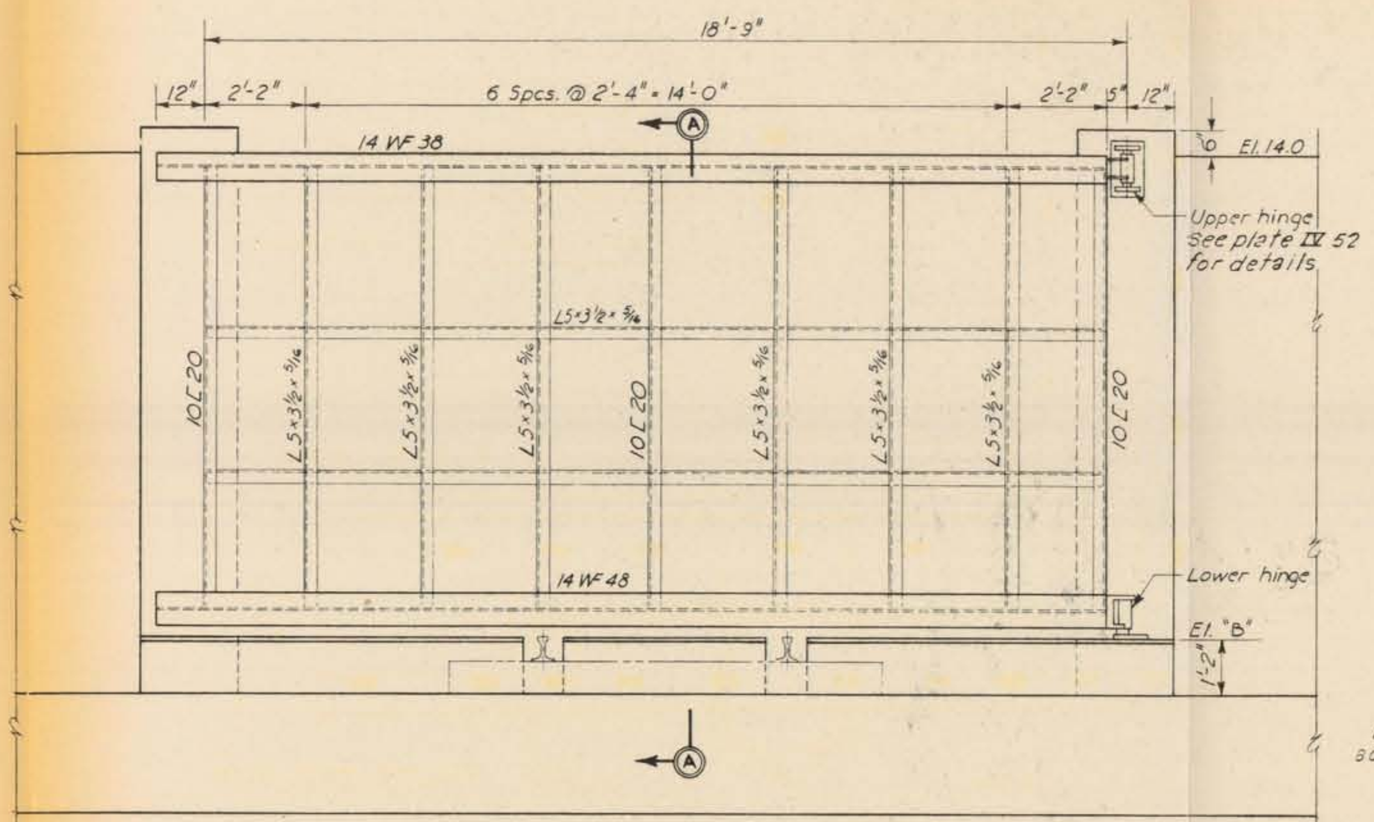
OVERHEAD ROLLER GATE
WEST AND EAST LEVEE
DETAILS

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

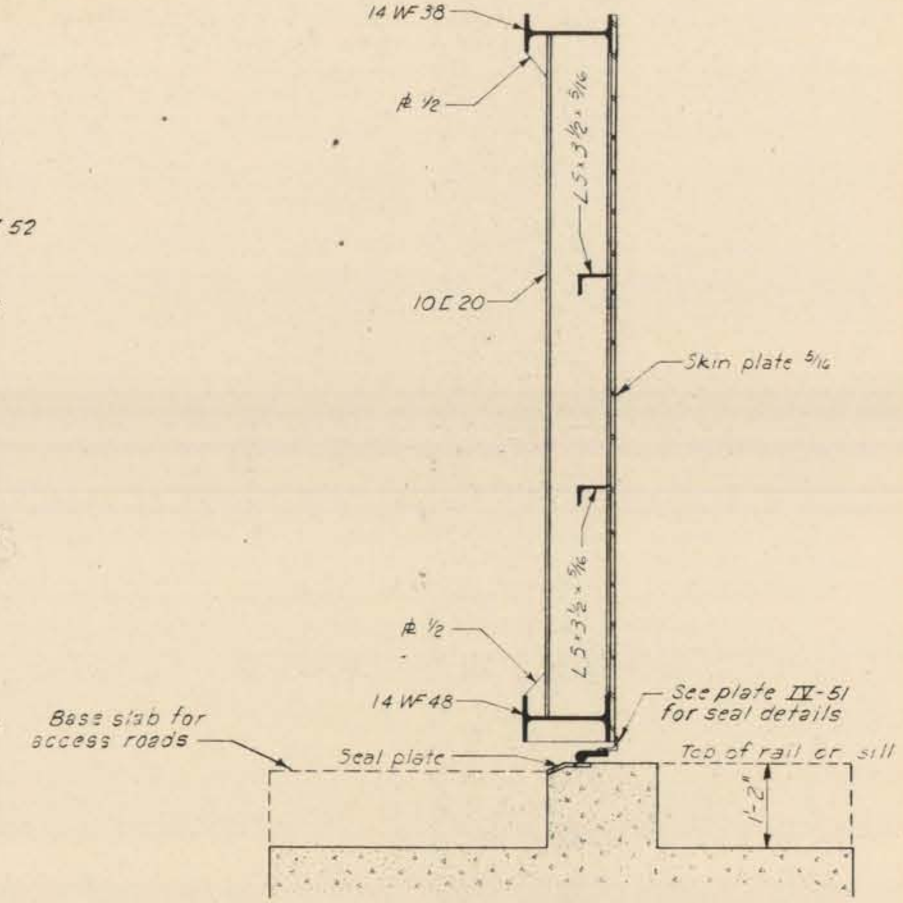
FEBRUARY 1968 FILE NO. H-2-24111



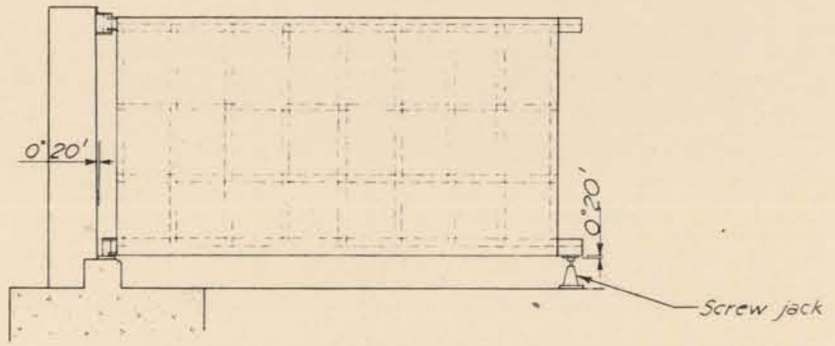
PLAN OF GATE MONOLITH
(GATE NOT SHOWN)
Scale: 1/8" = 1'-0"



FLOOD SIDE ELEVATION OF GATE
Scale: 1/4" = 1'-0"



SECTION A-A
Scale: 3/8" = 1'-0"



GATE IN STORED POSITION
Scale: 1/8" = 1'-0"

GATE SCHEDULE

Gate	Closure	Cl. Opng. "A"	Sill El. "B"
3 W	Access road	22'-0"	11.0
4 W	" "	22'-0"	11.0
5 W	" "	20'-0"	11.0
6 W	" "	22'-0"	11.0
10 W	Railroad	17'-0"	4.0

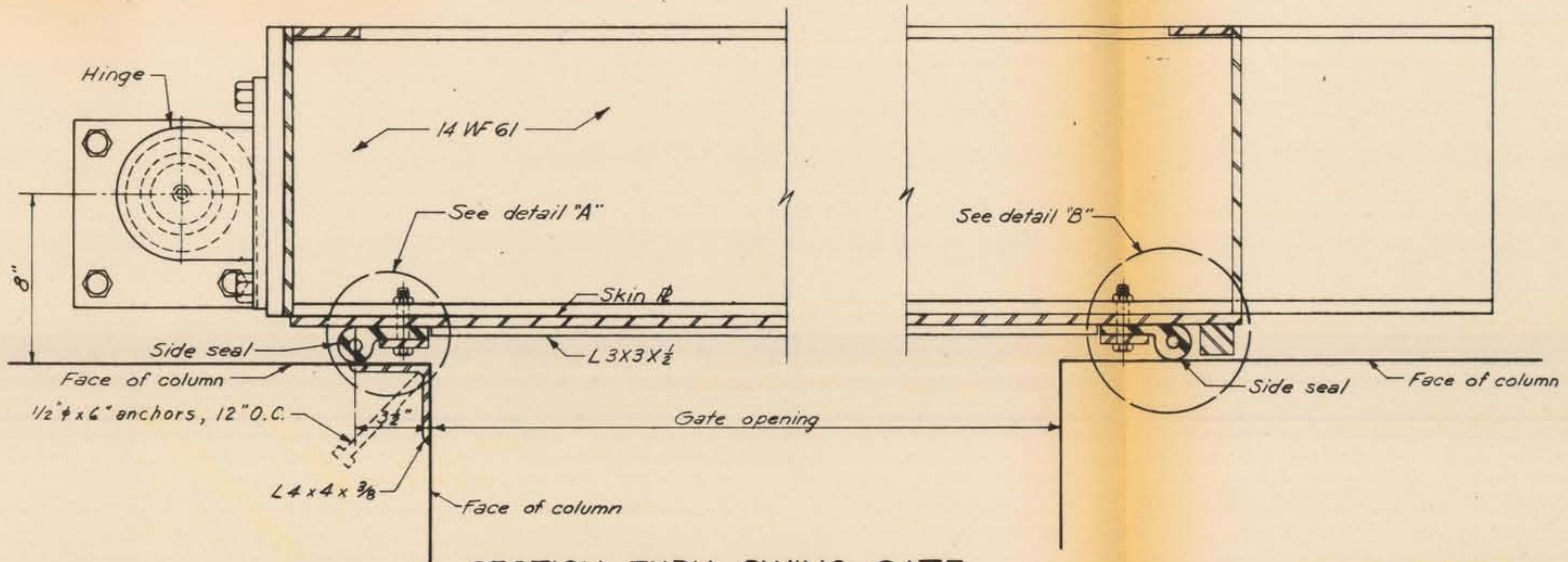
NOTE:
Gate 10W shown. Gates listed in "Schedule" are similar except for size, spacing of members and road crossing.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

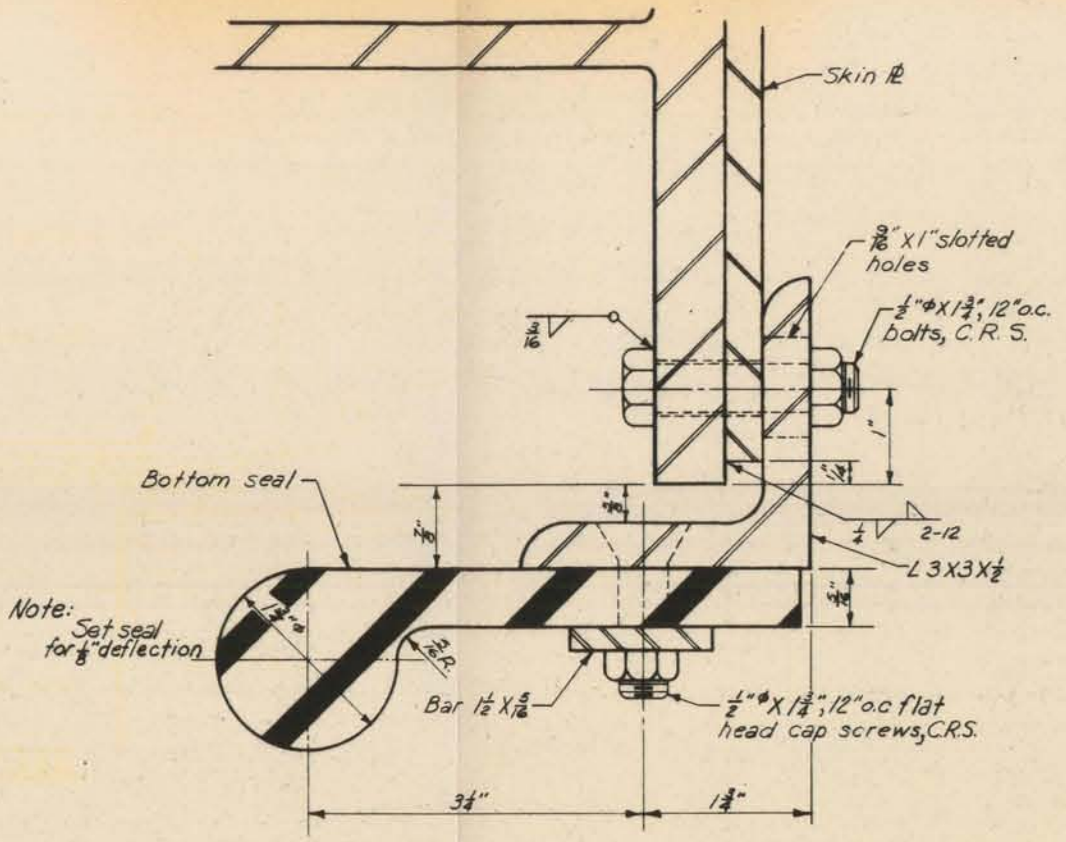
TYPICAL GAP CLOSURE
WEST AND EAST LEVEE
SWING GATE

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

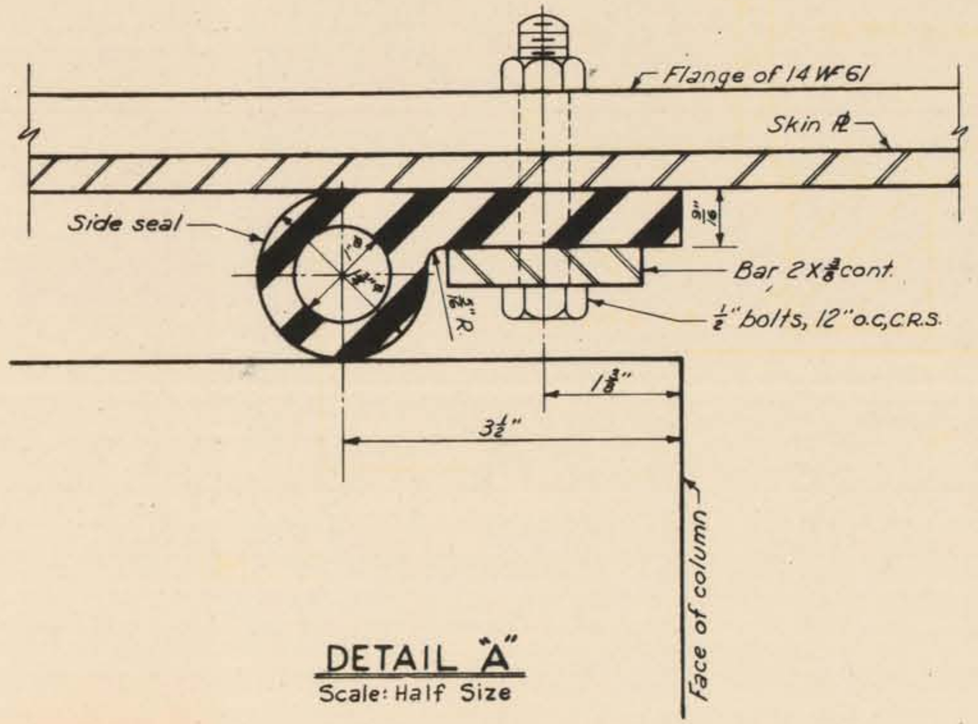
FEBRUARY 1968 — FILE NO. H-2-24111



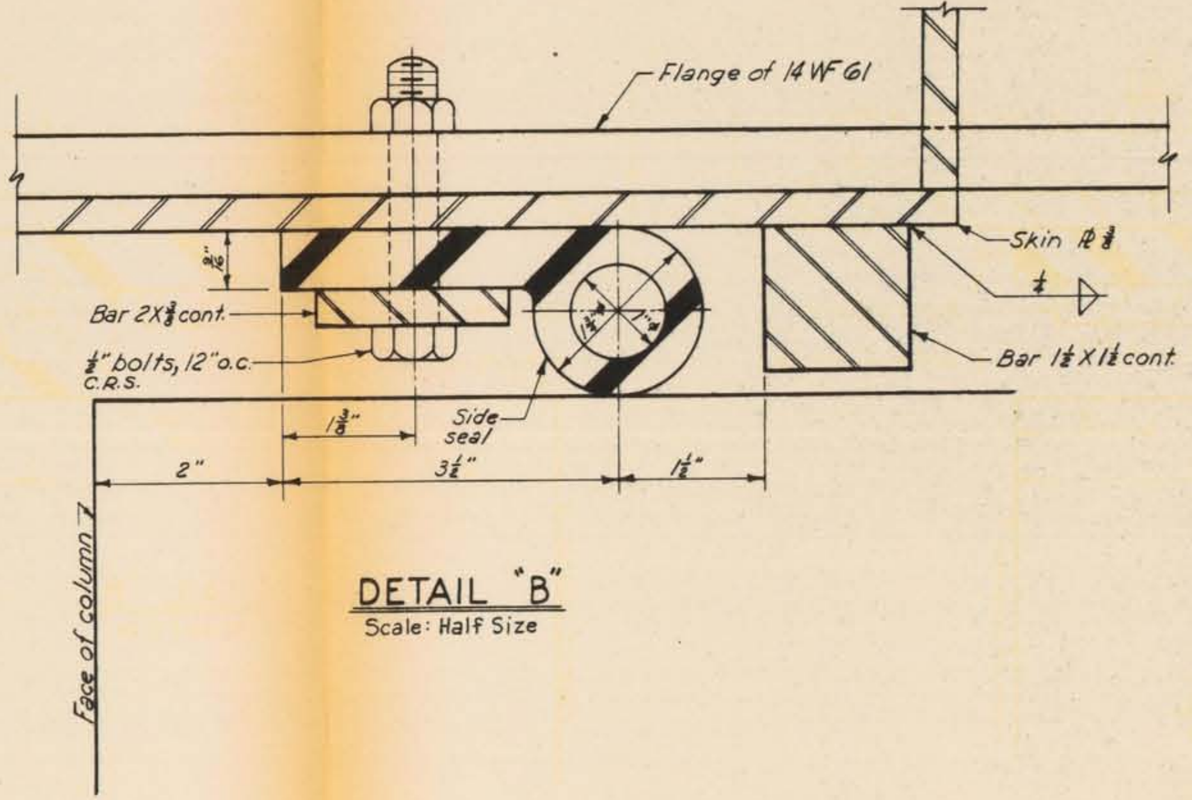
SECTION THRU SWING GATE
Scale: 1½" = 1'-0"



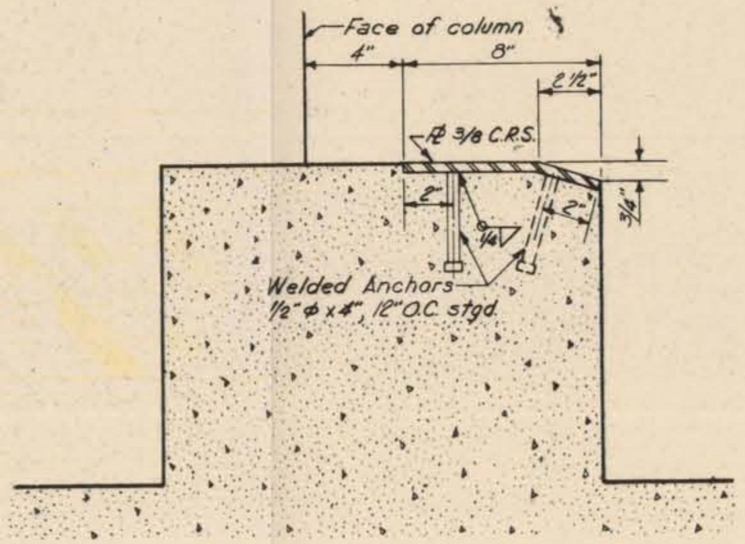
SECTION THRU BOTTOM SEAL
Scale: Half Size



DETAIL "A"
Scale: Half Size

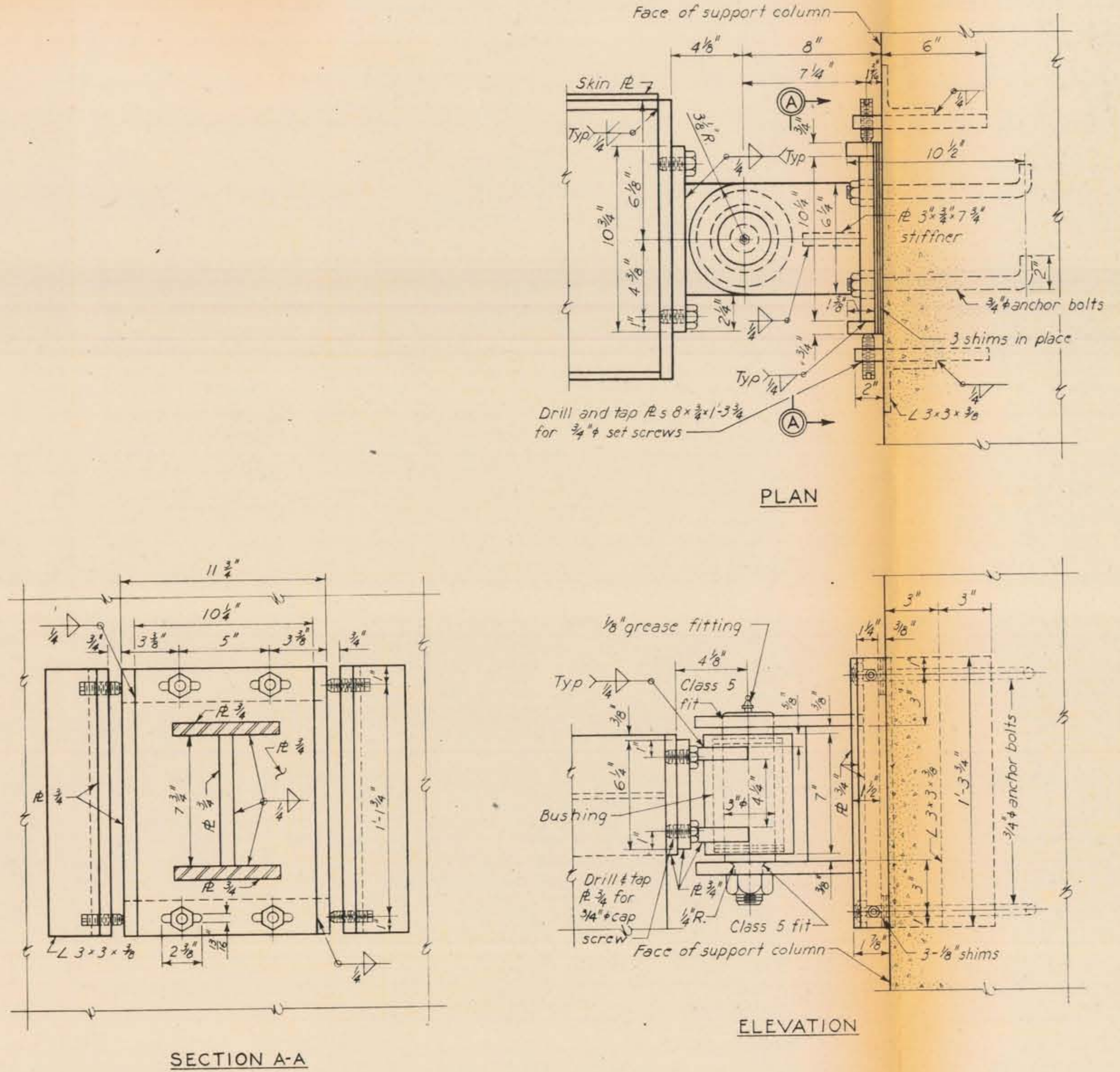


DETAIL "B"
Scale: Half Size

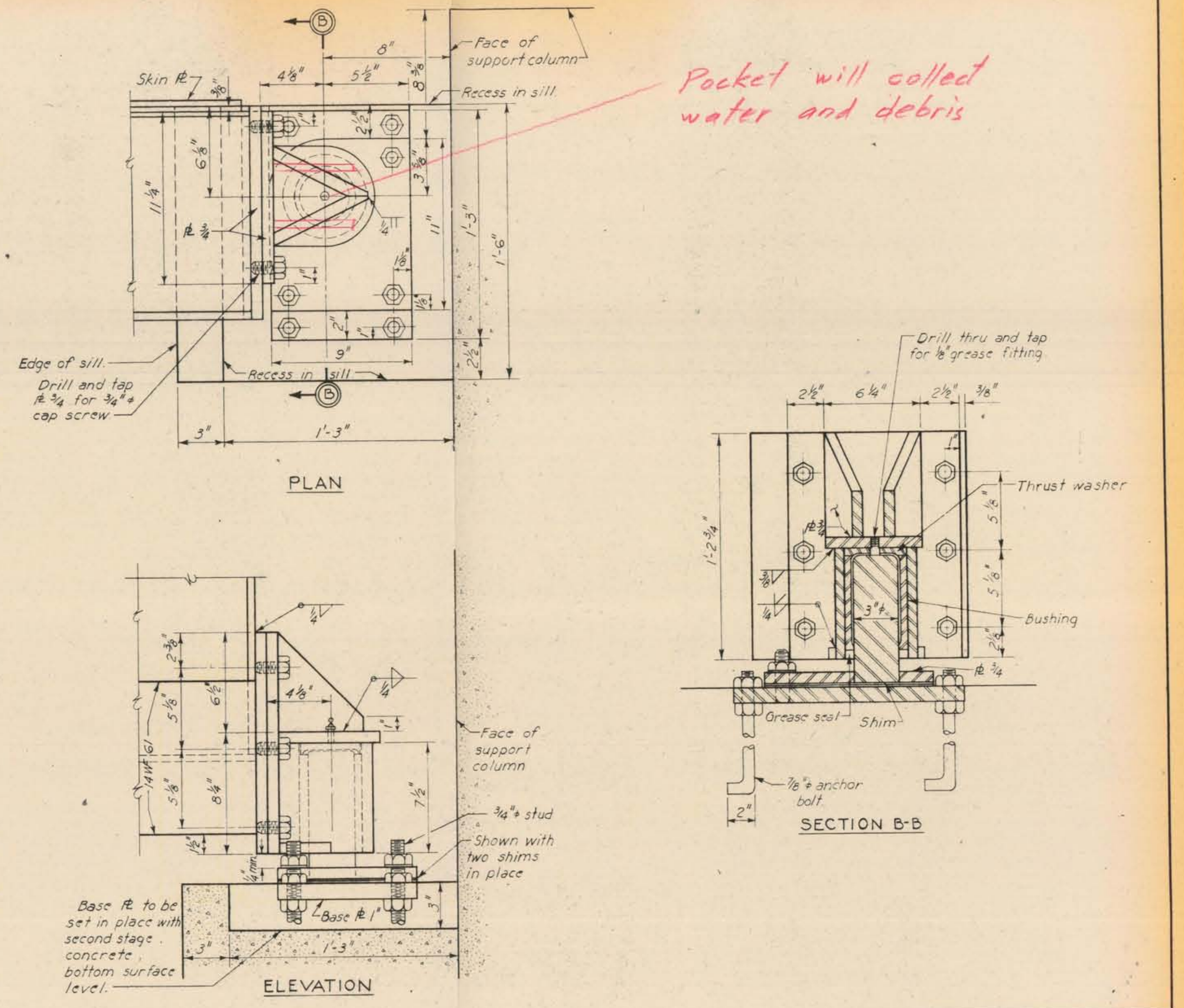


SWING GATE SEAL PLATE
Scale: 1½" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
SWING GATE
WEST AND EAST LEVEE
DETAILS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111



UPPER HINGE
Scale: 1½" = 1'-0"



LOWER HINGE
Scale: 1½" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

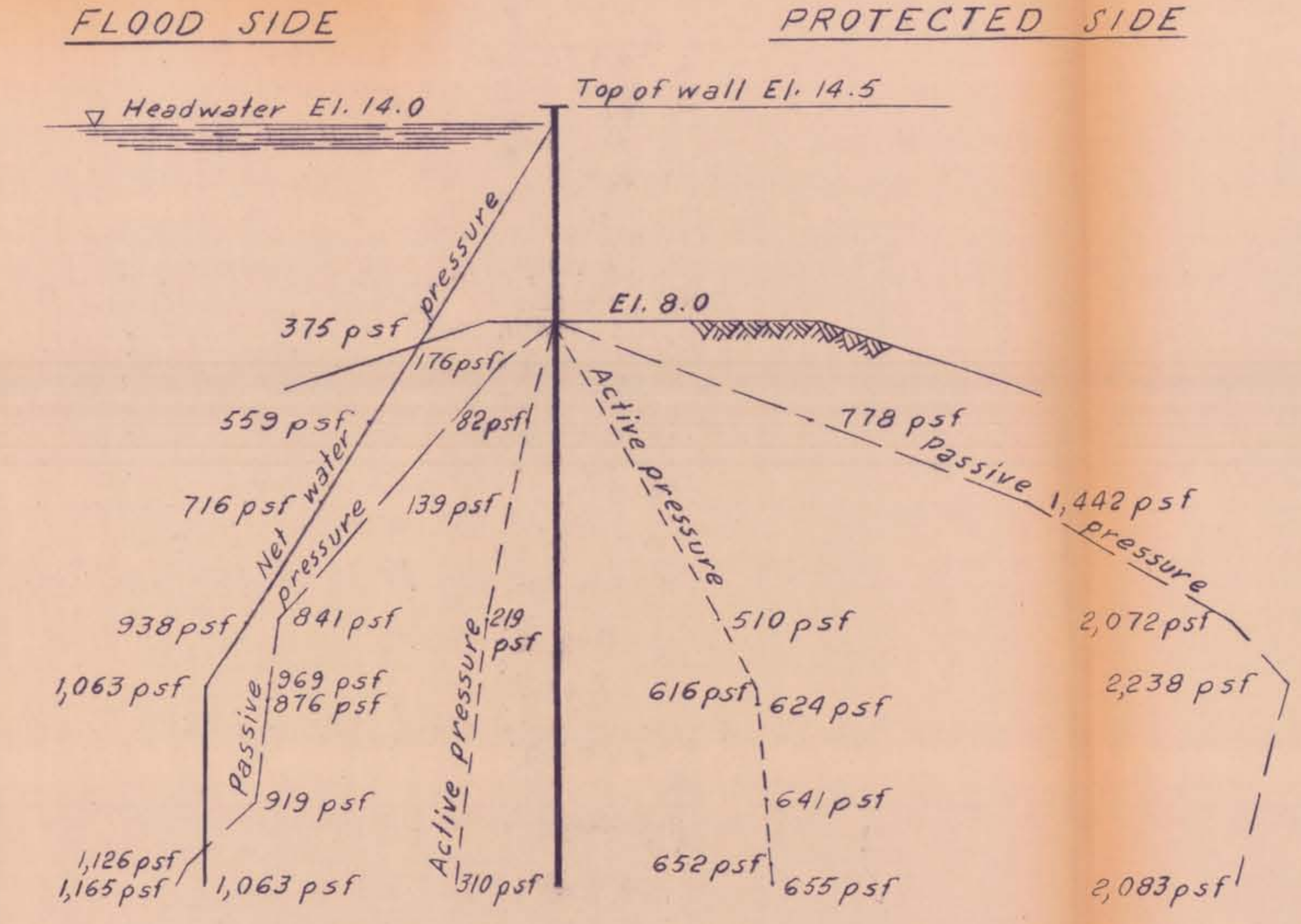
SWING GATE
WEST AND EAST LEVEE
HINGE DETAILS

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

FEBRUARY 1968

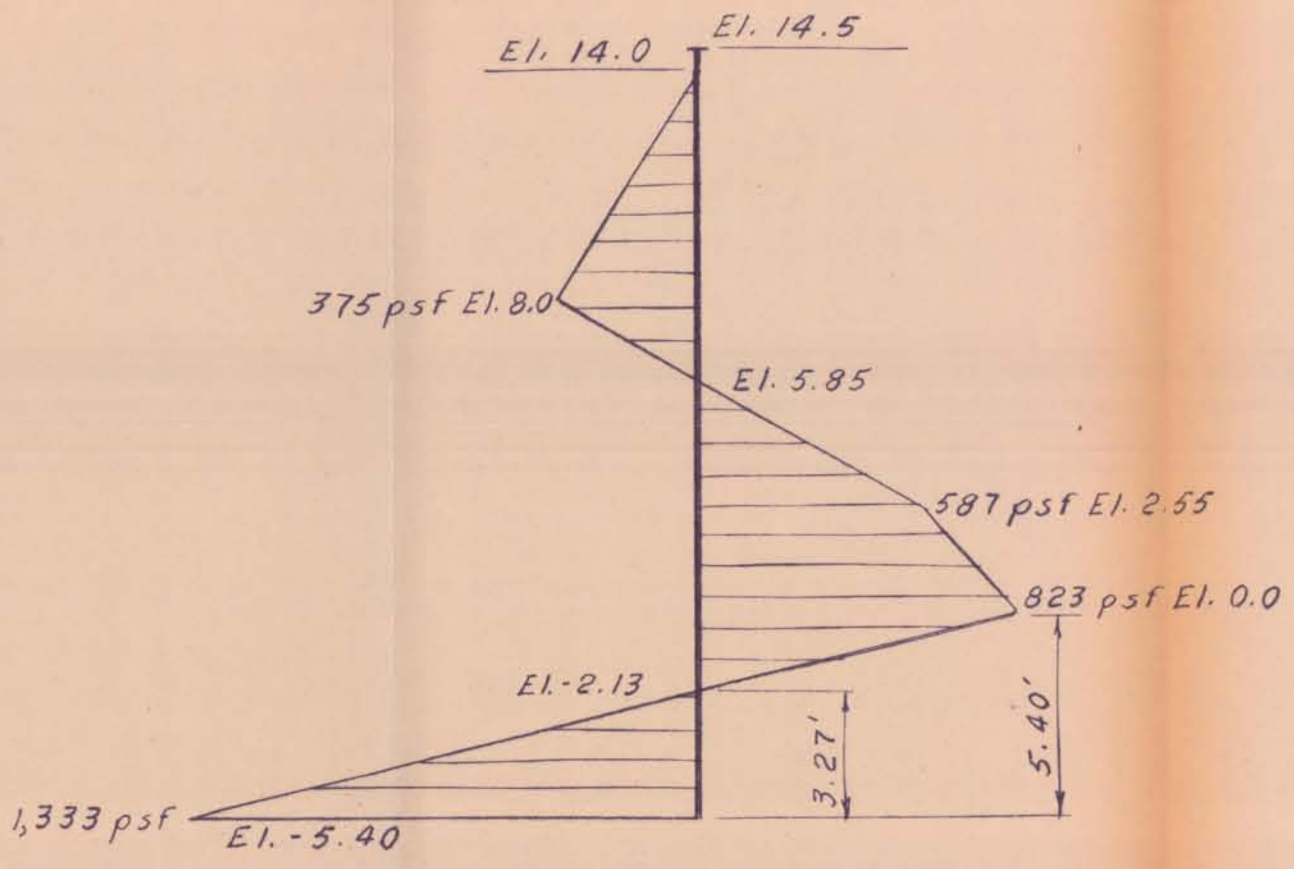
FILE NO. H-2-24111

PLATE IV-52



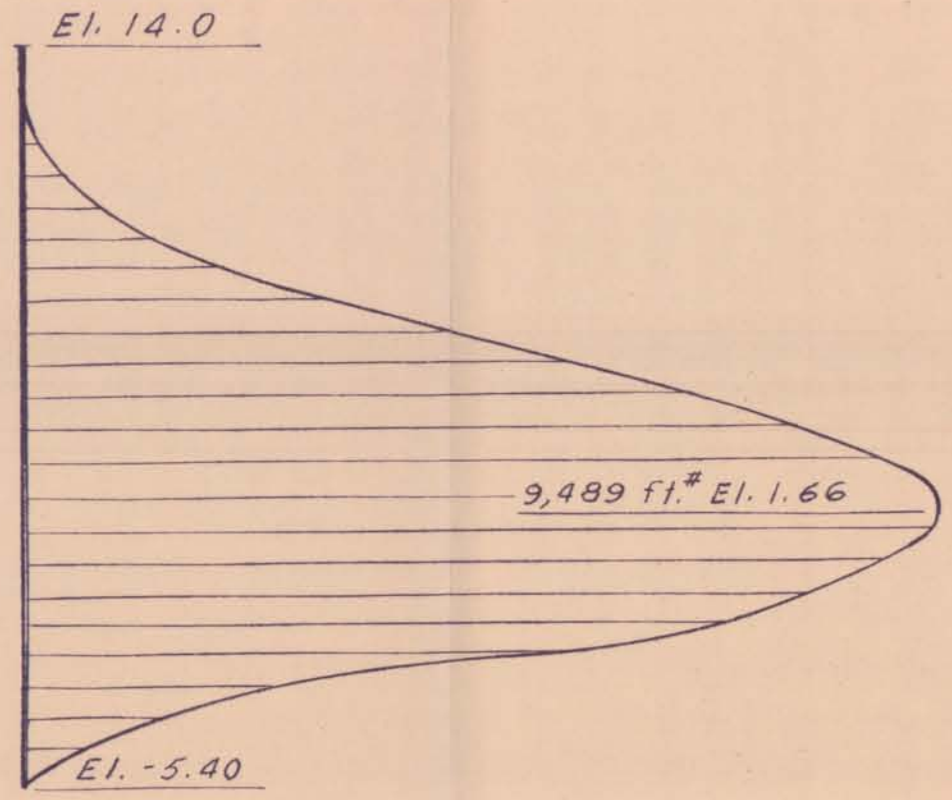
PRESSURE DIAGRAM (F. S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.313"

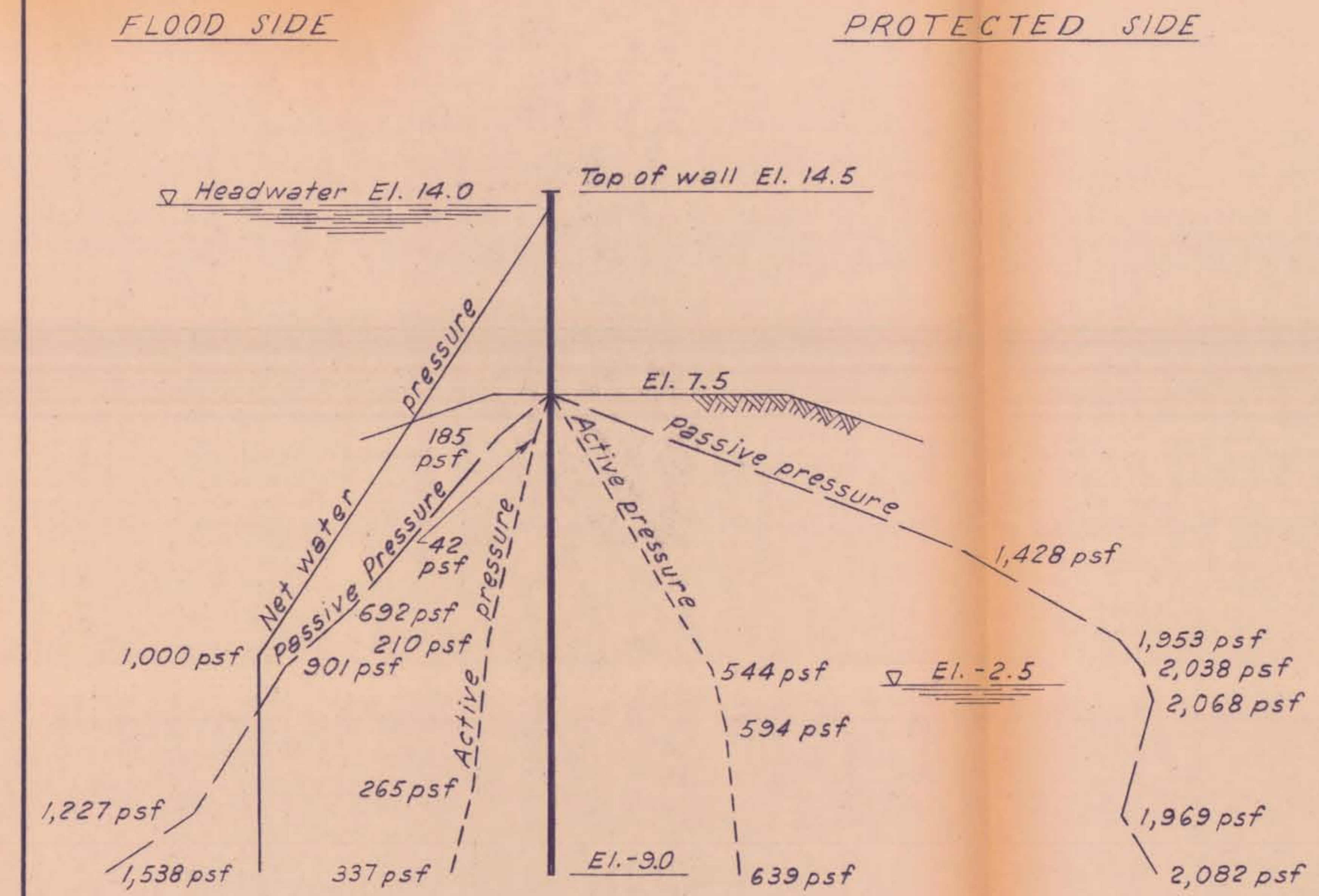
Note: Water at top of wall El. 14.5
Max. moment = 11,000 ft.#
Max. deflection = 0.377"
F.S. = 1.32

Scales: 1" = 5'
1" = 2,000 ft.#

STA. 61+00 TO STA. 70+00

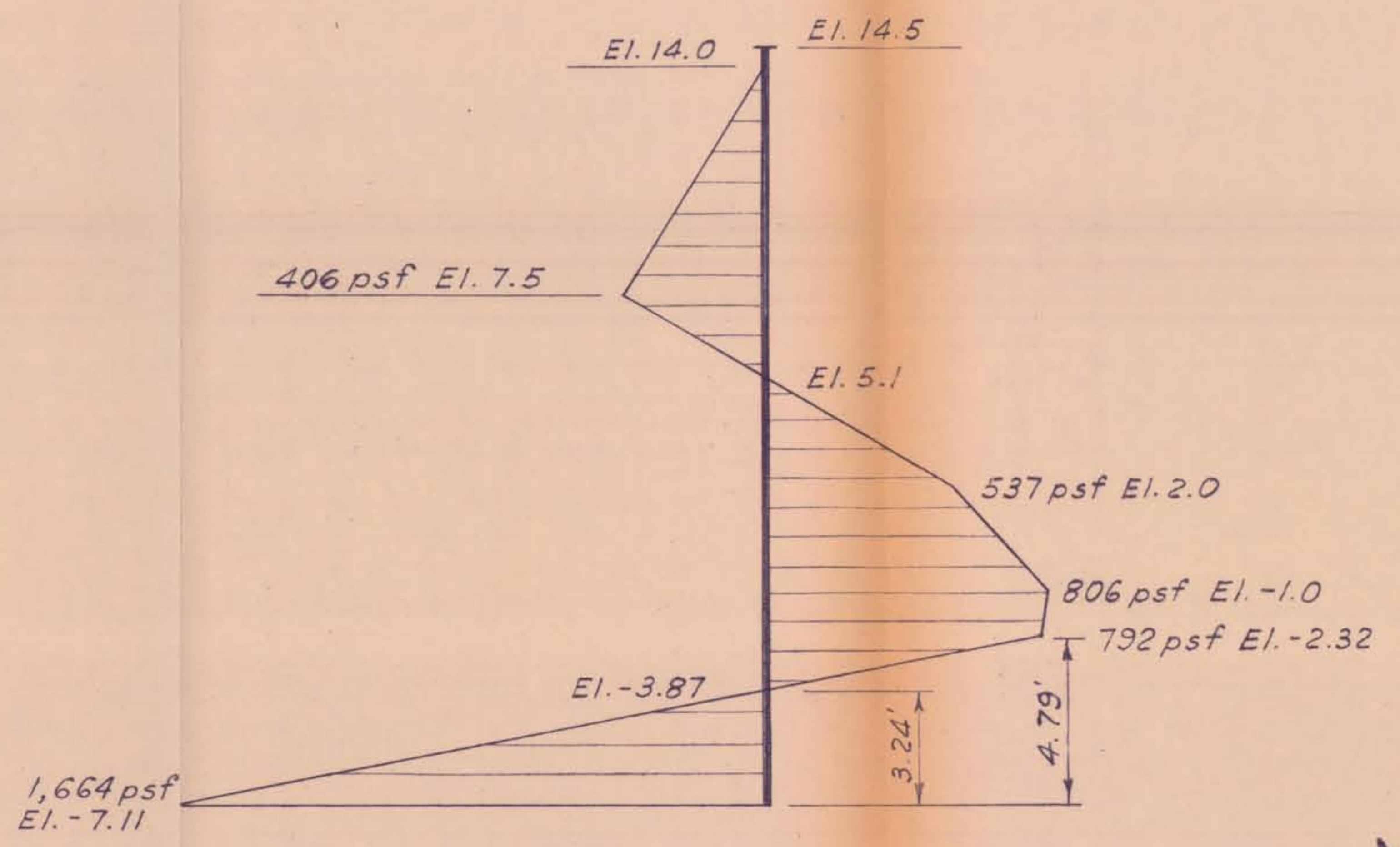
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
I-WALL DESIGN ANALYSIS
WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-1



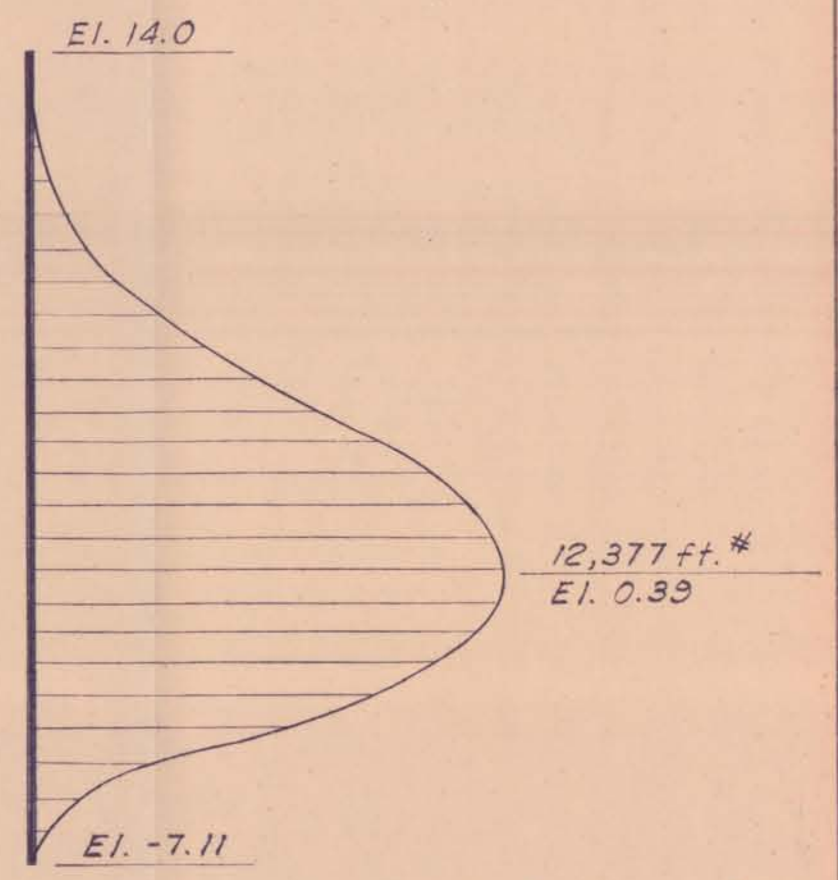
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.518"

Note: Water at top of wall El. 14.5
Max. moment = 14,147 ft.#
Max. deflection = 0.610"
F.S. = 1.36

Scales: 1" = 5'
1" = 5,000 ft.#

STA. 77+97 TO STA. 80+98

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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WEST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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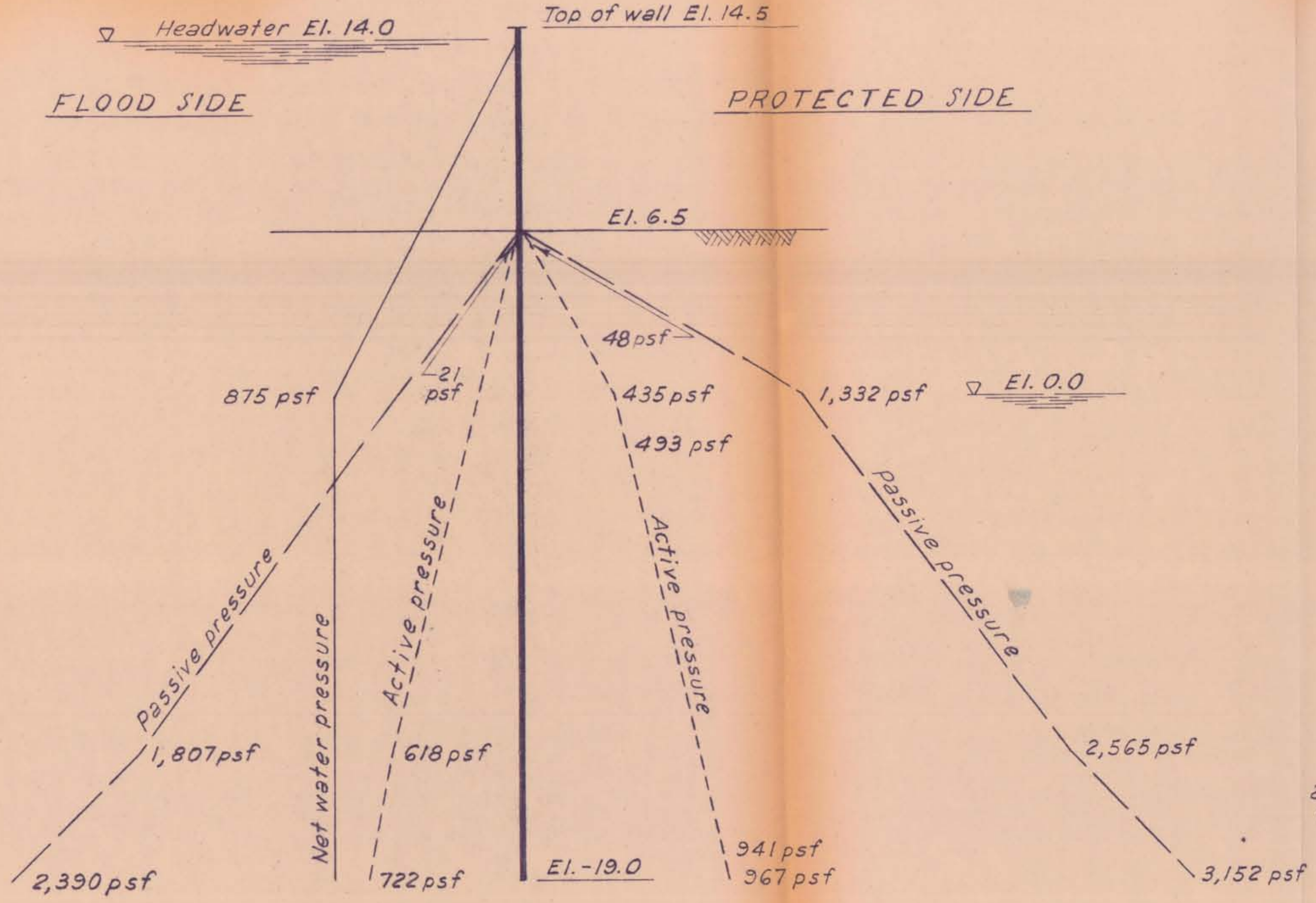
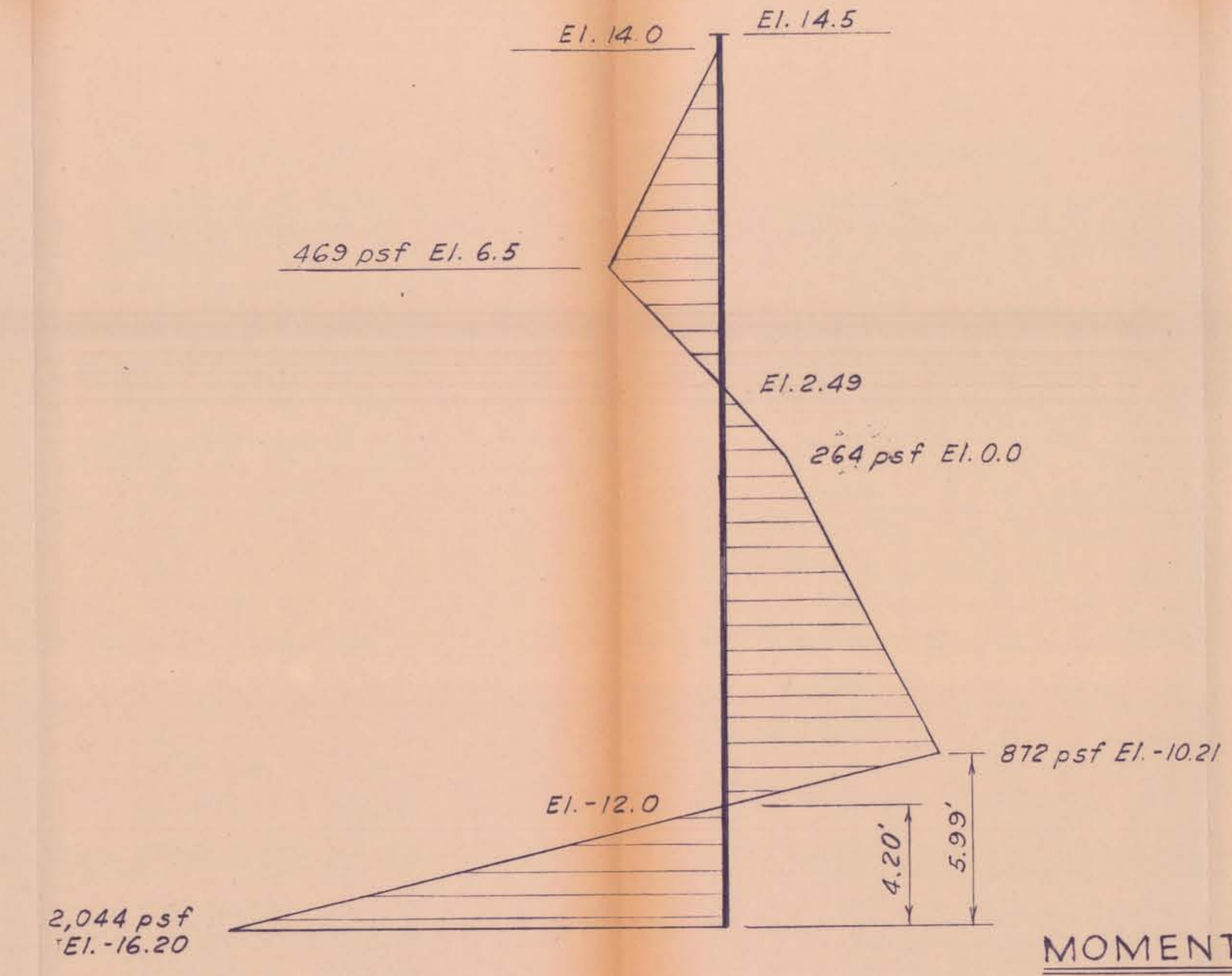
FIGURE 4-2



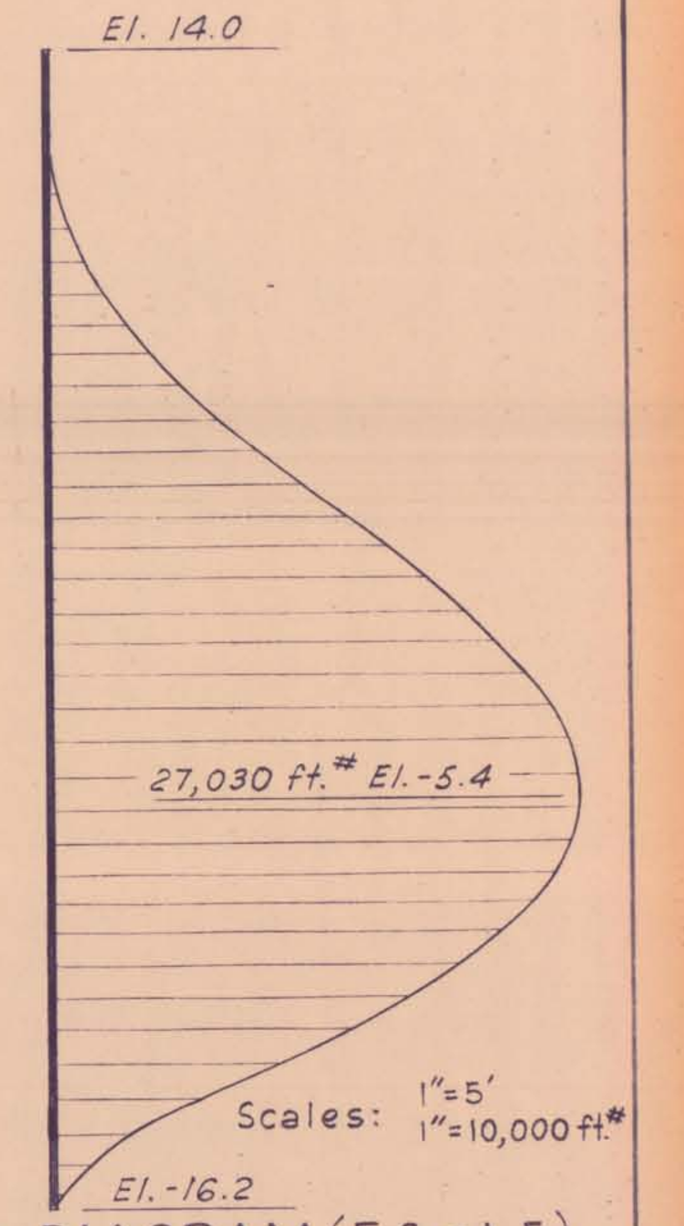
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 600 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 600 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 2.63"

Note: Water at top of wall El. 14.5
Max. moment = 31,165 ft.#
Max. deflection = 2.902"
F.S. = 1.41

STA. 106+01 TO STA. 115+65

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
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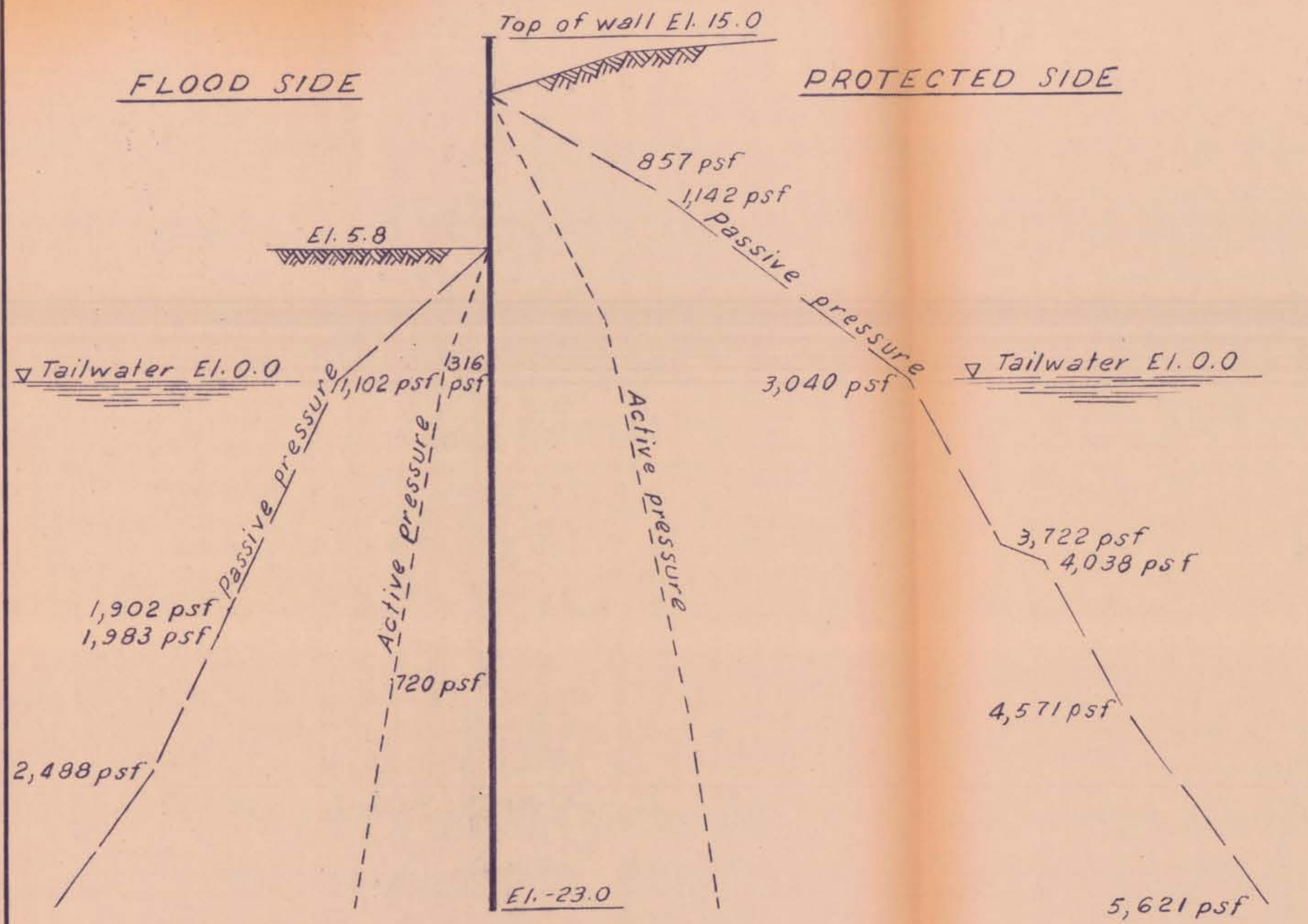
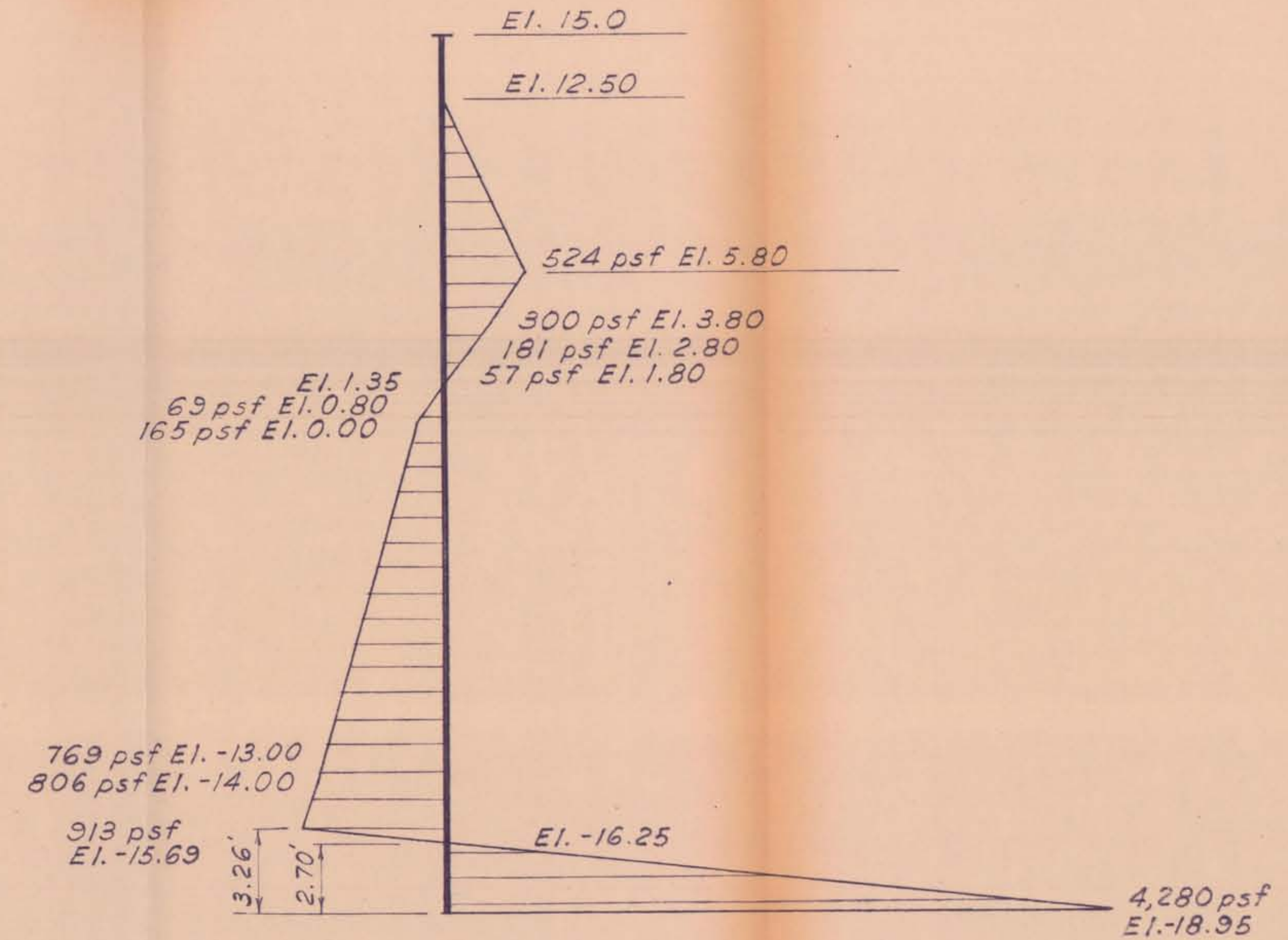
FIGURE 4-3



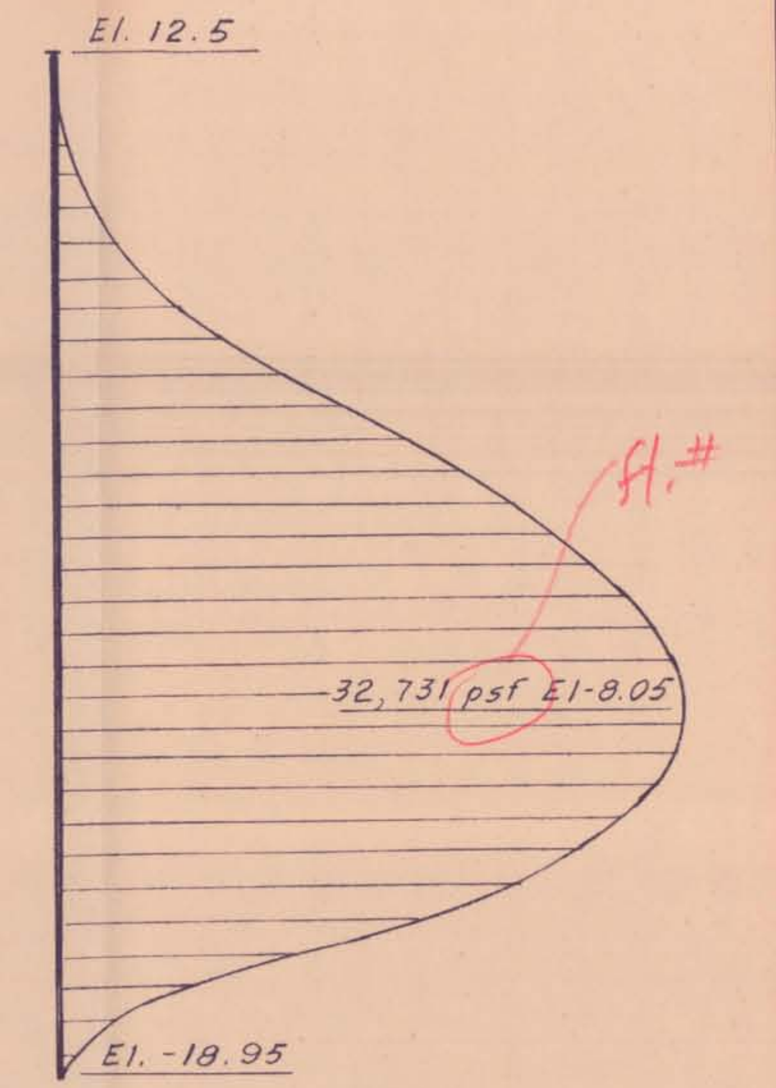
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 6'
1" = 1,000 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 6'
1" = 1,000 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 3.84"

Scales: 1" = 6'
1" = 10,000 psf

STA. 117+50 TO STA. 118+85

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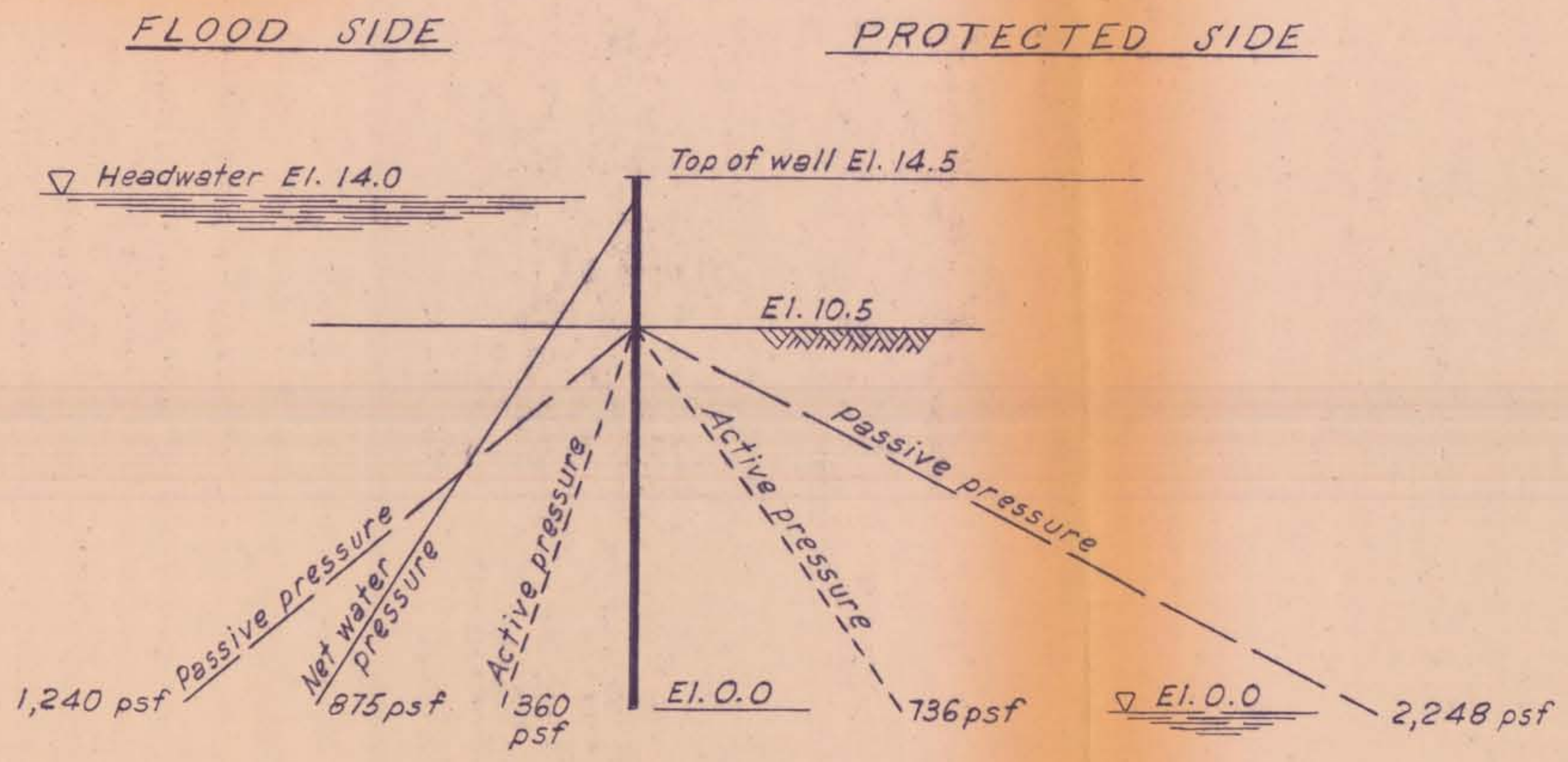
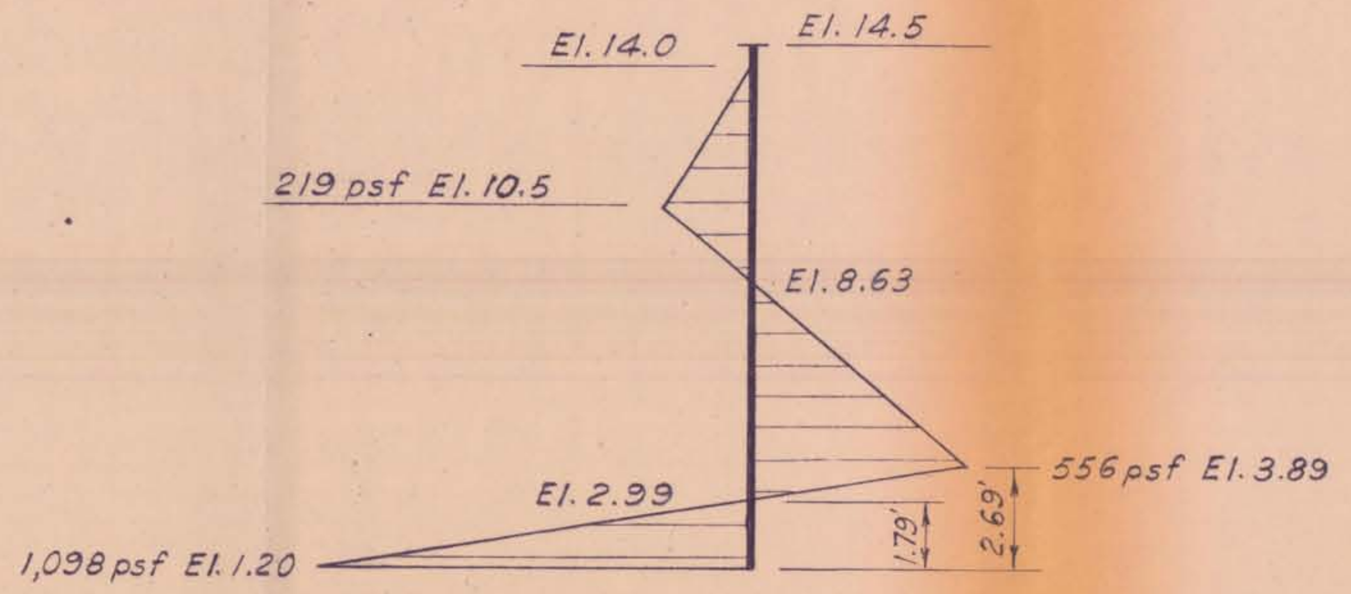
FIGURE 4-4



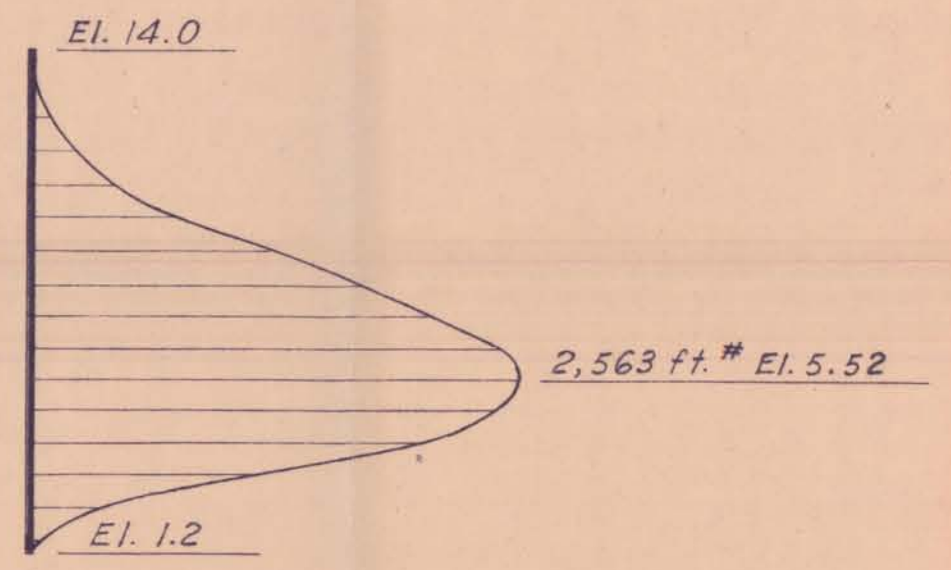
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.043"

Note: Water and shell at top of wall El. 14.5
Max. moment = 4,020 ft.#
Max. deflection = 0.057"
F.S. = 1.17

Scales: 1" = 5'
1" = 1,000 ft.#

STA. 119+59 TO STA. 132+00

LAKE PONTCHARTRAIN, LA. AND VICINITY
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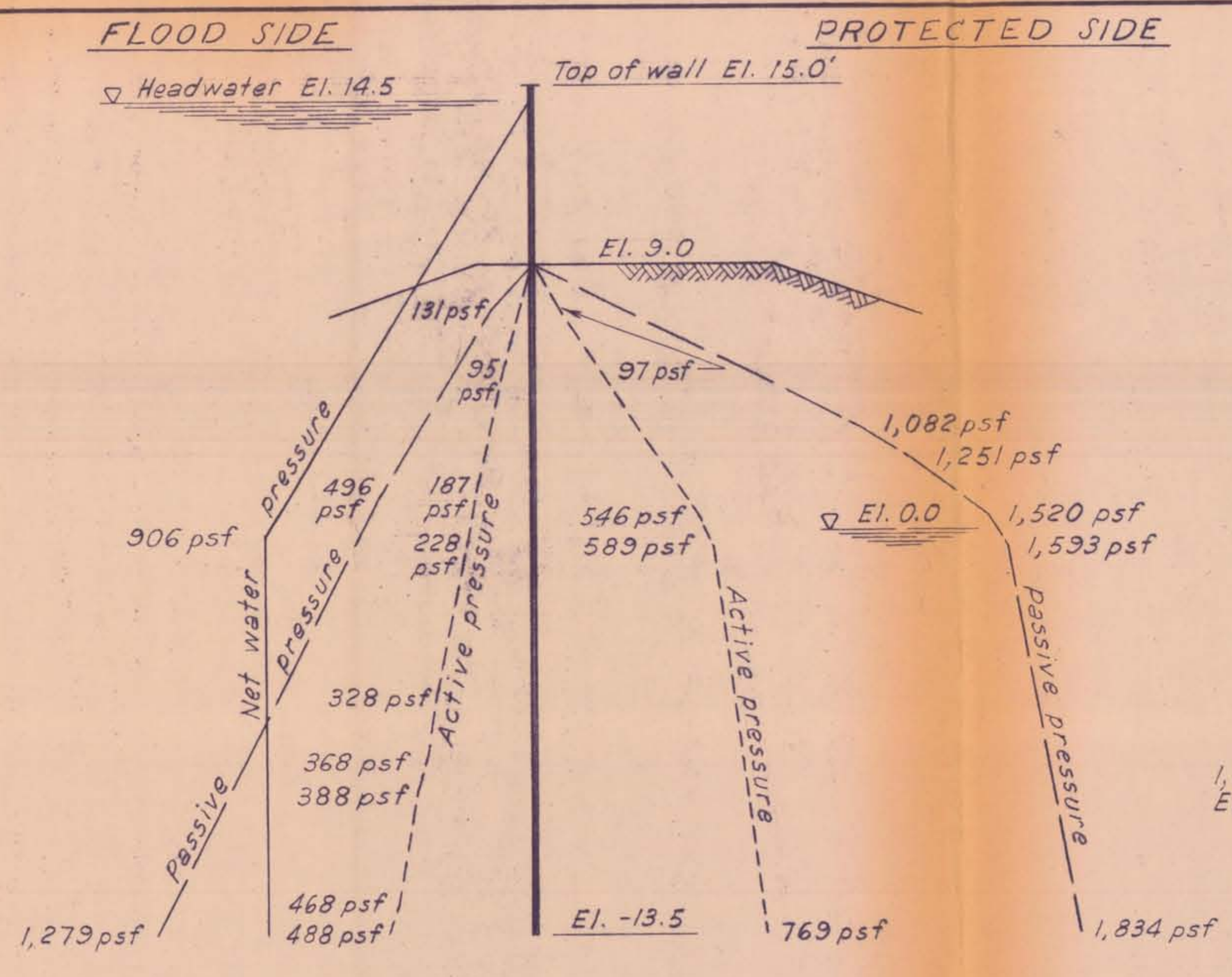
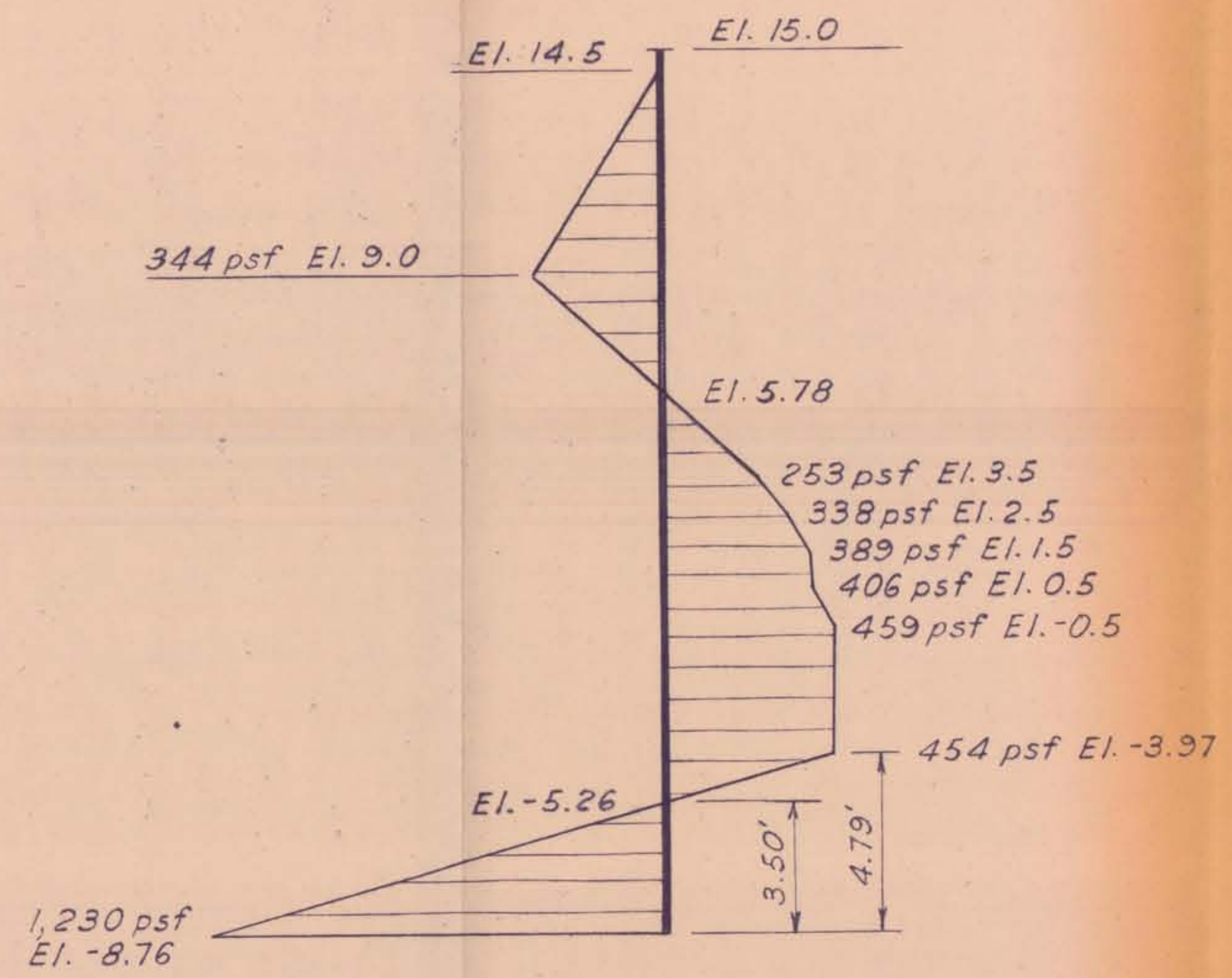
FIGURE 4-5



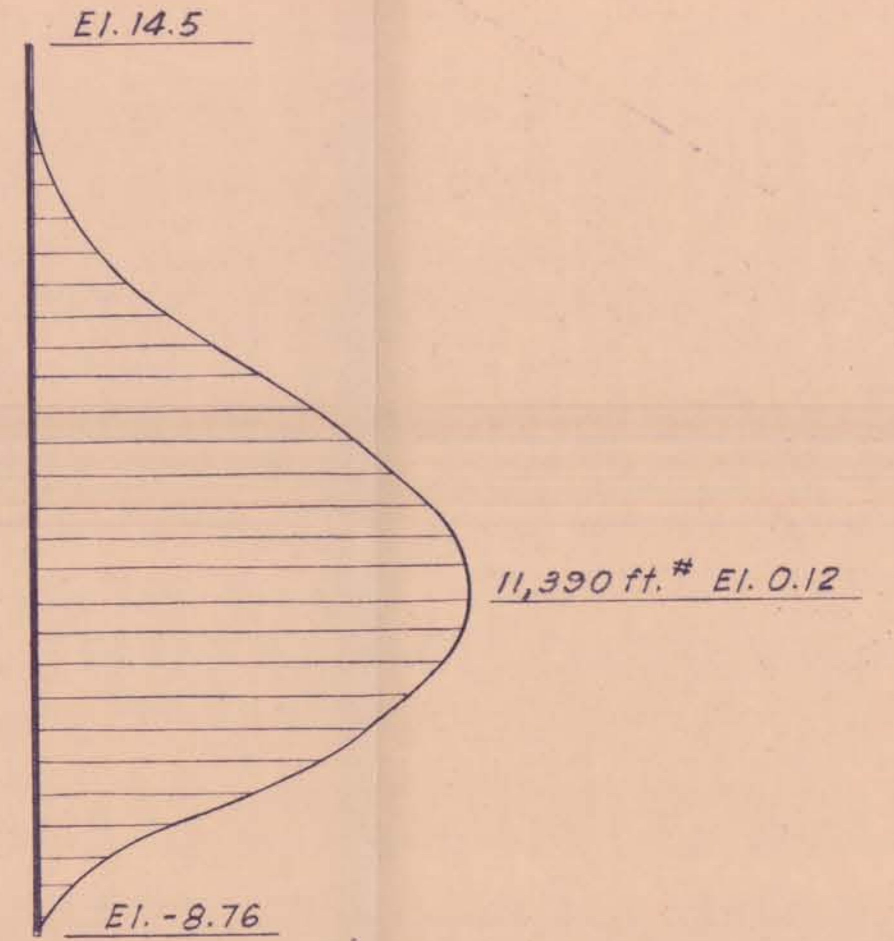
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.661"

Note: Water at top of wall El. 15.0
Max. moment = 13,194 ft.#
Max. deflection = 0.691"
F. S. = 1.35

Scales: 1" = 5'
1" = 5,000 ft.#

STA. 132+00 TO STA. 137+42

LAKE PONTCHARTRAIN, LA. AND VICINITY
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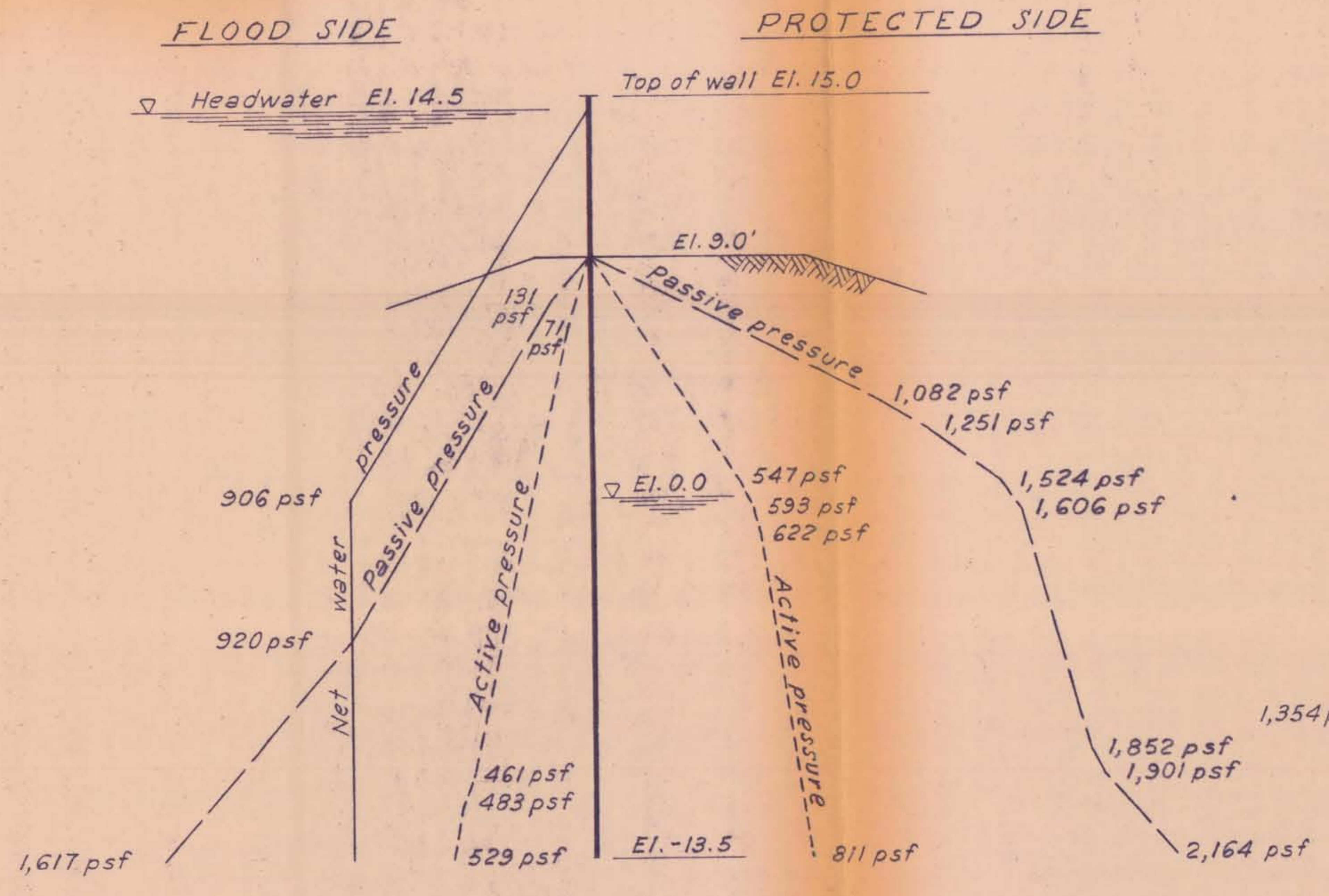
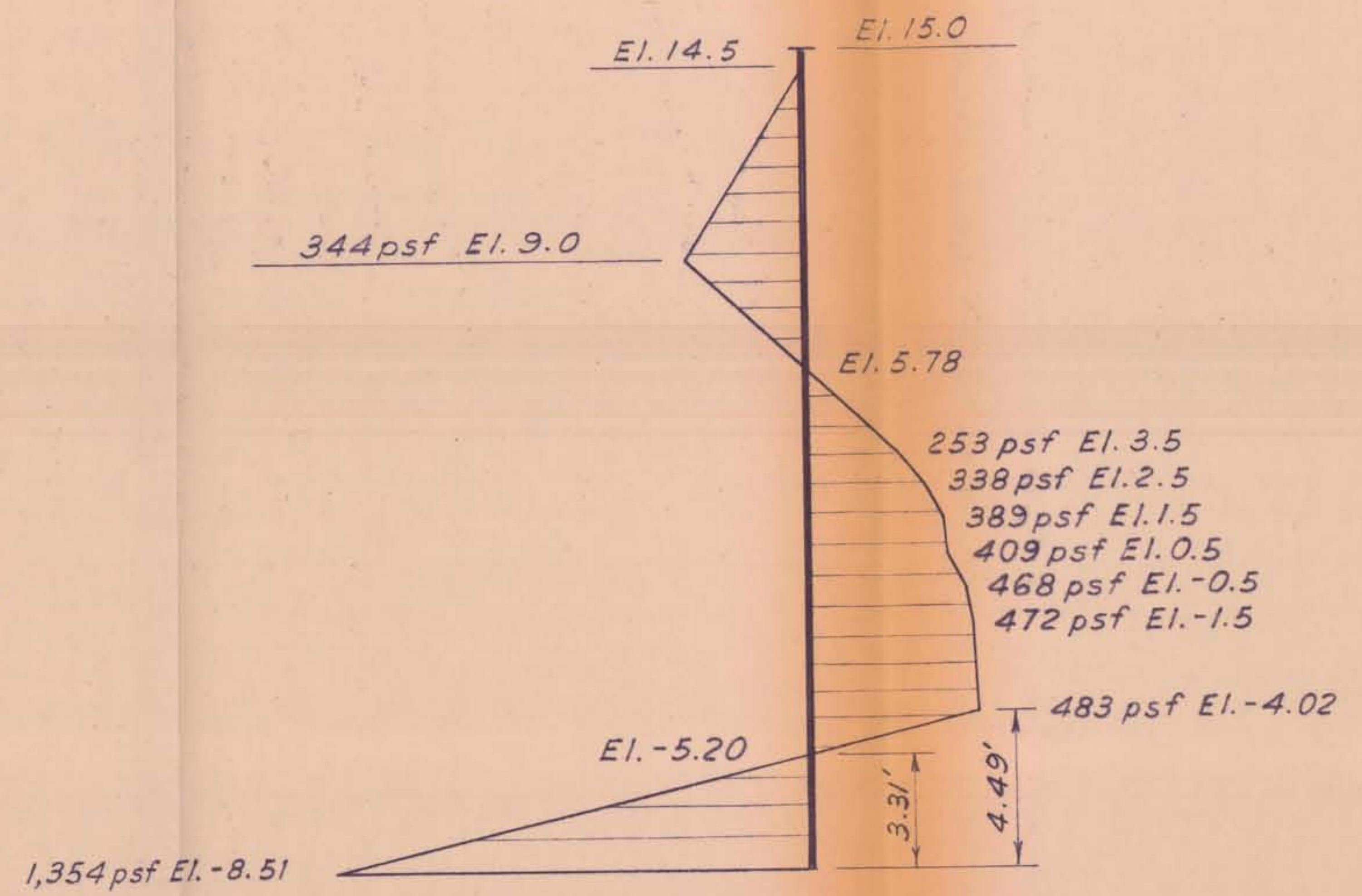
FIGURE 4-6



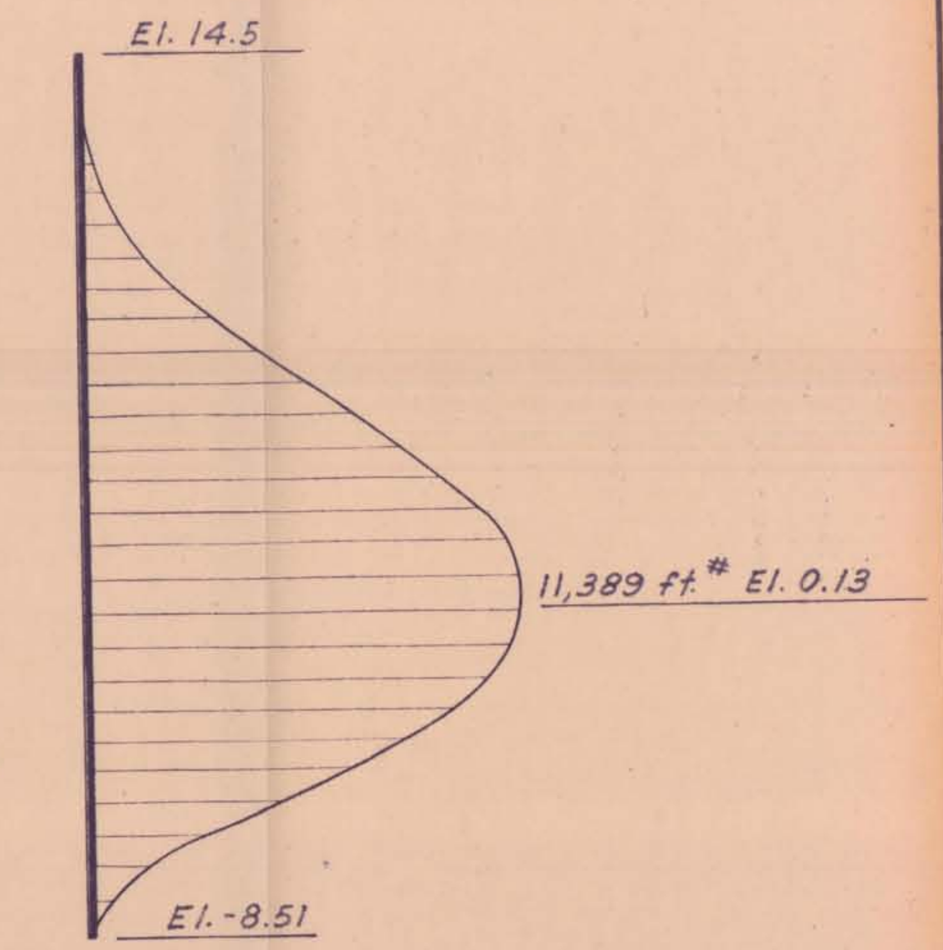
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.652"

Note: Water at top of wall El. 15.0
Max. moment = 13,194 ft.#
Max. deflection = 0.681"
F. S. = 1.35

Scales: 1" = 5'
1" = 5,000 ft.#

STA. 141+20 TO STA. 143+76

LAKE PONTCHARTRAIN, LA. AND VICINITY
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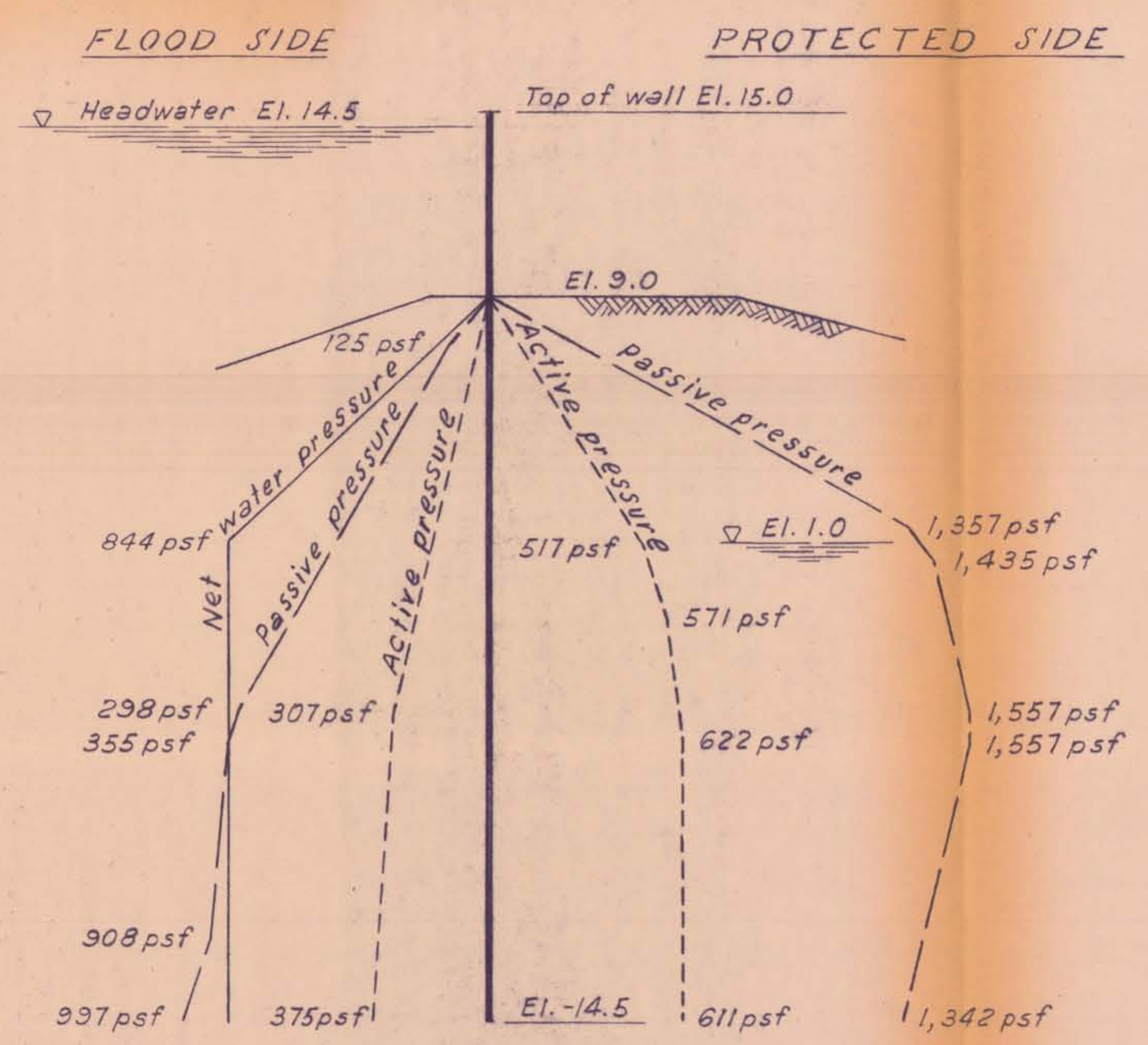
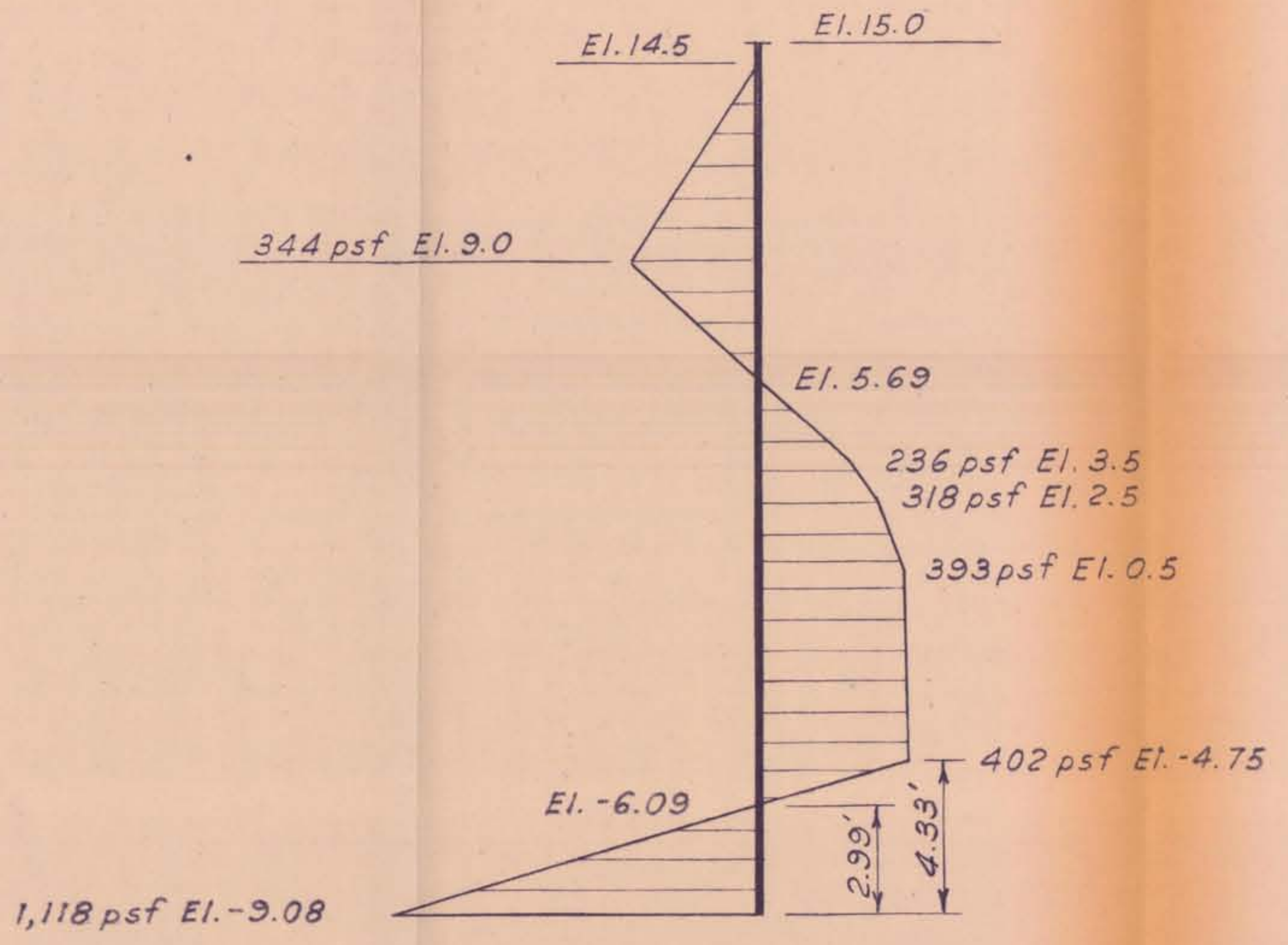
FIGURE 4-7



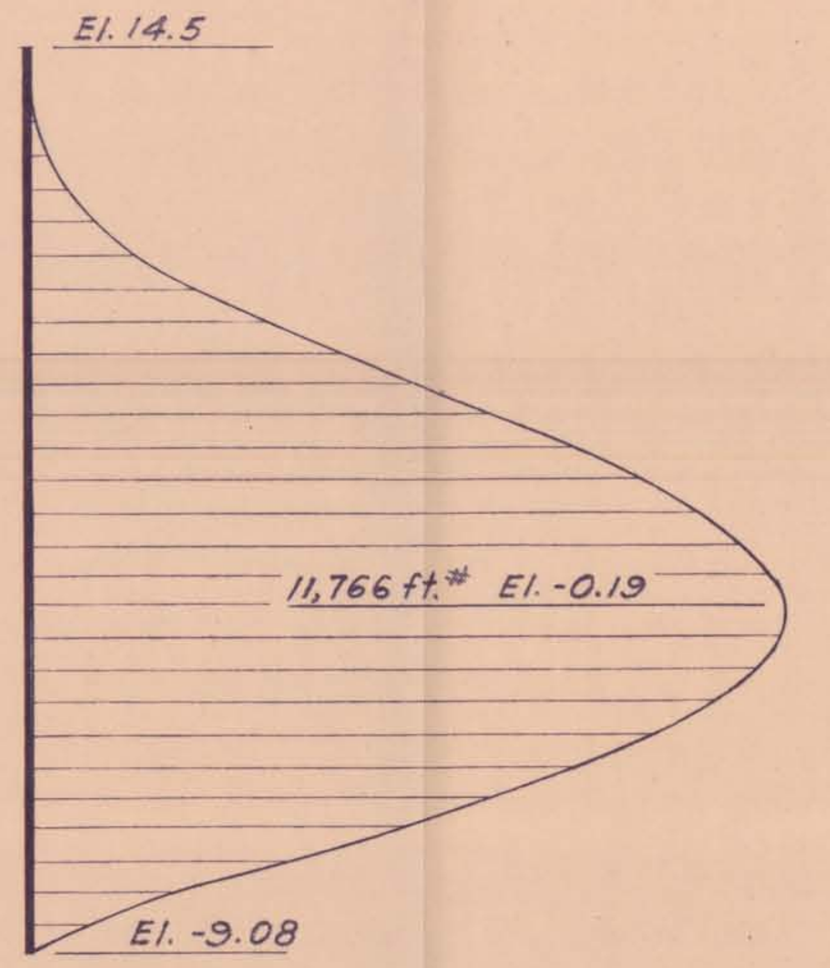
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.720"

Note: Water at top of wall El. 15.0
Max. moment = 13,609 ft.#
Max. deflection = 0.790"
F.S. = 1.35

Scales: 1" = 5'
1" = 3,000 ft.#

STA. 147+97 TO STA. 210+10

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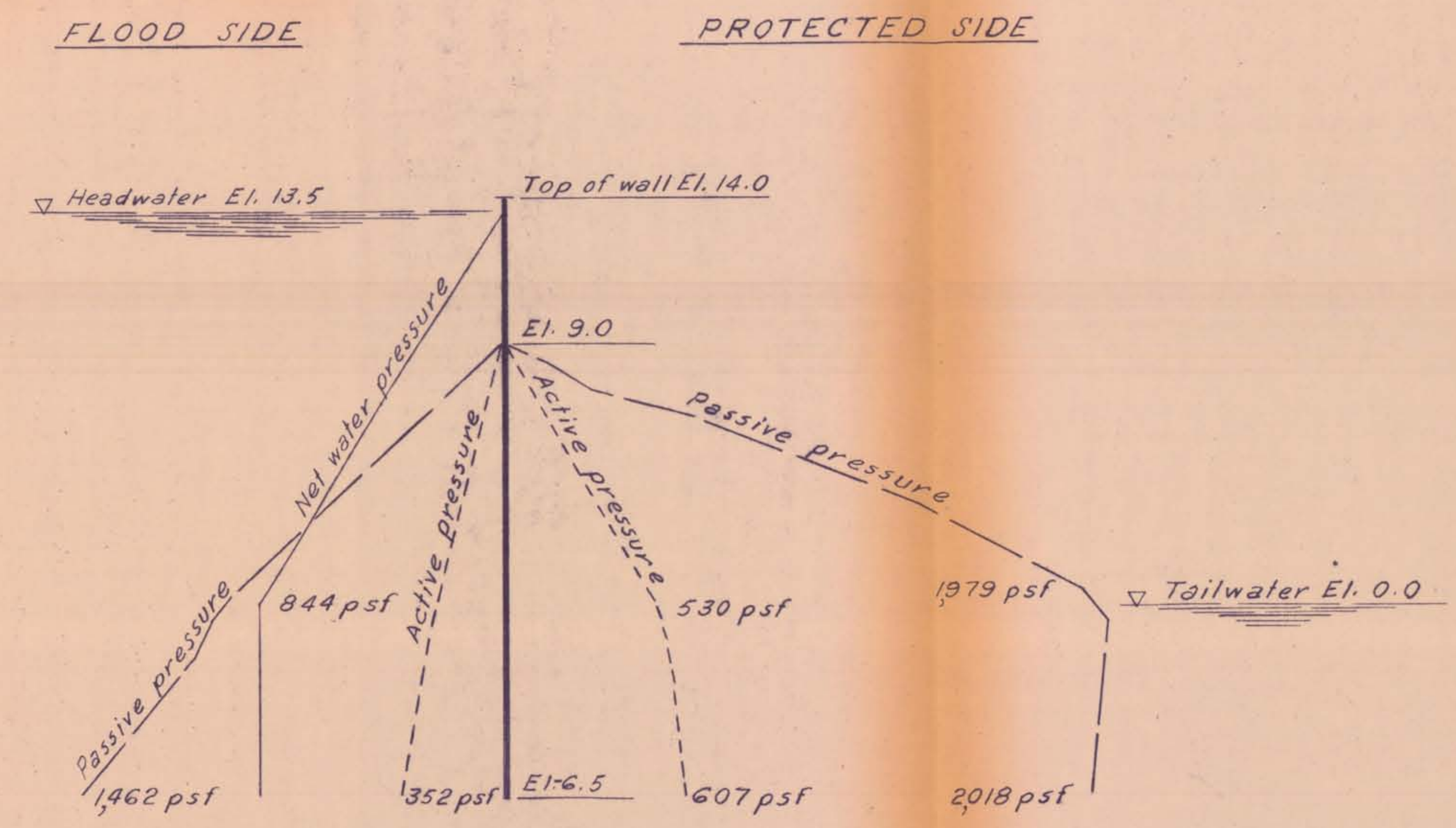
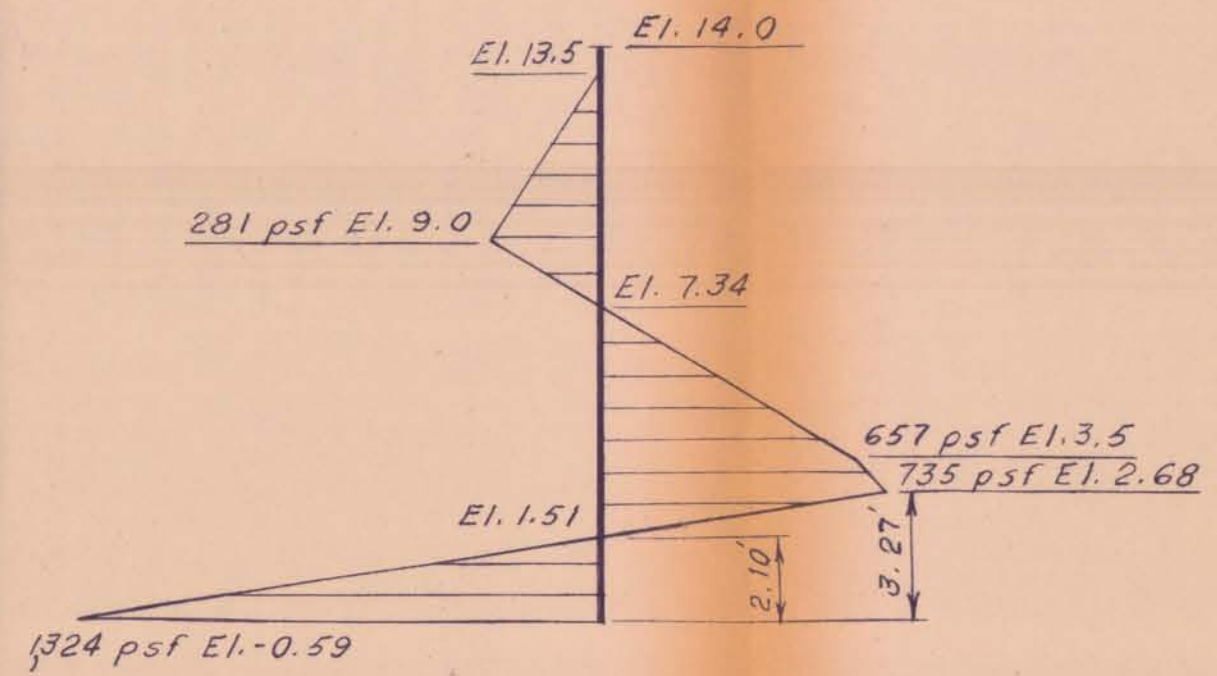
FIGURE 4-8



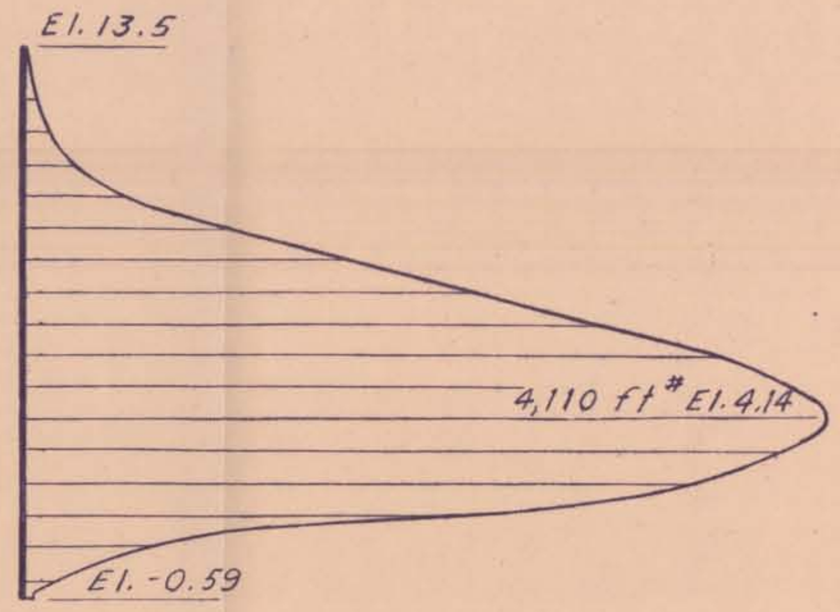
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.074"

Note: Water at top of wall El. 14.0
Max. moment = 4,824 ft#
Max. deflection = 0.088"
F.S. = 1.27

Scales: 1" = 5'
1" = 1,000 ft.#

STA. 37+75 TO STA. 47+00

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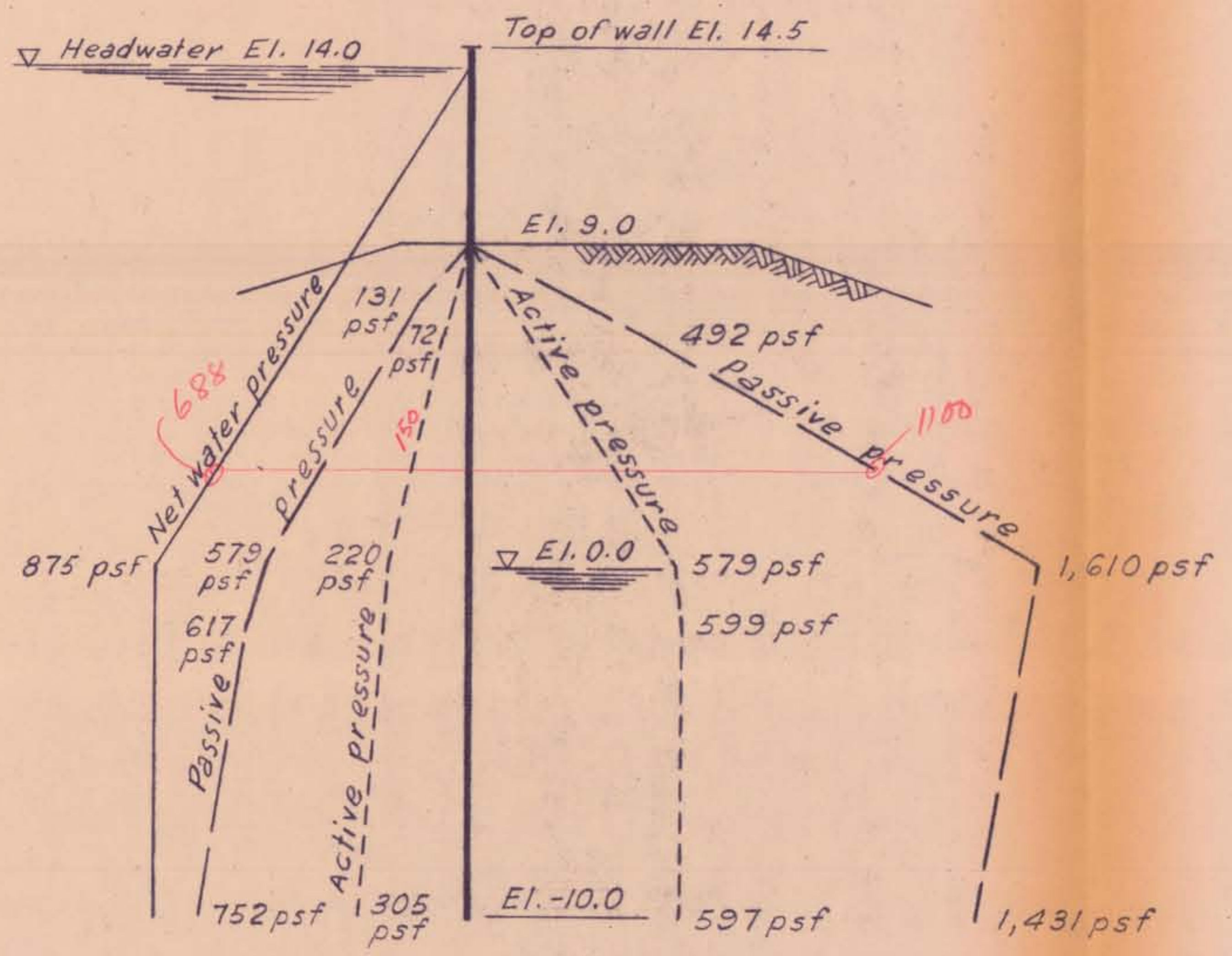
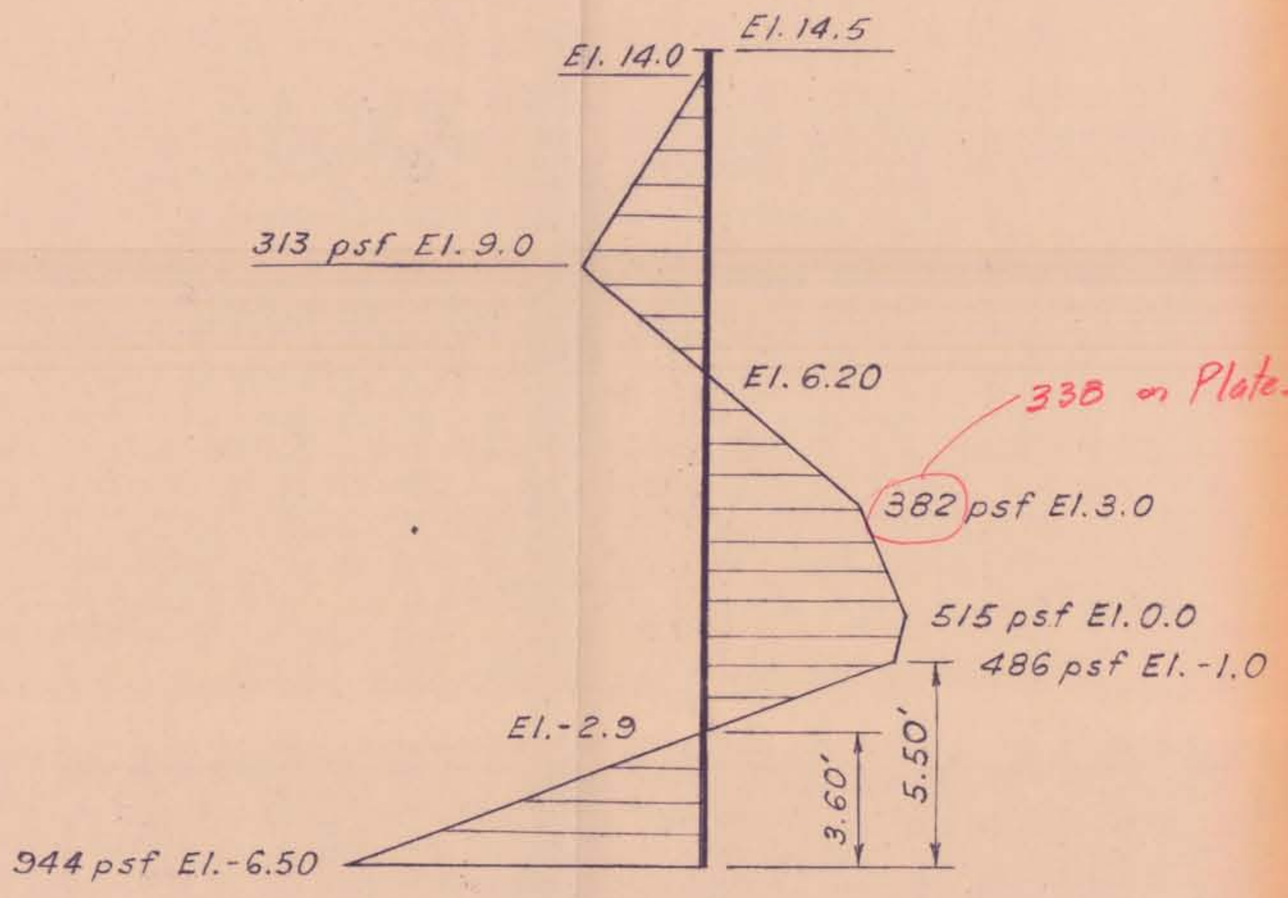
FIGURE 4-9



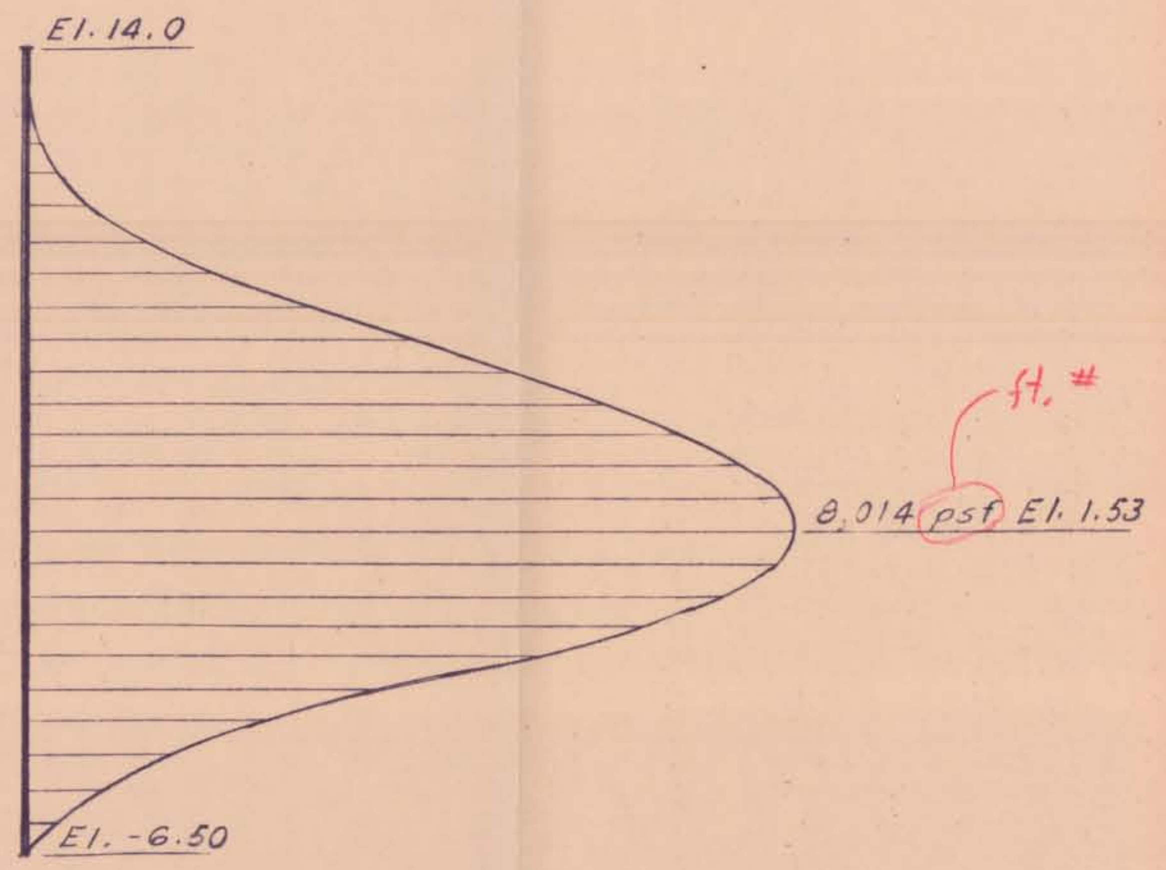
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.337"

Note: Water at top of wall El. 14.5
Max. moment = 9,763 ft.#
Max. deflection = 0.437"
F.S. = 1.31

Scales: 1" = 5'
1" = 2,000 ft.#

STA. 59+10 TO STA. 60+00

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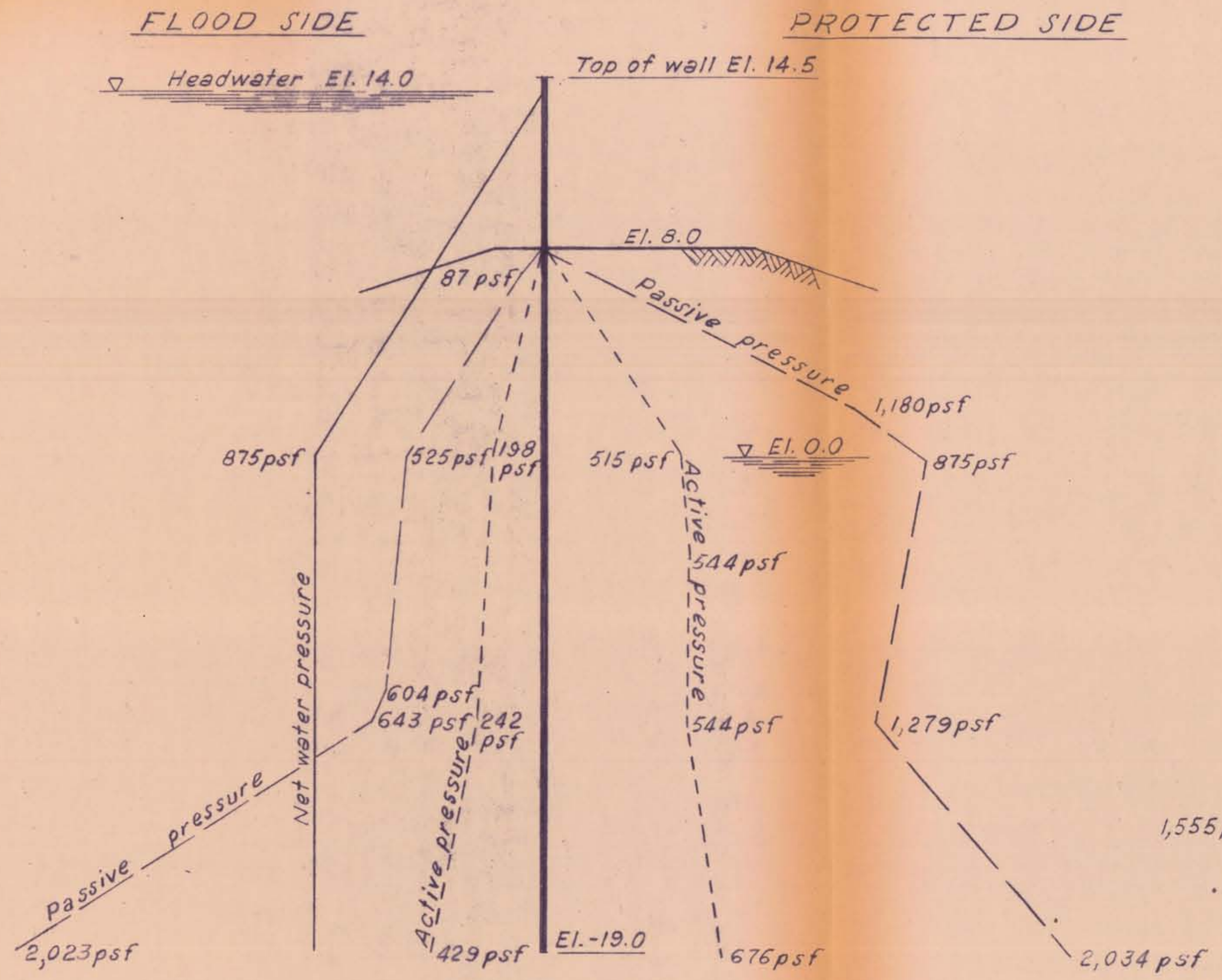
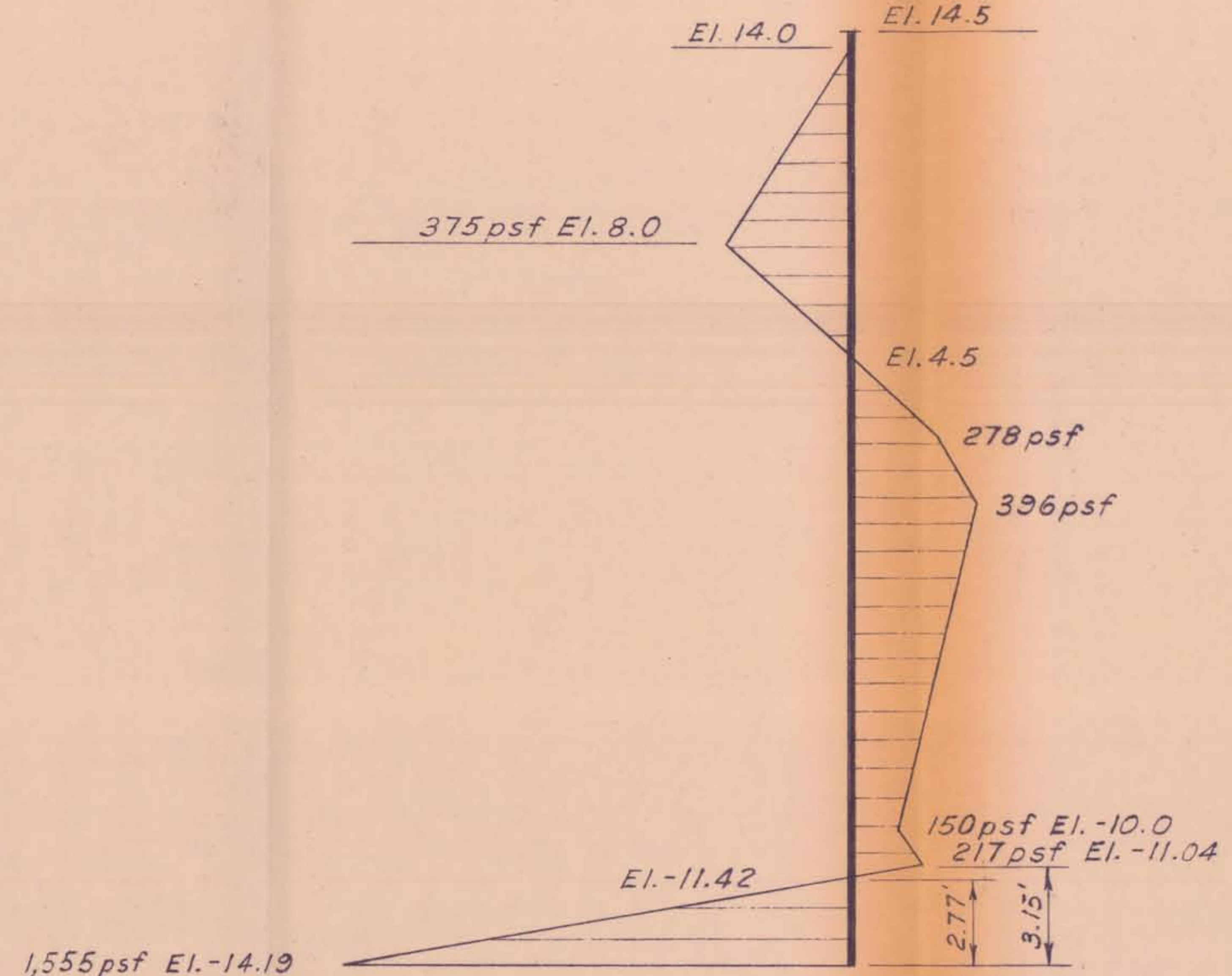
FIGURE 4-10



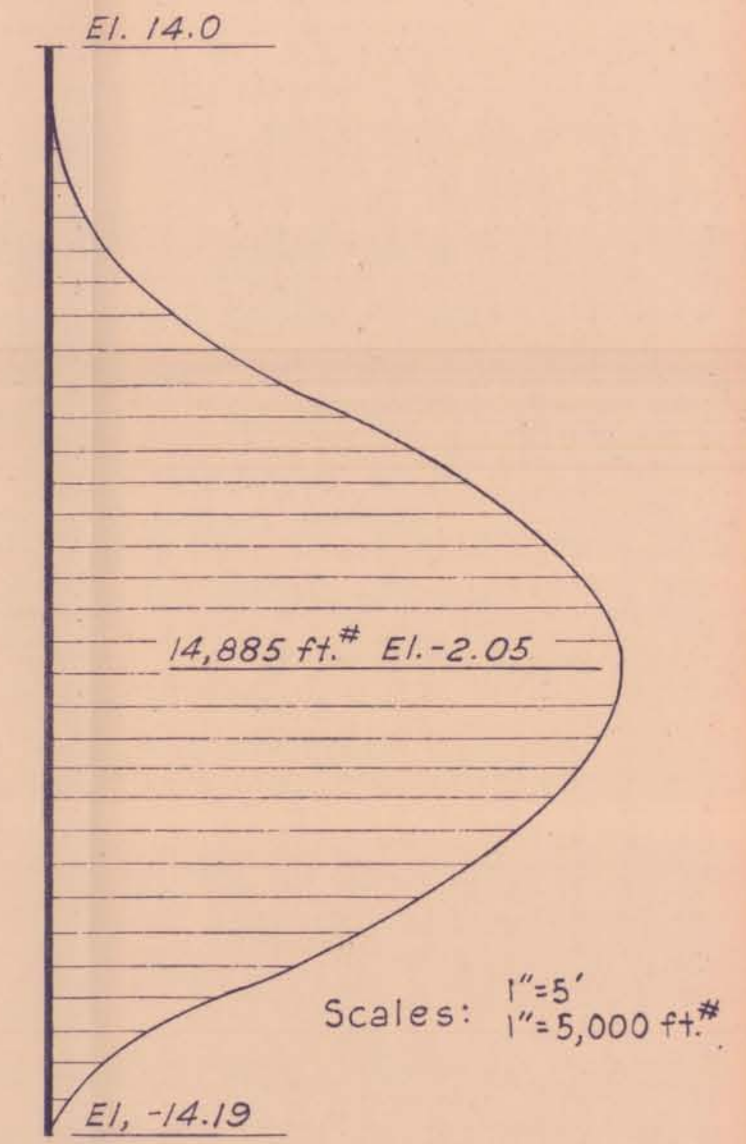
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



Scales: 1" = 5'
1" = 5,000 ft.#

MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 1.255"

Note: Water at top of wall El. 14.5
Max. moment = 17,365 ft.#
Max. deflection = 1.449"
F.S. = 1.37

STA. 60+10 TO STA. 60+60

LAKE PONTCHARTRAIN, LA. AND VICINITY
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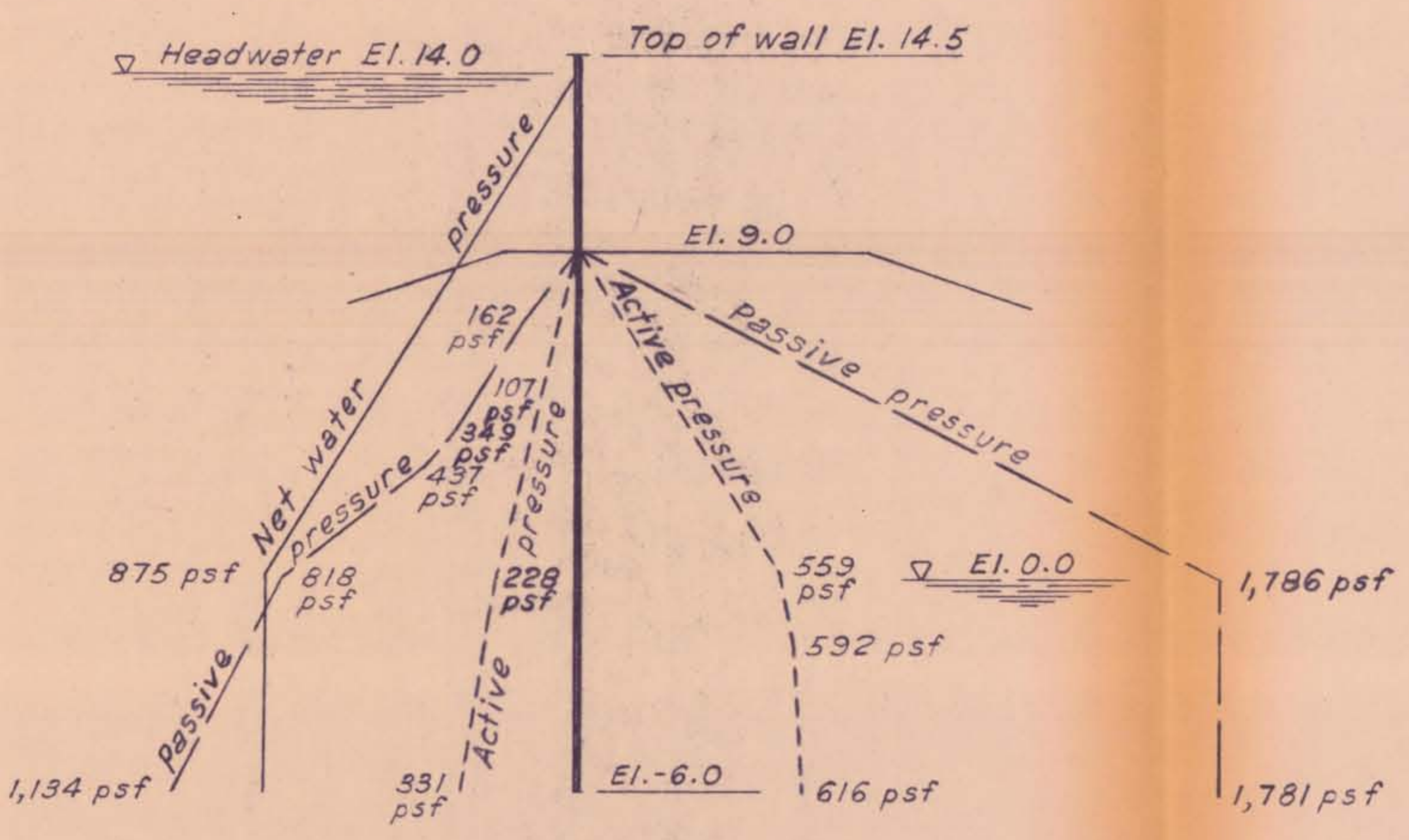
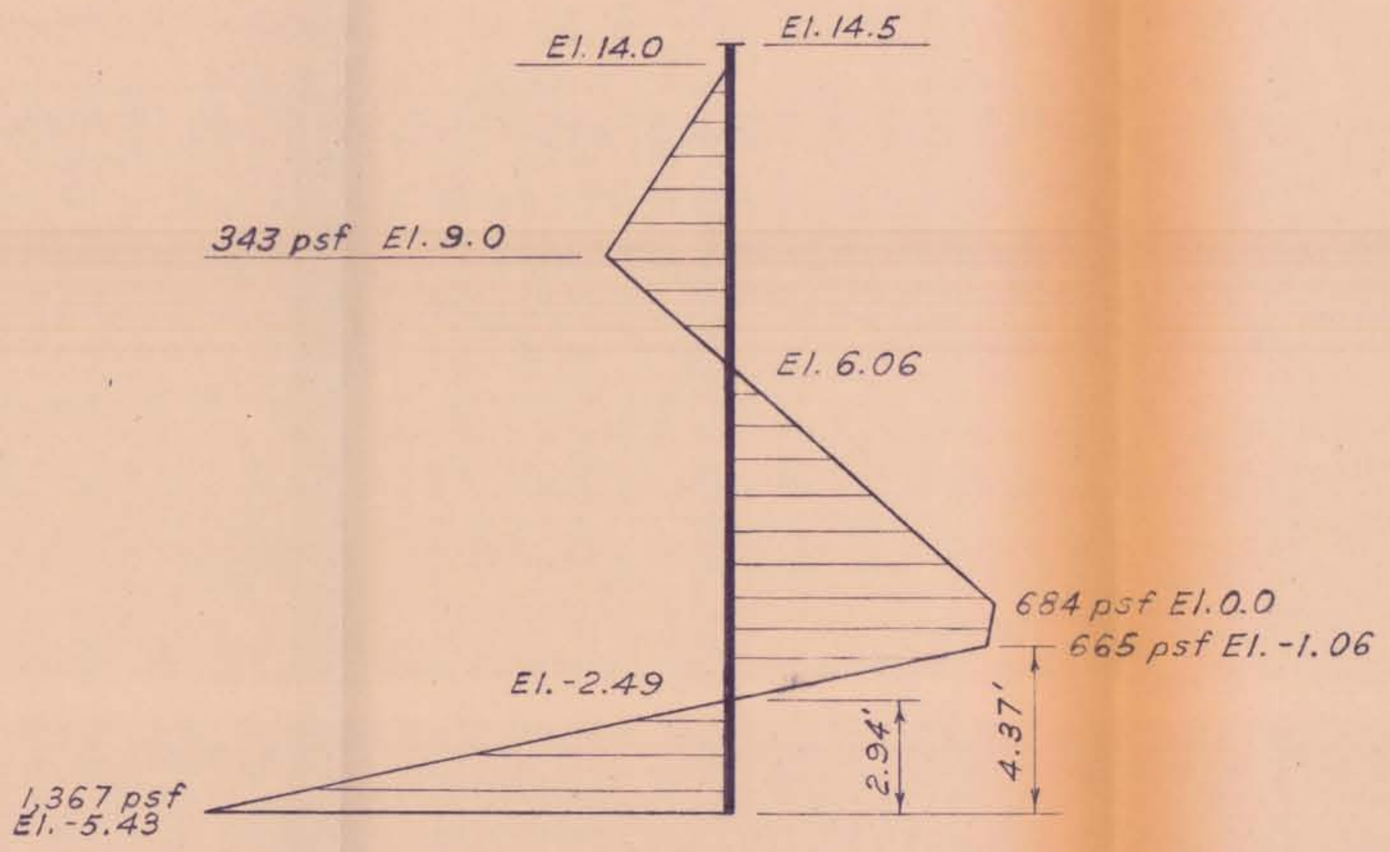
FIGURE 4-11



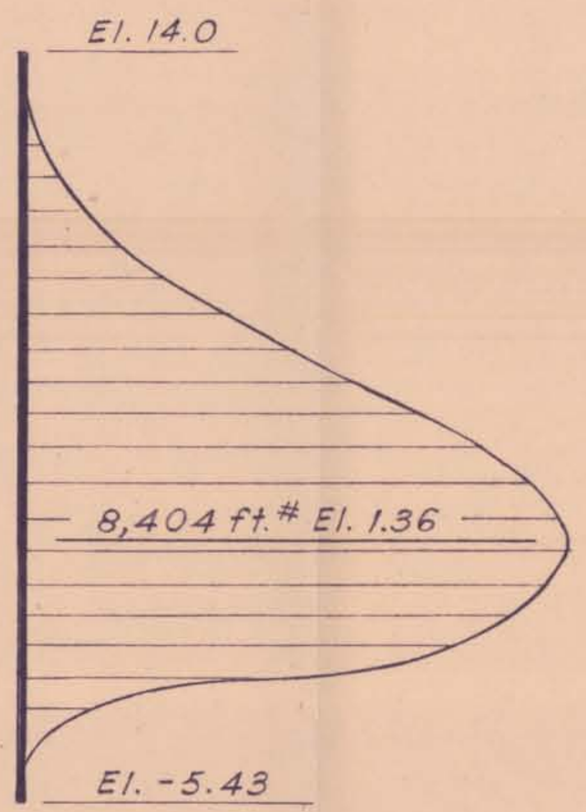
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.322"

Note: Water at top of wall El. 14.5
Max. moment = 9,765 ft.#
Max. deflection = 0.384"
F. S. = 1.32

Scales: 1" = 5'
1" = 3,000 ft.#

STA. 63+47=63+61 TO STA. 71+44

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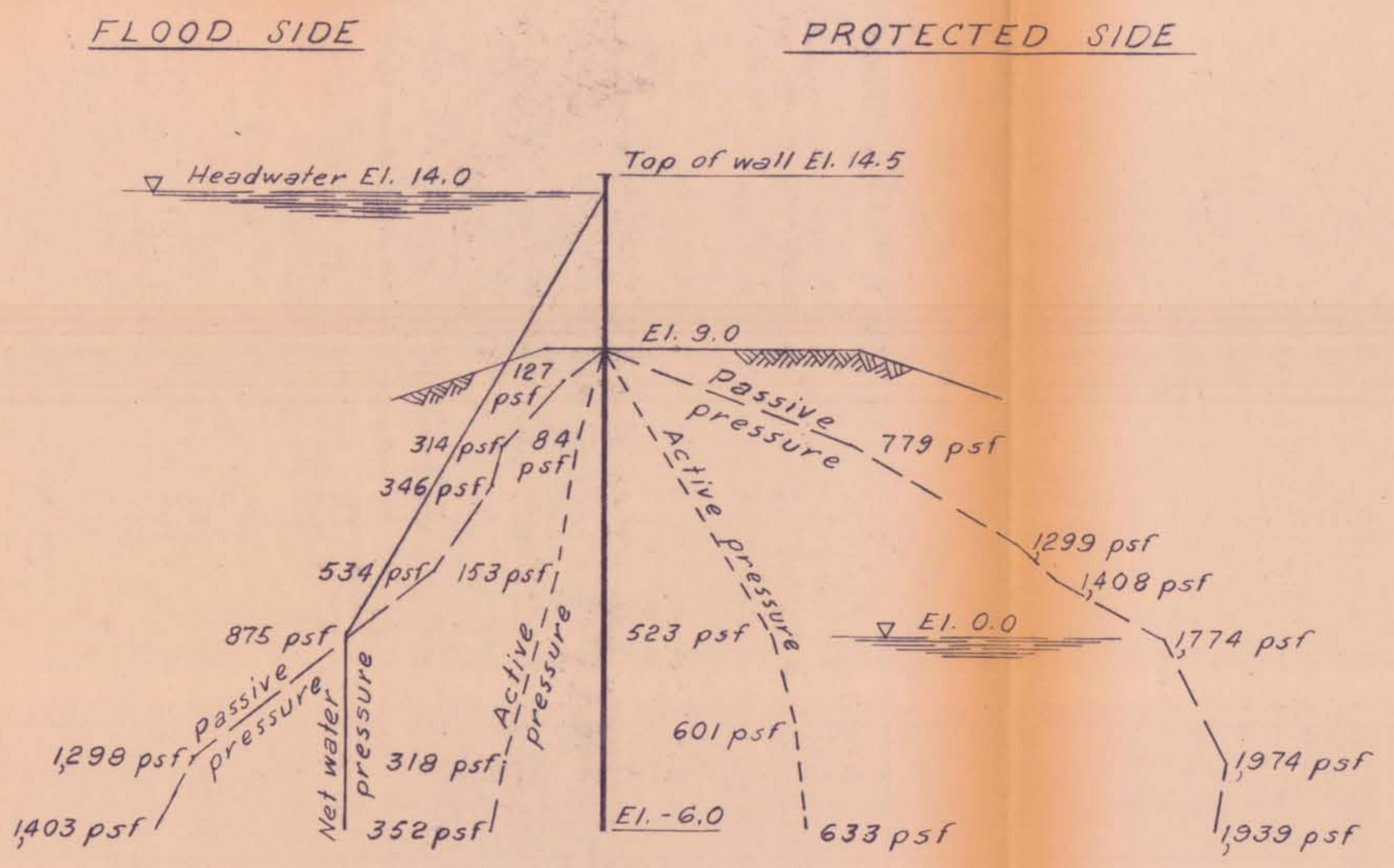
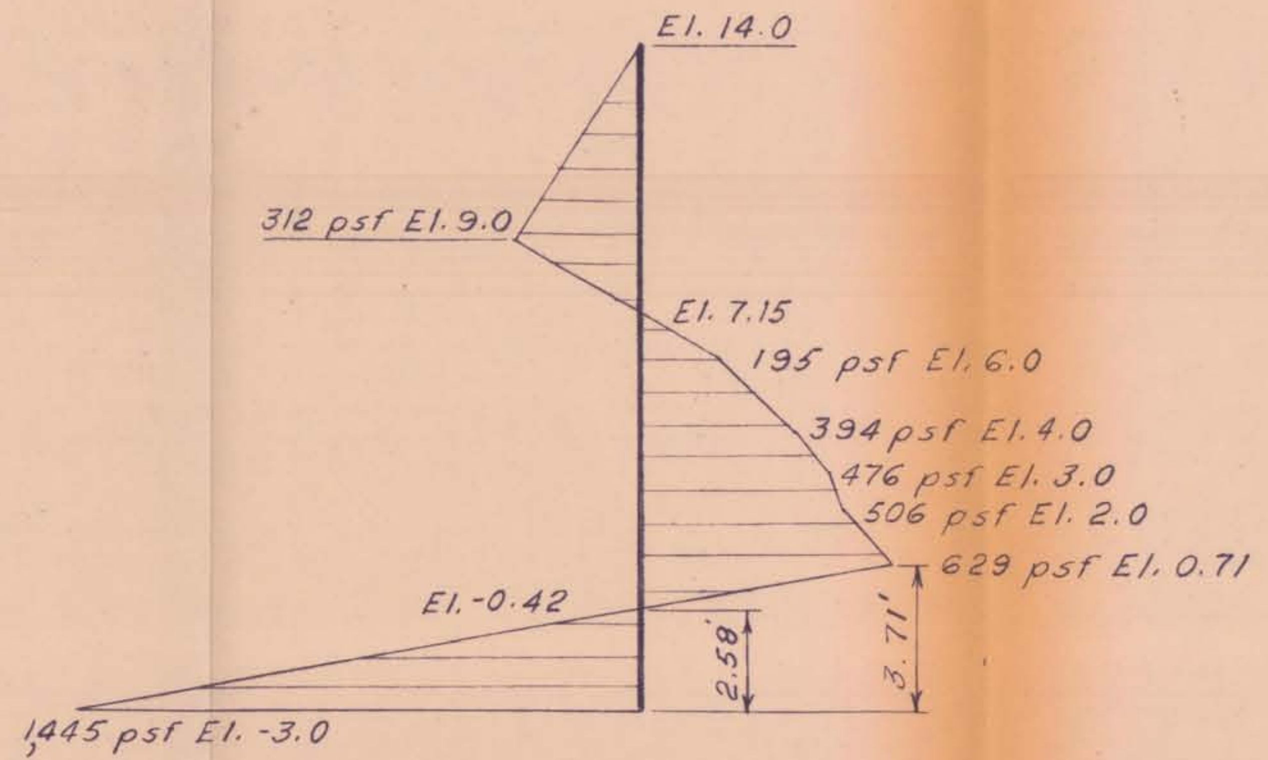
FIGURE 4-12



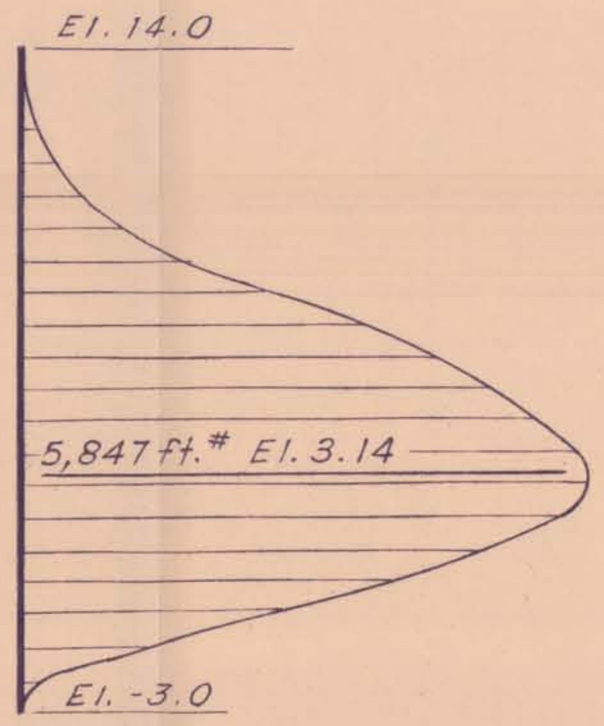
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.167"

Note: Water at top of wall El. 14.5
Max. moment = 6,661 ft.#
Max. deflection = 0.211
F.S. = 1.35

Scales: 1" = 5'
1" = 2,000 ft.#

STA. 71+44 TO STA. 80+44.5

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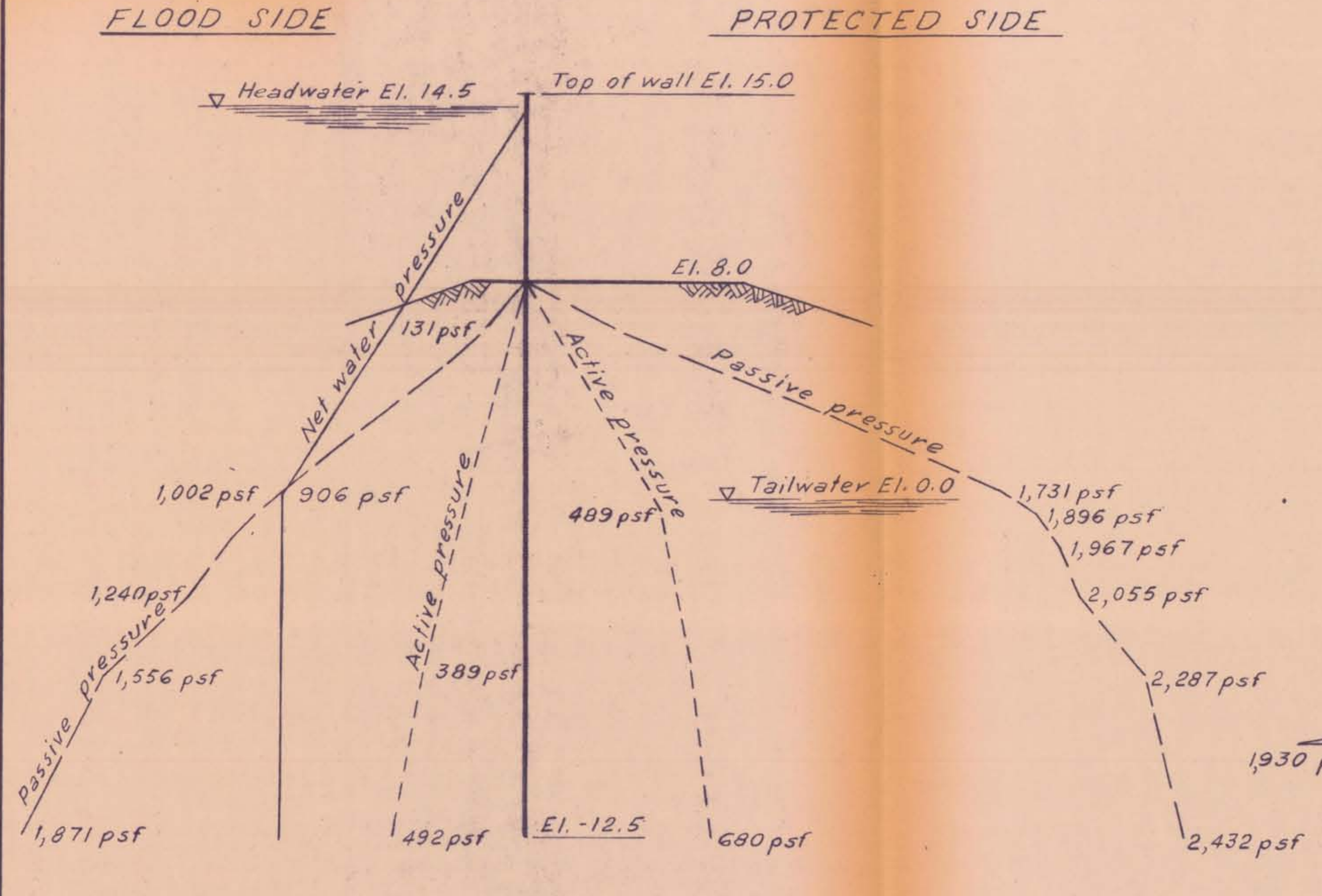
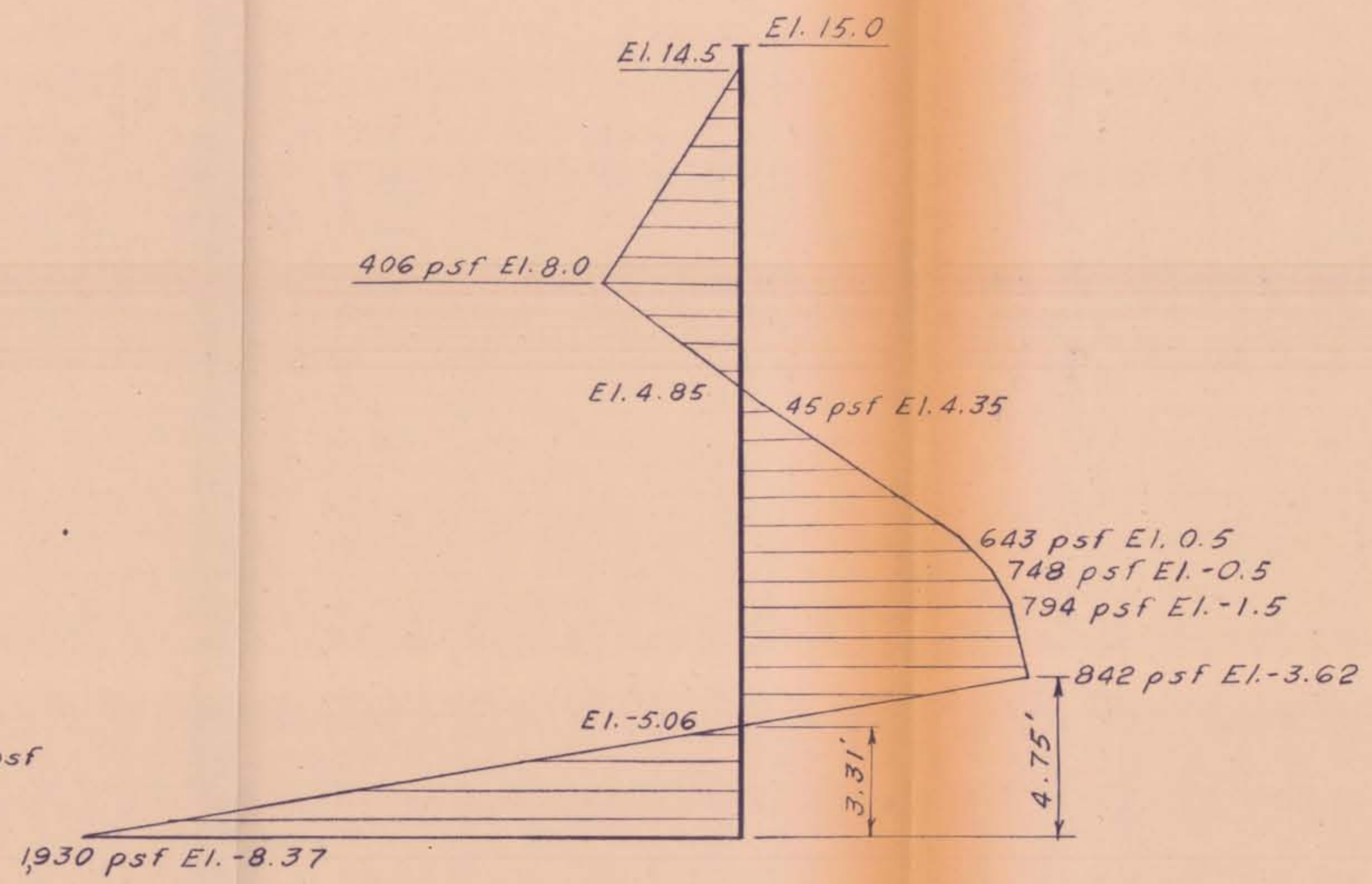
FIGURE 4-13



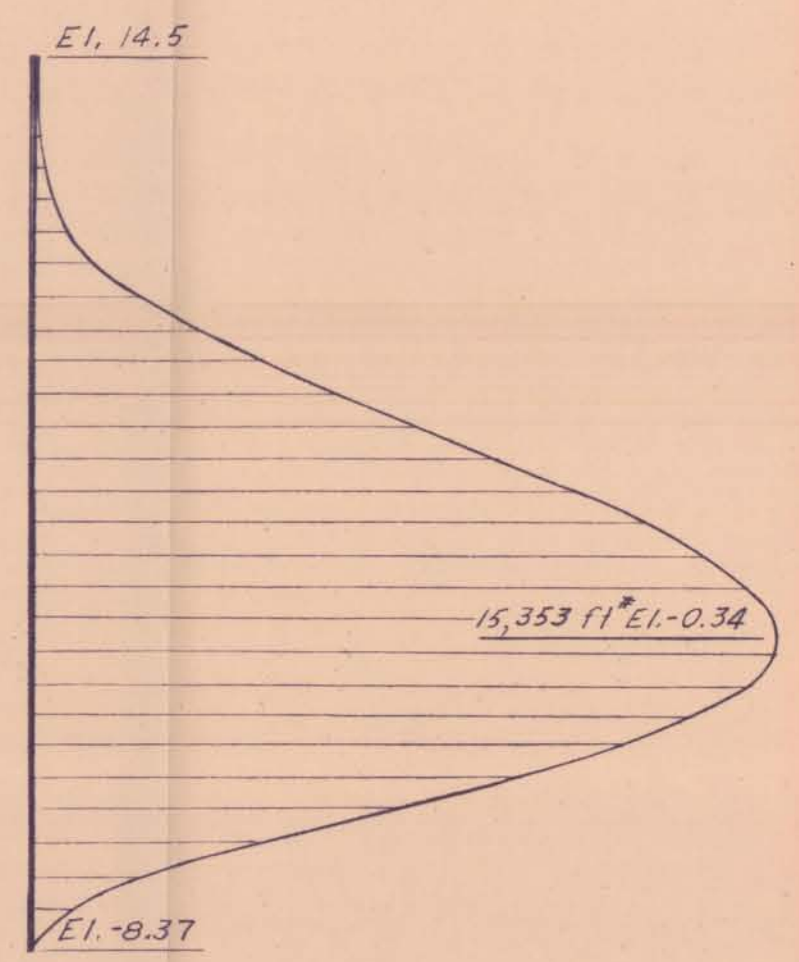
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.755"

Note: Water at top of wall El. 15.0
Max. moment = 16,809 ft.#
Max. deflection = 0.897"
F.S. = 1.37

Scales: 1" = 5'
1" = 4,000 ft.#

STA. 87+41 TO STA. 87+55

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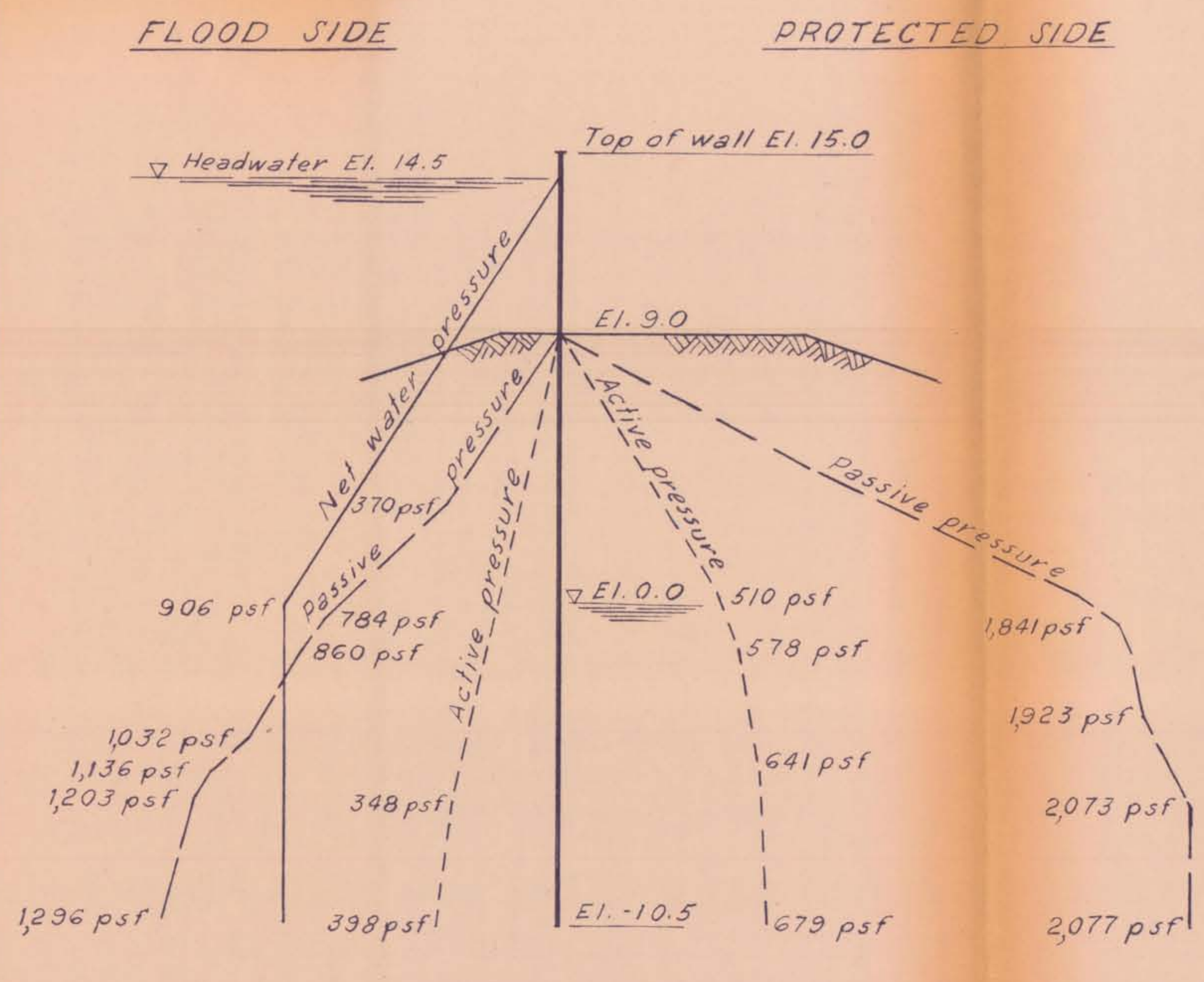
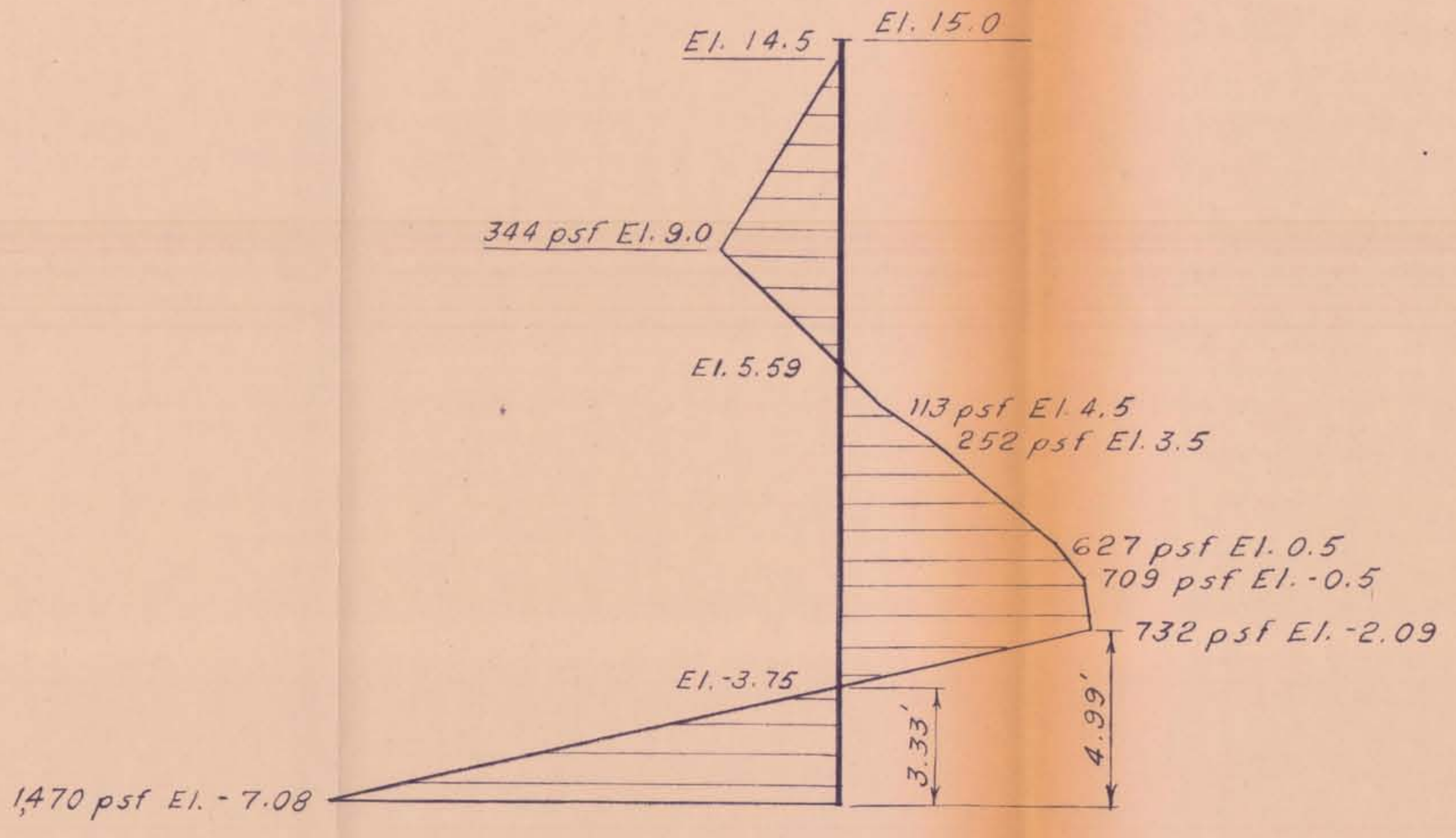
FIGURE 4-14



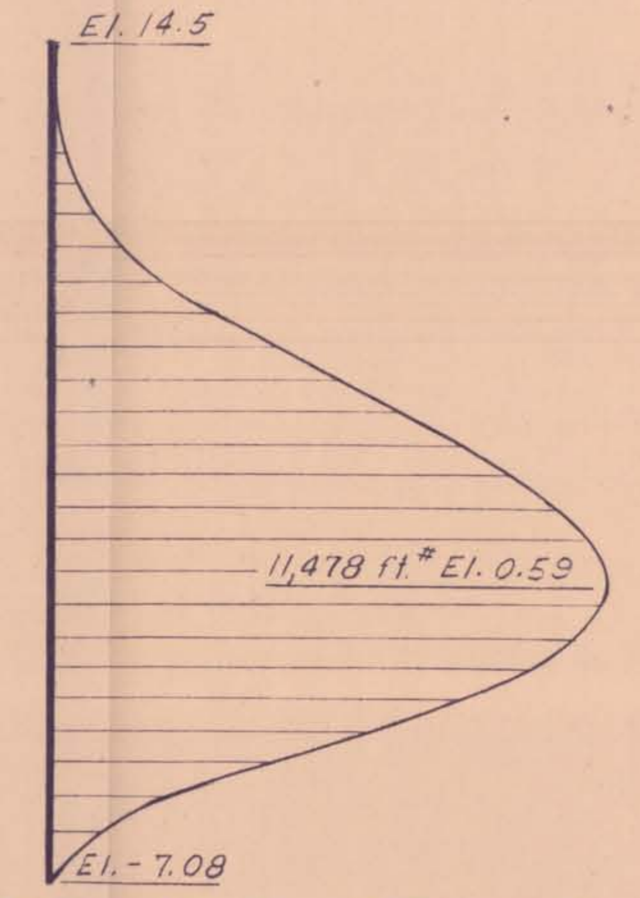
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.554"

Note: Water at top of wall El. 15.0
Max. moment = 13,213 ft.#
Max. deflection = 0.591"
F.S. = 1.35

Scales: 1" = 5'
1" = 4,000 ft.#

STA. 91+78 TO STA. 100+86

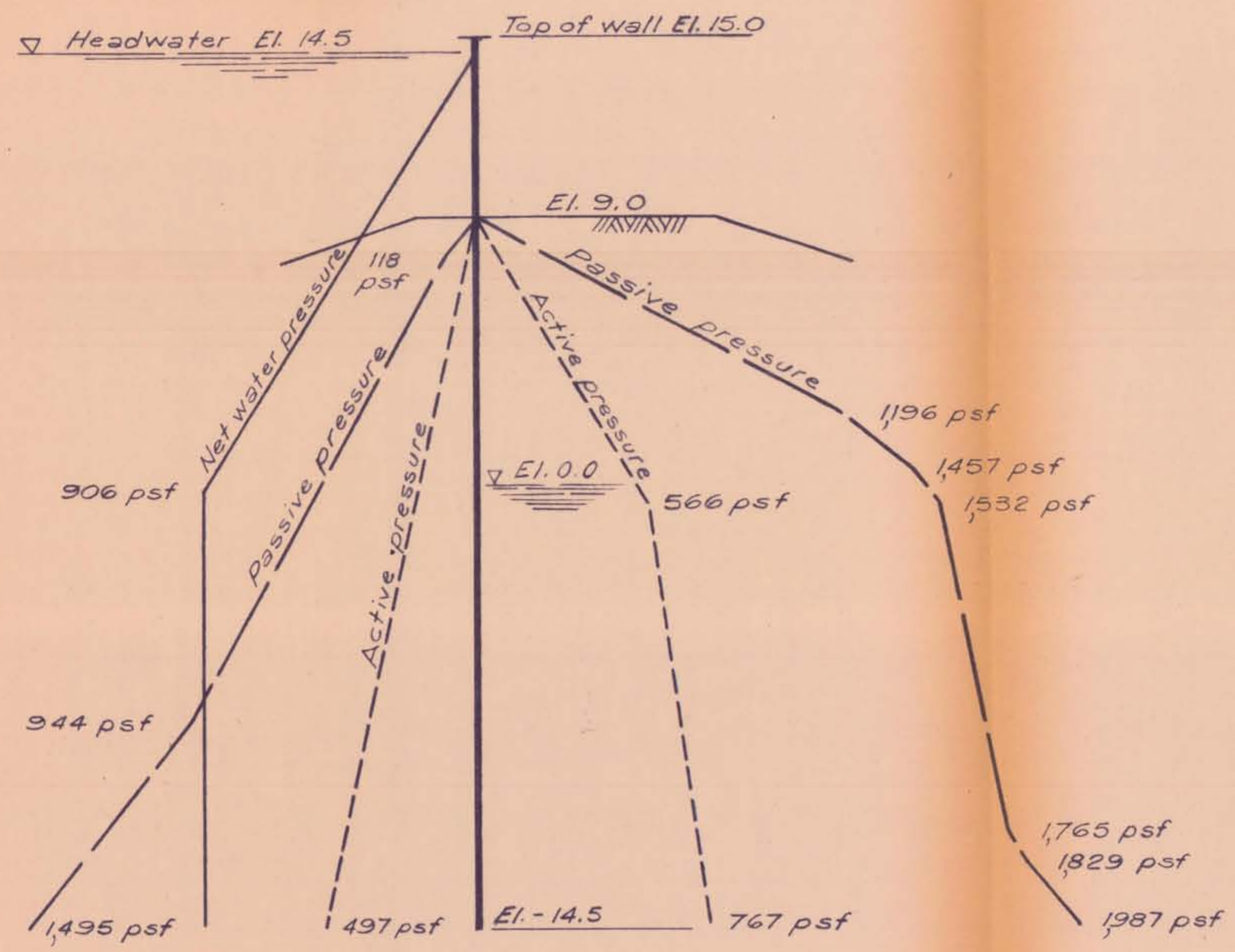
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

I-WALL DESIGN ANALYSIS
EAST LEVEE

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

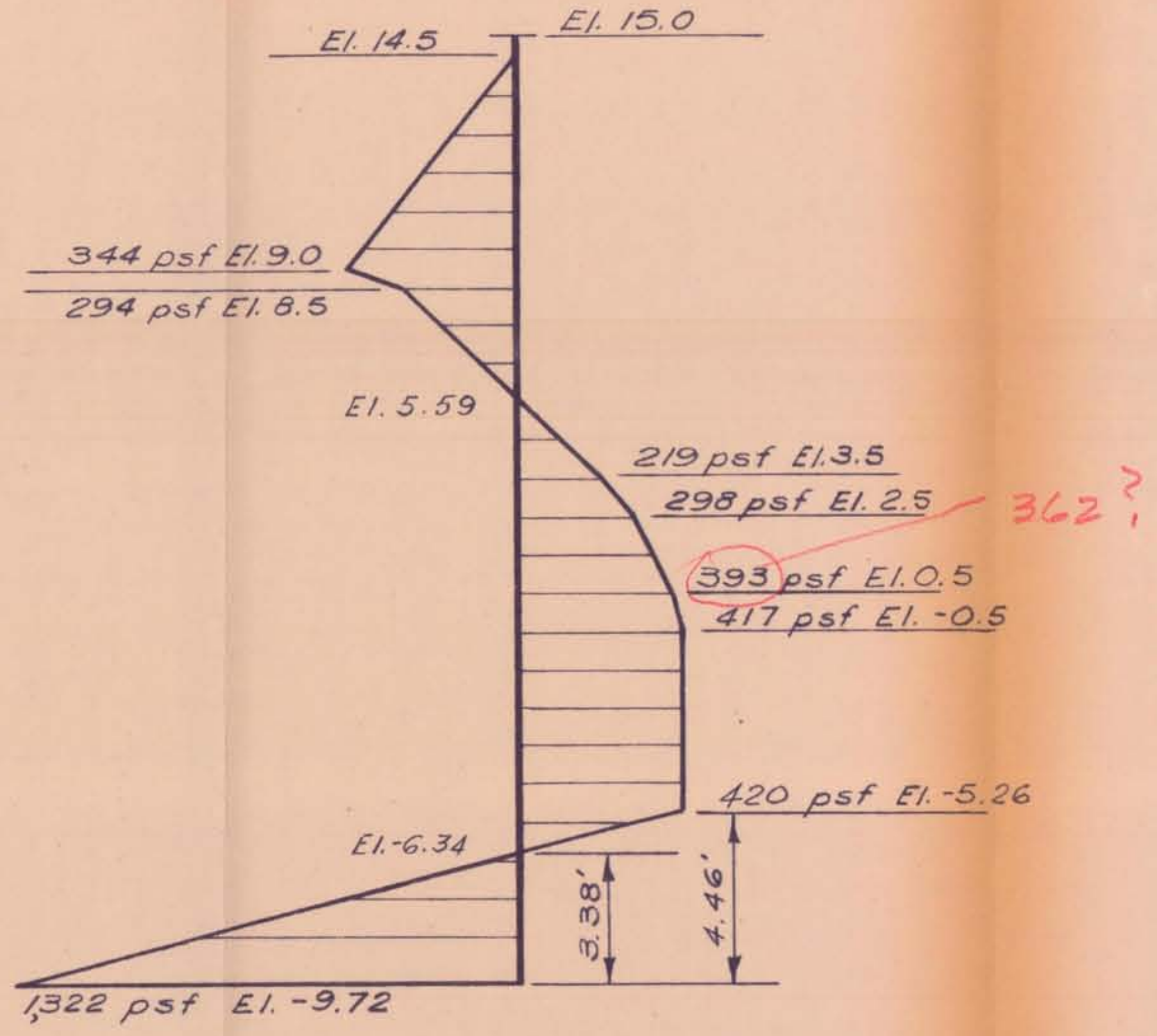
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-15



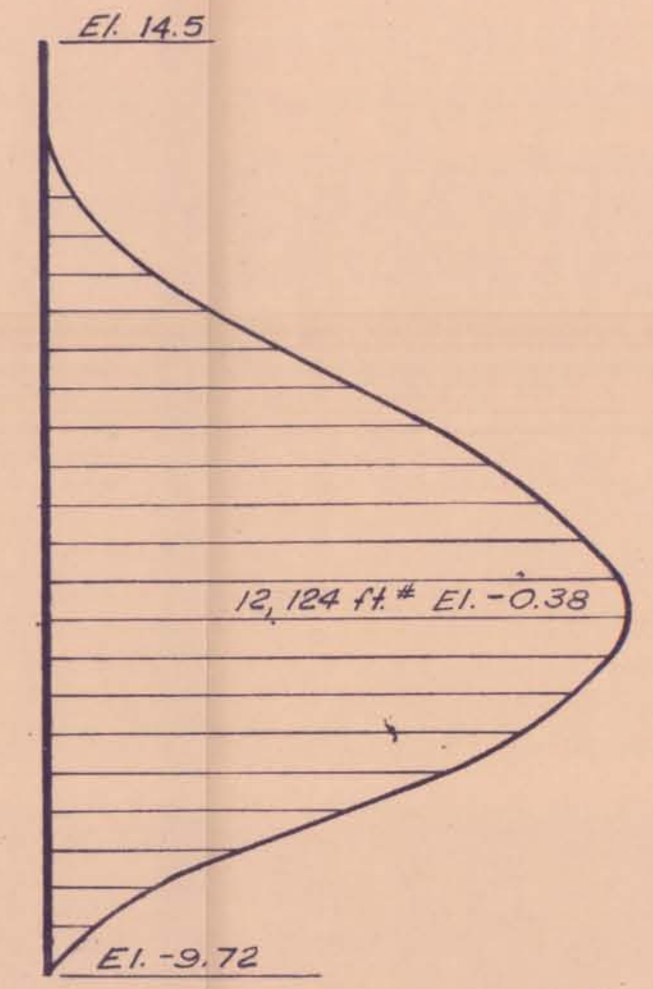
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.777"

Note: Water at top of wall El. 15.0
Max. moment = 13,635 ft.#
Max. deflection = 0.816"
F.S. = 1.35

Scales: 1" = 5'
1" = 4,000 ft.#

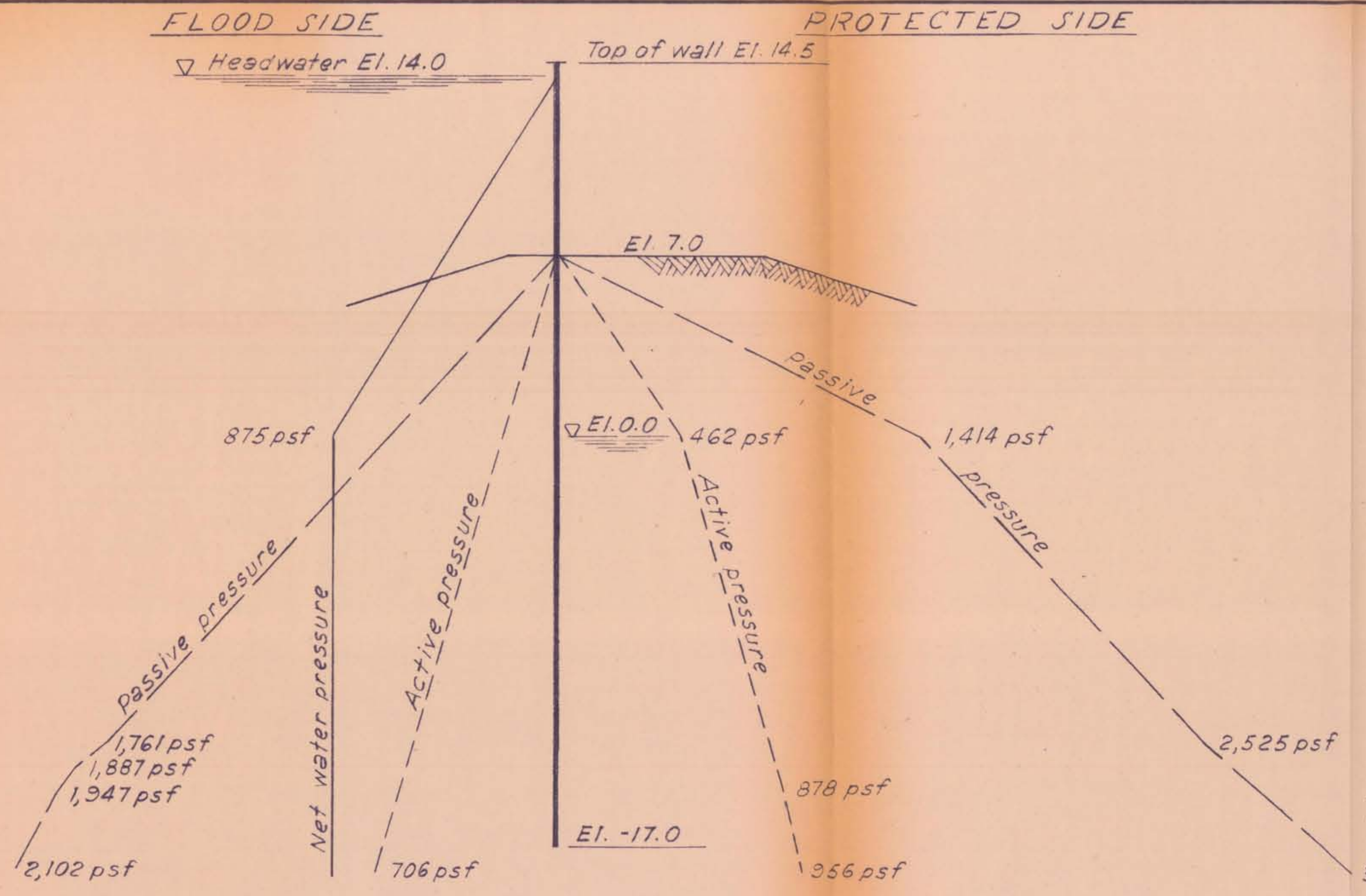
STA. 100+86 TO STA. 122+41
(Owens Glass Bldg. Excepted)

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

I-WALL DESIGN ANALYSIS

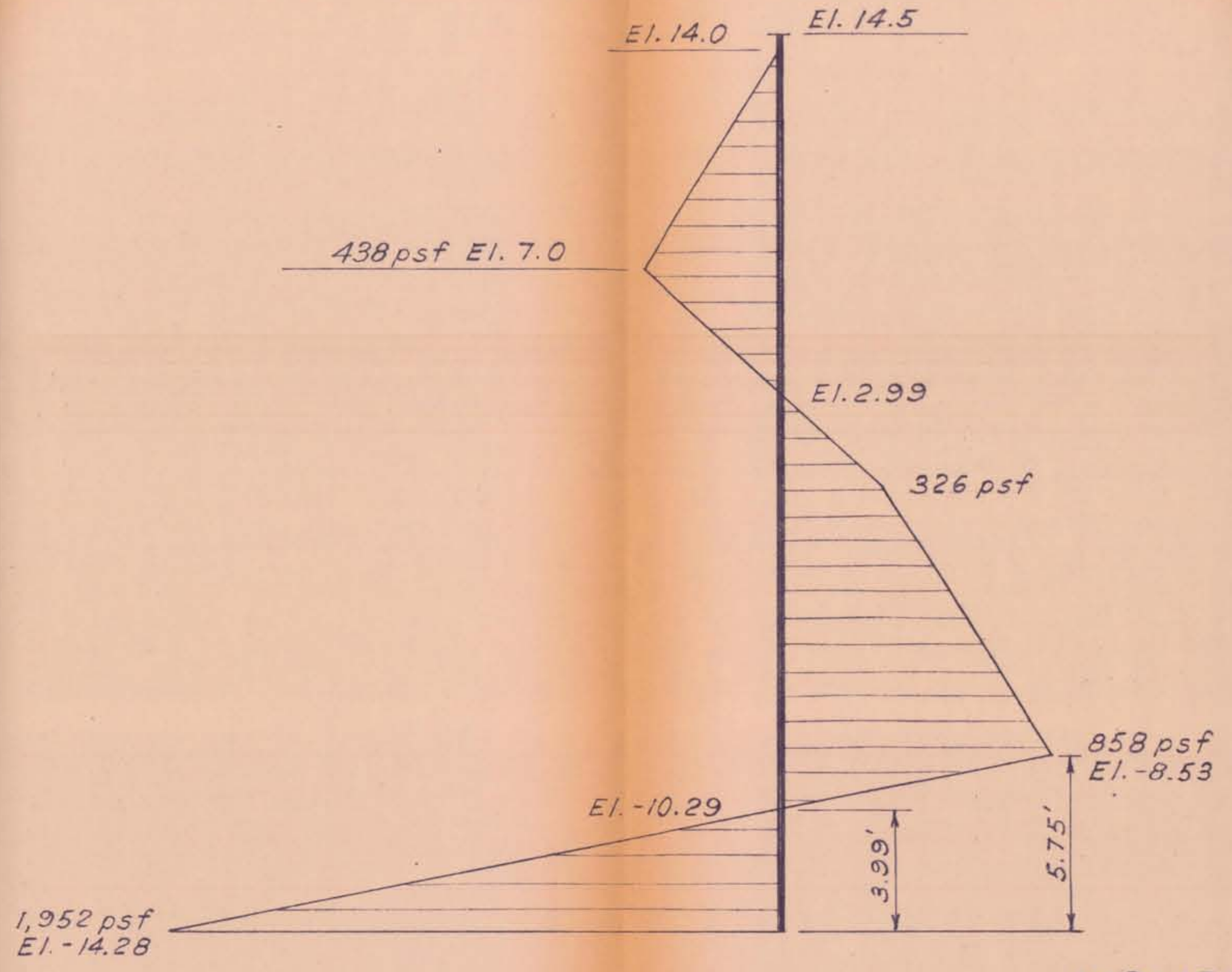
EAST LEVEE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-16



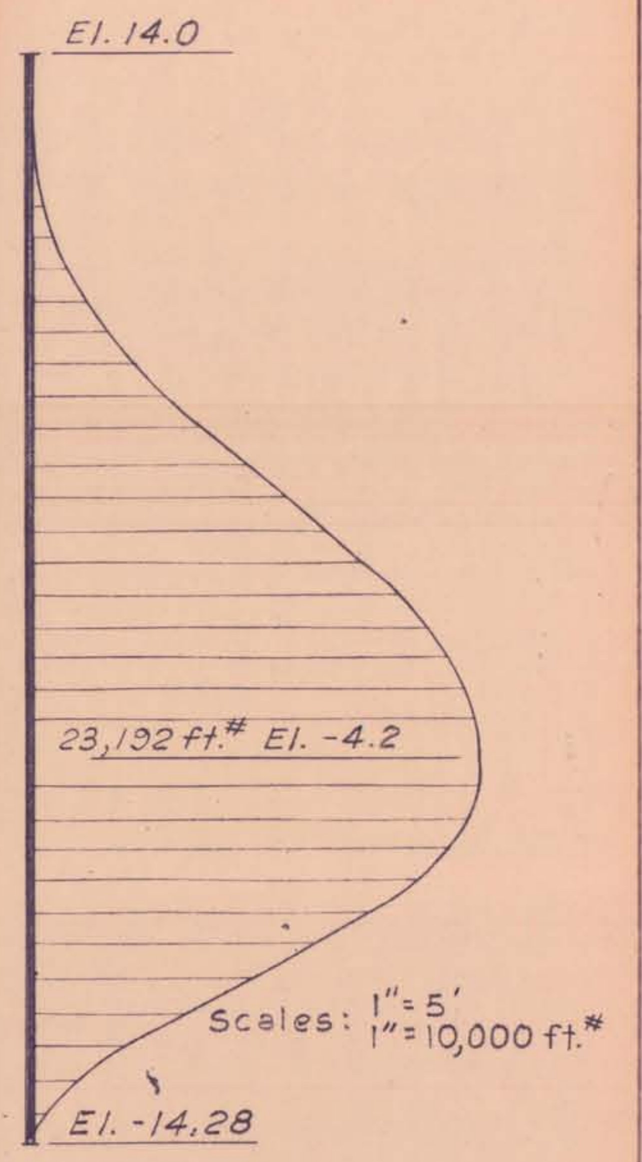
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 1.936"

Note: Water at top of wall El. 14.5
Max. moment = 26,083 ft.#
Max. deflection = 2.221"
F.S. = 1.37

STA. 123+05 TO STA. 130+91

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2-GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES

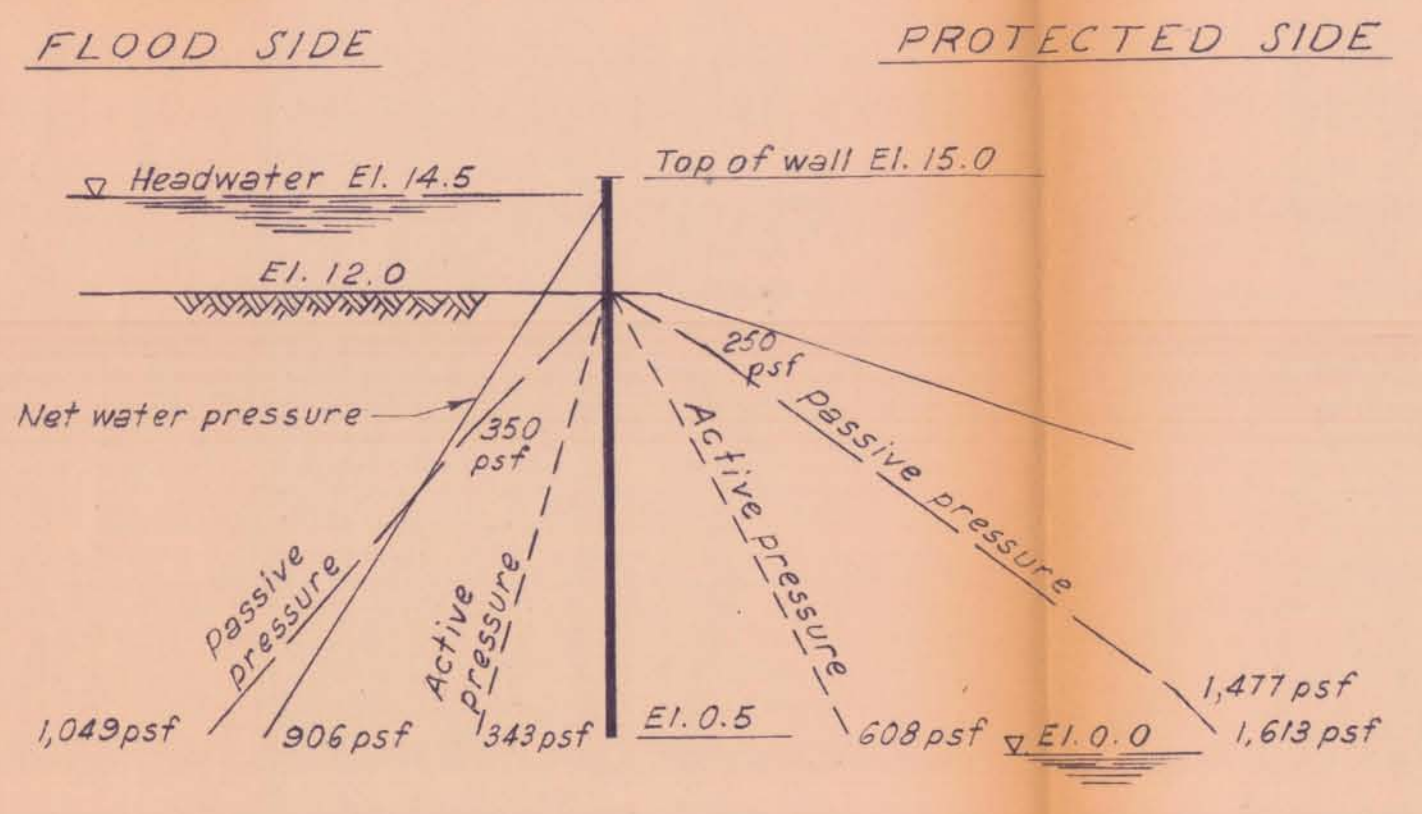
I-WALL DESIGN ANALYSIS

EAST LEVEE

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

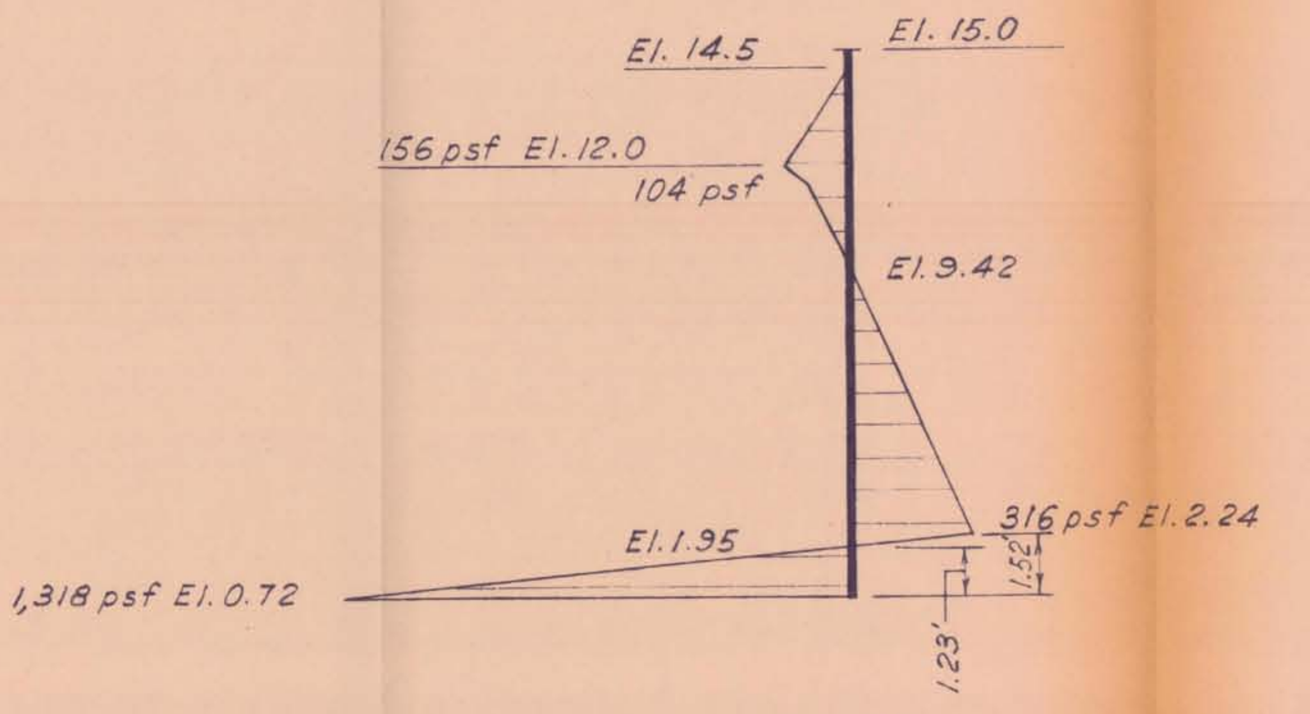
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-17



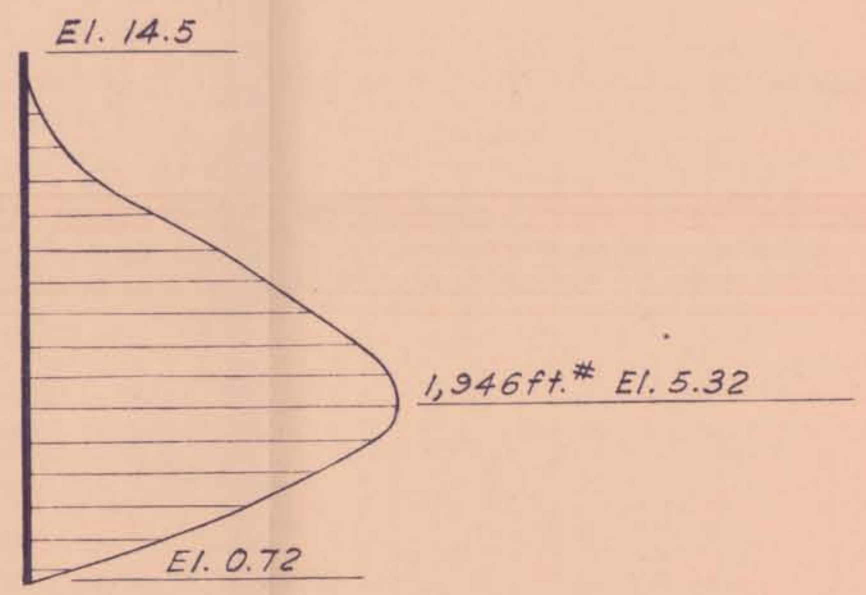
PRESSURE DIAGRAM (F. S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F. S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F. S. = 1.5)

MAX. DEFLECTION = 0.037"

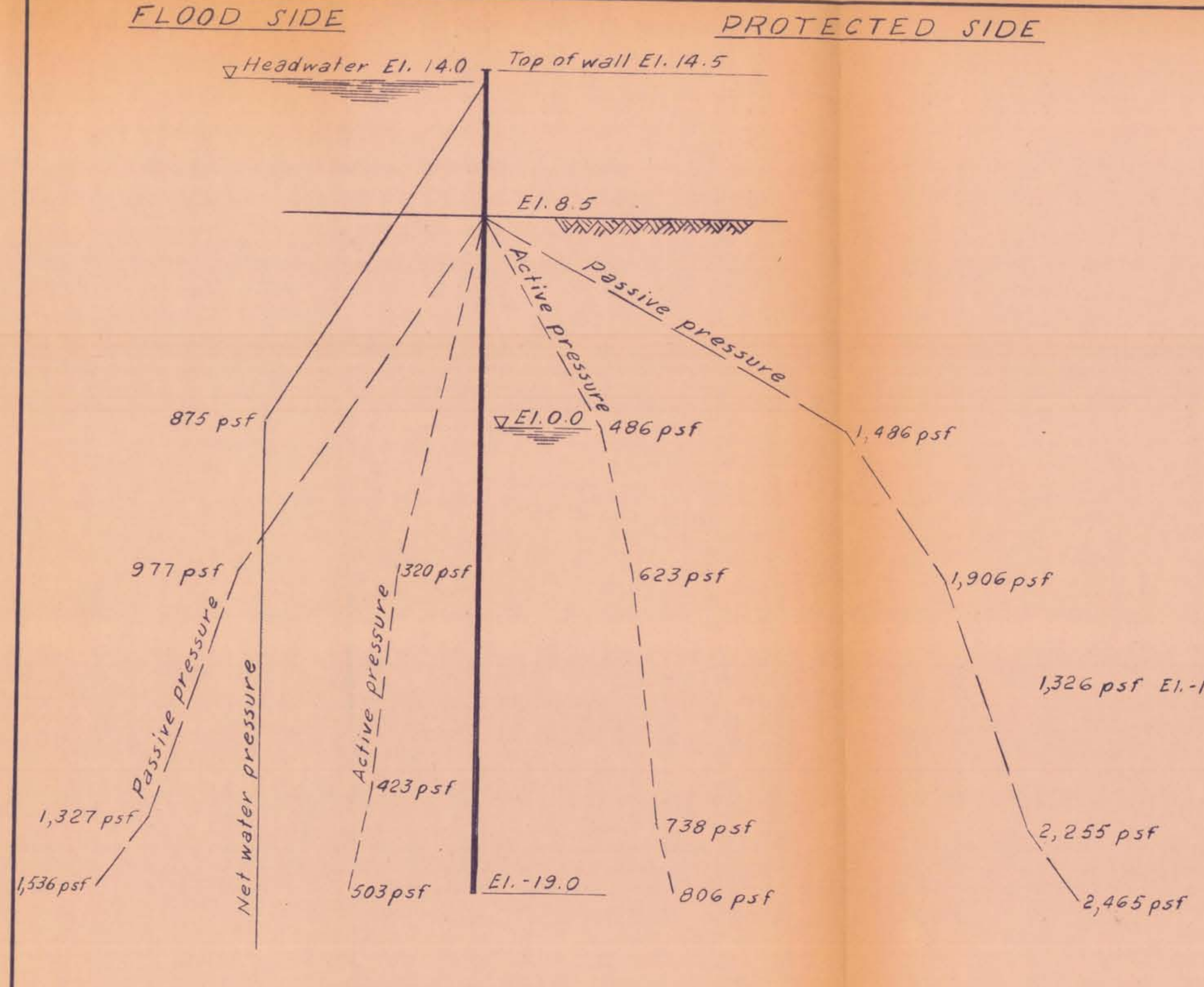
Note: Water at top of wall El. 15.0
Max. moment = 2,619 ft.#
Max. deflection = 0.058"
F. S. = 1.29

Scales: 1" = 5'
1" = 1,000 ft.#

STA. 139+90 TO STA. 141+44

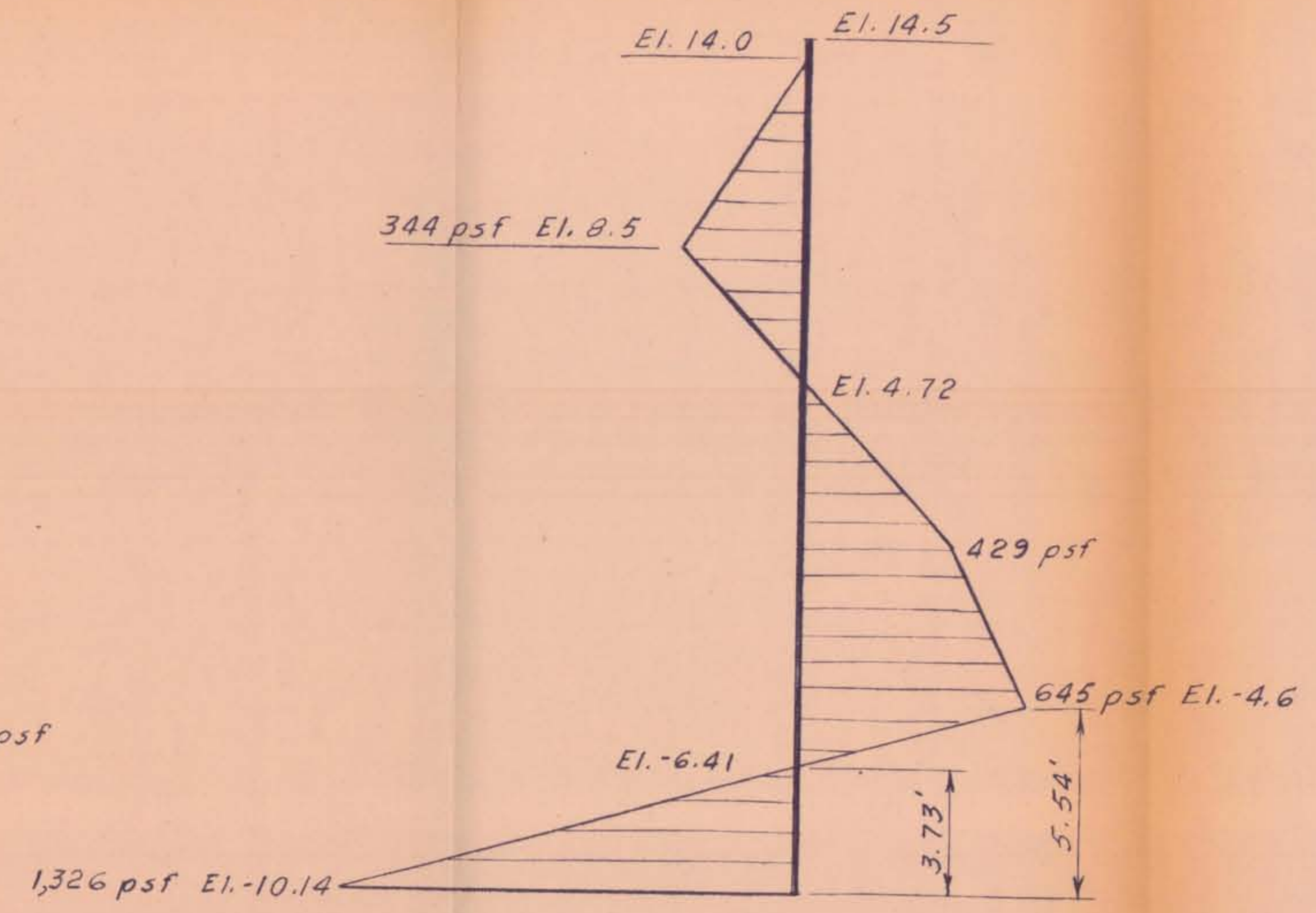
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
I-WALL DESIGN ANALYSIS
EAST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-18



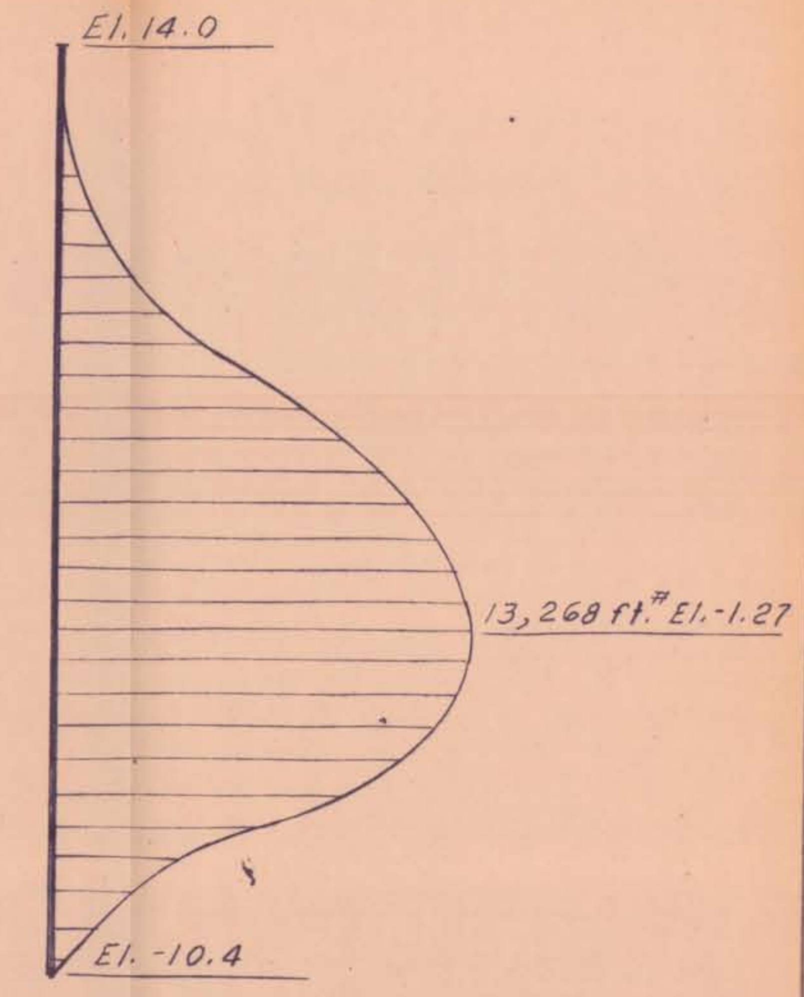
PRESSURE DIAGRAM (F.S. = 1.5)

Scales: 1" = 5'
1" = 500 psf



NET PRESSURE DIAGRAM (F.S. = 1.5)

Scales 1" = 5'
1" = 500 psf



MOMENT DIAGRAM (F.S. = 1.5)

MAX. DEFLECTION = 0.837"

Note: Water at top of wall El. 14.5
Max. moment = 14,479 ft.#
Max. deflection = 0.860"
F. S. = 1.35

Scales: 1" = 5'
1" = 6,000 ft.#

STA. 147+04 TO STA. 170+63
(Gates Excepted)

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8
IHNC REMAINING LEVEES
I-WALL DESIGN ANALYSIS
EAST LEVEE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FEBRUARY 1968 FILE NO. H-2-24111

FIGURE 4-19

LAKE PONTCHARTRAIN, LA. & VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

BY: CWR
NOV. 67

IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.

CKD. BY: DAM

IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

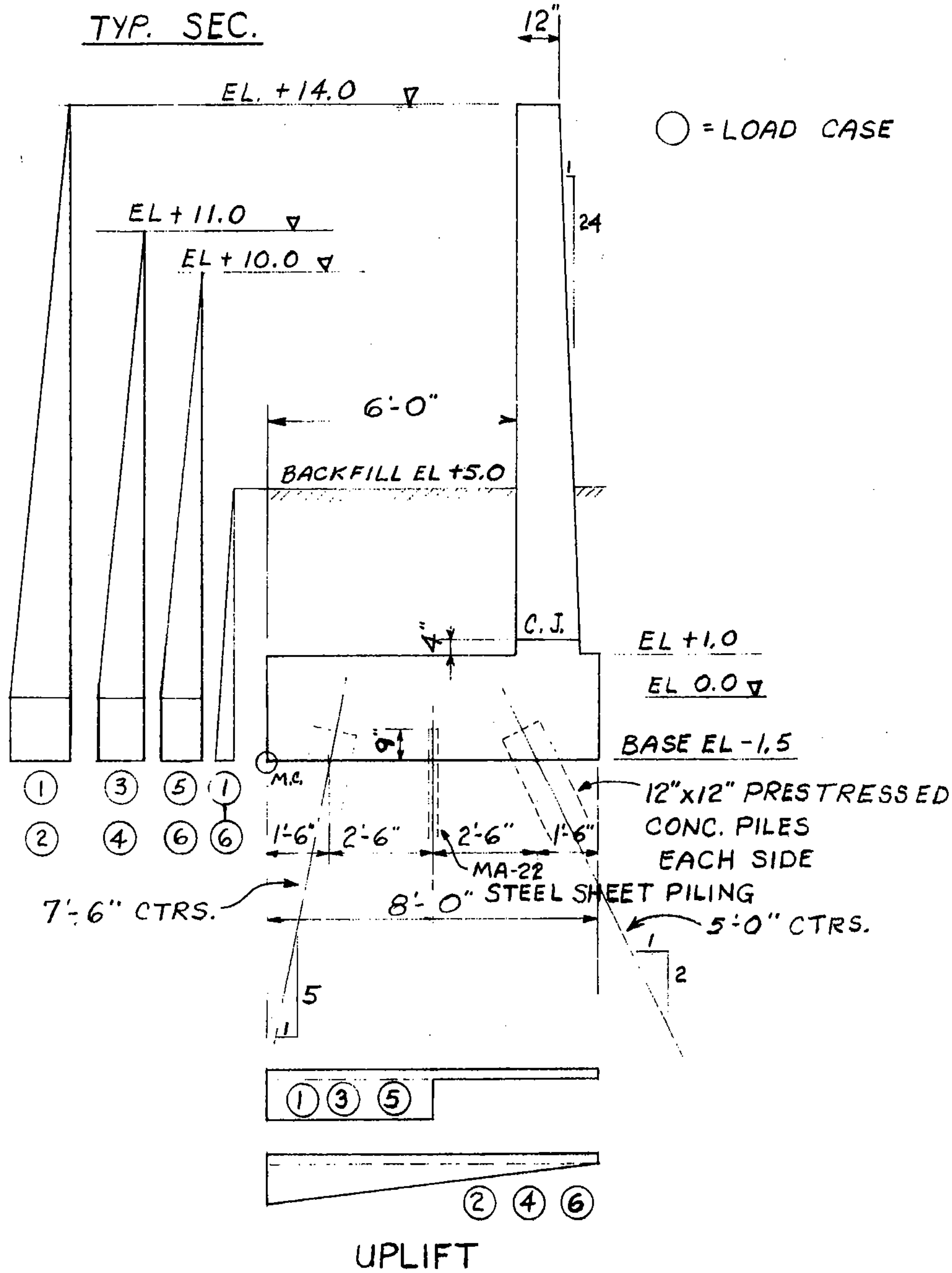


FIG. 4-20

LAKE PONTCHARTRAIN, LA. & VICINITY

Sh. 2 of 12
BY: CWR
NOV. 67
CKD. BY: DAM

LAKE PONTCHARTRAIN BARRIER PLAN

IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.

IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

TYP. 60' MONOLITH LENGTH - DES. COMPS.

ITEM	COMP.	H	V	ℓ	M
	CONSTANT ITEMS FOR ALL CASES				
CONC. STEM	$13 \times 1 \times .15 \times 60$	—	117.00	6.5	760.50
" "	$\frac{1}{2} \times (13)^2 \times \frac{1}{24} \times .15 \times 60$	—	31.6875	$\frac{517}{72}$	227.5339
CONC. BASE	$2.5 \times 8 \times .15 \times 60$	—	180.00	4.0	720.00
EARTH ON BASE	$4 \times 6 \times .055 \times 60$	—	79.20	3.0	237.60
" " "	$\frac{1}{2} \times 4 \times \frac{4}{24} \times .12 \times 60$	—	2.40	$\frac{539}{72}$	17.9667
" " "	$4(1-\frac{13}{24}) \times .12 \times 60$	—	13.20	$\frac{373}{48}$	102.575
HOR. EARTH	$\frac{1}{2}(6.5)^2 \times .75 \times .055 \times 60$	52.2844	—	$\frac{6.5}{3}$	113.2828
CONST. UPLIFT	$-1.5 \times 8 \times .0625 \times 60$	—	-45.00	4.0	-180.00
	SUB-TOTALS CONST. ITEMS	52.2844	378.4875	—	1999.4584
	CASES ① & ② WAT. EL. +14				
WAT. ON BASE	$13 \times 6 \times .0625 \times 60$	—	292.50	3.0	877.50
HOR. WAT.	$\frac{1}{2}(14)^2 \times .0625 \times 60$	367.50	—	$\frac{37}{6}$	2266.25
" "	$1.5 \times 14 \times .0625 \times 60$	78.75	—	.75	59.0625
	SUB-TOTALS FOR CASES ① & ②	498.5344	670.9875	—	5202.2709
UPLIFT ①	$-14 \times 4 \times .0625 \times 60$	—	-210.00	2.0	-420.00
CASE ①	TOTALS	498.5344	460.9875	—	4782.2709
UPLIFT ②	$-\frac{1}{2} \times 14 \times 8 \times .0625 \times 60$	—	-210.00	$\frac{8}{3}$	-560.00
CASE ②	TOTALS	498.5344	460.9875	—	4642.2709
	CASES ③ & ④ WAT. EL. +11	52.2844	378.4875	—	1999.4584
WAT. ON BASE	$10 \times 6 \times .0625 \times 60$	—	225.00	3.0	675.00
HOR. WAT.	$\frac{1}{2}(11)^2 \times .0625 \times 60$	226.875	—	$\frac{31}{6}$	1172.1875
" "	$1.5 \times 11 \times .0625 \times 60$	61.875	—	.75	46.4063
	SUB-TOTALS FOR CASES ③ & ④	341.0344	603.4875	—	3893.0522
UPLIFT ③	$-11 \times 4 \times .0625 \times 60$	—	-165.00	2.0	-330.00
CASE ③	TOTALS	341.0344	438.4875	—	3563.0522
UPLIFT ④	$-\frac{1}{2} \times 11 \times 8 \times .0625 \times 60$	—	-165.00	$\frac{8}{3}$	-440.00
CASE ④	TOTALS	341.0344	438.4875	—	3453.0522
	CASES ⑤ & ⑥ WAT. EL +10	52.2844	378.4875	—	1999.4584
WAT. ON BASE	$9 \times 6 \times .0625 \times 60$	—	202.50	3.0	607.50
HOR. WAT.	$\frac{1}{2}(10)^2 \times .0625 \times 60$	187.50	—	$\frac{29}{6}$	906.25
" "	$1.5 \times 10 \times .0625 \times 60$	56.25	—	.75	42.1875
	SUB-TOTALS FOR CASES ⑤ & ⑥	296.0344	580.9875	—	3555.3959

FIG. 4-21

X

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC-W. LEVEE - LAKE PONT. TO FLA. AVE.
IHNC - E. LEVEE - LAKE PONT. TO MR-GO
INVERTED T-TYPE FLOODWALL - WEST LEVEE
TYP. 60' MONOLITH LENGTH - DES. COMPS (CONT.)

ITEM	COMP.	H	V	ℓ	M
	SUB-TOTALS FOR CASES ⑤ & ⑥	296.0344	580.9875	--	3555.3959
UPLIFT⑤	- 10 X 4 X .0625 X 60	——	-150.00	2.0	-300.00
CASE⑤	TOTALS	296.0344	430.9875	—	3255.3959
UPLIFT ⑥	- ½ x 10 X 8 x .0625 X 60	——	-150.00	8/3	-400.00
CASE ⑥	TOTALS	296.0344	430.9875	—	3155.3959

Design Data for Pile Loads

12" x 12" precast prestressed conc. piles x 60' long.
8 tension piles @ 7'-6" ctrs.
12 compression piles @ 5'-0" ctrs.
47^K tension design load per pile
82^K compression design load per pile
Assumed pinned end, friction piles and modulus of subgrade soil reaction (K) = 135 psi

Pile loads were computed by the Hrennikoff * method and the allowable transverse loads were computed by the same method used in D.M. No. 2, Gen. Adv. Supp., for this Project, utilizing a G.E. 225 data processing system and programs 41-G1-Z5-02 (with minor modifications) and 13-G1-A2-15.

* Paper No. 2401 of ASCE Transactions - "Analysis of Pile Foundations with Batter Piles" by A. Hrennikoff.

FIG. 4-22

BY: CWR
NOV. 67
CKD. BY: DAM

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC-W. LEVEE-LAKE PONT. TO FLA. AVE.
IHNC-E. LEVEE-LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

TYP. 60' MONOLITH LENGTH - DES. COMPS. (CONT.)

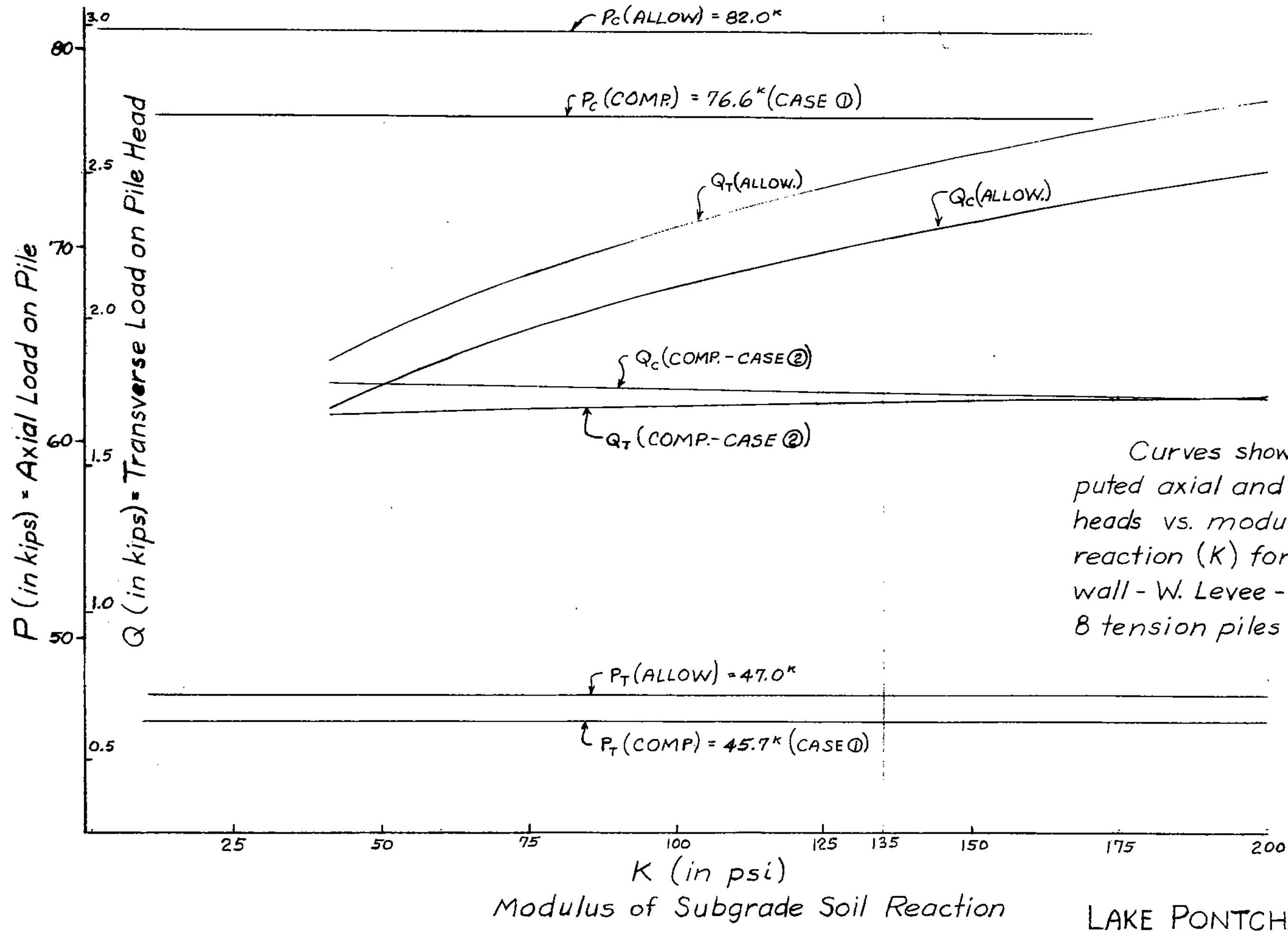
COMP. & ALLOW. PILE LOADS

CASE No.	TENSION		COMPRESSION	
	AXIAL	TRANSV.	AXIAL	TRANSV.
ALLOW.	47.00^K	2.500^K	82.00^K	2.279^K
1	45.704^K	-0.866^K	76.635^K	-0.814^K
2	42.306^K	-1.722^K	74.497^K	-1.754^K
3	18.429^K	-1.020^K	54.650^K	-1.007^K
4	15.759^K	-1.693^K	52.970^K	-1.746^K
5	11.735^K	-0.803^K	49.003^K	-0.776^K
6	9.308^K	-1.415^K	47.475^K	-1.447^K

FIG. 4-23

CWR NOV. 67
Sh. 5 of 12
CKD. BY: DAM

Fig 4-24



Curves showing allowable and computed axial and transverse loads on pile heads vs. modulus of subgrade soil reaction (K) for inverted T-type floodwall - W. Levee - Typ. 60' monolith with 8 tension piles & 12 compression piles.

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC-W. LEVEE - LAKE PONT. TO FLA. AVE.
IHNC-E. LEVEE - LAKE PONT. TO MR-GO

LAKE PONTCHARTRAIN, LA. & VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

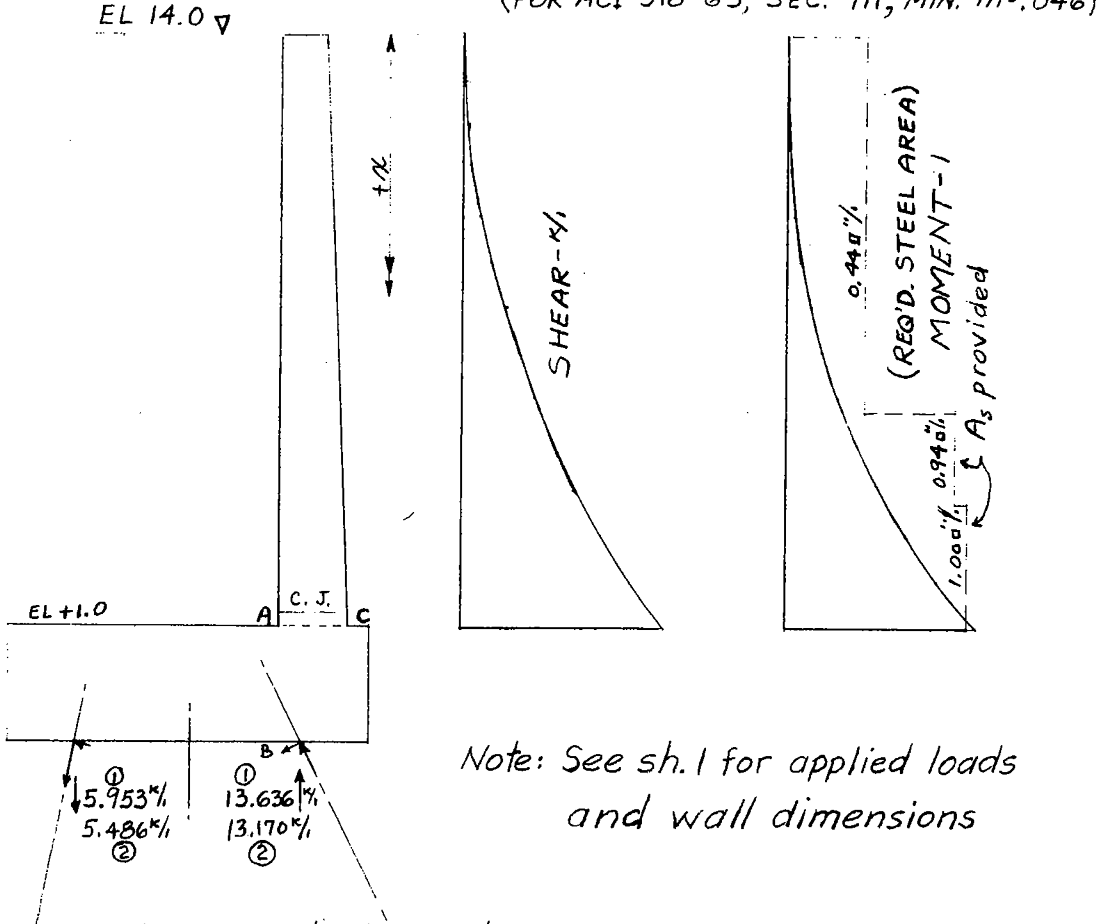
IHNC-W. LEVEE - LAKE PONT. TO FLA. AVE.

IHNC-E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design: $f'_c = 3$ ksi. $f_s = 20$ ksi.

(FOR ACI 318-63, SEC. 911, MIN. $m = .046$)



Note: See sh. 1 for applied loads and wall dimensions

Shear and Moment at Sec. A-B for 1 L.F. of Wall

ITEM	COMP.	V	x	M
WATER	-6 x 13 x .0625 - 6x4x.055 (EARTH)	-6.195	3.0	-18.585
CONC.	-6 x 2.5 x 0.15	-2.250	3.0	-6.750
	CONSTANT SUB-TOTALS	-8.445	—	-25.335
PILE ①	NET VERT. COMP. ①	-5.953	4.5	-26.7885
UPLIFT①	(+ 4 x 14 + 1.5x6) .0625	+4.0625	251/65	+15.6875
.	CASE ① TOTALS	-10.336K↓	—	-36.436'K/,
PILE②	NET VERT. COMP.	-5.486	4.5	-24.687
UPLIFT②	(+½ x 2½ + 5) 6 x .0625	+3.8438	144/41	+13.500
	CASE② TOTALS	-10.087K↓	—	-36.522'K/,

FIG. 4-25

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.
IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design (cont.): Vert. Stem Reinf.

Shear, Moment & Req'd Steel Area in Stem

for $x \leq 9$ $\quad n = 9.2 \quad A_s = \frac{M}{ad} \quad a = 1.44 \quad d = 9 + \frac{12x}{24}$

$V = 0.03125 x^2 \quad M = \frac{.03125 x^3}{3} \quad A_s = \frac{.03125 x^3}{3/2 (18 + x)(1.44)}$

for $x \geq 9$

$V = 0.03125 x^2 + 0.020625 (x - 9)^2$

$M = \frac{1}{3}[.03125 x^3 + .020625 (x-9)^3]$

$A_s = \frac{.03125 x^3 + .020625 (x-9)^3}{38.88 + 2.16 x}$

At top of base $\quad x = 13' \quad (x - 9) = 4' \quad d = 15.5'' \quad b = 12''$

$V = 5.61^{k}/' \quad M = 23.33^{'k}/' \quad$ Req'd. $A_s = 1.045 \square''/'$

$v = \frac{V}{bd} = 30.2$ psi < 60 O.K.

Try #9 @ 12" $\quad A_s = 1.00 \square''/' \quad \Sigma_o = 3.5''/'$

$m = \frac{nA_s}{bd} = .0495 \quad k = \sqrt{m^2 + 2m} - m = 0.269 \quad j = 0.91$

$f_s = \frac{12 M}{A_s j d} = \frac{12 \times 23.33}{1 \times .91 \times 15.5} = 19.85$ ksi < 20 O.K.

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1 - k} = \frac{1000 \times 19.85 \times .269}{9.2 (1 - .269)} = 794$ psi < 1050 O.K

$u = \frac{V}{\Sigma_o j d} = \frac{5610}{3.5 \times .91 \times 15.5} = 114$ psi < 233 O.K

Use #9 Bars @ 12" c/c. at top of base

FIG. 4-26

X

LAKE PONTCHARTRAIN, LA. & VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.

IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design - Vert. Stem Reinf. (cont.):

Stem at 6" above base: $x = 12.5'$ $(x-9) = 3.5'$ $d = 15.25''$

$b = 12''$ $V = 5.136^{k}/'$ $M = 20.64^{'k}/'$ Req'd. $A_s = 0.94 \square''/'$

$v = \frac{V}{bd} = 28.1\,psi < 60$ O.K.

Try #9@24" & #6@12" $A_s = 0.94\square''/'$ $\Sigma_o = 4.15''/'$

$m = \frac{nA_s}{bd} = .0473$ $k = \sqrt{m^2+2m} - m = 0.264$ $j = 0.91$

$f_s = \frac{12M}{A_s j d} = \frac{12 \times 20.64}{.94 \times .91 \times 15.25} = 19.0\ ksi < 20$ O.K.

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1-k} = \frac{1000 \times 18.987 \times .264}{9.2(1-.264)} = 740\ psi < 1050$ O.K.

$u = \frac{V}{\Sigma_o j d} = \frac{5136}{4.15 \times .91 \times 15.25} = 89\ psi < 233$ O.K.

∴ Add #6@12" above constr. joint & cut off half of #9 bars at 2'-9" above base (6" + 2'-3" for splice)

Stem at 4'-6" above base: $x = 8.5' < 9'$ $d = 13.25''$

$b = 12''$ $V = 2.258^{k}/'$ $M = 6.397^{'k}/'$ Req'd. $A_s = 0.335\square''/'$

$v = \frac{V}{bd} = 14.2\ psi < 60$ O.K. Try #6@12" $A_s = 0.44\square''/'$ $\Sigma_o = 2.4''/'$

$m = \frac{nA_s}{bd} = .0255 < .046$ Per Sec. 911 of ACI 318-63, for $m < .046$
use $A_s = \frac{3}{4} \times .44 = 0.33\square''/'$

$m = \frac{nA_s}{bd} = \frac{9.2 \times 0.33}{12 \times 13.25} = .01909$ $k = \sqrt{m^2+2m} - m = .1772$ $j = .941$

$f_s = \frac{12M}{A_s j d} = \frac{12 \times 6.397}{.33 \times .941 \times 13.25} = 18.66\ ksi < 20$ O.K.

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1-k} = \frac{1000 \times 18.66 \times .1772}{9.2(1-.1772)} = 439\ psi < 1050$ O.K.

$u = \frac{V}{\Sigma_o j d} = \frac{2258}{2.4 \times .941 \times 13.25} = 75\ psi < 351$ O.K.

∴ Cut off balance of #9 bars at 5'-9" above base (4'-6" + 1'-3")

FIG. 4-27

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.
IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design (cont.):

Vert. Stem Reinf. in land face: Min. $A_s = .002\ bd$

at Base, $d = 9 + 13/2 = 15.5''$ $b = 12''$

Min. $A_s = 0.37\ \square''/'$ Use #6 @ 12" $A_s = 0.44\ \square''/'$

Horiz. Bars in Stem: Min temp. $A_s = .002\ bD$

at Base, $D = 12 + 13/2 = 18.5''$

Min. Gross $A_s = 0.44\ \square''/'$ for both faces

For 60' Mono. Length, Use #6 @ 12" ea. face

$A_s = 0.44\ \square''/'$ ea. face

Base Reinf. - Transverse Bars in top: (sec. A-B)

from sh. 6, Max. $M = 36.52\ ^{'k}/'$ Max. $V = 10.34\ ^{k}/'$ $b = 12''$

$d = 30 - 4.5 = 25.5''$ Req'd. $A_s = \frac{M}{ad} = \frac{36.52}{1.44 \times 25.5} = 0.99\ \square''/'$

Try #8 @ 10" $A_s = 0.95\ \square''/'$ $\Sigma_o = 3.8''/'$

$m = \frac{nA_s}{bd} = \frac{9.2 \times .95}{12 \times 25.5} = .0286$ $k = \sqrt{m^2 + 2m} - m = 0.2121$ $j = 1 - \frac{k}{3} = 0.9293$

$f_s = \frac{12M}{A_s jd} = \frac{12 \times 36.52}{.95 \times .929 \times 25.5} = 19.467\ ksi < 20$ O.K.

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1-k} = \frac{1000 \times 19.467 \times .2121}{9.2(1 - .2121)} = 570\ psi < 1050$ O.K.

$v = \frac{V}{bd} = \frac{10340}{12 \times 25.5} = 33.8\ psi < 60$ O.K.

$u = \frac{V}{\Sigma_o jd} = \frac{10340}{3.8 \times .929 \times 25.5} = 115\ psi < 186$ O.K.

Per Sec. 911 of ACI 318-63, $m < .046$

$\therefore$ Req'd. $A_s = 4/3 \times .95 = 1.27\ \square''/'$

Use #10 @ 12" in top of base $A_s = 1.27\ \square''/'$ $\Sigma_o = 4.0''/'$

FIG. 4-28

LAKE PONTCHARTRAIN, LA. & VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN
IHNC-W. LEVEE - LAKE PONT. TO FLA. AVE.
IHNC-E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design - Base Reinf. (cont.):

Transverse Bars in Bottom:

Use Min. Steel, #6 @ 12" (Spaced to miss piles)

Longitudinal Bars in Bott. & Top: (Ten. piles @ 7.5' ctrs.)

Assume $b = 42"$ & $w = 10.336^{k}/'$ & $d = 25"$

From Mom. Dist., Max. $+M = 72.68'^{k}$ over end pile
$+M = 41.96'^{k}$ over 2nd pile
Max. $+M = 50.19'^{k}$ over int. piles
Max. $-M = 26.66'^{k}$ in int. spans
$-M = 16.17'^{k}$ in end span
Max. $V = 42.86^{k}$ at end pile
Max. $V = 39.86$ at int piles

Bottom Bars over end pile: Assume $j = .94$

Req'd. $A_s = \frac{12M}{f_s j d} = \frac{12 \times 72.68}{20 \times .94 \times 25} = 1.86 \square"$

Try 6-#5 Bars $A_s = 1.86 \square"$ $\Sigma_o = 11.8"$

$m = \frac{nA_s}{bd} = \frac{9.2 \times 1.86}{42 \times 25} = .0163$ $k = \sqrt{m^2 + 2m} - m = .165$ $j = 1 - \frac{k}{3} = .945$

$f_s = \frac{12M}{A_s j d} = \frac{12 \times 72.68}{1.86 \times .945 \times 25} = \underline{19.848 \text{ ksi} < 20 \quad O.K.}$

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1-k} = \frac{1000 \times 19.848 \times .165}{9.2(1-.165)} = \underline{426 \text{ psi} < 1050 \quad O.K.}$

$v = \frac{V}{bd} = \frac{42860}{42 \times 25} = \underline{40.8 \text{ psi} < 60 \quad O.K.}$

$u = \frac{V}{\Sigma_o j d} = \frac{42860}{11.8 \times .945 \times 25} = \underline{153.7 \text{ psi} < 421 \quad O.K.}$

Per Sec. 911 of ACI 318-63, $m < .046$ Reqd. $A_s = 4/3 \times 1.86 = 2.48$

$\therefore$ Use 6-#6 Bars ($A_s = 2.64 \square"$) in first 42" & #6 @ 12" in bal.

FIG. 4-29

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design - Longitudinal Base Reinf. (cont.):

Bottom Bars over int. piles: assume $j = .95$

$V = 39.86^{k}$ $M = 50.19'^{k}$

Req'd. $A_s = \frac{12M}{f_s j d} = \frac{12 \times 50.19}{20 \times .95 \times 25} = 1.27 \square''$

Try 3-#6 Bars $A_s = 1.32 \square''$ $\Sigma_o = 7.1''$

$m = \frac{nA_s}{bd} = \frac{9.2 \times 1.32}{42 \times 25} = .0116$ $k = \sqrt{m^2 + 2m} - m = .141$ $j = 1 - \frac{k}{3} = .953$

$f_s = \frac{12M}{A_s j d} = \frac{12 \times 50.19}{1.32 \times .953 \times 25} =$ 19.151 ksi < 20 O.K.

$f_c = \frac{1000 f_s}{n} \times \frac{k}{1-k} = \frac{1000 \times 19.151 \times .141}{9.2(1-.141)} =$ 342 psi < 1050 O.K.

$v = \frac{V}{bd} = \frac{39860}{42 \times 25} =$ 38 psi < 60 O.K.

$u = \frac{V}{\Sigma_o j d} = \frac{39860}{7.1 \times .953 \times 25} =$ 236 psi < 351 O.K.

Per Sec. 911 of ACI 318-63, $m < .046$

$\therefore$ Req'd. $A_s = 4/3 \times 1.32 = 1.76 \square''$

Use 4-#6 Bars ($A_s = 1.76 \square''$) in first 42" & #6 @ 12" in bal.

Top Bars: Max. -M = 26.66'k assume $j = .96$, $b = 36''$, $d = 25''$

Req'd. $A_s = \frac{12M}{f_s j d} = \frac{12 \times 26.66}{20 \times .96 \times 25} = 0.67 \square'' \times 4/3 = 0.89 \square''$

Try 3-#6 Bars $A_s = 1.32 \square''$ $\Sigma_o = 7.1$

$m = \frac{nA_s}{bd} = \frac{9.2 \times 1.32}{36 \times 25} = .01349$ $k = \sqrt{m^2 + 2m} - m = .1513$ $j = 1 - \frac{k}{3} = .950$

Req'd. $A_s = \frac{12M}{f_s j d} \times \frac{4}{3} = \frac{12 \times 26.66 \times 4}{20 \times .95 \times 25 \times 3} = 0.898 \square'' < 1.32$ O.K.

Use #6 @ 12" in Top $A_s = 0.44 \square''/'$ $\Sigma_o = 2.4''/'$

FIG. 4-30

x

LAKE PONTCHARTRAIN, LA. & VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
IHNC-W. LEVEE-LAKE PONT. TO FLA. AVE.
IHNC-E. LEVEE-LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - WEST LEVEE

Typ. Conc. Design (cont.):

Tension Pile Anchorage:

Max Pile Load in Tension = 47^k

Req'd. $A_s = 47/20 = 2.35\,\square''$

Use 4-#7 Bars w/std. hooks $A_s = 2.40\,\square''$

Compression Pile Anchorage:

Use 4-#7 Bars w/o hooks

FIG. 4-31

CWR NOV. 67

Sh. 1 of 1

CKD. BY: DAM

LAKE PONTCHARTRAIN, LA. & VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

IHNC - W. LEVEE - LAKE PONT. TO FLA. AVE.

IHNC - E. LEVEE - LAKE PONT. TO MR-GO

INVERTED T-TYPE FLOODWALL - EAST LEVEE

Sta. 60+60 to 61+31, Gate IE and Sta. 61+89 to 63+47

Typ. 60' Monolith W/ 5 tension piles at 12' ctrs. and 10 compression piles at 6' ctrs.

Pile length = 37'   k = 135 psi

All piles on 1:2 batter

Allowable and max. computed pile loads at Sta. 62+50

	Tension		Compression	
	AXIAL	TRANSV.	AXIAL	TRANSV.
ALLOWABLE	18.00 K	3.848 K	45.00 K	3.999 K
COMPUTED	18.027 K	0.147 K	41.415 K	0.672 K

Note: Computation of max. pile loads similar to Fig. 4-20 to Fig. 4-23

FIG. 4-32

LAKE PONTCHARTRAIN & VICINITY
IHNC EAST & WEST LEVEES
LAKE PONTCHARTRAIN TO FLA. AVE
GATE 7 W

Sheet 1 of
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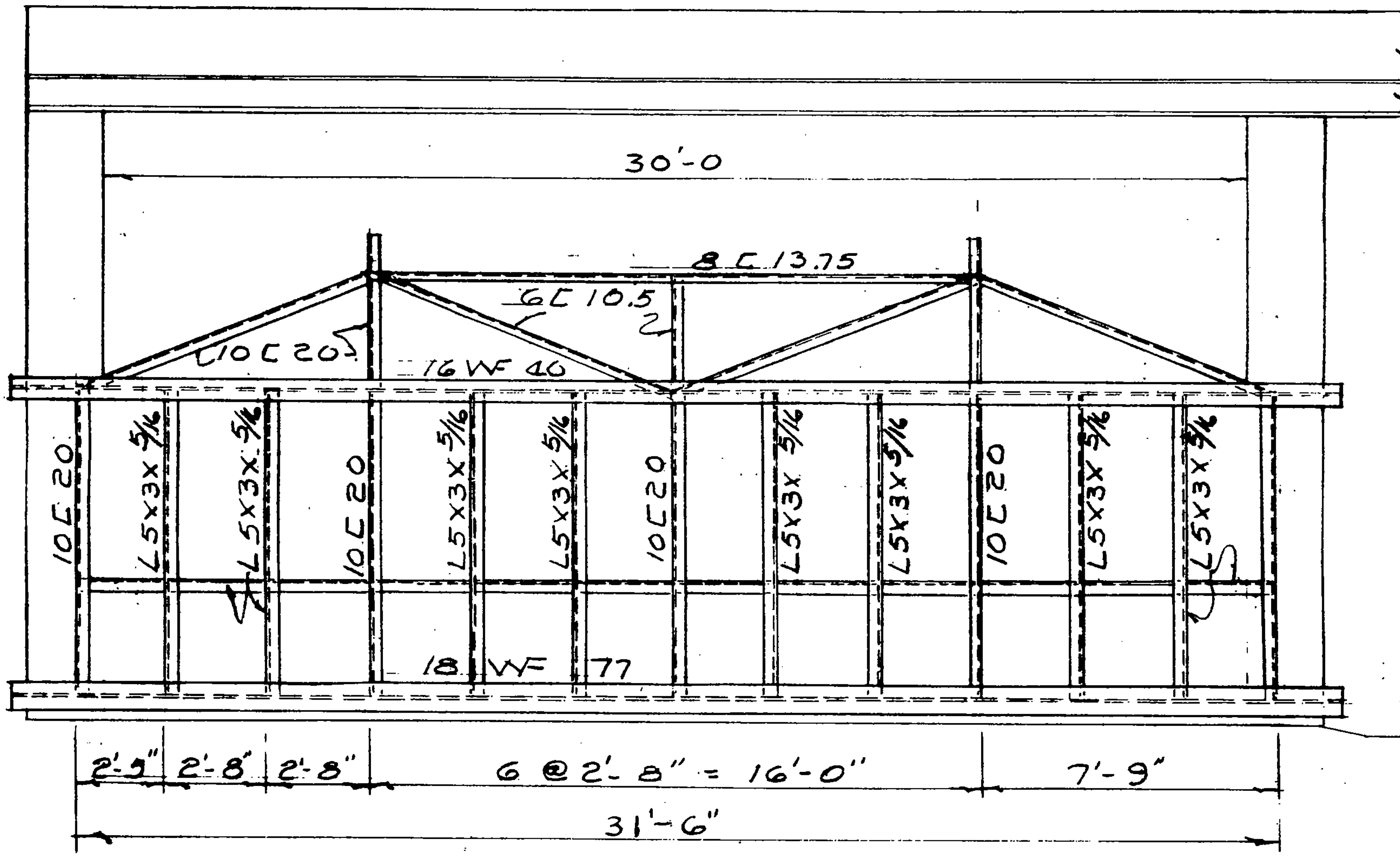
Checked by: WE



GATE 7 W – FLOOD SIDE ELEV.
SCALE: 1/4" = 1'-0

FIG. 4-33

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla Ave
GATE 7-W

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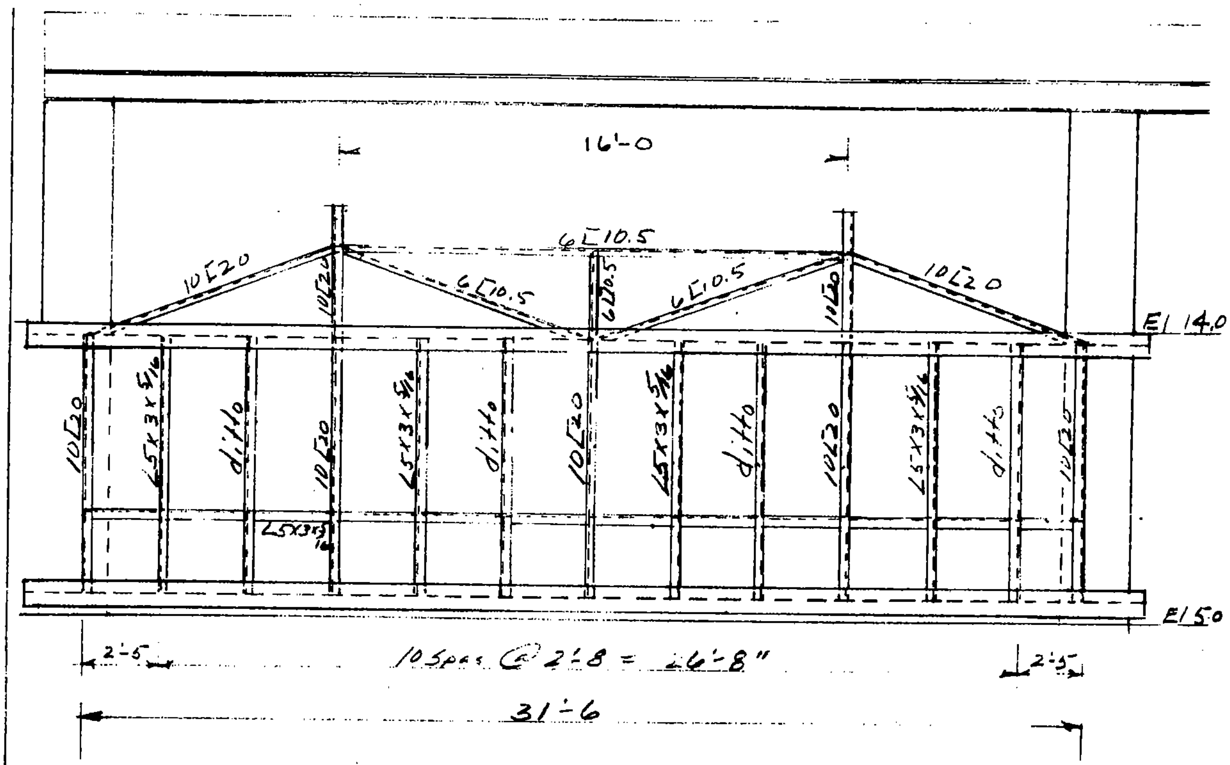

GATE 7 W
FLOODSIDE ELEVATION
Scale 3/16" = 1'-0

USE REVISED Sheet #1
THIS SHEET SUPERSEDED

Fig. 4-34

LAKE PONTCHARTRAIN LA & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla Ave.
GATE 7-W

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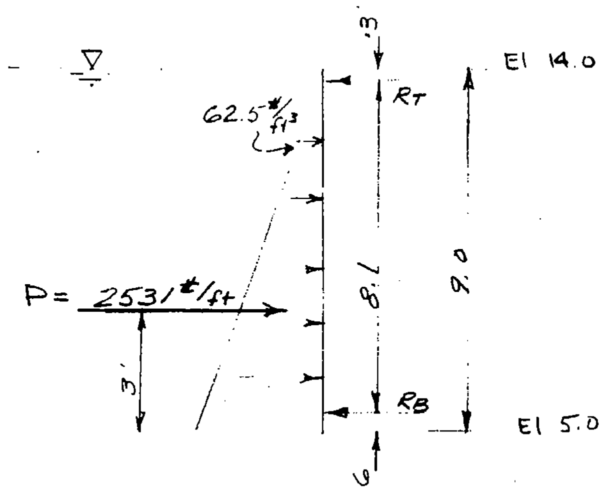

$P = 62.5 \times \frac{9^2}{2}$

$P = 2531$ #/'

REACTIONS

$R_T = \frac{2531 \times 2.4}{8.10} = 750$ #/'

$R_B = \frac{2531 \times 5.7}{8.10} = 1781$ #/'

GIRDER DESIGN

Allowable $f_s = 20,000$ #/□"

Top Girder span = 31.08 Load = 750 #/'

$M = \frac{750 \times \overline{31.08}^2}{8} = 90,560$ '#

$S = \frac{90,560 \times 12}{20,000} = 54.3 \text{ in}^3$

Use 16 WF 40, I = 515.5 S = 64.4 $f_b = 16,875$ #/□"

$\Delta = \frac{.013 W l^3}{EI} = \frac{.013 \times (31.08 \times 750^{\#}) \times (31.08 \times 12)^3}{30 \times 10^6 \times 515.5}$

$\Delta = 1.01''$

Bottom Girder span = 31.08 Load = 1781 #/'

$M = \frac{1781 \times \overline{31.08}^2}{8} = 214,981$ '#

$S = \frac{214,981 \times 12}{20,000} = 129.0 \text{ in}^3$

Use 18 WF 77, I = 1286.8 S = 141.7 $f_b = 18,206$ #/□"

$\Delta = \frac{.013 \times (1781 \times 31.08) \times (31.08 \times 12)^3}{30 \times 10^6 \times 1286.8} = 1.00''$

FIG. 4-35

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla Ave
GATE 7-W

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SKINPLATE

Use 5/16" Skinplate $I = \frac{12 \times .3125^3}{12} = .031$

$S = \frac{12 \times \overline{.3125}^2}{6} = .20$

Max load $62.5 \times 8.4 = 525$ #/

$M(max) = S \times f_s = .20 \times 20,000 = 4,000$ "#

Int. span $M = \frac{525 \times L^2 \times 12}{12} = 4,000$

$L^2 = \frac{4,000}{525} = 7.619$ $L = 2.76'$ Use 2'-8

Ext Span $M = \frac{525 \times L^2 \times 12}{10} = 4,000$

$L^2 = \frac{4,000 \times 10}{525 \times 12} = 6.349$ $L = 2.52'$ Use 2'-5"

$M_{INT} = \frac{525 \times \overline{2.667}^2 \times 12}{12} = 3,734$ "#

$f_b = \frac{3,734}{.20} = 18,670$ #/□" o.k.

$M_{ext} = \frac{525 \times \overline{2.42}^2 \times 12}{10} = 3,689$ "#

$f_b = \frac{3,689}{.20} = 18,445$ #/□"

FIG. 4-36

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

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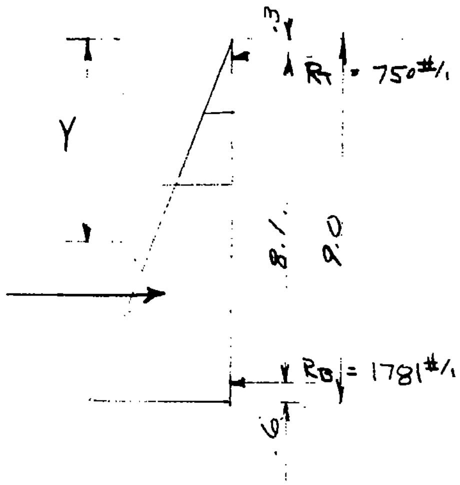


Pt of Zero Shear

$62.5 \times \frac{Y^2}{2} = 750$

$Y^2 = \frac{1500}{62.5} = 24.00$

$Y = 4.90$

$M_{max} = 750 \times (4.90-0.30) - 750\left(\frac{4.90}{3}\right)$

$M_{max} = 2225$ '#/'

DESIGN VERTICALS

2'-8 spacing or 2.67'

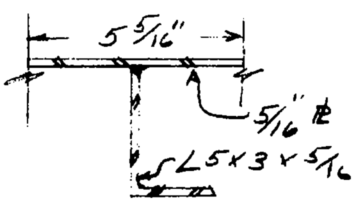
Allow f_s = 18,000 #/□"

$M = 2.67' \times 2225$ '#/'

$M = 5941$ '#

$S = \frac{5941 \times 12}{18,000} = 3.96 \, in^3$

Use ∠5×3×5/16 , I = 18.16 , S = 5.86 , f_b = 12,400 "#



$W = 62.5 \left(\frac{8.4 + 0.3}{2}\right)(8.1) = 2202$ #

$\Delta = \frac{.013 \times 2202 \times 2.67 \times (8.1 \times 12)^3}{30 \times 10^6 \times 18.16}$

$\Delta = .129$ "

FIG. 4-37

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla Ave
GATE 7-W

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LATERAL SUPPORT FOR GIRDERS

NOTE: Support girder flanges at ends, hanger ∠s & center ∠

Top Girder

$f_b = 16,875$ #/□"

$L_u = 8'-0 \qquad d/A_f = 4.54$

$$f_a = \frac{10,000,000}{L_u d/A_f} = \frac{10,000,000}{8 \times 12 \times 4.54}$$

$f_a = 22,936$ #/□" > 16875 #/□" ok

Bottom Girder

$f_b = 18,206$ #/□"

$L_u = 8'-0 \qquad d/A_f = 2.49$

$$f_a = \frac{10,000,000}{L_u d/A_f} = \frac{10,000,000}{8 \times 12 \times 2.49}$$

$f_a = 41,841$ #/□" > 18,206 #/□" ok

FIG. 4-38

LAKE PONTCHARTRAIN LA & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

Sheet 6 of
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WEIGHT AND LOCATION OF CENTROID

MEMBER	SIZE	No	WT/Ft	L	WEIGHT	$\bar{x}$	Moment
Top Girder	16WF40	1	40	34.8	1392#	8.313"	11,572"#
Bottom Girder	18WF77	1	77	34.8	2680#	9.393	25,173
Skinplate	5/16 x 8.75	1	112	31.5	3528	0.156	550
Vertical ∠s	∠5x3x5/16	8	8.2	8.1	531	3.633	1929
Vertical [s	10[20	5	20	8.1	810	5.313	4304
Vertical [s	10[20	2	20	3.8	152	5.313	808
Vertical [s	6[10.5	1	10.5	2.9	31	5.313	165
Sloped [s	10[20	2	20	8.3	332	5.313	1764
Sloped [s	6[10.5	2	10.5	8.5	179	5.313	951
Horizontal [	6[10.5	1	10.5	16.0	168	5.313	893
Stiffener PL	1/2" x 8"	5	13.6	1.25	85	8.313	707
Stiffener PL	1/2" x 3"	5	5.1	1.25	32	8.313	266
Stiffener PL	1/2" x 10"	5	17.0	1.38	117	9.393	1099
Stiffener PL	1/2" x 4"	5	6.8	1.38	47	9.393	441
Lateral support	5x3x5/16	1	8.2	31.5	258	3.633	937
			Totals		10,342#	4.98"	51,559

FIG. 4-39

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

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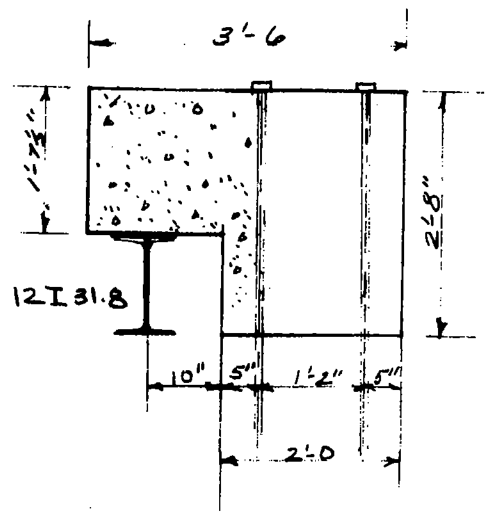
DESIGN OF GANTRY GIRDER:

Area Conc.

2 X 2.667 = 5.33
+ 1.5 X 1.625 = 2.44
Tot 7.77□'



wt. of trolleys = 250#

LL = 10,342# + wt. of trolleys

Total LL = 10,342 + 500# = 10,842# say 11,000#

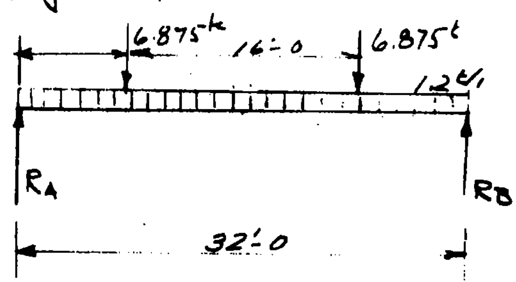
Total DL = 7.77 X 150 + 31.8#/' = 1,197 say 1200#/'

Design of Girder as simply supported beam

Impact factor = 1.25

LL on trolleys = $\frac{11,000}{2}$ x 1.25

= 6,875#



$M_{max} = \frac{1}{8} w l^2 + (R_A \times 16 - 6.875 \times 8)$

$= \frac{1}{8} \times 1.2 \times \overline{32}^2 + 6.875 \times 8$

$= 153.6'^k + 55'^k$

$R_A = 6.875^k$

$\underline{M_{max} = 208.6'^k}$

FIG. 4-40

LAKE PONTCHARTRAIN LA & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla Ave
GATE 7-W

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DESIGN OF GANTRY GIRDER

Concrete Design

$M = Kbd^2$ $\qquad K = 152 \qquad b = 24''$

$d^2 = \dfrac{208.6 \times 12{,}000}{152 \times 24}$

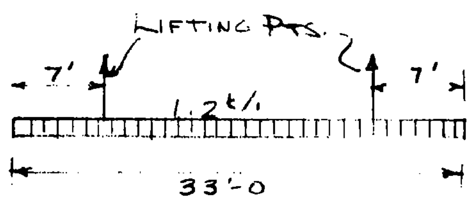
$d^2 = 686 \qquad d = 26.2''$ For Lal. design

Use $d = 28''$

Area Steel req'd $\qquad a = 1.44$, $d = 28''$

$A_s = \dfrac{M}{ad} = \dfrac{208.6}{1.44 \times 28}$

$A_s = 5.17\,\square''$ Use 4 - #9 & 1 - #10 for bottom steel $A_s = 5.27\,\square''$



$M = 1.2 \times 7 \times \dfrac{7}{2}$

$M = 29.4'^{k}$

Impact Factor = 1.50

$M = 1.50 \times 29.4 = 44.1'^{k}$

$A_s = \dfrac{M}{ad} = \dfrac{44.1}{1.44 \times 28}$

$A_s = 1.09\,\square''$ Req'd $\qquad$ Use - 4 - #5 @ Top $\qquad A_s = 1.24\,\square''$

FIG. 4-41

LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

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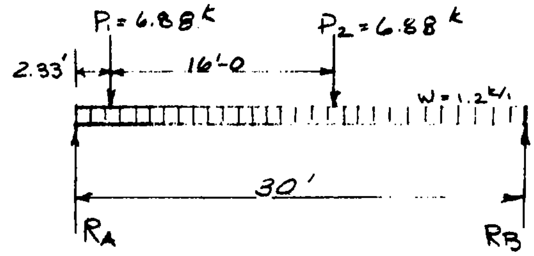
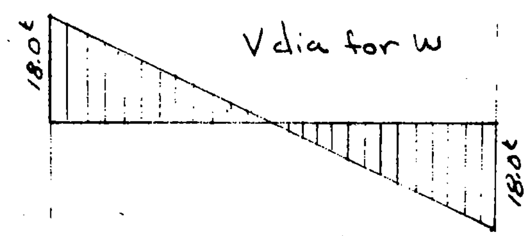
DESIGN FOR SHEAR AND TORSION

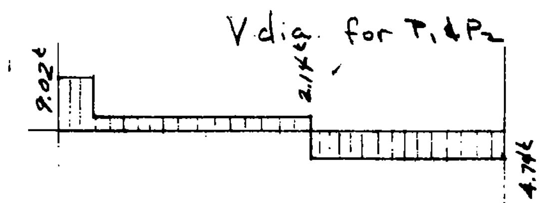
Loading Diagram

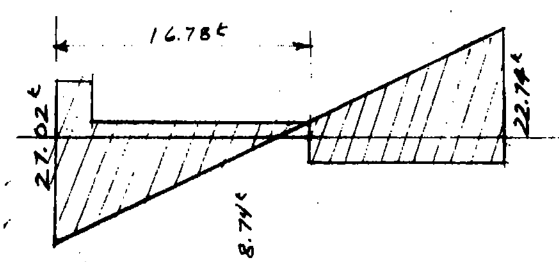


Shear Diagram for D.L.



Shear Diagram for concentrated loads





TORSION MOMENT:

D.L $2.44^{k/'} \times .15' \times 30' \times 21'' = 231''^k$
$+ .03^{k/'} \times 30' \times 22'' = 20''^k$
Tot. $251''^k$

L.L $= 13.76^k \times 22'' = 303''^k$

FIG. 4-92

LAKE PONTCHARTRAIN LA & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

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DESIGN FOR SHEAR AND TORSION

Shear @ A due to Torsion:

$$V = \frac{T}{k_2 b^2 h}$$

$$T = \frac{251}{2} + \frac{303 \times 19.67}{30}$$

$$T = 126 + 199$$

$$T = 325''^{k}$$

$$V = \frac{325 \times 1{,}000}{.21 \times \overline{24}^2 \times 32} = 84^{\#}/\square''$$

$$T_{P_1} = \left(\frac{251}{2} - \frac{251}{30} \times 2.33\right) + 199$$

$$T_{P_1} = 306''^{k}$$

$$V_{P_1} = \frac{306 \times 1{,}000}{.21 \times \overline{24}^2 \times 32} = 79^{\#}/\square''$$

Max Tors @ Center is w/ one load @ center

$$T_C = 0 + \frac{303}{2} \times \frac{15}{30} = 76''^{k}$$

$$V_C = \frac{76 \times 1{,}000}{.21 \times \overline{24}^2 \times 32} = 19.6^{\#}/\square'' \quad \text{say } 20^{\#}/\square''$$

Shear Stress
Influence diagram
due to Torsional
loads

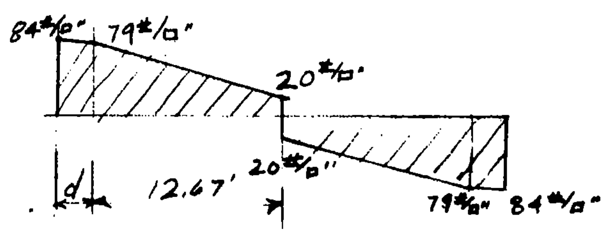
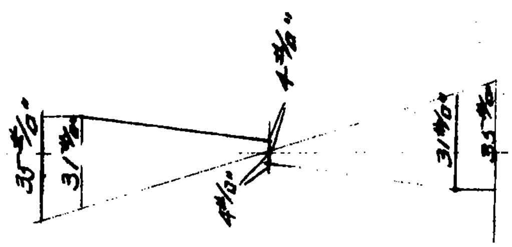


FIG. 4-43

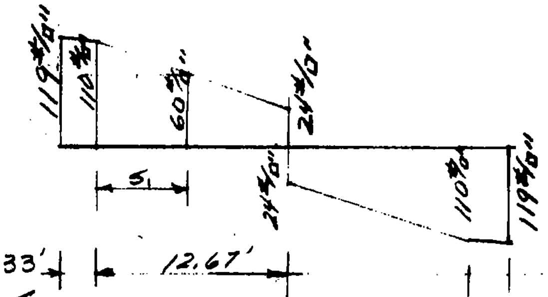
LAKE PONTCHARTRAIN LA. & VICINITY
IHNC East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 7-W

DESIGN FOR SHEAR AND TORSION

Shear Stress Influence Diagram due to moving vert. loads + dead load



COMPOSITE SHEAR AND TORSION INFLUENCE DIAGRAM



DESIGN OF VERTICAL STIRRUPS

$$S_1 = \frac{50 \times 12.67}{86} = 7.37'$$

USE #4 Stirrups $\quad \frac{v'b}{BA_v f_v} = \frac{50 \times 24}{1 \times 8{,}000} = .150$

1206b ACI $\quad \max s = \frac{A_v}{.0015\,b} = \frac{2 \times .20}{.0015 \times 24} = 11.1''$

say 10''

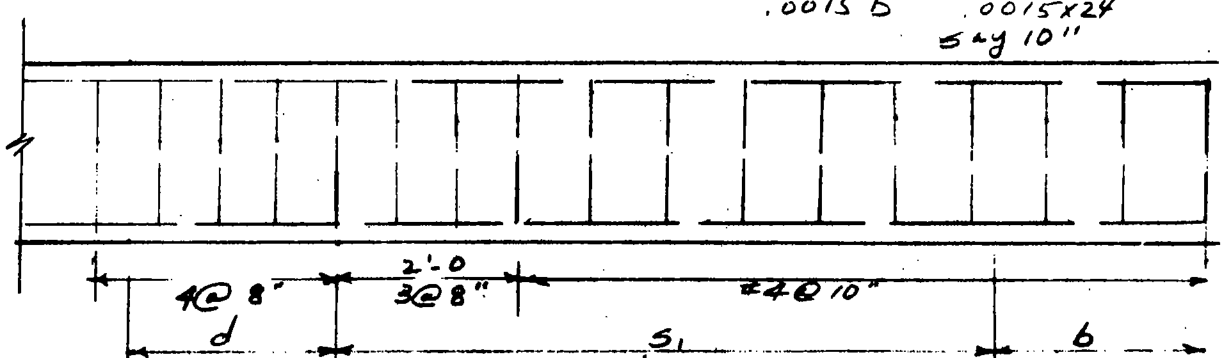
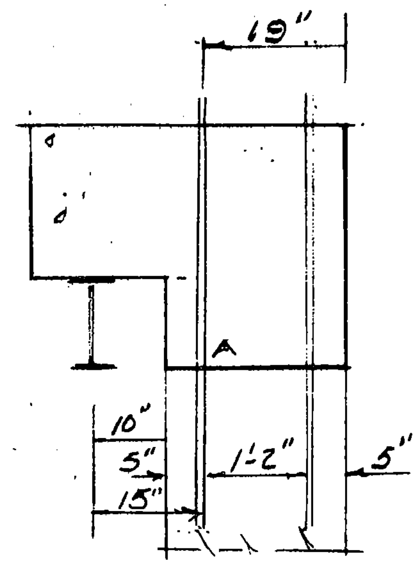


FIG. 4-44

LAKE PONTCHARTRAIN LA. & VIC — Sheet
IHNC EAST & WEST LEVEES — Comp. by RFW
LAKE PONTCHARTRAIN TO FLA. AVE — Chk TFP
GATE 7 W — July 67

DESIGN ANCHOR BOLTS

ΣM @ Pt A



Max reaction occurs when one trolley is directly under support $= \frac{W}{2} \times 1.5$

LL. Gate 10,500
Trolleys 500
+25° 2750
13,750#

Concrete

$2 \times 2.67 \times 150 \times 33' = 26430'$ — $\frac{13,750}{2} \times 1.5 \times 15'' = 154,688$

$1.5 \times 1.6 \times 150 \times 33 = 11880'$ — $11,880 \times \frac{1}{2} \times 14''$ 83 160

I Beam – $26430 \times \frac{1}{2} \times -7''$ – 92 505

$31.8 \times 33 = 1050$ — $1050 \times \frac{1}{2} \times 15$ 7 875

WIND — $4405 \times \frac{1}{2} \times 16 = 35\,240$

$50\#/\square' \times 2.67 \times 33 = 4405$ — TOTAL 188,458

Tension in bolt

$F \times 14'' = 188,458$ in lb

$F = 13,461\#$

Use $1\frac{1}{2}$ ϕ Bolts

$A = 1.767$, $O = 4.71''$

$T = \frac{13,450}{1.767} = 7,612$ psi

Embedment

$u = \frac{1.7\sqrt{f'_c}}{1.5} = \frac{1.7\sqrt{3000}}{1.5}$

$U = \frac{1.7 \times 55}{1.5} = 62.33$

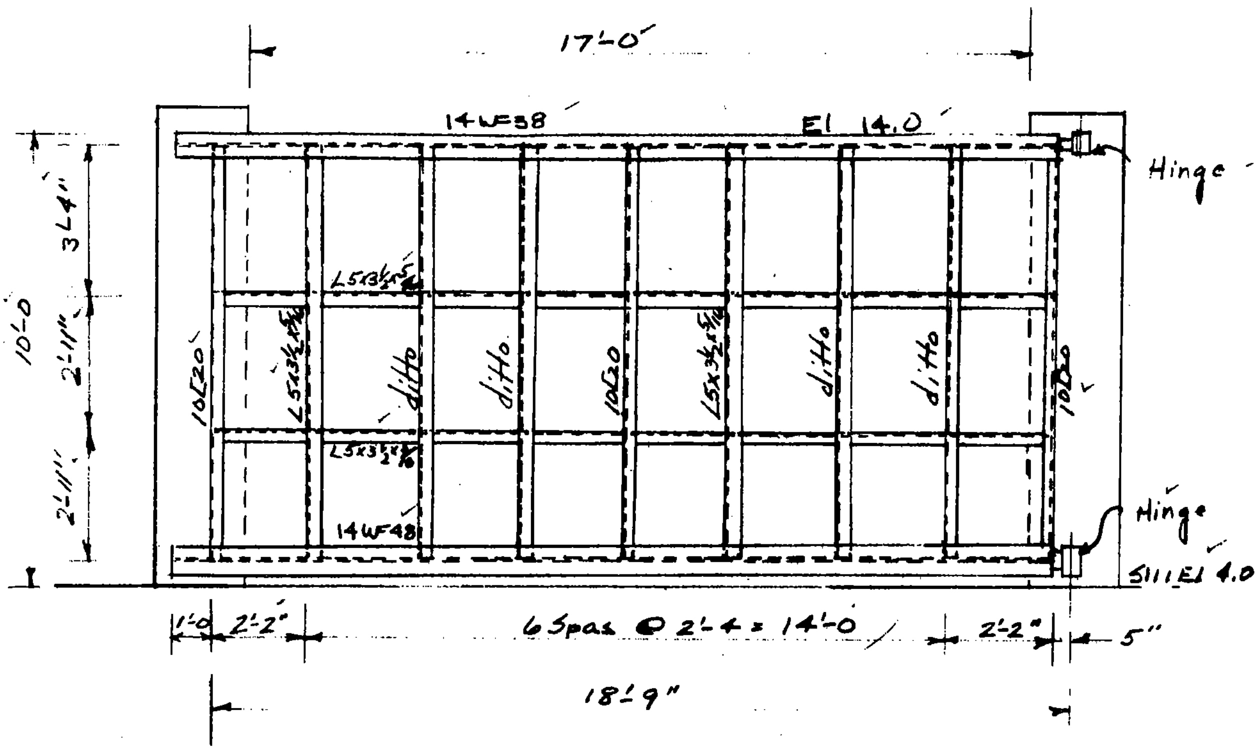
$62.33 \times 4.71\, L = 13,500$

$L = \frac{13500}{293.6} = 46''$

FIG. 4-45

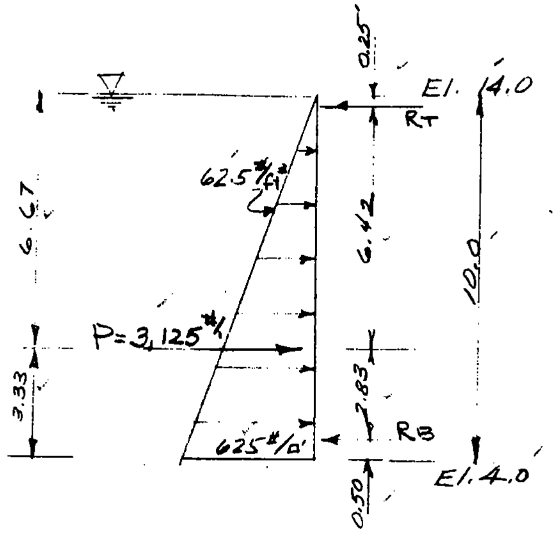
LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - West & East Levees
Lake Pontchartrain to Fla. Ave.
GATE 10W

Sheet 1 of
Comp. by WET
Date APR 67
Checked by RFW



SWING GATE 10W
FLOOD SIDE ELEVATION
Scale 1/4" = 1'-0"

FIG. 4-46



REACTIONS

$62.5^{\#}/ft^3 \times 10.0 = 625^{\#}/\square'$

$P = \frac{1}{2} \times 625 \times 10 = 3{,}125^{\#}/'$

$R_T = \frac{3{,}125 \times 2.83}{9.25} = 956^{\#}/'$

$R_B = \frac{3{,}125 \times 6.42}{9.25} = 2{,}169^{\#}/'$

$\Sigma R_T + R_B = 3{,}125^{\#}/'$

GIRDER DESIGN Allow $f_s = 20{,}000^{\#}/\square''$

Top Girder Span = 19'± Load = 956#/' $W = 19 \times 956 = 18{,}164^{\#}$

$M = \frac{wl^2}{8} = \frac{956^{\#}/' \times (19)^2 \times 12''/'}{8}$

$M = 517{,}674\ ''^{\#}$

$S = \frac{M}{f_s} = \frac{517{,}674}{20{,}000}$

$S = 25.88\ in^3$ req'd

Use 14 WF 38 : $I = 385.3\ in^4$ $S = 54.6\ in^3$
$f_b = 9{,}481^{\#}/\square''$

$\Delta = .013\frac{Wl^3}{EI} = \frac{0.013 \times 18{,}164^{\#} \times 19^3 \times 12^3}{30 \times 10^6 \times 385.3}$

$\Delta = 0.24''$

Bottom Girder Span = 19'± Load 2169#/' $W = 2169^{\#}/' \times 19 = 41{,}211^{\#}$

$M = \frac{wl^2}{8} = \frac{2169^{\#}/' \times (19)^2 \times 12''/'}{8} = 1{,}174{,}514^{\#}/''$

$S = \frac{M}{f_s} = \frac{1{,}174{,}514^{\#}/''}{20{,}000^{\#}/\square''} = 58.73\ in^3$

Use 14WF48 : $I = 484.9\ in^4$ $S = 70.2\ in^3$
$f_b = 16{,}731^{\#}/\square''$

FIG. 4-47

GIRDER DESIGN

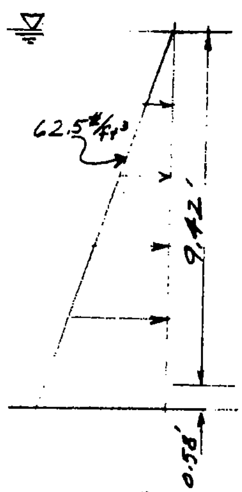
Bottom Girder $\Delta = \frac{.013\,Wl^3}{EI} = \frac{.013 \times 41{,}211 \times \overline{19}^3 \times \overline{12}^3}{30 \times 10^6 \times 484.9}$

$\Delta = 0.437 \text{ in}$

SKINPLATE DESIGN

Allow. $f_s = 20{,}000\#/\square''$

Use 5/16" Plate 0.3125"



$\frac{\frac{8.02''}{2} + 3''}{12} = 0.58'$

$I = \frac{bd^3}{12} = \frac{12 \times \overline{0.3125}^3}{12} = 0.031 \text{ in}^4$

$S = \frac{bd^2}{6} = \frac{12 \times \overline{0.3125}^2}{6} = 0.20 \text{ in}^3$

Max load $= 62.5\#/ft^3 \times 9.42 = 589.0$ say $600\#/\square'$

M_{max} int. spans $= \frac{1}{12} wl^2$

$M = \frac{1}{12} \times 600 \times l^2$

$M = S \times f_s = 0.20 \times 20{,}000.00$

$M = 4{,}000$ "#

$\therefore \frac{600\#/' \times l^2}{12} = 4{,}000\text{"\#} \times \frac{1}{12}$

$l = 2.58'$ allowable, use 2.33'

M_{max} ext. spans $= \frac{1}{10} wl^2$

$M = \frac{1}{10} \times 600 \times l^2$

$M = 4{,}000$ "#

$\therefore \frac{600\,l^2}{10} = 4{,}000\text{"\#} \times \frac{1'}{12''}$

$l = 2.35'$ allowable, use 2.167'

FIG. 4-48

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
Lake Pontchartrain to Fla. Ave.
GATE 10W

Sheet 4 of
Comp. by WET
Date APR67
Checked by RW

SKINPLATE DESIGN

$$M_{int.} = \frac{wl^2}{12} = \frac{600^{\#} \times \overline{2.33}^2}{12}$$

$$M = 271'^{\#}$$

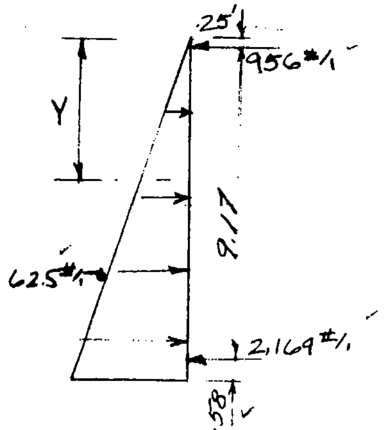
$$f_b = \frac{M}{S} = \frac{271 \times 12}{0.20} = \underline{16,260^{\#}/\square'' \text{ ok.}}$$

$$M_{ext.} = \frac{wl^2}{10} = \frac{600 \times \overline{2.167}^2}{10} = 282'^{\#}$$

$$f_b = \frac{M}{S} = \frac{282 \times 12}{0.20} = \underline{16,920^{\#}/\square'' \text{ o.k.}}$$

DESIGN VERTICAL SUPPORTS

Allow $f_s = 18,000^{\#}/\square''$



PT. OF Zero Shear

$$\frac{62.5Y^2}{2} = 956$$

$$Y^2 = \frac{956 \times 2}{62.5}$$

$$Y^2 = 30.59$$

$$Y = 5.53$$

$$M_{max} = 956^{\#} \times (5.28) - 957 \times \frac{5.53}{3}$$

$$= 3,284'^{\#}/'$$

$$W = 9.42 \times \frac{600}{2} = 2,826^{\#}/'$$

Max Spacing on Verticals is 2.33'

$$M = 2.33' \times 3,284'^{\#}/' = 7,652'^{\#}$$

$$S = \frac{M}{f_s} = \frac{7,652 \times 12}{18,000}$$

$S = 5.10$ in³ req'd

$$d = \frac{L \times 12''/'}{24} = \frac{9.17}{2} = 4.59 \text{ in req'd}$$

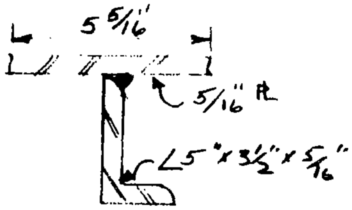
FIG. 4-49

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC- East & West Levees
Lake Pontchartrain to Fla. Ave
GATE 10W

Sheet 5 of
Comp. by WST
Date Apr 67
Checked by [illegible]

DESIGN VERTICAL SUPPORTS

Use $\angle 5'' \times 3\frac{1}{2}'' \times \frac{5}{16}''$



$I = 19.41\ in^4,\quad S = 6.48\ in^3$

$$f_b = \frac{7{,}652 \times 12}{6.48}$$

$f_b = 14{,}172\ \#/\square''$ ok.

$$\Delta = \frac{0.013 \times 2{,}826 \times 2.33 \times \overline{9.17}^3 \times \overline{12}^3}{30 \times 10^6 \times 19.41}$$

$\Delta = .196$ in

Weight & Centroid

MEMBER	SIZE	No	wt/ft	L	WT	x	MOMENT
Top Girder	14WF38	1	38	19.75	751.#	7.37"	5535'#
Bottom Girder	14WF48	1	48	19.75	948.0	7.22	6845
Skinplate	PL 5/16" x 9.72	1	124.42	18.75	2333.	0.156	364
Vertical L's	L5"x3½"x5/16"	6	8.7	9.14	477	3.72	1774
Vertical ['s	10[20	3	20	9.14	548	5.313	2912
Stiffener PL's	PL ½"x4"	4	6.80	1.10	30	7.37	221
Stiffener PL's	PL ½" x 10"	6	17	1.10	112.	7.37	825
TOTAL					5199#	3.55"	18,476'#

Total Wt = 5,199# say 5,200#

Centroid = 3.55" from outside face of skinplate

FIG. 4-50

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
Lake Pontchartrain to Fla Ave
GATE 10W

LATERAL SUPPORT FOR GIRDERS

14WF38 $f_b = 9{,}481 \#/\square''$ ✓
14WF48 $f_b = 16{,}733 \#/\square''$ ✓

NOTE: Provide supports for flanges at end and center verticals for top and bottom girders.

Top girder

$$f_a = \frac{10 \times 10^6}{Ld/A_f} = \frac{10 \times 10^6}{9.38 \times 12 \times 4.06}$$

$$f_a = 21{,}882 \#/\square'' > 9{,}481 \#/\square'' \quad o.k.$$

Bottom girder

$$f_a = \frac{10 \times 10^6}{Ld/A_f} = \frac{10 \times 10^6}{9.38 \times 12 \times 2.90}$$

$$f_a = 30{,}637 \#/\square'' > 16{,}733 \#/\square'' \quad o.k.$$

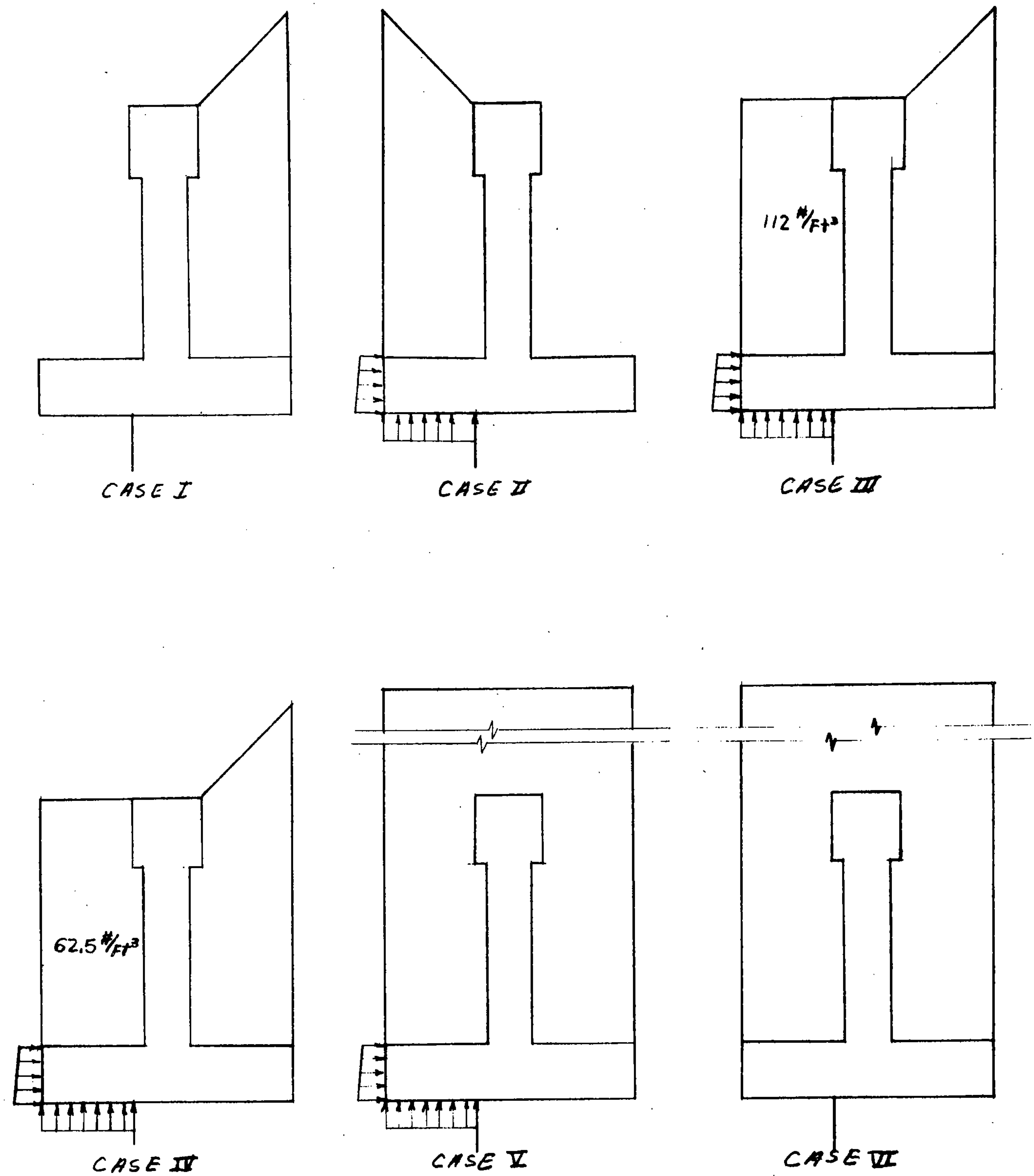


FIG. 4-52

T WALL AT ROCK STORAGE
WEST LEVEE, IHNC
FLA. AVE. TO IHNC LOCK
LAKE PONTCH. BARRIER PLAN

SHEET 1
A.R. 22 JUN 1967
Checked By H.L.B.

I. DESIGN CONSIDERATIONS:

A. GIVEN:

1. THE "ROCK" MATERIAL WEIGHS 112#/FT³
2. THE MATERIAL WILL STAND ON A 1 TO 1 SLOPE
3. A SOIL LAB. ANALYSIS IS NOT AVAILABLE
4. THE TOP OF THE WALL STEM WILL BE 3'x3'
5. THE TOP OF THE WALL WILL BE AT ELEV. 14.0
6. THE TOP OF THE BASE OF THE WALL WILL BE AT ELEV. 3.16
7. THE MATERIAL WILL HAVE A TOP ELEV. OF 42.00

B. ASSUMPTIONS:

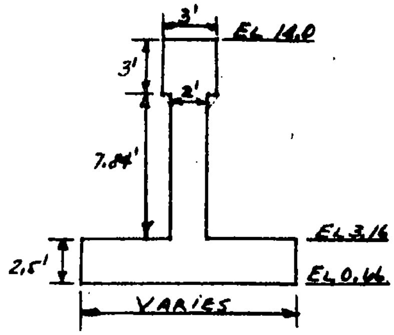
1. THE MATERIAL WEIGHS 112#/FT³ AT 100% SATURATION.
2. THE WALL IS ALLOWED TO MOVE NOT MORE THAN 0.65", AWAY FROM MATERIAL.
3. THE ACTIVE PRES. COEF. (K_a) WILL BE USED.
4. A 6" PAVEMENT, FLUSH WITH THE TOP OF THE BASE OF THE WALL, EXTENDS A SUFFICIENT DISTANCE FLOODSIDE & LANDSIDE OF THE WALL.
5. THE WALL WILL NOT BE STRUCTURALLY CONNECTED TO THE EXISTING SLAB OR FOOTING.
6. THERE WILL BE A ~~[illegible]~~ JOINT BETWEEN THE BASE OF THE WALL AND THE SLAB OR PAVEMENT SO THAT THE WALL WILL BE ALLOWED TO MOVE LATERALLY NO MORE THAN 0.65".
7. THE EXISTING SLAB OR PAVEMENT, NEAR THE WALL, IS RIGID AND WILL REMAIN HORIZONTAL WHEN LOADED.
8. WATER ENTERS THE JOINT AT THE BASE OF THE WALL AND THE PAVEMENT SO THAT LATERAL WATER PRESS. AND UPLIFT IS EXPERIENCED AT THE BASE OF THE WALL.
9. WATER UPLIFT PRESS. AT THE LANDSIDE LOWER CORNER OF THE BASE OF THE WALL, IS ZERO.
10. 12"x12" CONCRETE PILES WILL BE USED.

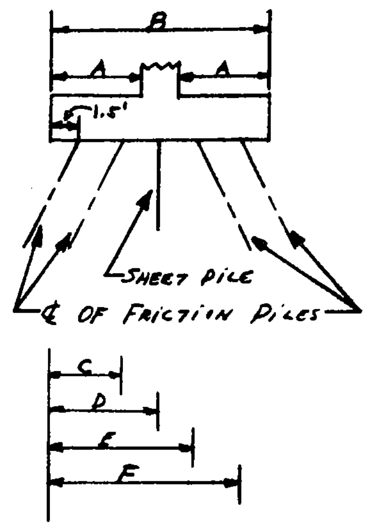
FIG. 4-53

T WALL AT ROCK STORAGE
WEST LEVEE, IHNC
LAKE PONT. BARRIER PLAN

SHEET 2
A.R. 22 JUN 67

11. DIMENSIONS OF THE WALL ARE:





	A	B	C	D	E	F
FOR 8' BASE 1 PILE LT. & 1 PILE RT.	3'	8'	0	4'	6.5'	0
11' BASE, 2 PILE LT. & ONE RT.	4.5'	11'	4.5'	7.0'	9.5'	0
11' BASE, 1 PILE LT. & TWO RT.	4.5'	11'	0	4'	6.5'	9.5'
14' BASE, 2 PILES LT. & TWO RT.	6.0'	14'	4.5'	7.0'	9.5'	12.5'

12. K_A:

IN ORDER TO COMPUTE K_A, FOUR VALUES MUST BE KNOWN:

ϕ = ANGLE OF INTERNAL FRICTION OF THE MATERIAL
i = ANGLE OF INCLINATION (SLOPE OF BACKFILL)
β = ANGLE OF WALL WITH HORIZ. (IN ALL OUR CASES, IT IS 90°)
δ = ANGLE OF FRICTION OF THE MATERIAL & THE WALL. (EM 1110-2-2502 RECOMMENDS USING δ OF NOT MORE THAN 3/4 OF ϕ.)

K_A WAS COMPUTED FOR SEVERAL VALUES OF ϕ FROM 10° TO 45° AND FOR SEVERAL VALUES OF i FROM 10° TO 45°. THE MAX. VALUE OBTAINED FOR K_A WAS 1.00 AND THEREFORE A K_A OF 1.00 IS USED.

FIG. 4-54

T WALL AT ROCK STORAGE
WEST LEVEE, IHNC
LAKE PONTCH. BARRIER PLAN

SHEET 3
A. R. 22 JUN 67

13. LENGTH OF PILES:

FOR ALLOWABLE PILE LOADS OF 40 KIPS IN TENSION AND 88 KIPS IN COMPRESSION, THE PILES MUST PENETRATE TO ELEV. -55.00.

SINCE ONLY BATTERS OF 1:2, 1:4 AND POSSIBLY 1:6 ARE BEING CONSIDERED, THEN THE LONGEST PILE THAT COULD BE USED AND BE DRIVEN TO ELEV. -55 WOULD OCCUR ON A BATTER OF 1:2. FOR OTHER BATTERS (1:4 AND 1:6) THE SAME LENGTH OF PILE WOULD PENETRATE TO A LOWER ELEVATION, AFFORDING GREATER ALLOW. PILE LOADS.

ON A 1:2 BATTER, A LENGTH OF PILE OF 64 FT. WOULD BE NEEDED AND THEREFORE, 64 FT. PILES ARE USED IN DESIGN.

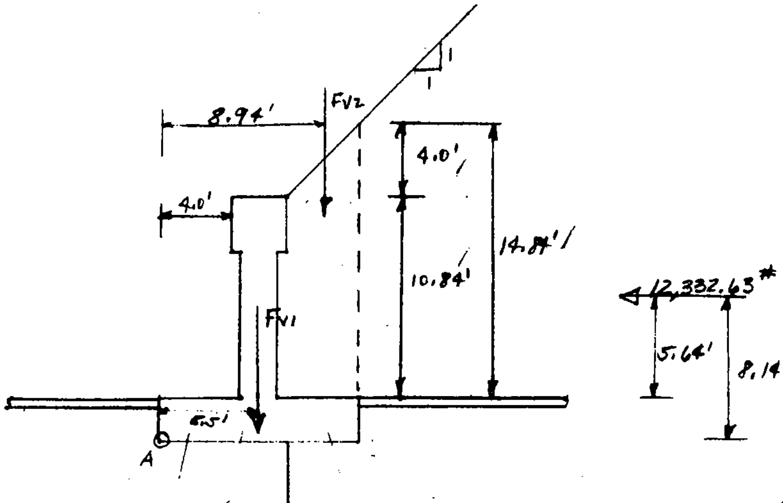
FIG. 4-55

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 9
A.R. 26 JUN 67

FOR 11' BASE (2 PILES LT., 1 RT.) IMPERVIOUS SITUATION:

CASE 1: (MAT'L ON LANDSIDE, ONLY)



$P_1 = \frac{\gamma H^2 K}{2} = 112^{\#}/FT^3 \times (14.84\ FT.)^2 \times 1.0 \times 1.0\ FT. \div 2.0 = 12,332.63^{\#}$

$\bar{Y}_1 = 0.38\ H = 0.38 \times 14.84' = 5.64'$

$F_{V1} = (2.5' \times 11.0' + 2.0' \times 7.84' + 3' \times 3')\ 1.0' \times 150^{\#}/FT^3 = 7,827.00^{\#}$

$\bar{X}_1 = 5.5'$

$F_{V2} = (4.5' \times 7.84' + 4.0' \times 3' + 0.5 \times 4.0' \times 4.0')\ 1.0' \times 112^{\#}/FT^3 = 55.28^{\square'} \times 1.0' \times 112 = 6,191.36^{\#}$

$\bar{X}_2 = 11.00 - \frac{35.28^{\square'} \times 2.25' + 12.0^{\square'} \times 2.0' + 8.0^{\square'} \times 1.33'}{55.28^{\square'}} = 11.00' - 2.06' = 8.94'$

$\Sigma M_A = 7,827.00^{\#} \times 5.5' + 6,191.36^{\#} \times 8.94' - 12,332.63^{\#} \times 8.14'$

$= 1,988.35'^{\#}$

$\Sigma F_V = 14,018.36^{\#} \downarrow$

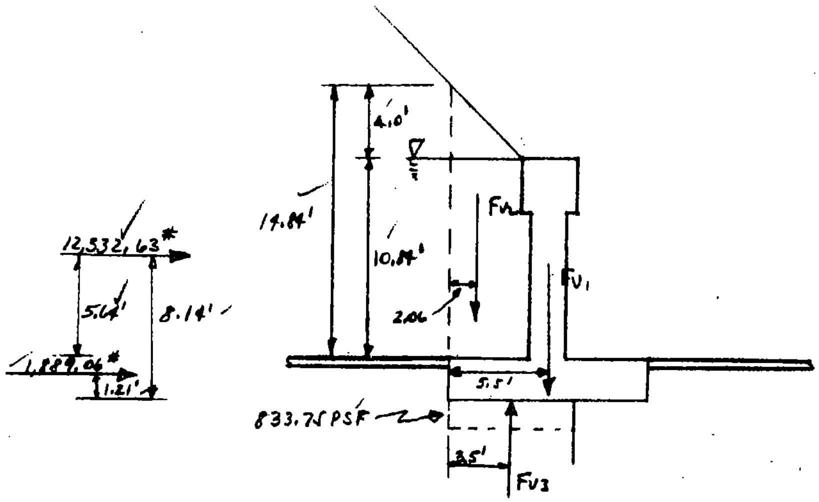
$\Sigma F_H = 12,332.63^{\#} \leftarrow$

FIG. 4-56

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 10
A.R. 27 JUN 67

CASE 2: (MAT'L & WATER ON FLOODSIDE, ONLY)



$P_1 = 12{,}332.63^{\#}$ $\bar{Y}_1 = 5.64'$
$P_2 = 1{,}889.06^{\#}$ $\bar{Y}_2 = 1.21'$
$F_{V1} = 7{,}827.00^{\#}$ $\bar{X}_1 = 5.5'$

$F_{V2} = 6{,}191.36^{\#}$ $\bar{X}_2 = 2.06'$

$F_{V3} = 833.75\ PSF \times 7.0' \times 1.0' = -5{,}836.25^{\#}$
$\bar{X}_3 = 3.5'$

$\Sigma M_A = 12{,}332.63^{\#} \times 8.14' + 6{,}191.36^{\#} \times 2.06' + 7{,}827.00^{\#} \times 5.5' - 5{,}836.25^{\#} \times 3.5' + 1{,}889.06^{\#} \times 1.21'$
$= 138{,}049.20'^{\#}$

$\Sigma F_V = 8{,}182.11^{\#} \downarrow$

$\Sigma F_H = 14{,}221.69^{\#} \rightarrow$

$$\bar{X}_{R_V} = \frac{7{,}827 \times 5.5 + 6{,}191.36 \times 2.06 - 5{,}836.25 \times 3.5}{8{,}182.1}$$

$\bar{X}_{R_V} = 4.32$
$R_V = 8{,}182.1$

$$\bar{Y}_{R_H} = \frac{12{,}332.64 \times 8.14 + 1{,}889.06 \times 1.21}{14{,}221.7}$$

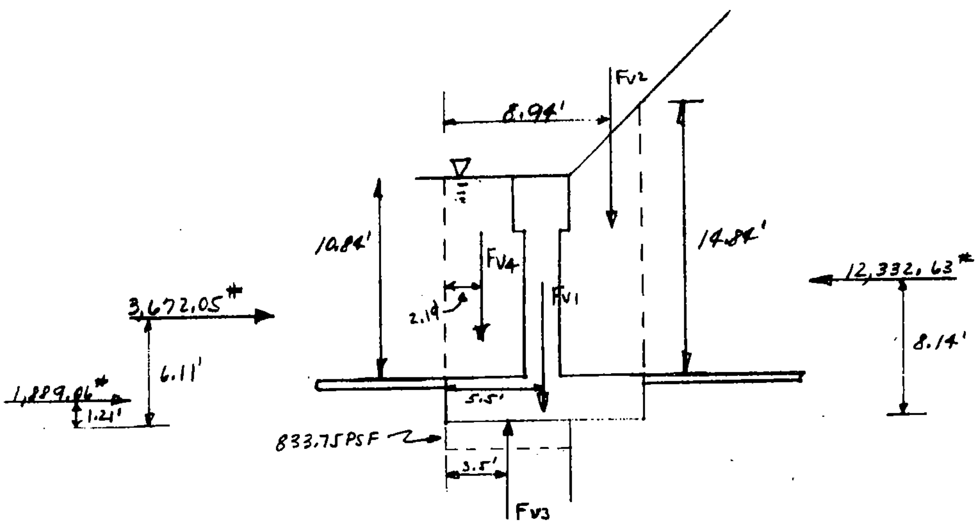
$\bar{Y}_{R_H} = 7.22$
$R_H = 14{,}221.7$

FIG. 4-57

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 11
A.R. 27 JUN 67

CASE 3: (WATER ON FLOODSIDE & MAT'L ON LANDSIDE)



$P_1 = 12,332.63^{\#}$ $\quad \bar{Y}_1 = 8.14'$

$P_2 = 1,889.06^{\#}$ $\quad \bar{Y}_2 = 1.21'$

$P_3 = 62.5^{\#}/FT^3 \times (10.84\,FT)^2 \times 1/2 \times 1.0' = 3,672.05^{\#}$

$\bar{Y}_3 : (10.84' \div 3) + 2.5' = 6.11'$

$F_{V1} = 7,827.0^{\#}$ $\quad \bar{X}_1 = 5.5'$

$F_{V2} = 6,191.36^{\#}$ $\quad \bar{X}_2 = 8.94'$

$F_{V3} = -5,836.25^{\#}$ $\quad \bar{X}_3 = 3.5'$

$F_{V4} = (4.5' \times 7.84' + 4.0' \times 3.0')\ 1.0' \times 62.5^{\#}/FT^3 = 2,955.0^{\#}$

$\bar{X}_4 = \dfrac{35.28^{\square'} \times 2.25' + 12.0^{\square'} \times 2.0'}{47.28^{\square'}} = 2.19'$

$\Sigma M_A = 3,672.05^{\#} \times 6.11' - 12,332.63^{\#} \times 8.14' + 7,827.0^{\#} \times 5.5' + 6,191.36^{\#} \times 8.94'$
$+ 2,955.0^{\#} \times 2.19' - 5,836.25^{\#} \times 3.5' + 1,889.06^{\#} \times 1.21'$

$= 8,778.21'^{\#}$ ↷

$\Sigma F_V = 11,137.11^{\#}$ ↓

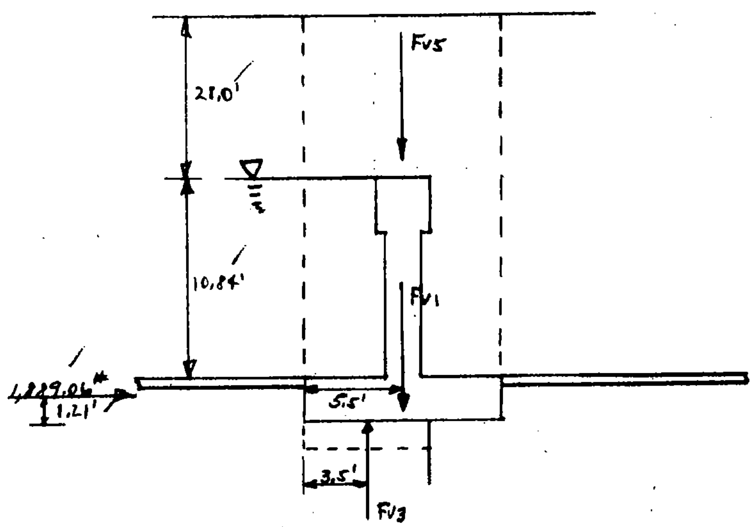
$\Sigma F_H = 6,771.52^{\#}$ ←

FIG. 4-58

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 12
A. R. 27 JUN 67

CASE 4: (MAT'L ON SIDES & TOP, WATER ON FLOODSIDE)



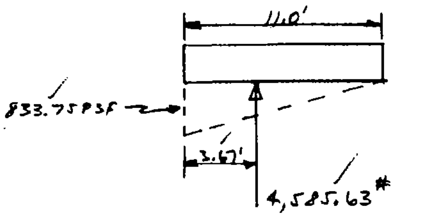
$P_2 = 1,889.06^{\#}$ $\bar{Y}_2 = 1.21'$
$F_{V1} = 7,827.0^{\#}$ $\bar{X}_1 = 5.5'$
$F_{V3} = -5,836.25^{\#}$ $\bar{X}_3 = 3.5'$
$F_{V5} = (11.0' \times 28.0' + 4.0' \times 3.0' \times 2.0 + 4.5' \times 7.84' \times 2.0)\ 1.0' \times 112^{\#}/FT^3 = 45,086.72^{\#}$
$\bar{X}_5 = 5.5'$
$\Sigma M_A = 7,827.0^{\#} \times 5.5' + 45,086.72^{\#} \times 5.5' - 5,836.25^{\#} \times 3.5' + 1,889.06^{\#} \times 1.21'$
$= 272,884.35'^{\#}$
$\Sigma F_V = 47,077.47^{\#} \downarrow$
$\Sigma F_H = 1,889.06^{\#} \rightarrow$

FIG. 4-59

T-WALL AT ROCK STORAGE
WEST LEVEE – IHNC
LAKE PONT. BARRIER PLAN

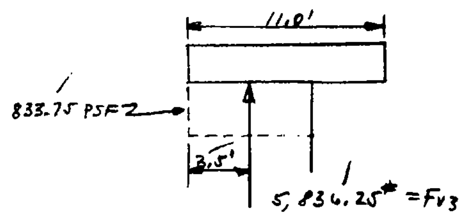
SHEET 13
A.R. 28 JUN 67

FOR 11' BASE, PERV. & IMP. SITUATIONS:

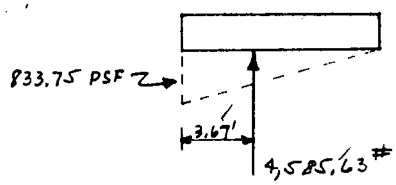


$M_A = 16{,}829.26'^{\#}$

DIFF. F_V = 1,250.62# ↓
DIFF M_A = 3,597.62'#

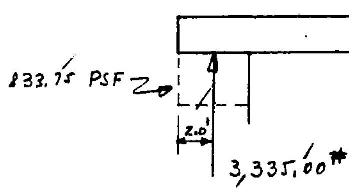


$M_A = 20{,}426.88'^{\#}$



$M_A = 16{,}829.26'^{\#}$

DIFF F_V = 1,250.62# ↓
DIFF. M_A = 3,597.62'#



$\Sigma M_A = 6{,}670.00'^{\#}$

DIFF. F_V = 2,501.25# ↓
DIFF. M_A = 13,756.88'#

FIG. 4-60

T-WALL AT ROCK STORAGE
WEST LEVEE — IHNC
LAKE PONT. BARRIER PLAN

SHEET 14
A.R. 28 JUN 67

FOR 11' BASE, 2 PILES LT. PERVIOUS SITUATION:

~~CASE No. 1:~~ ~~$\Sigma M_A = -1,988.35'^{\#} + 3,597.62'^{\#} = 1,609.27'^{\#}$ ↷~~
~~$\Sigma F_V = +14,018.36^{\#} + 1,250.62^{\#} = 16,268.98^{\#}$ ↓~~
~~$\Sigma F_H = 12,332.63^{\#}$ ←~~

CASE No. 2: $\Sigma M_A = +138,049.20'^{\#} + 3,597.62'^{\#} = 141,646.82'^{\#}$ ↷
$\Sigma F_V = +8,182.11^{\#} + 1,250.62^{\#} = 9,432.73^{\#}$ ↓
$\Sigma F_H = 14,221.69^{\#}$ →

CASE No. 3: $\Sigma M_A = +8,778.21'^{\#} + 3,597.62'^{\#} = 12,375.83'^{\#}$ ↷
$\Sigma F_V = +11,137.11^{\#} + 1,250.62^{\#} = 12,387.73^{\#}$ ↓
$\Sigma F_H = 6,771.52^{\#}$ ←

CASE No. 4: $\Sigma M_A = +272,884.35'^{\#} + 3,597.62'^{\#} = 276,481.97'^{\#}$ ↷
$\Sigma F_V = +47,077.47^{\#} + 1,250.62^{\#} = 48,328.09^{\#}$ ↓
$\Sigma F_H = 1,889.06^{\#}$ →

FOR 11' BASE, 2 PILES RT., IMPERV. SITUATION:

CASE No. 1:
$\Sigma M_A = -1,988.35'^{\#}$ ↶
$\Sigma F_V = +14,018.36$ ↓
$\Sigma F_H = 12,332.63^{\#}$ ←

CASE No. 2:
$\Sigma M_A = +138,049.20'^{\#} + 13,756.88'^{\#} = 151,806.08'^{\#}$ ↷
$\Sigma F_V = +8,182.11^{\#} + 2,501.25^{\#} = 10,683.36^{\#}$ ↓
$\Sigma F_H = 14,221.69^{\#}$ →

FIG. 4-61

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 15
A.R. 28 JUN 67

CASE No. 3:

$\Sigma M_A = +8,778.21'^{\#} + 13,756.88'^{\#} = 22,535.09'^{\#}$ ↷

$\Sigma F_V = +11,137.11^{\#} + 2,501.25^{\#} = 13,638.36^{\#}$ ↓

$\Sigma F_H = 6,771.52^{\#}$ ←

CASE No. 4:

$\Sigma M_A = +272,884.35'^{\#} + 13,756.88^{\#} = 286,641.23'^{\#}$ ↷

$\Sigma F_V = +47,077.47^{\#} + 2,501.25^{\#} = 49,578.72^{\#}$ ↓

$\Sigma F_H = 1,889.66^{\#}$ →

FOR 11' BASE, 2 PILES RT., PERV. SITUATION.

THE INPUT DATA IS IDENTICAL TO THE 11' BASE, 2 PILES LT., PERV. SITUATION.

ALLOW. WALL MOVEMENT:

THE COEFFICIENT USED IN THIS CALCULATIONS, K_A, IS THE ACTIVE PRESS. COEFF. AND THE WALL IS ALLOWED TO MOVE AWAY FROM THE BACKFILL NOT MORE THAN:

$\Delta_{TOT} = 0.005\ H = 0.005 \times 10.84\ FT. \times 12.0\ IN./FT.$

$= 0.65\ IN.$

CRITERIA:

TO DETERMINE THE MOST CRITICAL LOADING CASE, AN 8' BASE WALL WILL BE USED.

THE FOLLOWING CASES ARE TO BE ANALYZED:

A. FOR $\delta = 0°$

1. IMPERVIOUS SITUATION:

CASES 1, 2, 3, & 4

2. PERVIOUS SITUATION:

CASES 2, 3, & 4

B. FOR $\delta = 15°$

1. IMPERVIOUS SITUATION:

CASES 1, 2, & 3

2. PERVIOUS SITUATION:

CASES 2 & 3

THE LOADING CASES ARE TO BE EXAMINED FOR:

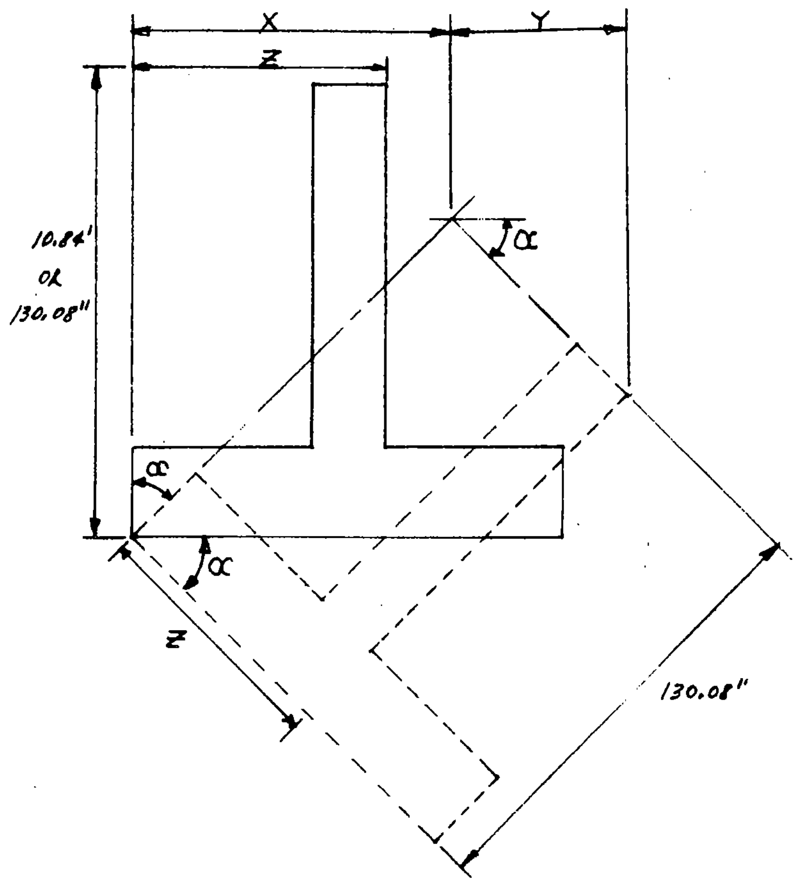
1. AXIAL LOAD ON PILE (P)
2. TRANSVERSE LOAD ON PILE HEAD (Q)
3. TRANVERSE DEFLECTION OF PILE HEAD (Y) $\left[Y = \frac{ST}{n_h}\right.$ IN $\left.\frac{KIPS}{IN.}\right]$
4. TOTAL DEFLECTION OF THE WALL (Δ_{TOT})

FIG. 4-68

T-WALL AT ROCK STORAGE
WEST LEVEE – IHNC
LAKE PONT. BARRIER PLAN

SHEET 31
A.R. 5 JUL 67

HORIZONTAL EFFECT OF ROTATION OF WALL: (Δ_R)
FOR $+\alpha$ (CLOCKWISE ROTATION)



X:

$$\frac{X}{130.08''} = \frac{\sin\alpha}{1}$$

$$X = 130.08'' \times \sin\alpha$$

Y:

$$\frac{Y}{Z} = \frac{\cos\alpha}{1}$$

$$Y = Z \times \cos\alpha$$

$$\Delta_R = X + Y - Z$$

$$= 130.08'' \sin\alpha + Z\cos\alpha - Z$$

FOR $\alpha < 0.01$ RADIANS, $\cos\alpha = 1.00$
FOR $\alpha < 0.04$ RADIANS, $\sin\alpha = \alpha$

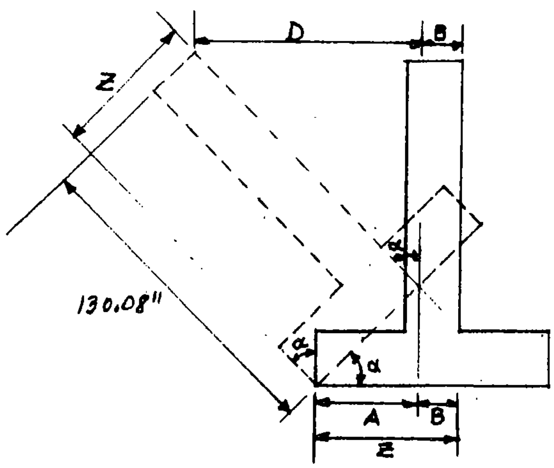
$$= 130.08''\alpha - Z$$

FIG. 4-64

T-WALL AT ROCK STORAGE
WEST LEVEE – IHNC
LAKE PONT. BARRIER PLAN

SHEET 32
A. R. 5 JUL 67

FOR $-\alpha$ (COUNTERCLOCKWISE ROTATION)



A:

$$\frac{A}{Z} = \frac{\cos\alpha}{1} \qquad \therefore \quad A = Z\cos\alpha$$

D:

$$\frac{D}{130.08''} = \frac{\sin\alpha}{1} \qquad \therefore \quad D = 130.08''\sin\alpha$$

$$\begin{aligned}\Delta_R &= D + B \\ &= D + Z - A \\ &= 130.08''\sin\alpha + Z - Z\cos\alpha \\ &= 130.08''\sin\alpha - Z\cos\alpha + Z\end{aligned}$$

FIG. 4-65

T-WALL AT ROCK STORAGE
WEST LEVEE - IHNC
LAKE PONT. BARRIER PLAN

SHEET 33
A.R. 6 JUL 67

COMPUTER INPUT DATA:

$$I = \frac{BH^3}{12} = \frac{12.0\text{ IN.} \times (12.0\text{ IN.})^3}{12} =$$

$$= 1{,}728.0\text{ IN}^4$$

$$E = (w)^{3/2}\ 33\sqrt{f'_c}$$

FOR $f'_c = 5{,}000$:

$$= (150)^{3/2} \times 33\sqrt{5{,}000}$$

$$= 1{,}837.1 \times 33 \times 70.71068$$

$$= 4{,}286{,}785.48\text{ psi}$$

$$= 4.29 \times 10^6\text{ psi}$$

SOIL CONSTANT OR MODULUS OF SOIL REACTION, (k) = 90.0 psi

LENGTH OF PILE = 64.0 FT.

ALLOW. COMPR. LD. ON PILE = 44.0 KIPS

COMPUTER PROGRAM:

PILE LOADS ARE TO BE COMPUTED BY THE HRENNIKOFF METHOD OF ANALYSIS OF PILE FOUNDATIONS WITH BATTER PILES, UTILIZING A.G.E. 225 DATA PROCESSING SYSTEM AND PROGRAM NO. 41-G1-Z5-002, WITH MINOR MODIFICATIONS.

FOR ANALYSIS OF COMPUTER RESULTS:

$$n = \frac{2AE}{L} = \frac{2}{1} \times \frac{144.0\text{ IN}^2}{1} \times \frac{4.29 \times 10^6\ \#}{\text{IN}^2} \times \frac{1}{64\text{ FT.}}$$

$$= 19.30500 \times 10^6\ \#/\text{FT.}$$

$$= 19.305 \times 10^3\text{ KIPS/FT.}$$

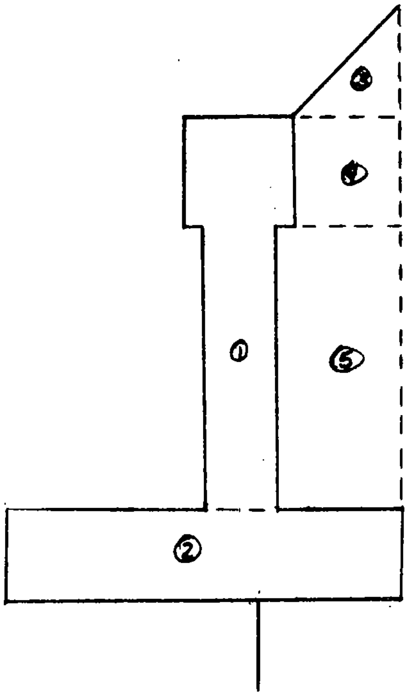
$$= 19{,}305.00\text{ KIPS/FT.}$$

OR:

$$= 1{,}608.75\text{ KIPS/IN.}$$

FIG. 4-66

WALL AT ROCK STORAGE
WEST LEVEE - IHNC
L. P. BARBIER PLAN
29 AUG 67 TFP



$W_1 = 3702$ ✓ $\quad X_1 = 6.5$ ✓ $\quad \underline{\Delta = 0°}$

$W_2 = 4125$ ✓ $\quad X_2 = 5.5$ ✓

$W_3 = 504$ ✓ $\quad X_3 = 10.0$ ✓

$W_4 = 1008$ ✓ $\quad X_4 = 9.5$ ✓

$W_5 = 3073$ ✓ $\quad X_5 = 9.25$ ✓

89,792 ✓

$H_1 = 10{,}727$ ✓ $\quad Y_1 = 7.759$ ✓ $\quad -\underline{83{,}231}$

6561 ✓

$\underline{\Sigma V = 12{,}412}$ ✓

$\underline{\Sigma H = -10{,}727}$ ←

$\underline{\Sigma M = 6561}$ ↻

CASE I

$\underline{\Delta = 15°}$

$\Sigma M (W_1 \rightarrow W_5) = 89{,}792$

$2778 \times 7.5 = \underline{20{,}835}$

110,627

$10{,}362 \times 7.759 = \underline{-80{,}407}$

30,220

$H_1 = 10{,}727 (0.966) = 10{,}362$

$Y_1 = 7.759$

$W_6 = 10{,}727 (0.259) = 2778$

$X_6 = 7.5$

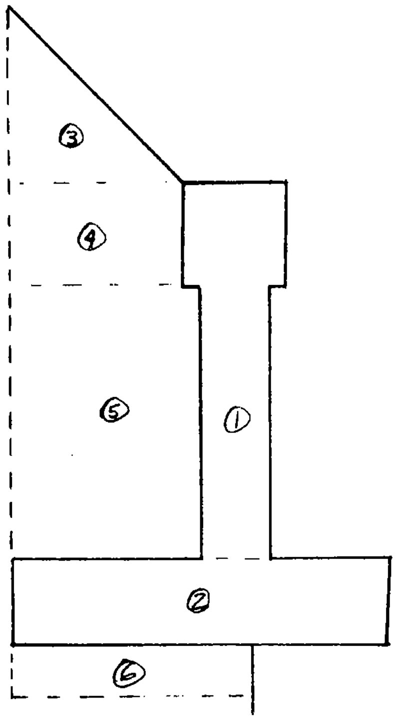
$\underline{\Sigma M = 30{,}220}$

$\underline{\Sigma H = -10{,}362}$

$\underline{\Sigma V = 15{,}190}$

FIG. 4-67

WALL AT ROCK STORAGE
WEST LEVEE - IHNC
L.P. BARRIER PLAN
31 AUG 1967 TFP



$W_1 = 3702 \quad X_1 = 6.5$

$W_2 = 4125 \quad X_2 = 5.5$

$W_3 = 1400 \quad X_3 = 1.67$

$W_4 = 1680 \quad X_4 = 2.5$

$W_5 = 4829 \quad X_5 = 2.75$

66,568

$W_6 = -5838 \quad X_6 = 3.5$

-20,433

46,135

$H_1 = 14{,}051 \quad Y_1 = 8.519$

$H_2 = 1889, \quad Y_2 = 1.21$

121,986

168,121

$\Sigma V = 9898$

$\Sigma H = 15{,}940 \rightarrow$

$\Sigma M = 168{,}121$

IMPERVIOUS $\Delta = 0°$

CASE II

PERVIOUS CASE $\Delta = 0°$

$\Sigma M = 168{,}121$

3 599

171,720

$\Sigma V = 11{,}149$

$\Sigma H = 15{,}940$

IMPERVIOUS $\Delta = 15°$

$H_1 = 14{,}051(.966) = 13{,}573$

$Y_1 = 8.519$

$W_7 = 14{,}051(.259) = 3639$

$X_7 = 5.5$

$\Sigma V = 13{,}537 \quad \Sigma H = 15{,}462$

$\Sigma M (W_1 \rightarrow W_6) = 46{,}135$

+ $13{,}573 \times 8.519 = 115{,}628$

$1889 \times 1.21 = 2286$

+ $3639 \times 5.5 = 20{,}015$

184,064

PERVIOUS $\Delta = 15°$

$H_1 = 13{,}573 \quad Y_1 = 8.519$

$W_7 = 3639 \quad X_7 = 5.5$

$\Sigma M (W_1 \rightarrow W_5) = 66{,}568$

+ $13{,}573 \times 8.519 = 115{,}628$

+ $3639 \times 5.5 = 20{,}015$

$H_2 \quad 1889 \times 1.21 = 2286$

204,497

− $4587 \times 3.67 = -16{,}834$

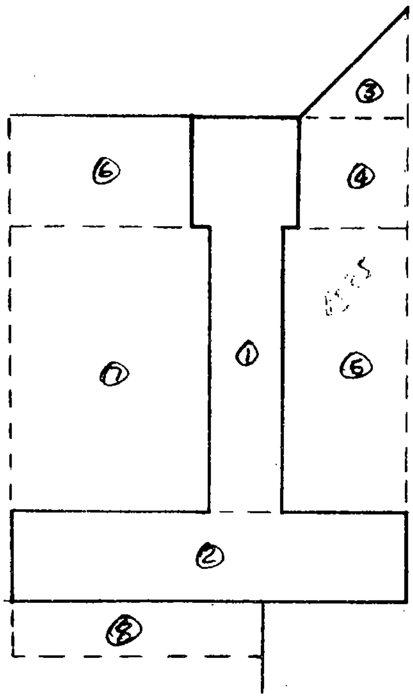
187,663

$\Sigma V = 11{,}149 + 3639 = 14{,}778$

$\Sigma H = 13{,}573 + 1889 = 15{,}462$

FIG. 4-68

WALL AT ROCK STORAGE
WEST LEVEE-IHNC
L.P. BARRIER PLAN
31 AUG 67 TFP



$W_1 = 3702$ ✓ $X_1 = 6.5$ ✓
$W_2 = 4125$ ✓ $X_2 = 5.5$ ✓
$W_3 = 504$ ✓ $X_3 = 10.0$ ✓
$W_4 = 1008$ ✓ $X_4 = 9.5$ ✓
$W_5 = 3073$ ✓ $X_5 = 9.25$ ✓
$W_6 = 1680$ ✓ $X_6 = 2.5$ ✓
$W_7 = 4829$ ✓ $X_7 = 2.75$ ✓

107,272 ✓

$W_8 = -5838$ ✓ $X_8 = 3.5$ ✓ -20,433

86,839 ✓

$H_1 = 10,727 \leftarrow Y_1 = 7.759$
$H_2 = 6581 \rightarrow Y_2 = 6.619$
$H_3 = 1889 \rightarrow Y_3 = 1.21$ -37,385

49,454 ✓

$\Sigma V = 13,083$ ✓ IMPERVIOUS $\Delta = 0°$
$\Sigma H = -2257$
$\Sigma M = 49,454$

CASE III

PERVIOUS CASE $\Delta = 0°$

$\Sigma M = 49,454$
3599
53,053

$\Sigma V = 14,334$
$\Sigma H = -2257$

IMPERVIOUS $\Delta = 15°$

$H_1 = 10,727 \times .966 = 10,362$
$Y_1 = 7.759$

$W_9 = 10,727 \times .259 = 2778$ $X_9 = 7.5$

$\Sigma M (W_1 \rightarrow W_8) = 86,839$
+ 6581 × 6.619
- 10,362 × 7.759
+ 2,778 × 7.5
+ 1889 × 1.21 -13,718
73,121

$\Sigma H = -1892$ $\Sigma V = 15,861$

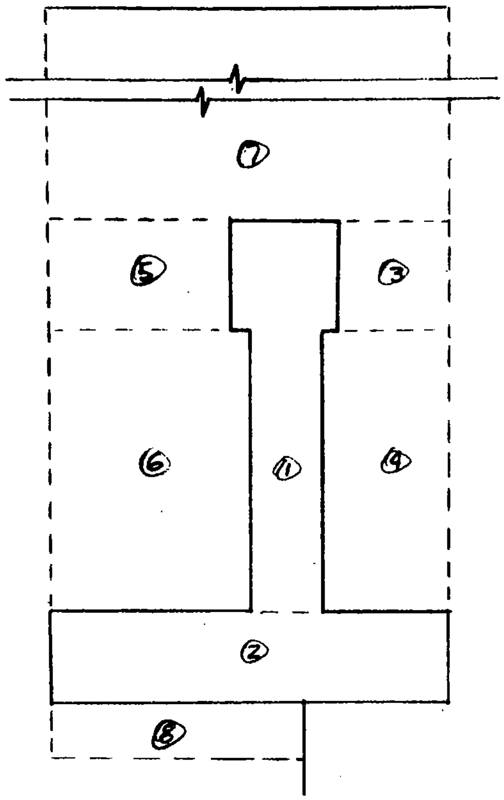
PERVIOUS $\Delta = 15°$

$H_1 = 10,362$ $Y_1 = 7.759$
$W_9 = 2778$ $X_9 = 7.5$
$W_8 = 4587$ $X_8 = 3.67$

$\Sigma M (W_1 \rightarrow W_7) = 107,272$
$+W_9$ 2778 × 7.5 = 20,835
$+H_3$ 1889 × 1.21 = 2,286
6581 × 6.619 = 43,560
173,953
$-W_8$ 4587 × 3.67
- 10,362 × 7.759 -97233
76,720

$\Sigma H = -1892$ $\Sigma V = 17,111$

FIG. 4-69



IMPERVIOUS $\Delta = 15°$

WALL AT ROCK STORAGE
WEST LEVEE-IHNC
L. P. BARRIER PLAN
31 AUG 67 TFP

$W_1 = 3702$ $X_1 = 6.5$

$W_2 = 4125$ $X_2 = 5.5$

$W_3 = 1008$ $X_3 = 9.5$

$W_4 = 3073$ $X_4 = 9.25$

$W_5 = 1680$ $X_5 = 2.5$

$W_6 = 4829$ $X_6 = 2.75$

$W_7 = 34{,}496$ $X_7 = 5.5$

$W_8 = -5839$ $X_8 = 3.5$

$\Sigma H = 1889$

$\Sigma V = 47{,}074$

$\Sigma M = 273{,}813$

291,960
− 20,433
271,527
1889 X 1.21 = 2286
273,813

IMPERVIOUS $\Delta = 0°$

CASE IV

PERVIOUS CASE $\Delta = 0°$

$\Sigma M = 271{,}527$
3599
275,126 + 2286 = 277,412

$\Sigma V = 48{,}325$

$\Sigma H = 1889$

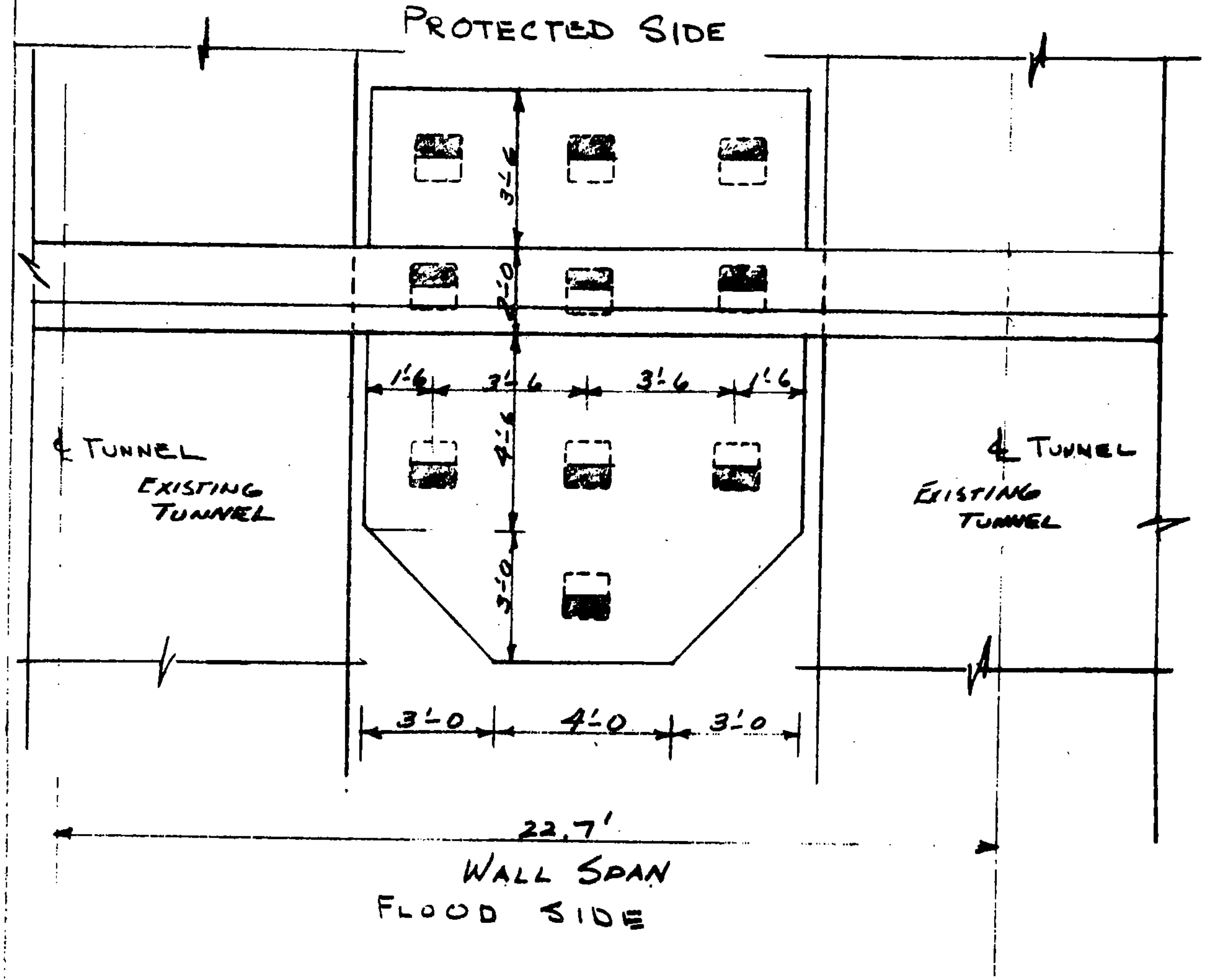
FIG. 4-70

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees

Sheet 1 of 15
Comp. D.G.M
checked H.L.R

A.B PATTERSON

DESIGN OF CENTER PILE FOUNDATION
FOR DOUBLE TUNNEL CROSSING.



PLAN OF CENTER FOOTING

Scale $\frac{1}{4}'' = 1'-0$

FIG. 4-71

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
A.B. PATTERSON

Sheet 2 of 13
Comp: WGM

DESIGN OF CENTER PILE FOUNDATION
FOR DOUBLE TUNNEL CROSSING

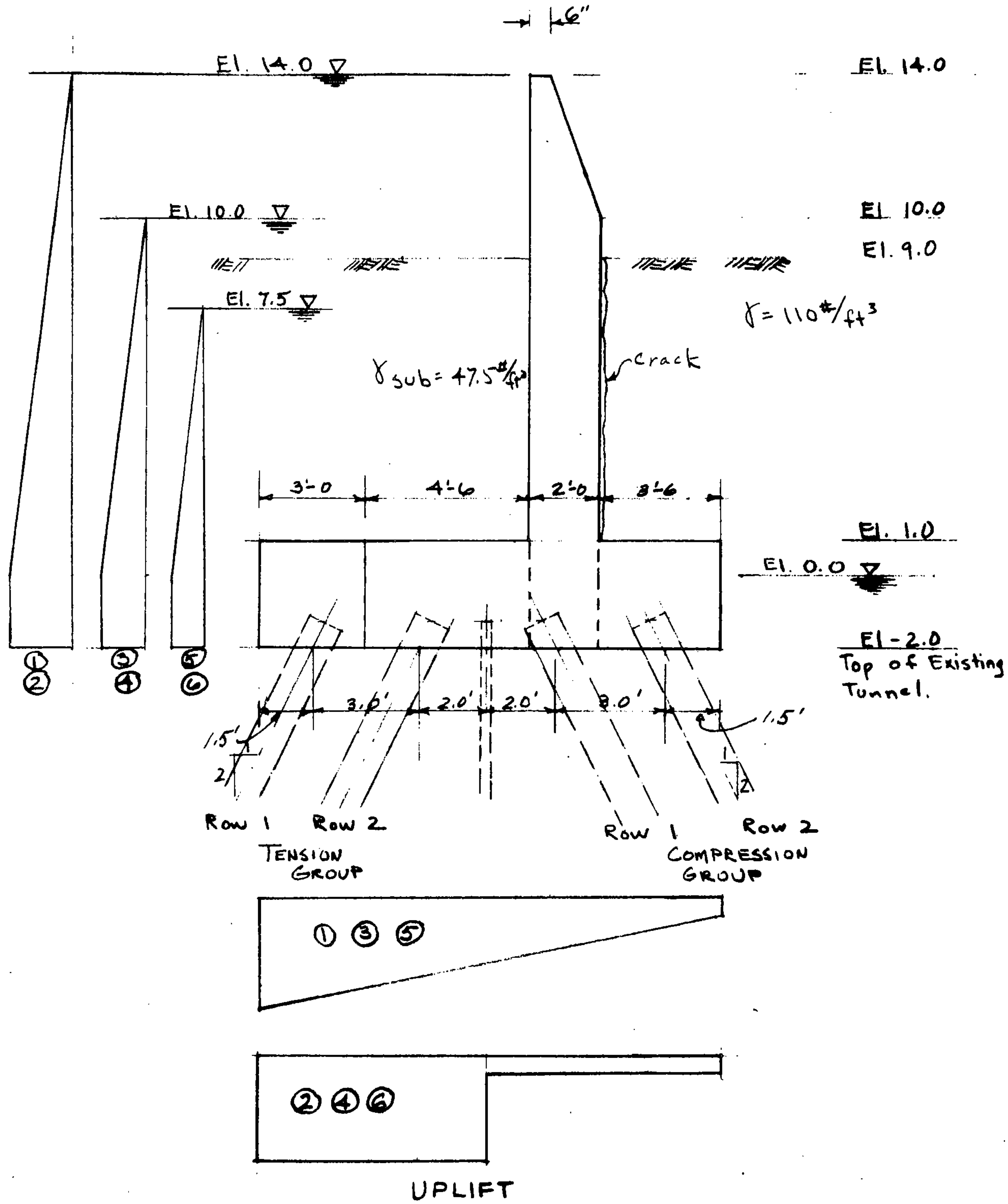


FIG. 4-172

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
A.B PATTERSON
DESIGN OF CENTER PILE FOUNDATION
FOR DOUBLE TUNNEL CROSSING

DESIGN ASSUMPTIONS

1. Earth Pressures at Rest (.75 γ)
2. Crack on protected side of wall.
3. Uniform distribution of Uplift Forces.

CASES 1 & 2

ITEM	COMPUTATION	H	V	$\bar{x}$	V Mom	H Mom.
RT. & LT. conc. Lower Stem	2.0 x 12.0 x 12.7 x .15		45.7k	8.5	388.45	
Upper Stem	$\frac{1.5}{2}$ x 4 x 22.7 x .15		10.2	8.5	86.70	
" "	.5 x 4 x 22.7 x .15		6.8	7.75	52.70	
Center Lower Stem	2.0 x 9.0 x 10.6 x .15		27.0	8.5	229.50	
Conc Base	10.0 x 10.0 x 3.0 x .15		45.0	8.0	360.00	
" "	$\frac{10+4}{2}$ x 3.0 x 3.0 x .15		9.5	1.73	16.44	
Vert Earth	.0475 x 7 x 3 x 8.0		8.0	1.73	13.84	
" "	.0475 x 10.0 x 4.5 x 8.0		17.1	5.25	89.78	
" "	.110 x 3.5 x 10.0 x 8.0		30.8	11.25	346.50	
Hor. Earth	.75 x .0475 x $\frac{11^2}{2}$ x 22.7	48.9		3.67		179.46
Water on Base	.0625 x 10.0 x 4.5 x 13		36.6	5.25	192.15	
" " "	.0625 x 7.0 x 3.0 x 13		17.1	1.73	29.58	
Horiz. Water	.0625 x $\frac{14^2}{2}$ x 22.7	139k		6.66		925.74
" "	.0625 x 14 x 2 x 22.7	39.7		1.0		39.70
Sub-totals w/o uplift		227.6	253.8		1805.64	1144.90
Uplift ①	- 2 x .0625 x 13 x 4		-6.5	6.5	-42.25	
	-2 x .0625 x 11.5 x 6		-8.6	7.23	-62.18	
	-14 x .0625 x $\frac{13}{2}$ x 4		-22.8	4.33	-98.72	
	-14 x .0625 x $\frac{11.5}{2}$ x 6		-30.2	5.33	-160.97	
Case ① totals		227.6	185.7		1441.52	1144.90
Uplift ②	-16 x .0625 x 3.5 x 10.0		-35.0	4.75	-166.25	
	-16 x .0625 x 3.0 x 7.0		-21.0	1.73	-36.33	
	- 2 x .0625 x 6.5 x 10.0		-8.1	9.75	-78.98	
Case ② totals		227.6	189.7		1524.08	1144.90

CASE ① Total Mom. 2586.42 X_H = 5.03 X_V = 7.76 (9.11)

CASE ② Total Mom. 2668.98 X_H = 5.03 X_V = 8.03

FIG. 4-73

CASES 3 & 4

ITEM	COMPUTATION	H	V	x	V Mom.	H Mom.
Water on Base	.0625 x 9.0 x 10.0 x 4.5		25.3	5.25	132.83	
" "	.0625 x 9.0 x 7.0 x 3.0		11.8	1.73	20.41	
Horiz. Water	$.0625 \times \frac{10^2}{2} \times 22.7$	70.9		5.33		377.90
" "	.0625 x 16 x 2 x 22.7	28.4		1.0		28.40
Conc. and Earth Totals from above		48.9	200.1		1583.91	179.46
Sub-totals w/o uplift		148.2	237.2		1737.15	585.76
Uplift (3)	-2 x .0625 x 13 x 4		-6.5	6.5	-42.25	
	-2 x .0625 x 11.5 x 6		-8.6	7.23	-62.18	
	$-10 \times .0625 \times \frac{13}{2} \times 4$		-16.3	4.33	-70.58	
	$-10 \times .0625 \times \frac{11.5}{2} \times 6$		-21.6	5.33	-115.13	
Case (3) Totals		148.2	184.2		1447.01	585.76
Uplift (4)	-12 x .0625 x 3.5 x 10.0		-26.3	4.75	-124.93	
	-12 x .0625 x 3.0 x 7.0		-15.8	1.73	-27.33	
	-2 x .0625 x 6.5 x 10.0		-8.1	9.75	-78.98	
Case (4) Totals		148.2	187.0		1505.91	585.76

CASE (3) Total Mom. 2032.77 $X_H = 3.95$ $X_V = 7.86$
$V = 176.7^k$ (184.2)
$H = 148.2$

CASE (4) Total Mom. 2091.67 $X_H = 3.95$ $X_V = 8.05$
$V = 187.0$
$H = 148.2$

IHNC - East & West Levees
A.B. PATTERSON

Comp: W.G.M

CASES 5 & 6

ITEM	COMPUTATION	H	V	x	V Mom.	H Mom.
Water on Base	$.0625 \times 6.5 \times 10.0 \times 4.5$		18.3	5.25	96.08	
" "	$.0625 \times 6.5 \times 7.0 \times 3.0$		8.5	1.73	14.71	
Horiz. Water	$.0625 \times \frac{7.5^2}{2} \times 22.7$	39.9		4.50		179.55
" "	$.0625 \times 7.5 \times 2 \times 22.7$	21.3		1.0		21.30
Conc. and Earth Totals from above		48.9	200.1		1583.91	179.46
Sub-totals w/o uplift		110.1	226.9		1694.70	380.31
Uplift 5	$-2 \times .0625 \times 13 \times 4$		-6.5	6.5	-42.25	
	$-2 \times .0625 \times 11.5 \times 6$		-8.6	7.23	-62.18	
	$-7.5 \times .0625 \times \frac{13}{2} \times 4$		-12.2	4.33	-52.83	
	$-7.5 \times .0625 \times \frac{11.5}{2} \times 6$		-16.2	5.33	-86.35	
Case 5 Totals		110.1	183.4		1451.09	380.31
Uplift 6	$-9.5 \times .0625 \times 3.5 \times 10.0$		-20.8	4.75	-98.80	
	$-9.5 \times .0625 \times 3.0 \times 7.0$		-12.5	1.73	-21.63	
	$-2 \times .0625 \times 6.5 \times 10.0$		-8.1	9.75	-78.98	
Case 6 Totals		110.1	185.5		1495.29	380.31

CASE 5 Total Mom. 1831.40 $X_H = 3.45$ $X_V = 7.91$
$V = 175.9^k$ 1434
$H = 110.1^k$

CASE 6 Total Mom. 1875.60 $X_H = 3.45$ $X_V = 8.06$
$V = 185.5$
$H = 110.1$

FIG. 4-75

Moments and forces

Case	Moment	Vert.	Horiz.
1	2586.42	185.7	227.6
2	2668.98	189.7	227.6
3	2032.77	184.2	148.2
4	2091.67	187.0	148.2
5	1831.42	183.4	110.1
6	1875.60	185.5	110.1

Pile loads were computed for the six cases listed above by the Hrennikoff Method* of analysis of pile foundations with batter piles, utilizing a G.E. 225 data processing system and program no 41-G1-Z5-002 with minor modifications.

Design Data for 12"x12" prestressed concrete piles:

Tension Load = 40^k Compression Load = 80^k
Min. penetration to El. -32.0
Assumed pinned end and friction type piles
Modulus of subgrade soil reaction (K) = 135 psi

PILE LOADS

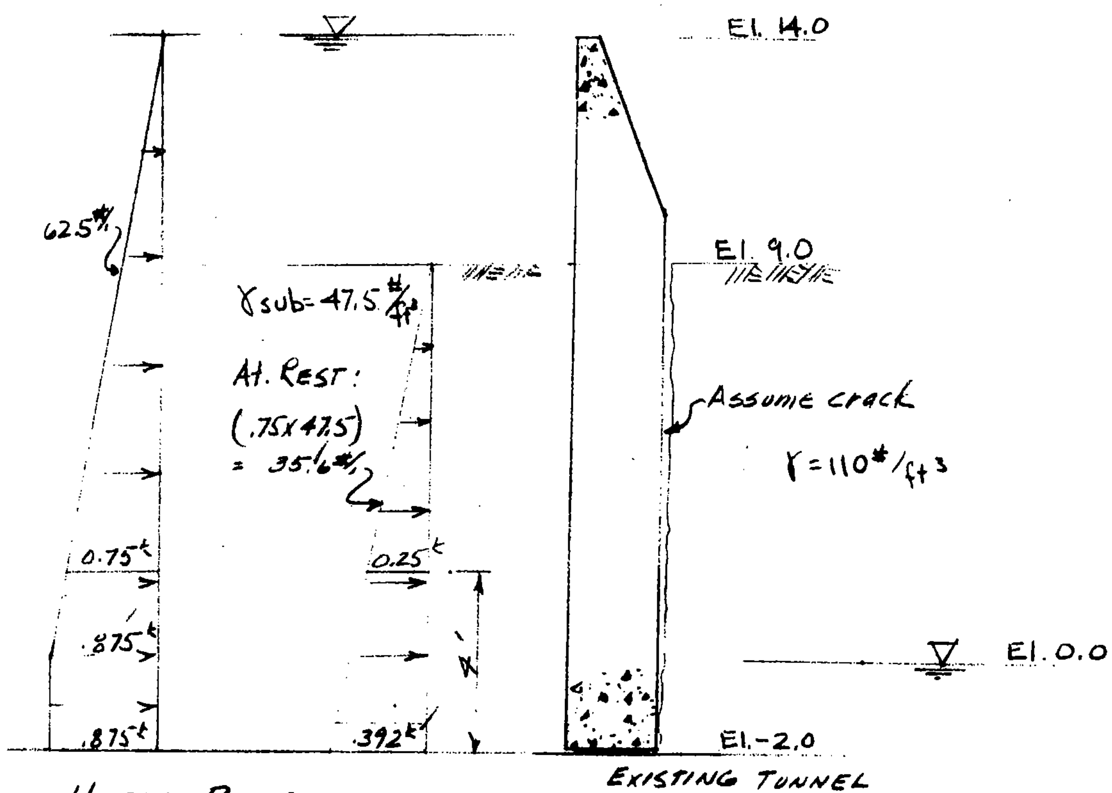
CASE No	ROW No	TENSION			COMPRESSION		
		AXIAL FORCE	TRANSVERSE		AXIAL FORCE	TRANSVERSE	
			FORCE	DEFL.		FORCE	DEFL.
1.	1.	10.86^k	0.65^k	.0074"	75.82^k	0.54^k	.0062"
	2.	39.12^k	0.60^k	.0069"	41.91^k	0.60^k	.0068"
2.	1.	25.38^k	0.46^k	.0053"	66.68^k	0.40^k	.0045"
	2.	37.36^k	0.44^k	.0051"	52.31^k	0.42^k	.0048"
3.	1.	-25.65^k	0.71^k	.0082"	70.37^k	0.56^k	.0064"
	2.	18.59^k	0.64^k	.0074"	17.29^k	0.65^k	.0074"
4.	1.	-15.18^k	0.58^k	.0067"	63.78^k	0.46^k	.0052"
	2.	17.32^k	0.53^k	.0061"	24.77^k	0.52^k	.0059"
5.	1.	-25.37^k	0.53^k	.0061"	56.53^k	0.40^k	.0046"
	2.	7.32^k	0.48^k	.0054"	17.30^k	0.46^k	.0053"
6	1.	-17.52^k	0.43^k	.0049"	51.58^k	0.32^k	.0037"
	2.	6.38^k	0.39^k	.0045"	22.91^k	0.37^k	.0042"
Allowable		40.0^k	2.83^k	.3480"	80.00^k	2.37^k	.2920"

FIG. 4-76

CONCRETE DESIGN

DESIGN OF WALL SPANNING OVER DOUBLE TUNNEL:

CLEAR SPAN = 15.5'
WALL DESIGNED FOR HOR. WATER & FLOODSIDE EARTH PRESSURE ACTING AT REST



<u>Horiz Bars</u>

Max $w = .875^k + .392^k$ At base of wall

$= 1.27^{k}/'$

Max Mom $= \frac{1}{10} w l^2$

$M = \frac{1}{10} \times 1.27^{k}/' \times \overline{15.5}^2$

$= \underline{30.5^{'k}/'}$

$f'_c = 3{,}000$
$f_c = 1050$
$a = 1.44$
$d = 21''$
$j = .891$

$A_s = \frac{30.5}{1.44 \times 21} = 1.01^{\square''}/'$ <u>Use #8 @ 9"</u>

$w = .75^k + 0.25^k$ At 4' above base of wall

$w = 1.00^{k}/'$

FIG. 4-77

CONCRETE DESIGN

$w = 1.0^{k}/_{1}$

$M = \frac{1}{10} w l^2$

$= \frac{1}{10} \times 1.0 \times \overline{15.5}^2$

$= 24.0^{'k}$

$A_s = \frac{24.0}{1.44 \times 21} = .79^{\square''}$ Use #8 @ 12" 4' above base

---

$w = .44 + .07$ At 9' above base of wall

$= .51^{k}$

$M = \frac{1}{10} w l^2$

$= \frac{1}{10} \times .51 \times \overline{15.5}^2$

$= 12.25$

$A_s = \frac{12.25}{1.44 \times 21} = .41^{\square''}$ Use #6 @ 12" 9' above base

---

VERT BARS

Temp Steel Req'd = .0025 x Gross Area of Conc.

Each Face $A_s = \frac{.0025}{2} \times 12 \times 24$

$A_s = .36^{\square''}$ Use #6 @ 12 EF

---

check shear and bond at base of wall

$V = \frac{15.5 \times 1.27^{k}}{2} = 9.84^{k}$

$v = \frac{V}{bd} = \frac{9840}{12 \times 21} = 39 psi < 60 psi$ ok

$u = \frac{V}{\Sigma_o j d}$ $\Sigma_o = 4.2$ u allow $= \frac{4.8 \sqrt{3{,}000}}{\frac{8}{8}} = 263$

$u = \frac{9840}{4.2 \times .891 \times 21} = 125 psi < 263$ psi o.k.

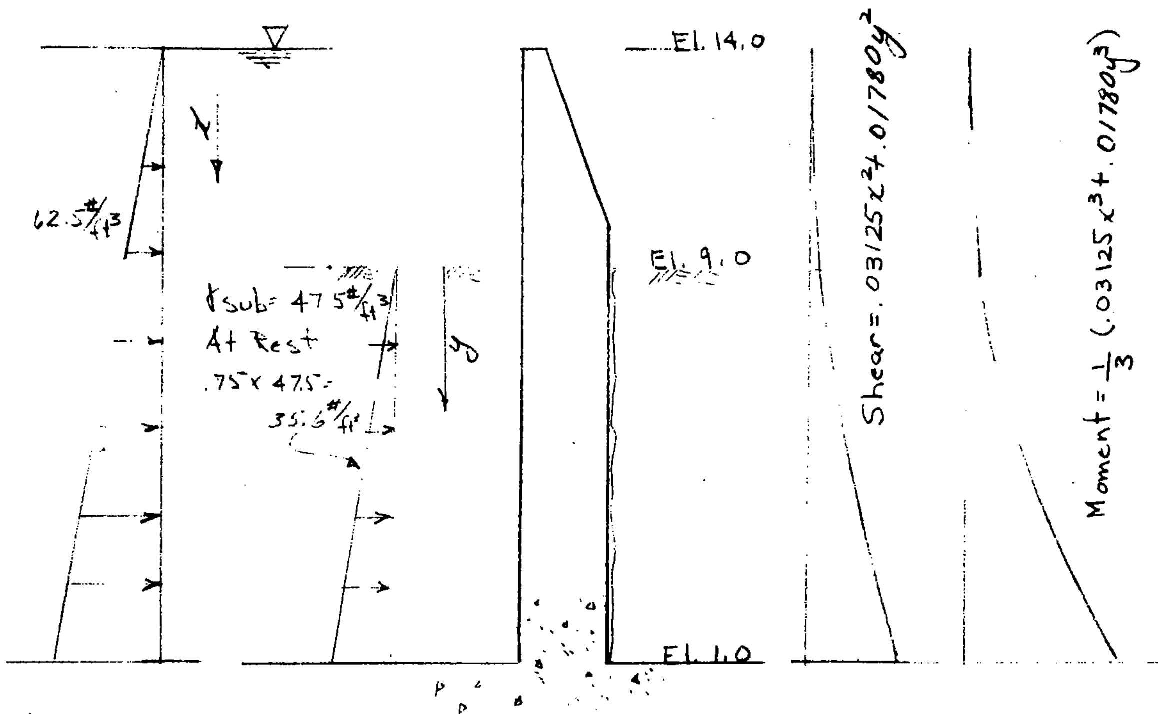
FIG. 4-78

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
A.B. PATTERSON

CONCRETE DESIGN

DESIGN OF CENTER STEM

length of contributing wall load = 22.7'
width of stem = 10.0'



VERTICAL BARS

Moment @ Top of base $x = 13$, $y = 8$

$M = \frac{1}{3}(.03125 \times \overline{13}^3 + .01780 \times \overline{8}^3)$

$M = 25.92$ '/'   Moment per ft of stem $= \frac{25.92 \times 22.7'}{10'}$

$M = 58.84$ '/' of stem $M = \underline{58.84}$ '/'

$A_s = \frac{58.84}{1.44 \times 21}$

$= 1.95$ □"/ Use #9@6 Area Steel = 2.0□"

CONCRETE:
$f'c = 3{,}000$
$fc = 1050$
$K = 152$
$a = 1.44$
$j = .891$
$d = 21''$

Check concrete:

Allow $M = kbd^2$

$M = \frac{152 \times 12 \times \overline{21}^2}{12{,}000} = 67.0$ 'k > 58.8 ok.

FIG. 4-79

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
A.B. PATTERSON

Sheet 1? of 1?
Comp: D.G.W.

CONCRETE DESIGN

check Shear and bond

allow $v = 60psi$

$V = (.03125x^2 + .0178y^2)\frac{22.7}{10}$

$V = 14.57^k$

$v = \frac{V}{bd} = \frac{14,570}{12 \times 21} = 57.8psi < 60psi$ ok.

$u = \frac{V}{\Sigma o j d}$

allow $u = \frac{4.8\sqrt{f'c}}{D} = 233psi$

$\Sigma o = 7.1''$

$u = \frac{14,570}{7.1 \times .891 \times 21} = 110 psi < 233psi$ ok.

Moment @ 3'-0 above top of base $x = 10.0,\ y = 5.0$

$M = \frac{1}{3}(.03125 \times \overline{10}^3 + .0178 \times \overline{5}^3)$

$= 11.16'^k/'$ of wall

$M = 11.16 \times \frac{22.7}{10}$

$=$

$M = 25.33'^k/'$ of stem

$As = \frac{25.33}{1.44 \times 21} = .84^{\square''}$ ∴ Stop half of #9 bars 3'-0 above top of base $As = 1.00^{\square''}$

check bond

$V = (.03125 \times \overline{10}^2 + .0178 \times \overline{5}^2)\frac{22.7}{10}$

$= 8.13^k$

$\Sigma o = 3.5''$

u allow $= 233psi$

$u = \frac{8,130}{3.5 \times .891 \times 21}$

$u = 124 psi < 233psi$ o.k.

Moment @ 6'-0 above top of base $x = 7.0 \quad y = 2.0$

$M = \frac{1}{3}(.03125 \times \overline{7}^3 + .0178 \times \overline{2}^3)\frac{22.7}{10} = 8.2'^k/'$ of stem

FIG. 4-80

LAKE PONTCHARTRAIN, LA & VICINITY
IHNC - East & West Levees
CONCRETE DESIGN

Moment @ 6'-0 above top of base

$M = 8.2^{k'}/$ of stem

$A_s = \frac{8.2}{1.44 \times 21}$

$= .27^{\square''}/$

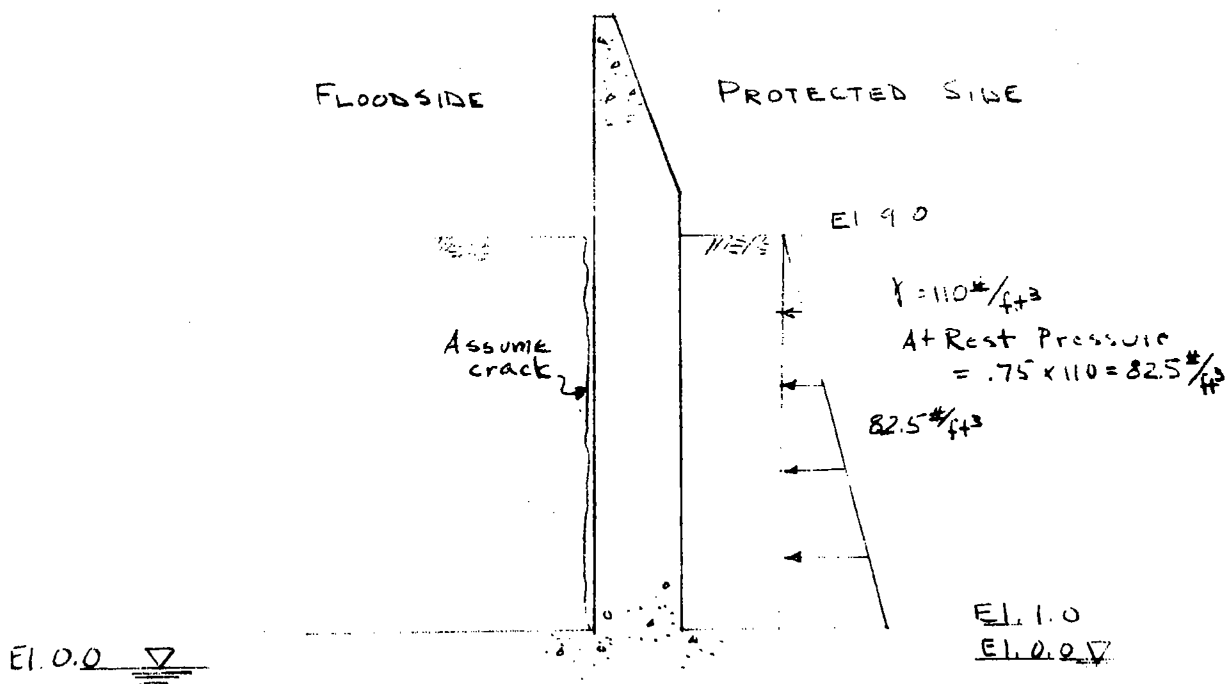
Min A_s for shrinkage and temp. $= \frac{1}{2} \times .0025 \times A_g$

$= \frac{1}{2} \times .0025 \times 12 \times 24$

A_s req'd $= .36^{\square''}/$

$\therefore$ Use # 6@12 @ 6'-0 above top of base

VERT. REINFORCING FOR PROTECTED FACE OF STEM:



$M = .0825 \times \frac{8.0^3}{6} \times \frac{22.7}{10}$ At base of stem

$M = 15.98^{k'}/$ of stem

FIG. 4-81

$M = 15.98^{1k}$

$A_s = \frac{15.98}{1.44 \times 21} = .53^{\square''}$ Use #7 @ 12" $A_s = .60^{\square''}$

30.24

check bond

$V = \frac{.0825 \times \bar{8}^2}{2} \times \frac{22.7}{10}$

$= 5.99^{k}$

$w = \frac{5,990}{2.8 \times .891 \times 21}$

$u = 114 psi < 300 psi$ o.k.

allow $u = \frac{4.8 \sqrt{3,000}}{\frac{7}{8}}$

allow $w = 300 psi$

$\Sigma_0 = 2.8$

$M = .0825 \times \frac{\overline{5.0}^3}{6} \times \frac{22.7}{10}$ At 3'-0 above base of stem

$= 3.90^{1k}$ of stem

$A_s = \frac{3.90}{1.44 \times 21} = .13^{\square''}$

Min $A_s = \frac{.0025 \times A_g}{2}$

$= .36^{\square''}$

Use #6 @ 12 At 3'-0 above base of stem $A_s = 0.31$

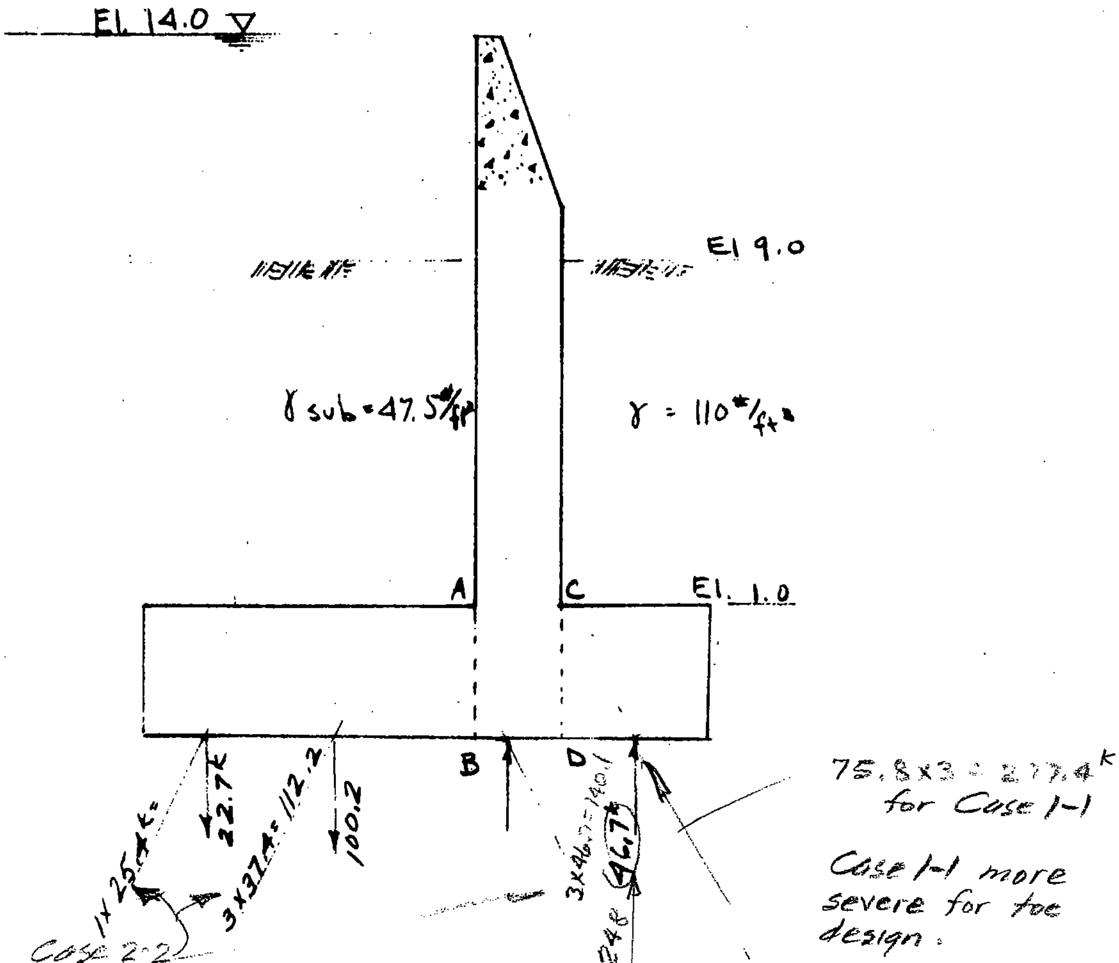
HOR. BARS REQ.D

MIN. $A_s = \frac{.0025 \times A_g}{2}$

$A_s = .36^{\square''}$

EXTEND HOR. BARS FROM AJACENT SPANING WALL THROUGH STEM

FIG. 4-82



MOMENTS AT A-B

Item	COMPUTATION	V	x	M
PILE		22.7k	6.0'	136.2'k
		100.2k	3.0	300.6
WATER	.0625 x 10.0 x 4.5 x 13	36.6	2.25	82.4
	.0625 x 7.0 x 3.0 x 13	17.1	5.77	98.7
CONC.	.150 x 10.0 x 4.5 x 3.0	20.3	2.25	45.7
	.150 x 3.0 x 3.0 x 7	9.5	5.77	54.8
UPLIFT 2	-16 x .0625 x 4.5 x 10.0	-45.0	2.25	-101.3
	-16 x .0625 x 7 x 3	-21.0	5.77	-121.2
	TOTAL	140.4k		495.9'k

FIG. 4-83

LAKE PONTCHARTRAIN, LA. & VICINITY
IHNC - East & West Levees
A.B. PATTERSON

CONCRETE DESIGN : BASE REINF.

At Sec A-B $V = 140.4^k$ $M = 495.9^{\prime k}$

$V = \frac{140.4}{10} = 14.04^{k/1}$

$M = \frac{495.9}{10} = 49.59^{\prime k/1}$

$A_s = \frac{49.59}{1.44 \times 31}$

$= 1.11^{\square''}$ Use #10 @ 12

$d = 31''$
$f_c' = 3{,}000$
$f_c = 1050$
$j = .891$
$a = 1.44$
$k = 152$

Moments AT CD

Item	Computation	V	z	M
PILE	3×46.7^k	140.1	2.0	280.2
CONC	$-3.5 \times 10 \times 3 \times .150$	-15.75	1.75	-27.6
Earth	$.110 \times 8 \times 3.5 \times 10$	-30.8	1.75	-53.9
	TOTAL	93.55		198.7

CONCRETE DESIGN : BASE REINF.

At Sec CD 93.6^k $M = 198.7^{\prime k}$

$V = \frac{93.6}{10} = 9.36^{k/1}$

$M = \frac{198.7^{\prime k}}{10} = 19.87^{\prime k/1}$

$A_s = \frac{19.87}{1.44 \times 31} = .45^{\square''}$

Min As for temp & Shrinkage $= \frac{.0025}{2} \times 36 \times 12$
Min As $= .54^{\square''}$

Per ACI Code 318-63, Sec 911, increase As
$A_s = .45 \times \frac{4}{3} = .60^{\square''}$
Use #7 @ 12

FIG. 4-84

CONCRETE DESIGN: (Cont.)

Longitudinal Reinf. (Tens. Pile Spacing 3.5')

$\text{Max } V = 14.04 \times \frac{3.5}{2} = 24.57^{k}$

$\text{Max } M = \frac{1}{10} \times 14.04 (3.5)^2 = 17.20^{1k}$

$d = 31''$ Assume $b = 36''$

$A_s = \frac{M}{ad} = \frac{17.20}{1.44 \times 31} = .38^{\square''}$

Per ACI Code 318-63, Sec. 911, increase As

$A_s = .38 \times \frac{4}{3} = .51^{\square''}$

$A_s/_{1} = \frac{.51}{3} = .17^{\square''}/_{1}$

Min. As for temp and shrinkage = .001 Ag

$\text{Min } A_s = \frac{.0025}{2} \times 12 \times 36$

$= .54^{\square''}/_{1}$

∴ Use # 7 @ 12 Top & Bot.

SECTION V - MECHANICAL

The overhead roller gates will be operated with geared-type manually operated trolleys as shown on plate IV-48. These trolleys will be equal to the Yale and Towne Mfg. Co., Models T-Geared Type.

SECTION VI - RELOCATIONS AND MODIFICATIONS

1. General. Under the authorizing law, local interests are responsible for the accomplishment of all"...necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities required by the construction of the project;..." Included in the required modifications are utilities, road ramps, and drainage rectification work.

2. West side IHNC.

a. Utility modifications. The following utility crossings will be modified to pass through the floodwall as shown on plate IV-41. The locations of the crossings are shown in plan and profile on plates IV-2 through IV-17. It should be noted that some modifications have been completed by the New Orleans District and others by the Orleans Levee District during construction of the interim hurricane protection system.

Station C/L Wall	Description	Status
39+45	6" C.I. Water Pipe	Completed by New Orleans District
51+51	6" C.I. Water Pipe	"
51+72	8" H.P. Gas	"
61+84	6" C.I. Water Pipe	"
70+93	12" C.I. Water Pipe	"
80+46	30"Sewer Force Main	"
80+60	16" Gravity Sewer	"
81+10	50" Water Main	"
84+82	6" Electrical Raceways 2 ea.	"
102+37	8" Gravity Sewer	"
114+50	12" Sewer Line	To be accomplished
118+76	NOPSI Power & Comm. Cable	"
118+94	Dept. Hwy. Power & Light Cable	"
119+79	3-SBTTC Armored Sub. Cable	"
	1-ATTC Coaxial TV Cable	"
122+03	2-SBTTC Sub. Cables	"
122+10	S&WB 12" Water Line	"
122+33	1-ATTC Coaxial TV Cable	"
132+21	Oil Tank	"
141+52	50" S&WB Water Line	"
143+84	2" Water Line	Completed by Orleans Levee Dist.
132+93	4" Gas Line	"
144+46	12" Water Line	"
211+37	16" Gas Line	"
211+33	16" Water Line	"
144+31	Signal Cable	"
113+17	Remove Concrete Slab	"
117+28	Remove Concrete Slab	"

b. Road ramp modification. At station 106+41, France Road will be raised to elevation 14.5 to form a ramp over the floodwall and provide for continuous uninterrupted flow of traffic. France Road carries considerable traffic to and from the industries along the west side of the IHNC. Detail sections of the France Road ramp are shown on plate IV-42. At stations 145+55 and 211+62, the floodwall will tie into two existing ramps on France Road. Both of these ramps have already been constructed by the Orleans Levee District. Details of these ramps are also shown on plate IV-42.

c. Interim hurricane protection modification. Between stations 143+94 and 144+48 and stations 210+10 and 211+46 the steel sheet piling forming the present interim protection system will be cut to proper elevation. See plates IV-10 and IV-15. Between station 227+33 and the end of the project the existing steel sheet pile will be driven to the elevation shown on plate IV-17. Between station 211+81 and 226+44 the levee will be raised to elevation 15.0 and berms added as shown on plates IV-15 through IV-17 and IV-36.

3. Lone Star Cement Company Plant. At the Lone Star Cement Company plant construction of the floodwall inside the rock storage bin will require the dismantling and reassembly of three bay roofs. In addition it will be necessary to remove and partially reconstruct the concrete slab and walls of the storage bin.

4. East side IHNC.

a. Utility modifications. The following utility crossings will be modified to pass through the floodwall as shown in plan and profile on plates IV-19 through IV-31.

Station Along C/L Wall	Description	Status
64+33	8" Sewer Line	Completed by New Orleans District
64+73	6" Gas Line	"
65+70	4-6" Water Line	"
85+62	50" Discharge Main	To be accomplished
85+74	50" Water Line	"
87+26	12" Water Line	"
87+36	12" Sewer Line	"
87+51	10" Gas Line	"
92+48	30" Sewer Line	"
92+70	8-6" Electric Conduit	"
93+62	6" Chlorine Line	"
94+06	1-1/2" Air Line	"
94+13	6" Water Line	"
94+22	Electrical Service	"

Station Along C/L Wall	Description	Status
98+38	10" Fuel Oil Line	To be accomplished
98+43	8" Water Line	"
98+47	1-1/2" Air Line	"
99+46	24" Water Discharge Line	"
99+57	36" Water Discharge Line	"
122+30	Power & Comm. Cable	"
123+34	1 Coaxial, 3 Armored Cables	"
123+38	2 Submarine Cables	"
124+04	12" Water Line	"
124+27	Coaxial Cable	"
138+48	3-Submarine Cables	"

b. Road ramp modifications. At station 85+20, Jourdan Road will be raised to an elevation of 14.25 so that the hurricane protection system can be complete as well as provide for continuous uninterrupted flow of traffic at this point. Jourdan Road is used continuously by the various industries along the IHNC.

c. Interim hurricane protection modification. Between stations 147+14 and 148+50, 153+37 and 155+63, 162+62 and 163+61, 169+59 and 170+63, portions of the existing levee will be degraded as required to allow construction of the access gates. Plan and profile of these gates are shown on plates IV-28 through IV-31.

5. A. B. Patterson Steam Generating Plant. At stations 94+19 and 97+41 the floodwall will pass over two large intake and discharge tunnels which supply the cooling water for the A. B. Patterson Steam Generating Plant. This is shown in plan and profile on plate IV-23 and in detail on plates IV-43 and IV-44. Design computations are shown in figures 4-71 through 4-85. The New Orleans Public Service, Inc. will also design and install, subject to approval of the Corps of Engineers, a flood closure gate on the intake structure. Details are shown on plate IV-45. Flood closure gates will not be necessary at the discharge tunnels since valves on each side of the units will be sufficient to cut off water.

6. Owens-Illinois Glass Plant. Between stations 105+60 and 112+03 the floodwall will become part of an existing floodwall built by Owens-Illinois Glass Plant on their recent plant extension. New sheet piling will be driven and capped with concrete which will be tied into the existing floodwall. Plan and profile of this tie-in is shown on plate IV-24 and a section is shown on plate IV-38. The existing reinforcing rods are protected with an asphalt coating and the existing seals are protected with a galvanized sheet metal cover.

SECTION VII - BEAUTIFICATION

1. General. The construction of the protective works covered herein will alter the existing terrain only to the extent of superimposing a floodwall and levee upon it. No borrow is to be taken from the area and all fill removed from existing levees will be hauled away and disposed of elsewhere. Levee work will be sodded in accordance with standard levee practice. Further opportunity for enhancing the appearance of the area is limited to measures involving the wall itself. In connection with the above, consideration was given to planting of shrubbery or vine-like plants or ivy for wall cover, or alternatively, providing a textured wall surface by use of exposed aggregate or other means. None of the above was deemed worthy of adoption, however, after all settlement has occurred in the vicinity of the floodwalls, concrete edging sills will be cast on both sides of the wall to permit the grass to be neatly trimmed when the embankment is mowed.

SECTION VIII - REAL ESTATE REQUIREMENTS

General. All rights-of-way will be acquired by the Orleans Levee District and furnished without cost to the United States. There will be no acquisition by the United States.

SECTION IX - ESTIMATE OF COST

1. Remaining IHNC levees. Based on December 1967 price levels, the estimated first cost of the improvements covered herein is $8,000,000. This estimate consists of $987,000 for Lands and Damages, $183,000 for Relocations, $5,293,000 for Levees and Floodwalls, $471,000 for Engineering and Design and $436,000 for Supervision and Administration. Detailed estimates of first cost are shown in Table IX-1.

2. Comparision of cost estimates. The estimate of $8,000,000 for the IHNC remaining levees represents an increase of $22,400 over the latest PB-3 dated 1 July 1967. The estimates presented in the PB-3 are project document estimates escalated to reflect July 1967 price levels. Table IX-2 shows a comparision of the project document, PB-3 and design memorandum estimates. Reasons for the difference between the design memorandum and PB-3 estimates are as follows:

a. Levees and floodwalls. The increase of $383,500 reflects the added cost for an increase in the height of the protective works above natural ground of approximately one foot resulting from releveling by the U. S. Coast and Geodetic Survey which in 1965 disclosed that ground surfaces in the project area were about one foot lower than they were considered to be when the project document cost estimates were prepared; replacing the concrete capped steel sheet piling wall with I-type or T-type floodwall, as appropriate; an increase in the number of required gap closures; constructing the protective works to higher net grades which resulted from hydraulic studies utilizing more severe parameters for the Standard Project Hurricane furnished by the U. S. Weather Bureau subsequent to project authorization; and general refinements in the coast estimate based on the more detailed information available.

b. Engineering and design. The increase of $33,300 reflects the added E&D as a result of applying the E&D percentage determined by use of 1962-1965 OCE curves to the construction cost.

c. Supervision and administration. The increase of $65,000 reflects the added S&A as a result of applying the S&A percentage determined by use of 1962-1965 OCE curves to the construction cost.

d. Lands and damages. The decrease of $642,400 reflects a reduction in rights-of-way areas for the revised alignment as compared with the alignment presented in the project document.

e. Relocations. The increase of $183,000 is the total relocations cost for the protective works covered in this supplement. The project document plan did not recognize the need for any relocations on the IHNC.

3. The cost of $8,000,000 as presented herein also represents an increase of $1,978,600 over the estimate included in the project document. Reasons for the difference between the design memorandum and project document estimates are as follows:

a. Levees and floodwalls. The total increase of $1,556,600 reflects, in addition to that presented in paragraph 2.a., a greater percentage for contingencies than that presented in the project document.

b. Engineering and design. The total increase of $296,000 reflects the added E&D as a result of applying the E&D percentages determined by use of 1962-1965 OCE curves to the construction cost.

c. Supervision and administration. The total increase of $174,000 reflects the added E&D as a result of applying the S&A percentage determined by use of 1962-1965 OCE curves to the construction cost.

d. Lands and damages. The decrease of $231,000 reflects a reduction in rights-of-way areas for the revised alignment as compared with the alignment presented in the project document.

e. Relocations. The increase of $183,000 is the same as that described in paragraph 2.

TABLE IX-1

DETAILED ESTIMATE OF FIRST COST (IHNC REMAINING LEVEES)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
	CONSTRUCTION				
11	Levees and Floodwalls				
	Excavation	61,381	cy	1.50	$92,071.00
	Levee Fill	122,375	cy	2.00	244,750.00
	MA 22 Steel Sheet Piling	47,584	sf	3.00	142,752.00
	Z-27 Steel Sheet Piling	516,630	sf	3.25	1,679,048.00
	Z-32 Steel Sheet Piling	670	sf	3.50	2,345.00
	12"x12" Prestressed Conc. Piling	153,244	lf	5.50	842,842.00
	Conc. in Stab. Slab	396	cy	35.00	13,860.00
	Conc. in T Wall Base	2,330	cy	40.00	93,200.00
	Conc. in Walls Cols. & Overhead Beams	13,531	cy	50.00	676,550.00
	Concrete Paving	33.5	sq	53.00	1,776.00
	Portland Cement	23,010	bbl	5.00	115,050.00
	Reinforcing Steel	1,779,870	lb	0.14	249,182.00
	Water Stops (3 bulb type)	5,640	lf	4.00	22,560.00
	Water Stops (L type)	560	lf	4.00	2,240.00
	Expansion Jt. Filler	14,717	sf	1.00	14,717.00
	Gate Seals	824	lf	5.00	4,120.00
	Structural Steel	133,992	lb	0.40	53,597.00
	Misc. Metal Work	Lump Sum	-	-	8,700.00
	Trolley Plan (2 ton)	9	ea	150.00	1,350.00
	Trolley General (2 ton)	9	ea	300.00	2,700.00
	Trolley Main (3 ton)	5	ea	300.00	1,500.00
	Trolley Geared (3 ton)	5	ea	450.00	2,250.00
	Struct. Backfill	10,221	cy	1.50	15,331.00
	Fertilizing & Seeding	21.5	acre	110.00	2,365.00
	Concrete Catch Basin	4.0	cy	75.00	300.00
	RELIEF WELLS				
	Riser Pipe, 8" ID	1,125	lf	40.80	45,900.00
	Wood Screen, 8" ID	1,975	lf	40.80	80,580.00
	Plugging Abandoned Wells	321	lf	10.00	3,210.00
	Plugging Abandoned Holes	320	lf	15.00	4,800.00
	Relief Well Pumping Tests (4 hrs)	84	ea	160.00	13,440.00
	Relief Well Additional Pumping	120	hr	30.00	3,600.00
	24" dia. galv. CMP coated	410	lf	20.00	8,200.00
	18" dia. galv. CMP coated	805	lf	15.10	12,155.00

TABLE IX-1 (cont'd)

DETAILED ESTIMATE OF FIRST COST (IHNC REMAINING LEVEES)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
	15" dia. galv. CMP coated	700	lf	10.00	$ 7,000
	12" dia. galv. CMP coated	1,091	lf	6.00	6,546.00
	10" dia. galv. CMP coated	250	lf	5.10	1,275.00
	8" dia. galv. CMP coated	500	lf	4.30	2,150.00
	Check Valves	84	ea	100.00	8,400.00
	Manhole Covers	92	ea	25.00	2,300.00
	Outlet Screens	68	ea.	25.00	1,700.00
	Shoring Collector Line Trench	2,700	lf	6.00	16,200.00
	Shell	150	cy	5.00	750.00
	15" dia. conc. pipe	450	lf	6.00	2,700.00
	Ramps	4	ea	90,000.00	360,000.00
	Piezometers Tubes	500	lf	12.50	6,250.00
	Test Piles	4	ea	12,000.00	48,000.00
	Sheet Pile Coating	30,605	sf	0.50	15,303.00
	Subtotal				$4,937,715.00
	20% Contingencies ±				987,085.00
11	Levees & floodwalls, total const. cost			5,724,800	$4,923,000.00
30	Engineering & design, 7.9% ±				471,000.00
31	Supervision & administration, 7.3% ±				436,000.00
	Total cost levees and floodwalls				$6,830,000.00
	RELOCATIONS				
1	Rock Storage Bin				
a.	Concrete Removal	259	cy	40.00	10,360.00
b.	Piling Removal	700	lf	1.00	700.00
c.	Removal of Roof	5,980	sf	0.50	2,990.00
d.	Removal of Roof Truss	2	ea	1,500.00	3,000.00
e.	Replace Roof Truss	2	ea	2,000.00	4,000.00
f.	Replace Roof & New Roofing	5,980	sf	1.00	5,980.00
2	6" Water or Sewer Line	4	ea	500.00	4,000.00
3	8" Water or Sewer Line	3	ea	600.00	1,800.00
4	12" Water or Sewer Line	7	ea	1,000.00	7,000.00
5	16" Water or Sewer Line	2	ea	1,600.00	3,200.00
6	24" Water or Sewer Line	1	ea	2,000.00	2,000.00
7	30" Water or Sewer Line	2	ea	2,500.00	5,000.00
8	36" Water or Sewer Line	1	ea	3,000.00	3,000.00
9	50" Water or Sewer Line	4	ea	5,000.00	20,000.00
10	2" Water Line	1	ea	200.00	200.00
11	4" Gas Line	1	ea	500.00	500.00

TABLE IX-1 (cont'd)

DETAILED ESTIMATE OF FIRST COST (IHNC REMAINING LEVEES)

Item No.	Description	Estimated Quantity	Unit	Unit Price	Estimated Amount
12	6" Gas Line	1	ea	500.00	$ 500.00
13	8" Gas Line	1	ea	1,500.00	1,500.00
14	10" Gas Line	1	ea	900.00	900.00
15	16" Gas Line	1	ea	2,000.00	2,000.00
16	6" Elect. Raceways	11	ea	500.00	5,500.00
17	TV Coaxial Cables	4	ea	500.00	2,000.00
18	Submarine Cables	16	ea	400.00	6,400.00
19	6" Chlorine Line	1	ea	500.00	500.00
20	10" Fuel Oil Line	1	ea	900.00	900.00
21	1-1/2" Air Lines	2	ea	100.00	200.00
22	Power & Comm. Cable	1	ea	800.00	800.00
23	Oil Tank Relocation	Lump Sum	-	-	8,100.00
24	Intake Structure Closure Gate	1	ea	30,000.00	30,000.00
	Subtotal				$133,030.00
	20% Contingencies ±				26,670.00
	Subtotal				$159,700.00
	Engineering & design 7.9% ±				12,000.00
	Supervision & administration 7.3% ±				11,300.00
	Total relocations				$183,000.00
	LANDS				
	West side of IHNC	33.67	acres	varies	426,600.00
	East side of IHNC	21.53	acres	varies	459,500.00
	Severance - None				
	Improvements - fencing	Lump Sum			10,000.00
	Total lands & improvements				896,100.00
	Contingencies 10% ±				89,500.00
	Real estate hired labor cost (7 tracts)				175.00
	Acquisition cost by others (7 tracts)				1,225.00
	Total real estate cost				$987,000.00

TABLE IX-2

COMPARISION OF ESTIMATE
(IHNC Remaining Levees)

		Project Document	PB-3 Approved 23 Aug 67 Effective 1 Jul 67	GDM No. 2 Supp. No. 8	Difference Between Supp. No. 8 & PB-3	Difference Between Supp. No. 8 and Project Document
11	Levees & floodwalls	$4,366,400	$5,539,200	$5,923,000	+ $383,500	+ $1,556,600
30	Engineering & design	175,000	438,000	471,000	+ 33,300	+ 296,000
31	Supervision & Administration	262,000	371,000	436,000	+ 65,000	+ 174,000
	Lands & damages	1,218,000	1,629,400	987,000	- 642,400	- 231,000
	Relocations	0	0	183,000	+ 183,000	+ 183,000
	TOTAL	$6,021,400	$7,977,600	$8,000,000	+ $ 22,400	+ $1,978,600

SCHEDULES FOR DESIGN AND CONSTRUCTION
INNER HARBOR NAVIGATION CANAL LEVEES AND FLOODWALLS
LAKE PONTCHARTRAIN TO FLORIDA AVENUE

4. The sequence of contracts and the schedule for design and construction are shown below:

Contracts	*Design		Construction			Estimated construction cost (including contingencies)
	Start	Complete	Advertise	Award	Complete	
West Side-Floodwall (Sta. 31+00 to 106+01 148+00 to 210+00)	Feb 67	May 68	Apr 68	May 68	May 69	$1,969,000 1/
West Side-Floodwall & Levee (Sta. 106+01 to 148+00)	Feb 67	Aug 68	Sep 68	Oct 68	Jun 70	1,360,000 2/
West Side-Floodwall & Levee (Sta. 210+00 to 235+77 including wall in Lone Star Cement Plant)	Feb 67	Oct 68	Nov 68	Jan 69	Sep 69	721,000 3/
East Side-Floodwall (Sta. 34+00 to 83+45)	Feb 67	Apr 68	May 68	Jun 68	Oct 68	617,000 4/
East Side-Floodwall (Sta. 83+45 to 122+41)	Feb 67	Nov 68	Dec 68	Jan 69	Jun 70	930,000
East Side-Floodwall (Sta. 123+05 to 179+47)	Feb 67	Nov 68	Dec 68	Jan 69	Aug 69	448,000 5/

*Includes design memorandum and plans and specifications for the period from start to final approval.

1/ Includes an expenditure of $438,700 by the Corps of Engineers for furnishing and driving steel sheet piling between Stations 31+00 and 106+00 in calendar year 1967 and an expenditure of $381,600 by the Orleans Levee District (OLD) for furnishing and driving steel sheet piling between Stations 148+00 and 210+00 in calendar year 1966.

2/ Includes an expenditure of $102,100 by the OLD for furnishing and driving steel sheet piling and constructing a levee and a ramp between Stations 137+72 and 148+00 in calendar year 1967.

3/ Includes an expenditure of $186,200 by the OLD for furnishing and driving steel sheet piling and constructing a levee and a ramp between Stations 210+00 and 235+73 in calendar year 1967.

4/ Includes an expenditure of $197,500 by the Corps of Engineers for furnishing and driving steel sheet piling between Stations 34+00 to 83+45 in calendar year 1967.

5/ Includes an expenditure of $73,600 by the OLD for constructing a levee between Stations 141+75 and 179+47.

NOTE: The value of the work performed by the Orleans Levee District will be credited to the Levee District in accordance with the conditions of local cooperation and the understanding contained in exchange of correspondence between the Levee District and the Corps of Engineers (see Appendix ____).

SCHEDULE FOR DESIGN AND CONSTRUCTION (cont'd)

To maintain the schedule for the IHNC Remaining Levees, Federal funds will be required by fiscal years as follows:

Estimated cost through F.Y.	1967	$ 661,000
Appropriation required	1968	330,400
	1969	3,355,800
	1970	1,760,500
TOTAL		$6,107,700

SECTION X - OPERATION AND MAINTENANCE

As specified in the authorizing act, local interests are required to maintain and operate all completed works in accordance with regulations prescribed by the Secretary of the Army (except the navigation locks at the Rigolets, for which operation and maintenance they will provide a cash contribution equal to the capitalized value of the estimated annual cost of operation and maintenance of the lock). Maintenance of the levees and floodwalls covered in this supplement is estimated to cost $1,900.00 annually. Operation and maintenance of the 20 gap closures are estimated to cost a total of $4,400.00 annually; further, it is estimated that replacements of gates and hardware will be necessary at 30-year intervals. The annual charge for these replacements is $1,475.00. The total estimated annual cost to local interests for operation and maintenance and replacement of the features covered in this supplement is, accordingly, $7,775.00.

SECTION XI - RECOMMENDATIONS

Recommendations. The plan of protection presented herein for the protective works on the bank of the IHNC between Florida Avenue and Hayne Boulevard on the west side and between Hayne Boulevard and the MR-GO on the east side consists of I-type floodwall, T-type floodwall, and levee. Fifteen overhead roller gates and six swing gates are provided at vehicular and railroad crossings to preserve access during nonhurricane periods and permit rapid closure when hurricanes impend. The plan is considered to be the optimum one for accomplishing the project purposes and is, accordingly, recommended for approval.

APPENDIX A

Correspondence relative to planning procedures
for Lake Pontchartrain Barrier Plan

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS
FOOT OF PRYTANIA STREET
NEW ORLEANS, LOUISIANA

ADDRESS REPLY TO:

DISTRICT ENGINEER
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
P. O. BOX 60267
ORLEANS, LA. 70160

REFER TO FILE

LMNED-PP 7 October 1965

SUBJECT: Outline of Proposed Planning Procedures for Proposed "Lake Pontchartrain, La. and Vicinity," Project

TO: Division Engineer
U. S. Army Engineer Division
Lower Mississippi Valley
ATTN: LMVED-TD

1. Reference is made to the following:

a. LMNED letter "Review of Possible Engineering and Design Overload" dated 17 August 1965, and 1st Indorsement thereto.

b. Record of telecon between Messrs. Dement, LMVD, and Chatry, NOD, dated 15 September 1965, relative to subject project.

c. DIVR 1110-2-9.

2. The occurrence of hurricane "Betsy" has exerted a distinct influence on the course that should be followed in initiating planning of the subject project. First, it has introduced a requirement for increased tidal hydraulics coverage in the design process; second, it has generated substantial pressure for so arranging the planning that construction may be initiated at the earliest practicable date; and finally, it has preempted, for other purposes, the services of District engineering personnel required for participation in the overall planning effort.

3. We propose to respond to the peculiar requirements imposed by the above-described conditions by utilizing the following planning procedure. In the descriptions, please refer to inclosed map (incl 1):

a. A design memorandum (No. 1) on tidal hydraulics will be prepared in-house with maximum use of overtime when effective. Based on the project being funded on or before 15 October 1965, this memorandum would be forwarded for approval in January 1966. This submission date presupposes that studies now being made by the U. S. Weather Bureau will not result in a change in any of the parameters of the design hurricane. The scheduling of other design memoranda also is influenced by this presupposition.

b. Preparation of a general design memorandum (No. 2) on the barrier complex; i.e., the system of levees and structures required to exclude storm tides from Lake Pontchartrain, will be initiated concurrently with the memorandum on tidal hydraulics. Preparation of this memorandum would be by an A-E contractor with a local office. This memorandum will involve extensive coordination with various local entities, and for this reason is not considered suitable for accomplishment by another Corps office. Work would continue into fiscal year 1967 with submission date estimated to be March 1967, assuming initial funds are available by 15 October 1965.

c. Preparation of a general design memorandum (No. 3) on the Chalmette area also will be initiated concurrently with the memorandum on tidal hydraulics, utilizing an A-E contractor with a local office. For the reason cited in subparagraph b. above, this memorandum is not considered suitable for accomplishment by another Corps office. Work would continue into fiscal year 1967 and the memorandum would be submitted in November 1966, assuming initial funds are available by 15 October 1965.

d. In order to permit the earliest practicable start of construction, a single memorandum (No. 2A) supplementary to both the above GDM's, covering all levees along the Inner Harbor Navigation Canal, will be prepared in-house and submitted in advance of the GDM's. The existing Inner Harbor Navigation Canal levees proved to be very vulnerable during "Betsy." Further, the existing levee system, which will, in effect, provide the base for the project improvements, is under the exclusive control of the Orleans Levee Board, which agency is most anxious to cooperate. In addition, the entire project levee along the west bank of the canal, and that part of the project levee on the east bank of the canal which is north of the Gulf Intracoastal Waterway, will be integral parts of the barrier system, which system will produce more widespread benefits than any other project feature. Assuming that funds are available by 15 October 1965 and maximum use of overtime when effective, the advance supplement would be submitted in May 1966. With normal review time and allowing eight months, after submission of the advance supplement, for preparation of plans and specifications, review, advertisement, etc., construction could be initiated by January 1967.

e. A combination general and detailed design memorandum (No. 3 of the Mississippi River-Gulf Outlet series) for the Seabrook Lock will be prepared by another Corps office or by A-E contractor, using Mississippi River-Gulf Outlet funds. Assuming that funds are available by 15 October 1965, this memorandum would be submitted in July 1966.

LMNED-PP 7 October 1965

SUBJECT: Outline of Proposed Planning Procedures for Proposed "Lake Pontchartrain, La. and Vicinity," Project

4. CPM schedules and estimated planning and construction costs (including E&D and S&A) for the features described above are shown on inclosure 3. The funds required for fiscal year 1966, assuming A-E accomplishment of the barrier and Chalmette general design memoranda, exclusive of the $180,000 of Mississippi River-Gulf Outlet funds required for Seabrook Lock (preparation by A-E), are indicated to be in excess of $450,000 which is the amount expected to be made available. A request for additional funds will, however, be deferred until negotiations with A-E contractors are complete and a more positive requirement for additional funds exists.

5. Reference a. (1st Indorsement) indicated that our request for engineering assistance should be deferred until receipt of definite information that initial funds will be made available. We consider that receipt of initial funds in the amount of $450,000 for the subject project is, for all practical purposes, now assured. Accordingly, it is requested that we be authorized to proceed with arrangements to have the design memoranda for the barrier and the Chalmette area prepared by an A-E contractor. It is further requested that you arrange for preparation of the design memorandum on Seabrook Lock by another Corps office, or that we be authorized to arrange for its preparation by an A-E contractor.

6. Twelve copies of plates 3 and 9 from the survey report on the project are furnished herewith for use in briefing other Corps offices on the Seabrook Lock. Additional copies will be made available on request.

7. Approval of the procedure outlined in paragraphs 3-5 is requested. Further information on planning subsequent to that described will be the subject of future correspondence.

Thomas J. Bowen

THOMAS J. BOWEN
Colonel, CE
District Engineer

4 Incl
1. Map H-2-22077, plate 3 (12 cys)
2. Map H-2-22077, plate 9 (12 cys)
3. CPM - 1 sheet (12 cys)
4. CPM - 8 sheets (trip)

LMVED-TD (7 Oct 65) 1st Ind
SUBJECT: Outline of Proposed Planning Procedures for Proposed "Lake Pontchartrain, La. and Vicinity," Project

DA, Lower Miss. Valley Div, CE, Vicksburg, Miss. 39181 9 Dec 65

TO: District Engineer, New Orleans District, ATTN: LMNED-PP

1. Returned for terminal filing.

2. Action on basic letter was correlated with that taken on your letter, LMVED-PP, 5 November 1965, subject: Revised Outline of Planning Procedures for "Lake Pontchartrain, La. and Vicinity," Project, by LMVED-TD 1st indorsement dated 8 December 1965.

FOR THE DIVISION ENGINEER:

4 Incl
wd 1 cy ea

A. J. DAVIS
Chief, Engineering Division

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNED-PP

5 November 1965

SUBJECT: Revised Outline of Planning Procedures for "Lake Pontchartrain, La. and Vicinity," Project

TO: Division Engineer
Lower Mississippi Valley Division
ATTN: LMVED

1. Reference is made to letter LMNED-PP dated 7 October 1965 subject "Outline of Planning Procedures for Proposed 'Lake Pontchartrain, La. and Vicinity,' Project."

2. Continuing consideration of the subject planning procedures reveals that certain revisions in the procedures outlined in the referenced letter are desirable. A discussion of proposed procedural changes follows in subsequent paragraphs.

3. It is understood that your office is opposed to the combined general and detail memorandum on Seabrook Lock. Accordingly, both an abbreviated general design memorandum establishing the general features of the lock and its precise location and a detail design memorandum will be prepared. Preliminary discussions have already been held with the Buffalo District and WES, and it has been determined that both memoranda will be prepared by Buffalo with assistance from WES on soils, foundations, and geology. Buffalo and WES have agreed to furnish estimates of time and cost for preparation of the two memoranda in the near future. We shall schedule the memoranda after receipt of the above data.

4. In order to reduce the time required to begin construction of elements covered in the general design memorandum for the barrier (see par. 3.b. of referenced letter), we now propose to prepare a general design memorandum for the entire Lake Pontchartrain barrier plan, with full design memorandum scope coverage limited to the two barrier structure complexes and a section of the Citrus back levee extending from the Inner Harbor Navigation Canal to near Michoud. The remainder of the plan would be given only brief coverage using survey report data with cost estimates and benefits updated. Segments of the plan given brief coverage in the general design memorandum will be developed further in a series of supplements.

5. Preparation of the above-mentioned general design memorandum and plans and specifications for the section of levee detailed therein would be by A-E contractor. A schedule for the work and government estimate of cost (incl 1 & 2) are inclosed.

6. We plan to leave unchanged our prior proposals on design memoranda coverage for the tidal hydraulics, Inner Harbor Navigation Canal levee, and the Chalmette area. The schedules previously furnished for these memoranda are obsolete as to date and will be resubmitted.

7. A government cost estimate for the general design memorandum for the Chalmette area, which is also to be prepared by the A-E contractor, will be forwarded at an early date.

8. A list of proposed design memoranda covering the entire project is inclosed (incl 3).

9. Approval of the revised procedure discussed in paragraphs 3-7 is requested.

10. Approval of the government estimate of cost for the A-E contract for the general design memorandum on the Lake Pontchartrain barrier plan and authority to proceed with contract negotiations are requested.

Thomas J. Bowen
THOMAS J. BOWEN
Colonel, CE
District Engineer

3 Incl (dupe)
1. Schedule
2. Gov't est.
3. List of DM's

LMVED-TD (NOD 5 Nov 65) 1st Ind
SUBJECT: Revised Outline of Planning Procedures for "Lake Pontchartrain, La. and Vicinity," Project

DA, Lower Miss. Valley Div, CE, Vicksburg, Miss. 39181 8 Dec 65

TO: District Engineer, New Orleans District, ATTN: LMNED-PP

1. In addition to letter, LMNED-PP, NOD, 7 Oct 65, cited in par 1 of basic communication, the following correspondence is pertinent to the contents of this indorsement:

a. Letter, LMNED-PP, NOD, 19 Oct 65, subject: Lake Pontchartrain, Louisiana and Vicinity, Dual-Purpose Control Structure at Seabrook (Seabrook Lock), and 1st Ind, LMVED-PH/LMVED-TD, LMVD, 17 Nov 65, thereon.

b. Letter, ENGCW-EY, OCE, 12 Nov 65, subject: Engineering Assistance for the New Orleans District, and 1st Ind, LMVED-PH, LMVD, 23 Nov 65, to NOD.

c. Letter, LMVED-TV, LMVD, 24 Nov 65, to OCE, subject: Request for Engineering Assistance for the New Orleans District, 1st Ind, ENGCW-EZ, OCE, 29 Nov 65, thereon, and 2d Ind, LMVED-T, LMVD, 3 Dec 65.

2. This indorsement is in response to both basic communication and your letter of 7 Oct 65 referred to in par 1 hereof. Your proposed planning on this project provides for use of Architect-Engineer services for preparation of general design memoranda on the Barrier Complex and on the Chalmette Area, for the use of the Buffalo District for preparation of both the GDM and FDM on Seabrook Lock and for the in-house preparation of design memoranda on tidal hydraulics and the Inner Harbor Navigation Canal levees. Reference 1b above authorized the use of A-E services subject to the conditions stated in par 2 thereof. Transfer of the planning work on Seabrook Lock to the Buffalo District was authorized by 1st Ind, ENGCW-EZ, OCE, 29 Nov 65 (see reference 1c above, copy inclosed).

3. Revised planning procedure discussed in par 3 through 7 of basic letter is approved subject to the comments in par 5 below. Government estimate of cost for A-E contract (Incl 2) is approved. You are authorized to proceed with contract negotiations which should be conducted in accordance with par 2 of reference 1b above.

4. In reference 1a above, you were authorized to design Seabrook Lock on a controlling elevation of 7.2 ft msl. Recent review of the authorization contained in the Flood Control Act of 1965 has raised the question as to whether this modification in the controlling elevation is within the discretionary powers of the Chief of Engineers. In view of this uncertainty, it is desired that you proceed with definite project studies to a stage where a firm controlling elevation can be established

for the lock. Upon either confirmation of elevation 7.2 ft msl or the establishment of a new controlling elevation, it is further desired that a letter report be prepared covering this modification in the project. The letter report will be forwarded to the Chief of Engineers for approval pursuant to par 10, EM 1110-2-1150.

5. The following comments are furnished for consideration in firming up your planning schedules:

a. Your understanding in par 3 of basic letter that we are opposed to a combined GDM and FDM on Seabrook Lock is correct. Confirming par 3 of 1st Ind, LMVED-PH/LMVED-TD, LMVD, 17 Nov 65 (reference 1a above), separate general design and feature design memoranda are desired.

b. The schedule for preparation of GDM No. 2 provides very little slack time. Following the notice to proceed, the schedule requires a number of various field and design operations to proceed concurrently. This apparently will require a fair size staff of experienced engineers available to proceed with the work shortly after the notice to proceed is given. It may be difficult to find an A-E with this capability on short notice. The time scheduled may not make sufficient allowance for the various contingencies.

c. Normally, it is desirable to firm up the general requirements and types of structures to be built in the GDM. If the time scheduled does not permit a study of alternate types of structures, then the structures in the GDM could be based on previous structures of similar nature developed only in sufficient detail to serve as a basis for cost estimating. In this case the study of types of structures would either be covered in the FDM or in a letter report submitted for review prior to starting the FDM.

d. The furnishing of satisfactory assurances by local interests is prerequisite to construction. In view of the large non-Federal costs involved (a contribution of $19,021,000 for the Lake Pontchartrain Area

LMVED-TD (NOD 5 Nov 65) 1st Ind 8 Dec 65
SUBJECT: Revised Outline of Planning Procedures for "Lake Pontchartrain, La. and Vicinity," Project

and $3,644,000 for the Chalmette Area, plus the costs of rights-of-way and relocations), it may be a distinct advantage in working out your planning schedule to ascertain from responsible local interests their attitude toward the project and their ability to provide the necessary cooperation. This action, if successful, may dictate changes in your schedule which would permit planning to progress in parallel with the activities of non-Federal interests. Under the present authorization, which includes the recommendation of the Secretary of the Army that the cost of Seabrook Lock be shared equally between hurricane protection and navigation, assurances from local interests must be obtained for the Lake Pontchartrain Area before construction of Seabrook Lock can be initiated.

FOR THE DIVISION ENGINEER:

George B. Davis
for A. J. DAVIS
Chief, Engineering Division

4 Incl
wd 1 cy ea incl 1-3
Added 1 incl
4. Ltr, LMVD, 24 Nov 65, w/1st & 2d Ind

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNED-PP

8 November 1966

SUBJECT: Lake Pontchartrain, La. and Vicinity - Revised Approach to Advance Supplement on Inner Harbor Navigation Canal Levees

TO: Acting Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. The advance supplement on the Inner Harbor Navigation Canal (IHNC) levees is presently scheduled for submission on 31 December 1966. As you know, this supplement is being prepared as a means of accelerating construction in an area proven to be critical by the passage of hurricane "Betsy" in September 1965. Preparation of the supplement has proceeded on the basis of having it cover all of the IHNC levees except those on the east bank between the IHNC lock and Florida Avenue, which segment is included in the GDM for the Chalmette area plan submitted to you under date of 1 November 1966 (see incl). As planning has progressed, it has become apparent that certain alignment and design problems would not permit coverage of some areas in sufficient detail for preparation of plans and specifications to follow directly from the advance supplement, and that additional design reports of a detailed nature would be required. Coverage in the advance supplement for such areas (which include the siphon crossings at Florida Avenue, all work on the west bank between the IHNC lock and Florida Avenue, and work on both banks in the vicinity of Interstate Highway 10 and U. S. Highway 90) was, accordingly, to have been limited to survey report scope, with detail design memoranda to follow as required.

2. On 24 October 1966, Mr. Armand Willoz, Chief Engineer of the Orleans Levee District, local cooperators for the project, expressed grave concern over the fact that current schedules would not result in Federal construction on the west bank of the Canal between the IHNC lock and Florida Avenue prior to the next hurricane season. Mr. Willoz explained that construction by the Orleans Levee District since "Betsy" has resulted in a significant increase in the degree of protection in all other areas which proved to be critical in "Betsy," and pointed out the technical factors which render impracticable an interim approach to providing protection such as has been applied in other areas. He also described the difficulties experienced and the disruption involved in providing emergency protection in the area by makeshift means during the hurricane season just past.

3. We pointed out to Mr. Willoz that, if our planning were revised to emphasize work in the subject area and all preconstruction planning completed in time to permit start of construction prior to next hurricane season, the fiscal outlook was such that construction funds in the amount required might not be available. Mr. Willoz indicated that the Levee District would be happy to undertake the construction with their own funds (subject to credit as in the case of the interim work already done by them), provided we gave them authority to do so. He further offered to have the necessary engineering done by architect-engineers if such action would expedite the production of approved plans.

4. In view of the above, we propose to modify our present planning schedules as follows:

a. The advance supplement will be modified so as to cover only that portion of the Canal between IHNC lock and Florida Avenue on the west bank. Coverage will be in sufficient detail to permit preparation of plans and specifications directly from the advance supplement.

b. Available in-house capability in the structural design area will be concentrated on preparation of the modified advance supplement. We expect that, under these conditions, the advance supplement can be submitted on or before 15 February 1967. Assuming normal review time, an approved set of plans and specifications for the work could be available by 15 June 1967.

c. Two additional supplements to the GDM for the barrier plan will be prepared for other segments of the IHNC levees. One would cover the Florida Avenue siphon crossings, and the other the remainder of the work on the Canal.

d. The emphasis placed on completing the advance supplement will result in slippage of the present schedule for the GDM for the barrier plan. However, this memorandum will cover in detail only the levee on the north bank of the Mississippi River-Gulf Outlet between the IHNC and Michoud. This levee has been raised to elevation 13 feet m.s.l. by the Levee District and currently affords a very high degree of protection. We plan to submit, at an early date, and prior to completion of the barrier plan GDM, a letter report on evaluation of alternate barrier locations, approval of which will permit site selection studies for the barrier structures to proceed without delay. Thus, progress on planning for these structures, which are crucial to the project, will not be delayed by slippage of the barrier plan GDM. We expect that this GDM, presently scheduled for submission on 31 January 1967, can be submitted on or before 1 September 1967. In view of the above, it is considered that this delay can be tolerated.

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5. Based on the foregoing, it is recommended that the advance supplement for the Inner Harbor Navigation Canal levees presently scheduled for submission on 31 December 1966 cover only the work between the IHNC lock and Florida Avenue on the west bank of the Canal, and that revised submission dates of 15 February 1967 and 1 September 1967, respectively, for this supplement and the GDM for the barrier plan, be approved.

Thomas J Bowen

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Mosaic fwd sep

THOMAS J. BOWEN
Colonel, CE
District Engineer

LMVED-TD (NOD 8 Nov 66)   1st Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity - Revised Approach to Advance Supplement on Inner Harbor Navigation Canal Levees

DA, Lower Miss. Valley Div, CE, Vicksburg, Miss. 39180 18 Nov 66

TO: District Engineer, New Orleans District, ATTN: LMNED

1. Recommendation in para 5 of basic communication is approved.

2. Confirming telephone conversation between Messrs. A. J. Davis and George Hudson 17 Nov 66, tentative agreement has been reached with Chief, Engineering Division, OCE, for concurrent review of the design memorandum followed by a field conference about 10 days after receipt of DM in OCE. When preparation of the DM has progressed to a stage where a firm submission date can be established advise us promptly in order that arrangements may be made with OCE for the field conference.

3. In order to advance work on this project in an expeditious manner, it is desired that the design memorandum, when approved by OCE, be furnished the Orleans Levee District for preparation of contract drawings and specifications and for construction. Contract drawings and specifications prepared by the Orleans Levee District will be reviewed by NOD and submitted to LMVD for review and approval prior to advertising for bids.

4. In view of the reduction in work allowance for FY 67 from $1,600,000 to $850,000, the above procedure will encourage the use of local funds for the work between the IHNC lock and Florida Avenue and permit use of available Federal funds at other locations, thereby further advancing the project.

5. We suggest that all references to "supplement" be changed to "part" in identifying portions of GDM No. 2 for the Barrier Plan as was done with Design Memorandum No. 1, Tidal Hydraulics. All future design memoranda or parts thereof should contain a flyleaf map similar to those prepared as project maps for the purpose of showing the entire project and the relation of the work covered by a specific DM to the overall project. Once the map is prepared, it can be used in all DM's by delineating thereon the work covered by the DM being submitted.

FOR THE ACTING DIVISION ENGINEER:

A. J. Davis

wd all incl

A. J. DAVIS
Chief, Engineering Division