JUNE 1969

LAKE PONTCHARTRAIN, LA. and VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 GENERAL DESIGN SUPPLEMENT NO. 2 RIGOLETS LOCK AND ADJOINING LEVEES

PREPARED FOR
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
NEW ORLEANS, LOUISIANA

STANLEY CONSULTANTS, INC.
STANLEY BUILDING
MUSCATINE, IOWA 52761

AND

B. M. DORNBLATT AND ASSOCIATES, INC.
826 LAFAYETTE STREET
NEW ORLEANS, LOUISIANA 70113

A JOINT VENTURE

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

LMNED-PP 16 July 1969

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, General Design Memorandum No. 2, Supplement No. 2, Rigolets Lock and Adjoining Levees

Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. The subject general design memorandum is submitted herewith for review in accordance with the provisions of ER 1110-2-1150 dated 1 July 1966.

2. Stanley Consultants, Inc., Muscatine, Iowa and B. M. Dornblatt and Associates, Inc., New Orleans, Louisiana prepared this design memorandum under the provisions of Contract No. DACW29-68-C-0011.

3. Approval of the subject design memorandum is recommended.

Herbert R. Haar, Jr.

HERBERT R. HAAR, JR.
Colonel, CE
District Engineer

1 Incl (16 cys)
GDM No. 2, Supp. No. 2

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING 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	Approved 6 Mar 69
	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 Dec 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 2, Lake Pontchartrain Barrier, Rigolets Lock and Adjoining Levees	Submitted 16 Jul 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 3, Lake Pontchartrain Barrier, Chef Menteur Pass Complex	Submitted 17 Jun 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 4, New Orleans East Back Levees	Scheduled Jan 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees - West of IHNC	Scheduled Jan 71

STATUS OF DESIGN MEMORANDA (cont'd)

Design Memo No.	Title	Status
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5A, Orleans Parish Lakefront Levee - East of IHNC	Scheduled Sept 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 6, St. Charles Parish Lakefront Levees	Scheduled Aug 69
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	Approved 6 Jun 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 9, New Orleans East Levee from South Point to GIWW	Scheduled Sept 71
3	Chalmette Area Plan, GDM	Approved 31 Jan 67
3	Chalmette Area Plan, GDM, Supplement No. 1, Chalmette Extension	Submitted 21 Oct 68
4	Lake Pontchartrain Barrier Plan and Chalmette Area Plan, GDM, Florida Avenue Complex, IHNC	Not scheduled
5	Chalmette Area Plan, DDM, Bayous Bienvenue and Dupre	Approved 29 Oct 68
6	Lake Pontchartrain Barrier Plan, DDM, Rigolets Control Structure and Closure	Scheduled Jan 71
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	Scheduled Jul 70
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Scheduled Sept 70

STATUS OF DESIGN MEMORANDA (cont'd)

Design Memo No.	Title	Status
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	Scheduled Jul 70
10	Lake Pontchartrain Barrier Plan, Corrosion Protection	Approved 21 May 69
12	Source of Construction Materials	Approved 30 Aug 66
1	Lake Pontchartrain, La. and Vicinity, and Mississippi River-Gulf Outlet, La., GDM, Seabrook Lock	Scheduled Oct 69
2	Lake Pontchartrain, La. and Vicinity, and Mississippi River-Gulf Outlet, La., DDM, Seabrook Lock	Scheduled May 70

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN

SUPPLEMENT NO. 2

RIGOLETS LOCK AND ADJOINING LEVEES

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APPENDICES

PERTINENT DATA

LOCK

Lock Structure

"U" frame, reinforced concrete gate bays
Earth embankment side walls protected by riprap

Gates - Sector Type

Guidewalls - Timber

Dimensions	Feet
Width of lock (inside)	110
Usable length of lock	800
Length of lock, center to center gate pintles	862
Total overall length of lock (excluding approach guidewalls)	967
Length of approach guidewalls, gulf and Lake Pontchartrain ends, south side	350
north side	100

Elevations

Datum	mean sea level
Top of lock chamber walls	6.0
Top of guide walls and gate bays	13.5
Gate sills	-14.0 (-13.2 m.l.g.)
Lock floor	-14.0 (-13.2 m.l.g.)
Top of skin plate, Gulf end gates	13.5
Top of skin plate, Lake end gates	6.0
Floor elevation of control house	19.5
Ground elevation of reservation area	9.0
Floor elevation of office	19.5
Limiting grade, spoil deposition north of channel	3.0

Hydraulic Design Criteria (Elevations in feet mean sea level)

Maximum tide, Gulf	12.8
Maximum tide, Lake Pontchartrain	11.5
Minimum water level at gates, Gulf end	- 5.25
Minimum water level at gates, Lake Pontchartrain end	- 6.5
Maximum differential, Gulf to Lake	16.5
Maximum reverse head, Lake to Gulf	15.25
Maximum storm tide elevation at which lock will be operated	4.0
Minimum water surface at which lock will be operated	- 3.0

CHANNELS

West Channel

Length	0.11 mile
Bottom width	150 feet
Bottom elevation	-14.0 (-13.2 m.l.g.)
Side slopes	1 on 3

East Channel

Length	0.51 mile
Bottom width	150 feet
Bottom elevation	-14.0 (13.2 m.l.g.)
Side slopes	1 on 3

LEVEE

Length	2.08 miles
Crown width	20 feet
Crown elevation	9.0 **
Side slopes	Varies

** Except in vicinity of lock where elevation will be 14.0

RIGHTS-OF-WAY AND EASEMENTS

Channel R/W	87.0 Acres
Levee R/W	38.0
Borrow Area Easements	10.1
Spoil Disposal Easement (Lock)	231.0
Spoil Disposal Easement (Levee)	34.0

COST

TOTAL	$11,000,000

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PROJECT AUTHORIZATION

1. Authority. 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, Eighty-Ninth Congress, 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.

2. The report of the Chief of Engineers, dated 4 March 1964, and 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 eastern-most 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 in 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..."

3. Purpose and Scope. Design Memorandum No. 2 - General Design presents in summary form the features, layout, costs, and economics of the Lake Pontchartrain Barrier Plan. This supplement concerns the Rigolets Lock and Adjoining Levees. The purpose of this supplement is two-fold: it will serve to present the general design considerations and corresponding cost estimates for the Rigolets lock and channel, including a comparison for two lock widths, 84 feet and 110 feet; and, in addition, to present the essential data, assumptions, criteria, computations, design and costs for the adjoining

levees in sufficient detail to provide an adequate basis for preparing plans and specifications for the levees without additional design analyses.

4. Ordinarily, the general design memorandum for a project is not submitted until preliminary design studies for all project features have been completed (Ref. ER 1110-2-1150, Par. 5.d.). In the instant case, however, the overall complexity of the project, the number of project features involved, and the need to concentrate available design capability on the detailed design of features for which there is an urgent need for early construction precluded this procedure since it would have inordinately delayed submission of the general design memorandum. A decision was accordingly made to present the general design memorandum in the form of a skeletonized initial document which will be expanded in scope and form by the addition of supplementary documents as design studies progress. The basic procedure was described and recommended in LMNED-PP letters dated 7 October 1965 and 5 November 1965, entitled "Outline of Proposed Planning Procedures for Proposed Lake Pontchartrain, La., and Vicinity project" and "Revised Outline of Planning Procedures, Lake Pontchartrain, La., and Vicinity project" respectively and approved in 1st Ind. to the latter. A list of supplements to the general design memorandum and the scheduled submission dates is contained herein under "Status of Design Memorandums."

5. Local Cooperation. The conditions of local cooperation pertinent to the Lake Pontchartrain Barrier Plan, as specified in the report of the Board of Engineers for Rivers and Harbors and concurred in by 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 work;

"(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,...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 . . . . . 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..."

INVESTIGATIONS

6. Project Document Investigations. Investigations made in connection with the report on which authorization is based (H.D. No. 231, 89th Congress, 1st session) include research of information available from existing reports or projects in the area, extensive research into the history and records of hurricanes and hurricane damages, extensive tidal hydraulics investigations involving both office and model studies relating to the effect 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.

7. Investigations Subsequent to Project Authorization. Subsequent to project authorization detailed investigations were undertaken as follows:

a. Aerial and topographic surveys of the proposed Rigolets lock area.

b. Soils investigations including general and undisturbed type borings and associated laboratory tests and evaluations.

c. Tidal hydraulic studies required to establish design grades for protective works based on revised hurricane parameters furnished by the U.S. Weather Bureau subsequent to project authorization.

d. Office studies to evaluate alternate alignments for the Lake Pontchartrain Barrier. See appendix A.

e. Detailed design studies for levees including levee section stability determination and erosion protection.

f. Office studies to evaluate alternate lock chamber wall designs, floodwall designs, and types of bearing piles.

g. General design studies to determine feasibility and type of gates for 110 foot wide lock.

h. General design studies for lock, channels and powerhouse-office building.

i. Real estate requirements and appraisals.

j. Cost estimates of levees, floodwalls and alternative lock designs and approach channels.

k. Alignment studies for levees, lock, and channels.

LOCAL COOPERATION

8. Local Cooperation Requirements. The conditions of local cooperation as specified by the authorizing law are quoted in paragraph 5.

9. Status of Local Cooperation. 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 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 the Rigolets Lock and Adjoining Levees, as well as other portions of the project located in Orleans, Jefferson, St. Charles and St. Tammany Parishes. 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. Edward N. Lennox, President
Board of Levee Commissioners
Orleans Levee District
Room 200, Wild Life and Fisheries Building
418 Royal Street
New Orleans, Louisiana 70130

10. Views of Local Interests. The Board of Levee Commissioners of the Orleans Levee District represents local interest and is in agreement with the general plan.

11. Estimated Cost to Local Interests. The present estimated non-Federal contribution for the entire Lake Pontchartrain Barrier Plan, including the additional contribution for operation and maintenance of the Rigolets Lock is $52,438,000 as shown on the current PB-3 effective 1 July 1968. The intention and capability of the local sponsor to provide this contribution have been amply demonstrated.

LOCATION OF PROJECT

12. Project Location. The Rigolets Lock and Adjoining Levees, as shown on plate 2, is located in St. Tammany Parish near the northern bank of the present Rigolets channel. The associated levee will extend from the easterly end of the Rigolets Closure Dam in a northerly direction to the U.S. Highway 90 embankment which will complete the barrier to Apple Pie Ridge. The navigation channel and lock lie on a generally east-west alignment parallel and adjacent to the north bank of the present channel.

PROJECT PLAN

13. General. The project plan presented herein and indicated on plate 2 consists of a channel which will replace the present Rigolets channel as the navigable access between Lakes Borgne and Pontchartrain,

a navigation lock and levees which will serve in conjunction with other elements of the connecting Lake Pontchartrain Barrier to curtail inflow of water into Lake Pontchartrain from Lake Borgne during hurricanes.

14. Navigation Channel. The channel, as shown on plate 2, provides a channel bottom elevation of -13.2 m.l.g.[1] with a channel bed width of 150 feet. The total length of channel to be excavated is 0.62 mile, exclusive of the lock. Navigational aids will be provided to define the channel at times of high water. Because significant shoaling is not anticipated, dredging is considered to be the most economic method of maintaining the channel.

15. Dolphins. Dolphins will be provided to mark the extremities of the approach channel.

16. Lock. Alternative lock dimensions have been investigated and are presented herein to facilitate feasibility analyses. The authorized project provides for a lock 84 feet wide with 800 feet usable length. The recommended plan is for a lock 110 feet wide with 800 feet usable length. The lock will be provided with sector gates with sills at elevation -14.0 feet m.s.l. (-13.2 m.l.g.).

[1]All elevations herein are in feet and refer to mean sea level unless otherwise noted to refer to mean low gulf.

17. Levees. The levees are necessary to complete the barrier northwards from the Rigolets Closure Dam to Apple Pie Ridge. A total length of approximately 2.1 miles of levee is required under this feature of the Lake Pontchartrain, La., and Vicinity project.

18. Construction of the levees, except in the immediate vicinity of the lock, is scheduled to begin prior to lock and channel construction. This report presents the final design features of the levees and the general design features of the lock and channel. The final detail lock and channel design features will be presented in a design memorandum to be published later.

DEPARTURES FROM THE PROJECT DOCUMENT

19. Significant changes have been made to the plan as presented in the authorizing document. The following changes, which are within the discretionary authority of the Chief of Engineers, have been incorporated into the authorized plan.

a. The horizontal width of the lock was increased from 84 feet to 110 feet so that the controlling horizontal clearance to and from Lake Pontchartrain, with the project in place, will be approximately that which is now available. This would ensure adequate connections from Lake Pontchartrain to the Gulf of Mexico, Gulf Intracoastal Waterway, Mississippi River, and other navigable

waterways of the United States during the economic life of the project. Refer to page 71 of this memorandum for complete justification of the increase in width.

b. In view of their land improvement program along the Geoghegan Canal, local interests requested that the barrier embankment alignment north of the Rigolets Lock be modified so that the embankment connects to U.S. Highway 90 north of the existing Geoghegan Canal rather than across the canal, as authorized. Engineering studies indicate that the change in alignment is incrementally justified. The average annual incremental benefits of $36,200 and average annual incremental charges of $25,000 result in a favorable benefit-to-cost ratio of 1.4 to 1.

HYDROLOGY AND HYDRAULICS

20. General. Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part 1 - Chalmette approved presents the climatology and hydrology for the entire project area. Design Memorandum No. 1, Part II Barrier approved describes the essential data, assumptions and criteria and the results of studies providing bases for determining design surge heights, runup, overtopping and frequencies for the Lake Pontchartrain Barrier. Appendix B of this document, entitled "Tidal Hydraulics," furnished by the New Orleans District, Corps of Engineers, describes the specific design criteria developed for the Rigolets Lock and Adjoining Levees.

21. Datum Plane. All elevations are in feet and refer to mean sea level, unless otherwise noted. The lock sill and bottom

of approach channels has been set at elevation -14.0 corresponding to -13.2 m.l.g.

22. Area Characteristics.

a. Topography. The area is marshland being almost completely inundated at mean tide. The area is intersected by East Double Bayou which connects with the Rigolets Channel on both sides of the proposed Closure Dam and will be closed by the levee between Rigolets Lock and Apple Pie Ridge.

b. Precipitation. There are two periods of heavy rainfall. These occur in the summer from about mid-June to mid-September and in the winter from mid-December to mid-March. Average annual rainfall, based on records from U.S. Weather Bureau station at New Orleans amounts to 61 inches. Variations of plus or minus 50 percent may be encountered in individual years. Maximum monthly rainfalls exceeding 12 inches are not uncommon in any year. As much as 25 inches has been recorded in a single month. On one occasion a calendar month of zero rainfall was recorded. Snow is of infrequent occurrence but an 8.2-inch fall occurred in New Orleans in February 1895. Average and extreme monthly rainfall at New Orleans for the 95-year period ending in 1964 are reported in Design Memorandum No. 1, Part 1 - Chalmette.

c. Temperature. The mean annual temperature, based on 94 years of records at the weather station in New Orleans, is about 70° F. Recorded extremes are 7° F and 102° F. Monthly averages, average maximum, and average minimum temperatures are given in Design Memorandum No. 1, Part 1 - Chalmette.

23. Stages. Water surface elevations are obtainable for Lake Borgne at the Rigolets since December 1957 and at Chef Menteur Pass for April to June 1945, February and March 1950 and since July 1957. Details of recording stations are reported in Design Memorandum No. 1, Part 1 - Chalmette.

24. The greatest recorded fluctuations in the level of Lake Pontchartrain have been attributed to hurricanes. The maximum recorded stage (Frenier, 29 September 1915) was 13.0. The mean level of Lake Pontchartrain for the period 1949 through 1956 was 0.3.[2] The Bonnet Carre Spillway diverts flood flows of the Mississippi River into Lake Pontchartrain. Maximum influences upon Lake Pontchartrain levels due to this cause are relatively small. Temporary increases of 0.8 foot, 1.5 feet and 1.0 foot are estimated for the floods of 1937, 1945 and 1950, respectively. Direct rainfall upon the Lake and tributary inflow also exert minor influences upon Lake levels.

25. Tides. The normal tide is diurnal in nature and has a general range of one-half foot in Lake Pontchartrain and one foot in Lake Borgne. Astronomic tides are frequently obscured by variations due to wind and flood effects. Severe hurricanes sometime raise the Gulf level as much as 10 feet or more. During the winter season, strong northerly winds may depress water levels as much as 2 feet. Average high tide in Lake Pontchartrain during the hurricane season is 0.7.[2] Tributary inflow and direct rainfall upon the Lake might raise levels an additional 0.8 foot should the control structures be closed during passage of a hurricane.

[2]Adjusted to reflect 1965 leveling.

26. Storms and Floods of Record. Hurricanes "Flossy" of September 1956, "Audrey" of June 1957, "Bertha" of August 1957, "Esther" of September 1957, "Carla" of September 1961, "Cindy" of September 1963, "Hilda" of October 1964 and "Betsy" of September 1965 each significantly affected levels in Lake Pontchartrain in recent years. The highest recorded level (13.0 at Frenier in 1915) was approached in 1965 when a maximum lake level of 12.1 was recorded at Frenier. Maximum flood effects in Lake Pontchartrain are described in paragraph 24.

27. Design Hurricane. The standard project hurricane was selected as the design hurricane, as described in Design Memorandum No. 1, Part I. The design hurricane is estimated to have an average recurrence of once in approximately 200 years. Characteristics of the design hurricane include a central pressure index of 27.6 inches of mercury and a maximum wind velocity of 100 mph at a radius of 30 nautical miles. A design hurricane moving at a forward speed of 11 knots directly inland from the Gulf and crossing the coast about 30 miles south of the Rigolets, i.e., track F, produces the greatest gulfside still water level of elevation, 12.8 at the Rigolets Lock.

28. Littoral Currents. Present current systems through the Rigolets Channel due to tidal and flood effects between Lakes Pontchartrain and Borgne will not exist after completion of the Rigolets

Closure Dam. Currents at each end of the new navigation channel are expected to be minor because of the project water level control facilities.

29. Hydraulics of Lock. The purpose of the lock is to facilitate navigation between Lakes Pontchartrain and Borgne after construction of the Rigolets Channel Closure Dam. The lock will form an integral part of the Lake Pontchartrain Barrier, the purpose of which is to limit hurricane surge inflow into Lake Pontchartrain. The lock will be operable between a minimum water surface elevation of -3.0 and a maximum water surface elevation of 4.0. At stages exceeding these elevations, the proximity of the hurricane would be such as to prohibit navigation. The top of lock chamber side walls will be at elevation 6.0 and the top of the gates and timber guide walls will be at elevation 13.5. The top of the skin plate of the Lake Borgne (Gulf end) gates will be at elevation 13.5 while the top of the skin plate of the Lake Pontchartrain (Lake end) gates will be at elevation 6.0. Hydraulic data for lock design, furnished by the New Orleans District, Corps of Engineers, are shown in table 1 for the Gulf End Gate Structure and in table 2 for the Lake End Gate Structure.

TABLE 1

DESIGN DATA

GULF END GATE

Case	Water Elevations		Structural Design — Basic Stress - Steel/Concrete			Remarks
	Gulfside	Lakeside	D.L. + W.L.	D.L. + W.L. + Wave	D.L. + W.L. + Boat	
1	12.8	-1.0		$\frac{0.67\ F_y}{0.45\ f_c'}$		Hurricane Condition - Increased Stresses
2	11.0	-4.5		$\frac{0.67\ F_y}{0.45\ f_c'}$		Same as Case 1
3	10.0	-6.5		$\frac{0.67\ F_y}{0.45\ f_c'}$		Same as Case 1
4	9.0	-4.5	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Hurricane Condition - Normal Stresses
5	6.0	-3.0	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Max. Head Under Which Gates Will Operate - For Machinery Design
6	1.5	1.5			$\frac{0.67\ F_y}{0.45\ f_c'}$	Normal High Water Level
7	-2.5	11.5	$\frac{0.67\ F_y}{0.45\ f_c'}$			Hurricane Condition - Increased Stresses

TABLE 1 (Continued)

DESIGN DATA

GULF END GATE

Case	Water Elevations		Structural Design — Basic Stress - Steel/Concrete			Remarks
	Gulfside	Lakeside	D.L. + W.L.	D.L. + W.L. + Wave	D.L. + W.L. + Boat	
8	-5.25	10.0	$\frac{0.67\ F_y}{0.45\ f_c'}$			Same as Case 7
9	-4.5	9.0	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Hurricane Condition - Normal Stresses
10	-3.0	6.0	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Max. Head Under Which Gates Will operate - For Machinery Design
11	1.5	1.5			$\frac{0.67\ F_y}{0.45\ f_c'}$	Normal High Water Level
12	5.0	5.0	$\frac{0.5\ F_y}{0.35\ f_c'}$			Dewatered Condition

NOTES: 1. For Hurricane Condition - Increased Stresses, Design for Maximum Condition for Case 1, 2, or 3 and Case 7 or 8.

2. Spoil from Navigation channel shall be placed as shown on Plate 2

TABLE 2

DESIGN DATA

LAKE END GATE

Case	Water Elevations		Structural Design — Basic Stress - Steel/Concrete			Remarks
	Gulfside	Lakeside	D.L. + W.L.	D.L. + W.L. + Wave	D.L. + W.L. + Boat	
1	6.0	-4.5	$\frac{0.67\ F_y}{0.45\ f_c'}$			Hurricane Condition - Increased Stresses
2	4.0	-6.5	$\frac{0.67\ F_y}{0.45\ f_c'}$			Hurricane Condition - Increased Stresses
3	4.0	-4.5	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Hurricane Condition - Normal Stresses
4	6.0	-3.0	$\frac{0.5\ F_y}{0.35\ f_c'}$		$\frac{0.67\ F_y}{0.45\ f_c'}$	Max. Head Under Which Gates Will Operate - For Machinery Design
5	1.5	1.5			$\frac{0.67\ F_y}{0.45\ f_c'}$	Normal High Water Level
6	-3.0	6.0	$\frac{0.5\ F_y}{0.35\ f_c'}$	$\frac{0.67\ F_y}{0.45\ f_c'}$	$\frac{0.67\ F_y}{0.45\ f_c'}$	Hurricane Condition - For Structural and Mechanical Design
7	1.5	1.5			$\frac{0.67\ F_y}{0.45\ f_c'}$	Normal Water Level

TABLE 2 (Continued)

DESIGN DATA

LAKE END GATE

Case	Water Elevations		Structural Design — Basic Stress - Steel/Concrete			Remarks
	Gulfside	Lakeside	D.L. + W.L.	D.L. + W.L. + Wave	D.L. + W.L. + Boat	
8	5.0	5.0	$\frac{0.5\ F_y}{0.35\ f_c'}$			Dewatered Condition

NOTES: 1. For Hurricane Condition - Increased Stresses, Design for Maximum Condition, Case 1 or 2.

2. Spoil from Navigation Channel to be placed as shown on Plate 2.

30. The cases listed in tables 1 and 2 as well as loadings imposed during construction will be considered in the detailed structural design. A boat impact load of 125 kips for appropriate cases, will also be applied in the gate designs.

31. Extreme hydraulic conditions affecting stability of the structures are summarized below:

a. Gulf End Gate

Case 1. The maximum design still water level on the Lake Borgne side is elevation 12.8. The design deep water wave equal to the average of the highest 1 percent of waves to be expected under this condition is computed to be 8.2 feet from trough to crest. Tops of design waves will therefore be at elevation 16.9 and will periodically overtop the lock gates and approach embankments. The lock control house and powerhouse floors will be set at elevation 19.5.

Case 3. The maximum differential head across the Gulf end lock gate of 16.5 feet occurs for a Lake Borgne elevation of 10.0 and a coincident Lake Pontchartrain elevation of -6.5. An allowance has been made for flow overtopping the barrier and flowing into the channel between the lock and Lake Pontchartrain. Additional loading due to unbroken waves 6.8 feet high is included under this condition.

Case 8. The maximum reverse differential head, Lakeside to Lake Borgne, is 15.25 feet. This occurs for an elevation

of 10.0 in Lake Pontchartrain and an elevation of -5.25 in Lake Borgne. Wave action is **not** included for this condition in the design criteria.

b. Lake End Gate

Cases 1 and 2. Maximum differential head for the Lake Pontchartrain end gate is 10.5 feet acting toward Lake Pontchartrain. This occurs when level in the Lake Pontchartrain approach channel is elevation -4.5 and the level inside the lock is elevation 6.0. No wave condition is applicable for these cases.

Case 6. The maximum reverse differential head is 9.0 feet. This occurs with a level of elevation 6.0 in Lake Pontchartrain and elevation -3.0 inside the lock. In this case the effect of a wave 5.3 feet high breaking in the shallow water adjacent to the channel is to be applied.

Case 6. Extreme levels for lock chamber wall design are 6.0 outside and -3.0 inside producing a differential head of 9.0 feet.

GEOLOGY

32. Physiography. The proposed project area is located within the central Gulf Coastal Plain. Specifically, the project which is in the Pontchartrain Basin is located on the eastern flank of the Mississippi River Deltaic Plain between the alluvial ridge of the present Mississippi River and the uplands to the north in a marshland area traversed by several small bayous. Dominant physiographic

features of the area are marshes, natural levees, abandoned distributaries, and lakes. Relief in the vicinity is slight with a maximum variation of about four (4) feet between the marshlands in the immediate vicinity of the Rigolets and the uplands to the north.

33. General Geology. During the Brydan (Peorian) Interglacial stage, the Pleistocene Prairie Formation was deposited over the project area in the form of a huge delta, centered in southwest Louisiana.

34. When sea level began to fall in the early part of the Late Wisconsin glacial stage, the Mississippi River and the smaller streams began to entrench into the Prairie surface. By the end of the Pleistocene Epoch (and Late Wisconsin glacial stage), with sea level about 450 feet below its present level, the Mississippi River had become deeply entrenched to the west of the project area. The prairie surface in the project area remained relatively undissected as a shelf on the northeast side of the Mississippi River trench. During this period, the sediments on this high shelf were weathered and desiccated.

35. As sea level rose, the Mississippi River began to aggrade the deep trench cut when sea level dropped. Alluvial sedimentation was confined to the central portion of the alluvial valley and the project area (Pontchartrain Basin) became a shallow arm of the gulf, or a huge bay. Concomitantly, downwarping of the Prairie surface and some faulting along the northern edge of Lake Pontchartrain occurred, resulting in a gulfward dip of the Prairie surface of about 1.6 feet per mile in the project area. Two prominent beaches

began to develop as sea level neared its present level - one on the northern side of Lake Pontchartrain about 5 to 6 miles south of the present north shoreline (Mandeville), the second one along the south shore of Lake Pontchartrain from the vicinity of Pearl River to the vicinity of New Orleans (the Pine Island Beach Trend).

36. About 5,000 years ago, sea level reached its present stand and the Mississippi River filled its entrenchment and began to migrate laterally back and forth across the deltaic plain. Approximately 4,500 to 4,000 years ago, the first Recent deltaic and alluvial sediments of consequence were carried into the project area when the Mississippi River occupied the Cocodrie course. About 3,500 years ago, the Mississippi shifted its course over to the western margin of the valley and occupied the Teche course until about 2,800 years ago. During this period, the project area was subjected to erosion and subsidence. Several relic beaches were formed in the project area around the margins of the deteriorating Cocodrie Delta, the most continuous one being a shell beach paralleling the south shore of Lake Pontchartrain between the shoreline and the relic Pine Island Beach Ridge. When the Mississippi abandoned its Teche course, it shifted eastward and began to occupy the LaLoutre or St. Bernard course. About 1,500 years ago, the river shifted westward again and occupied the Lafourche course and for a period of several hundred years the project area was not subjected to sedimentation. When the Mississippi River shifted eastward about 1,200

years ago and began to occupy the present Plaquemine course, sediments were again introduced into the project area but in lesser quantities than had been carried in by previous courses. No large distributaries flowed into the project area and sediments consisted primarily of those brought in by overtopping of the natural levees along the Mississippi River. The main center of deposition shifted southward of the project area. With the construction of the levees along the Mississippi River, floodwaters have been eliminated from the region and at present no sediments are being introduced into the project area.

37. Progressive subsidence and downwarping have been occurring in the project area since the end of the Pleistocene. The Pleistocene surface has been downwarped towards the south and west from zero at the Pleistocene outcrop on the north side of Lake Pontchartrain to about 500 feet at 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 occured in the marsh and swampland areas, a result of the shrinking of the highly organic surface soils as the land was reclaimed and drained.

38. Mineral Resources. Oil and gas production are found in the vicinity, and future exploration and production may take place. The project is not anticipated to adversely affect existing or future exploration and production.

39. Foundation Conditions. Deposits of Recent origin occur from the ground surface to the Pleistocene at about elevation -88. Surface marsh deposits of peat and fat clays with organic matter occur to elevations of -7 to -10 throughout the project area except in the uplands to the north. Interdistributary clays, which occur at the surface in the upland area, also underlie the marsh deposits. Extending to elevations of -10 to -22, the interdistributary clays are underlain by buried beach deposits of sand with shell and shell fragments. Medium to stiff prodelta clays occur beneath the buried beach at elevations of -40 to -65 and extend to the Pleistocene.

SOILS

40. Field Investigations. Five 5-inch diameter undisturbed soil borings were made in the project area; three along the alignment of the proposed levees, and two in the lock area. Seventeen 1-7/8-inch I.D. general type core borings were also made in the project area; two of these being at the proposed lock site, three in the proposed navigation channel, and the others along the alignment of the proposed levees. These borings extended in depth to elevations of approximately -15 to -100. The locations of borings are shown on plate 2.

41. Laboratory Tests. Consolidation (C), unconfined compression (UC), unconsolidated, undrained triaxial compression (Q), and consolidated, drained direct shear (S) were performed on representative soil samples from the 5-inch undisturbed borings. Unconfined compression tests were also performed on several samples from the

general type core borings. Other tests, such as natural water content, unit weight, Atterberg liquid and plastic limits, grain size analysis, and permeability, were also performed on selected samples.

42. All of the laboratory tests were performed either by the New Orleans District soils laboratory or the soils laboratory of the U.S. Engineer Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi. The location and results of laboratory tests for the 5-inch diameter borings are shown on plates 26 through 28. Detail shear test data for these borings are shown on plates 29 and 30. The location and results of laboratory tests on samples obtained from the general type borings are shown on plate 31.

43. Soil Conditions. The subsurface conditions for the project feature described herein are shown on the generalized soil profiles on plate 32. The subsoils encountered from the ground surface to approximately elevation -10 along the alignment of the proposed lock and channel are Recent deposits consisting of very soft to soft fat clays containing organic matter.

44. From lock and channel centerline station 11+00 to about station 17+50, these very soft clays are underlain by a thin stratum of loose silty sand. This thin silty sand stratum is also encountered in the vicinity of station 20+50. Underlying these near-surface deposits is the post-Pleistocene erosion horizon encountered

at elevations of about -10 to -12. Between stations 11+00 and 31+00, medium to stiff tan and gray clays, both CH and CL, occur below this horizon. They clay strata are relatively thin, extending to an elevation of about -19 at station 11+00 and about -13 at station 30+00.

45. Underlying these clay strata, and elsewhere along the lock and channel centerline immediately underlying the marsh deposits, is a stratum of medium dense to very dense fine sand with variable coloration of white, tan, brown, but predominantly gray. This sand stratum terminates at about elevation -66 at station 11+00 and about -50 at station 46+00. The predominant materials beneath the sand stratum are medium to very stiff greenish-gray and brown clays with some relatively minor strata of silt and silty sand.

46. Reference to the subsoil profile developed from borings drilled along the baseline shows the post-Pleistocene erosion horizon is encountered at approximately elevation -19 at the western end of the baseline and at approximately -1 at the eastern end of the baseline. The marsh deposits occurring from the ground surface to elevations of -1 to -10 consist principally of very soft fat clays containing organic matter, with surface deposits of peat extending to depths of 2 to 3 feet between baseline stations 83+00 and 113+00 (levee stations 9+20 and 39+20). Beneath this and extending to the post-Pleistocene erosion horizon are strata of

medium to stiff gray and tan clays,(CL) and (CH), interspersed with strata of silt (ML) and silty sand (SM). The subsoils encountered immediately below the erosion horizon consist primarily of medium to very stiff light gray and greenish-gray and tan clays (CL) and (CH). These clays terminate at elevations varying from about -9 to -22, and are underlain by the same deposits of medium dense to very dense fine sand encountered along the lock and channel centerline. The sand stratum extends to elevations of -40 to -65, and is underlain by medium to stiff gray or greenish-gray clay.

47. Types of Protective Works. A navigation lock and channel will connect Lake Borgne with Lake Pontchartrain in the vicinity of the Rigolets Pass. An earthen levee constructed to a net grade of 14.0 will extend from the proposed Rigolets Closure Dam to the lock and from the lock to a point about 470 feet north of the lock centerline. From this point, a transition in levee grade to elevation 9.0 will extend for about 100 feet. The earthen levee will then be constructed along the indicated alignment to a net grade of 9.0. The locations of the lock, channel, and levees are shown on plate 2.

48. Method of Levee Construction. Levee design sections are shown on plates 16 through 18. The connecting levee from the Rigolets Closure Dam to the lock, and that portion of the levee extending from the lock to levee station 55+70, and from station

56+95 to station 79+95, will be constructed by first excavating the very soft soils and backfilling this excavation with hydraulically pumped sand from the Rigolets borrow area disignated plot 5 on plate 20. On this sand foundation, a semi-compacted fill of Pleistocene clays taken from nearby borrow sources, designated as plots 1, 2 and 3 on plate 20 will be constructed to the required grades and slopes.

49. The levee from station 79+95 to the northern terminus of the project will consist of semi-compacted fill of Pleistocene clays constructed on the existing ground surface. The stream closure section from station 55+70 to station 56+95 will also be constructed of the Pleistocene clay borrow. A sand core will not be used for these reaches.

50. Muck Excavation. Using data from the soils borings shown on plates 26, 27, 28 and 31, analyses were made to determine required minimum berm distances between the excavated area and the adjacent spoil area. Spoil will be placed to a maximum elevation of 3.0. The minimum berm distances shown on plate 33 will assure a minimum factor of safety of 1.3 with regard to failure into the excavation.

51. Levee Stability. Using cross-sections representative of existing conditions along the proposed alignment and data from the soils borings shown on plates 26, 27, 28 and 31, the stability of the levees was determined by the method of planes. The design

sections are the results of (Q) stability analyses based on a minimum factor of safety of 1.3. The results of the stability analyses are shown on Plates 34 through 36.

52. Sufficient natural overburden exists on the Lake Pontchartrain side to provide factors of safety ranging from 1.0 to 2.0 against uplift due to the pressure head in the foundation sand with the hurricane head at elevation 9.0.

53. Construction of levees adjacent to the gulfside gate bay will be limited initially to grades and slopes that will permit easy access, provide adequate working area and insure stability of the levees during excavation and construction of the gulfside gate bay. The gulfside cofferdam will be a semi-compacted fill of the Pleistocene clay borrow on a sand blanket placed on the existing ground surface. Stability analyses of the gulfside cofferdam and levees adjacent to the excavation are shown on plates 37 and 38.

54. Estimated Settlement of Levees. Using the results of the available consolidation tests, analyses were made to determine estimates of ultimate settlement. The results of these analyses are shown in the table below.

Levee Stations		Estimated Ultimate Settlement
From	To	In Feet
1+00	9+76	0.4
13+40	16+80	0.4

Levee Stations		Estimated Ultimate Settlement
From	To	In Feet
16+80	54+52	0.2
54+52	64+55	0.3
64+55	79+95	0.2
79+95	108+41.99	0.3
Gulfside Cofferdam		1.6

Each of the above levee reaches will be overbuilt by the indicated amount to provide for ultimate settlement to net grade.

55. Stability of Lock Chamber Slopes. Due to the relative instability of the near-surface soils, the existing materials will be removed to elevation -9.0. Earth side levees will be constructed above this elevation with sand fill taken from the borrow area in the Rigolets designated on Plate 2. Crown elevation will be 6.0 with side slopes of 1 on 4. A filter blanket and riprap will protect the sand embankment. Seepage through the levees and foundation will be controlled with a steel sheet piling cutoff. The design will be based on a minimum factor of safety of 1.3 considering the maximum drawdown under hurricane conditions.

56. Stability of Channel Slopes. Channel slopes on both the Lake Pontchartrain and Lake Borgne sides of the lock will be 1 on 3 to provide a minimum factor of safety of 1.3 with regard to maximum drawdown and to provide relatively stable slopes with regard to wave wash.

57. Foundations for Structures. Considering the amount of preboring and/or jetting that will be required to install precast concrete piles through the dense sand stratum, the use of 14-inch steel H-piles driven to tip embedments of -90 to -100 to achieve required single pile design load capacities of 100 tons in compression and 30 tons in tension will be considered during preparation of the detail design memorandum. The overall safety of pile groups supporting the gate bays will be checked when plans become more definite and additional soil data is available prior to final design. However, based on the data presently available, adequate safety exists against the possibility of a group failure of a pile group with tips embedded at elevations varying from -90 to -100.

58. Treated Class "B" timber piles driven to a tip elevation of about -30 will be used to support the proposed structures in the reservation area.

ALTERNATIVE LOCK DESIGNS

59. Lock Construction. a. Designs for a 110-foot wide lock with 150-foot wide approach channels and an 84-foot wide lock with 125-foot approach channels were developed to compare the practicality of the two concepts. Both are technically feasible. The 110-foot wide lock is recommended to ensure adequate connections from Lake Pontchartrain to the Gulf of Mexico, Gulf Intracoastal Waterway,

Mississippi River and other navigable waterways of the United States during the economic life of the project. Refer to paragraphs 115 thru 120 herein for more detailed information. Detailed information for the 84-foot wide lock is presented in appendix C.

b. Lock Chamber Walls. To determine the most suitable type of construction for the lock chamber walls, five basic designs were considered. These consisted of cantilevered sheet piling; tied sheet piling; precast concrete gravity wall sections; monolithic reinforced concrete "U" section; and open chamber with earth side levees and floor, both protected by riprap. Typical sections and comparative cost estimates considered are shown in appendix D. Based on a comparison of alternate lock chamber wall design, the following conclusions ensued:

(1) Cantilevered sheet piling walls were found to be inadequate due to the height and water pressure against the outside of the wall.

(2) Tied sheet piling walls were not adopted because of excessive cost and the danger of the tie anchor support soil being eroded during a hurricane.

(3) Precast concrete gravity wall sections floated into position and sunk were not adopted because of excessive cost and difficulty with seepage cutoff.

(4) Monolithic reinforced concrete "U" section was not investigated in detail because the cost would obviously exceed that of other designs considered.

(5) An open chamber with earth side levees and floor protected by riprap was adopted as the optimum type of construction with respect to economy and adequate reliability. Due to instability of the surface soils at the site, it will be necessary to remove the existing materials to elevation -9.0. The side levees will be constructed above this elevation with sand fill and protected with graded filter blanket and riprap.

c. Seepage Cutoff. Three methods were considered for providing seepage cutoff through the lock side wall levees and the substrata. These methods were grout curtain, slurry trench and steel sheet piling. The grout curtain was rejected because of high cost and it is not considered adequate for this particular construction. Slurry trench is a developing method which is not considered suitable for use in this particular location.

(1) Steel sheet piling was adopted as the most suitable method of providing seepage cutoff. It will be driven through the lock side wall levees and below the reinforced concrete floodwalls and sector gate bay structures forming a continuous cutoff around the lock. Based upon preliminary seepage analysis for the overlying fine sands, the sheet piling will be driven to approximate elevation -50.0 under the Gulf end gate bay and flood walls and to approximate elevation -40.0 around the remainder of the lock. The sheet piling greatly reduces the possibility for piping of the in-situ fine sands and improves the locking time.

(2) The top of the sheet piling will be at elevation 0.0 in the lock side wall levees. A compacted clay fill will be placed above elevation -2.0 to complete the seepage cutoff. Compaction of the clay is facilitated by the dewatering scheme proposed.

(3) Below elevation -2.0, corrosion of the sheet piling should not be a problem because of embedment in soil and continuous submergence. Unprotected steel in this case should suffer little corrosion damage even over many years. In this installation, the sheet piling will not be required to resist structural load so that the major portion of the steel section is available to resist corrosion. Reference is made to paragraph 59 f entitled "Corrosion Protection."

d. Piling. Three types of pile supports for the concrete gate bay structures were considered. Timber piles are not suitable because of the large loads encountered. Both prestressed concrete and steel H-piles are applicable for this support. Steel H-piles are considered the most feasible for this installation since the piles will be embedded in soil and continuously submerged, corrosion should not be detrimental. Driving of concrete piles through the dense strata of sand beneath the lock is expected to be difficult and to necessitate pre-drilling. In the absence of driving

and load tests, preliminary cost estimates have been based on the use of steel H-piling which can be specified with certainty. A comparison of costs for steel H-piling versus concrete piling is included in appendix E.

e. Floodwalls. Floodwalls of cantilever design will be adequate at the lake end gate bay and for the lower sections at the gulf end bay. Both cantilevered and inverted "T" floodwalls were found to be inadequate for the high sections at the Gulf End gate bays due to the high hydraulic pressures at design hurricane conditions. Soil filled concrete box sections supported on piling were adopted as the most suitable type of construction for the high gulf end floodwalls. Double rows of steel sheet piling tied at the top and filled between with soil were also investigated. The steel sheet piling type was not adopted due to the high cost of corrosion protection of the sheet piling above elevation -2.0.

f. Corrosion Protection. The serviceable life of steel materials below the water level and embedded in soil should be essentially unaffected by corrosion, and special protection other than electrical grounding will not be provided for steel materials in the permanently saturated zone in the initial construction. Test sections of steel sheet piling will be driven at appropriate locations with their tops at elevation

-2.0. These test sections will be inspected at future dates to determine actual corrosion. Provision will be incorporated in the initial design to electrically ground all buried steel and to make connections available should it be desirable to add cathodic protection systems in the future. In addition to visual inspection of the test sections, soil resistivity and structure-to-soil potential measurements will be made at specific time intervals to aid in detecting areas of corrosion.

ALTERNATE LEVEE DESIGN

60. Review of the soil conditions shows that the only material for levee construction available on site throughout most of the project area are very soft clays with organic material occurring from the ground surface to depths of about 2 feet to 10 feet. Levee construction of these soils on the existing ground surface would require extensive berms to ensure stability and would experience substantial settlement over relatively long periods of time, thus requiring additional material to maintain the desired crown elevation. It would also be very impractical to maintain an adequate roadway on the levee crown.

61. Considering the relatively shallow depth of the very soft clay strata and the abundance of sand borrow from the Rigolets, it appeared that a more satisfactory levee could be provided by excavation of the very soft clays and replacement

with sand by hydraulic methods. The sand fill provides an adequate levee core that will minimize settlements and reduce the quantity of impermeable material required for the levees. Semi-compacted Pleistocene clay fill from available borrow sources will be used to blanket the sand core and with the addition of shell surfacing will provide an adequate access roadway.

62. Considering the existing soils conditions in the available borrow areas, this method of levee construction is considered the most feasible for this location and was, therefore, adopted for the project.

63. A survey of the area was made to locate areas near the project site where suitable clays could be obtained for use in the levee construction. This survey resulted in locating three areas readily accessible by truck to the site and with clays sufficiently close to the surface to enable excavation by dragline, crane or backhoe. These are shown on plate 20 as borrow areas 1, 2 and 3. An estimated 262,000 cubic yards of clay borrow is available in these three borrow areas.

64. In addition consideration was given to the Howze Beach borrow area, which is shown as plot 4 on plate 23. Use of borrow from this area would require loading and unloading from barges and also necessitate truck haul from the barge to the placement location.

However, the availability of the Howze Beach borrow area would afford the contractor the option of utilizing barge or truck haul or a combination thereof. It is believed that this option is particularly relevant to the construction of the levee connecting the Rigolets Closure Dam with the lock.

DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

65. Lock. The proposed lock as shown on plates 3 and 4 will provide a chamber of 800 feet usable length and 110 feet wide. Sill elevation will be -14.0 (-13.2 m.l.g.) providing 11 feet of depth at a minimum operating water level stage of -3.0 (-2.2 m.l.g.). The structure will consist of two concrete gate bays, one at each end of the lock chamber, which will be flanked by riprap protected side levees. Timber guide walls will be provided within the lock and at the outside approach to each gate. Steel sector type gates will be used because of the reverse head conditions to be encountered. Gate bays will be provided with slots for needle beams and needles so that gate bays can be dewatered for repair and maintenance. The concrete needles will be designed for use on the other structures of the Lake Pontchartrain hurricane protection project.

66. Instrumentation at the lock will include water level gages on the gulfside and lakeside of the lock and within the lock, reference points to measure structure vertical and horizontal movements, and settlement gages in the fills.

67. The top of the gate bays, chamber guide walls, and approach guide walls will be at elevation 13.5. This is 10 feet above mean annual high water, exclusive of hurricane effects.

68. Two schemes of dewatering for the lock construction were considered, (1) two-stage wellpoint systems located at each gate bay excavation and, (2) a deep well system around the periphery of the entire lock area. For either scheme, dewatering would be accomplished inside an enclosure consisting of earth cofferdams connected to the adjacent levees as shown in appendix F. Also, for both schemes, marine excavation is considered to be the most suitable method of excavation. Gravel pack is recommended for both wells and wellpoints due to the presence of fine sand of uniform grain size. A cost comparison indicates little difference between the two schemes; however, the deep well system provides the following advantages for the lock construction:

(1) Permits all construction except excavation to be performed in the dry.

(2) Permits a reduced construction schedule by facilitating concurrent operations in the lock chamber and at the gate bays.

(3) Minimizes interference between dewatering operations and construction operations.

Accordingly, the deep well system around the entire lock construction area was selected.

69. Critical features of design which particularly affect the feasibility of the 110-foot lock are, the sector gates, their hinge and pintle connections and the gate bay "U" frame structure. Following preliminary structural design of the gates, effects of horizontal and vertical deflection under load were examined. Dead load deflections will not be a problem since they are almost constant and compensation may be made during construction. Maximum horizontal water load deflection will be approximately 0.43 inch. This deflection can be tolerated by making use of gate seals which can be compressed during initial gate closing. Vertical water load deflections are small and will not materially affect the ability of the gates to provide an effective water barrier. Loads transmitted through the gate hinge and pintle are concentrated at a localized point. The gate hinges will be required to resist maximum forces from approximately 750 kips compression to 780 kips tension. The gate pintles will be required to resist maximum forces from approximately 1,700 kips compression to 500 kips tension. Although these forces are large, they can be successfully resisted.

70. Each steel sector gate will be operated by means of a rack and pinion driven by a hydraulic motor which is powered by an electric motor driven variable displacement hydraulic pump. Operating machinery and controls will be arranged to permit operation of both lake end and gulf end gates from control houses located at each

end of the lock. A cathodic protection system will be provided for each lock gate. The system will be an impressed current system using anodes of high silicon iron. Rectifiers, controls and necessary instrumentation will be located in the gate control houses. Gate bays will be designed as reinforced concrete "U" frames supported on piling.

71. Guide walls will be provided on both sides of the lock chamber between gate bays. The guide walls will be constructed of timber with vertical and battered piles, horizontal timber wales and mooring cleats. Approach guide walls of the same construction will be provided at both ends of the lock. Length of approach walls will be 350 feet on the south side and 100 feet on the north side of the navigation channel. Steel sheet pile dolphins filled with broken concrete or rock will be provided at the ends of the approach guide walls to reduce the probability of damage to guide walls and lock. The Southern Pine piling will receive a 25-pound creosote treatment because of the presence of marine borers. All other timbers will be given 12-pound creosote treatment.

72. The chamber bottom will be at elevation -14.0 (-13.2 m.l.g.). Chamber bottom and lock side wall slopes and crest will be protected with 24 inches of riprap and 12 inches of graded filter blanket.

Roadways on the crowns of these levees will consist of four inches of shell. A continuous steel sheet piling cutoff will extend beneath lock walls, gate structures and floodwalls.

73. The gulf end gate bay structure will be connected to the barrier levees by means of floodwalls. Where the height of the floodwall is in excess of 6 feet above the ground surface, the walls will be soil filled reinforced concrete box construction supported on piling. I-type reinforced concrete cantilevered walls supported on piling will be used where the floodwalls are less than 6 feet above finished levee grade. The walls connecting the lakeside structure and the lock chamber side levees will also be the I-type reinforced concrete cantilevered construction.

74. Reservation Area. A reservation area at elevation 9.0 will be located on the north side of the lock as shown on plate 3. Access will be via the north levee or by boat. An office building and emergency powerhouse with maintenance shop and storage room will be provided. The building will be of hurricane resistant construction supported on timber piles. The floor elevation will be 19.5.

75. Paint storage and provisions for car parking will also be located in the reservation area. Roadways and parking area will be covered with a 4 inch layer of shells. The proposed arrangement of the powerhouse and office building is shown on plate 6.

76. The source of power for the lock will be commercial power with a stand-by diesel engine-generator and associated electrical equipment located in the office and power house building. The fuel storage tank will be placed under the building floor slab. These locations are above the design hurricane levels for Lake Pontchartrain.

77. Sewage treatment will consist of a 1,000 gallon per day extended aeration type package treatment unit complete with comminution equipment, aeration chamber and settling compartment. Sewage will be pumped to the treatment unit from a small pump well located under the office. Discharge of the treated sewage will be underwater on the gulf side of the lock.

78. A potable water supply will be provided from a deep well drilled in the reservation area. The deep well pump will deliver water to a pressure storage tank located in the powerhouse and office building.

79. The lock and levees will rise above a level tidal area. The linear pattern of the levee alignment is consistent with the low line pattern of the surrounding landscape. Plant materials and land forms are not considered appropriate beautification treatment of this type area. The ecological and natural aspects of the tidal area may be observed from the levee north of the lock. An observation platform will be constructed to accommodate those

interested in these aspects and the operations of the lock. Limited public parking will be made available at the reservation parking area and along the 20 foot wide levee crown.

80. Channel (West). Channel bed width will be 150 feet with side slopes of 1 on 3. Slope protection is not provided. A 2 foot allowable overdepth to compensate for dredging inaccuracies will be permitted. Spoil deposition will not be permitted on the north side of this section of channel. Spoil disposal will be permitted on the south bank but not in the existing Rigolets Channel. Right-of-way limits required for the west channel will be 420 feet on the north side and 300 feet on the south side of the channel centerline. Typical channel cross sections are shown on plate 5.

81. Channel (East). Dimensions, outline and criteria for this channel will be the same as for the west channel. The area reserved for spoil disposal on the gulf side of the barrier is shown on plate 2. The elevation of spoil placed to the north of the channel will not exceed elevation 3.0 because of hydraulic considerations. No spoil will be deposited in the Rigolets Channel. Rights-of-way limits required for the east channel will be 300 feet on each side of channel centerline. Typical channel cross sections are shown on plate 5.

82. Timber Dolphins. Dolphin pile clusters will be located at the entrances to the lock approach channels to define the navigable waterway when the banks are submerged at high tide. Navigational aids will be mounted on the dolphins.

83. Levees. The general location of the Rigolets Barrier Embankment north of the Rigolets Channel is shown on plate 2. Plan and profile details are shown on plates 7 through 10. A total length of levee of approximately two miles is required for this feature of the Lake Pontchartrain, Louisiana, and Vicinity Project.

84. The connecting levee between the Rigolets Closure Dam and the lock, and the levee immediately north of the lock to station 16+30 will be constructed to crown elevation 14.0. Between levee station 17+30, and levee station 108+41.99, the barrier levee will be constructed to a crown elevation of 9.0. A transition length of 100 feet between levee stations 16+30 and 17+30 will connect the two reaches.

85. The portion of the levee north of levee station 15+67.92 will be completed to elevation 9.0 prior to award of the lock construction contract, thereby providing land access to the lock site. Between levee station 15+67.92 and station 17+30, the levee will be built initially to elevation 9.0 in accordance with the elevation 14.0 cross section. The temporary end of the levee will slope toward the lock construction site at a 1 on 10 slope as shown on plate 8. These measures will

facilitate the lock contractor's use of the levee as a construction plant area. To reduce erosion, exposed slope areas between stations 15+67.92 and 17+30 and the temporary end slope will be seeded by means of a fibre mulch sprayed on the slope. Later, vegetation on the end slope will be removed prior to the construction of the levee closure.

86. Construction of the levee north of the lock will begin at levee station 56+45.36 (base line station 130+25), the intersection with East Double Bayou, and proceed in both directions from this intersection. Minor widening at East Double Bayou will be required for access. Demucking using barge mounted equipment or a small dredge can be conducted in both directions along the levee alignment during the initial stage of construction. Construction of the connecting levee south of the lock will require excavation of a short slip from the Rigolets Channel to provide access.

87. The initial stage of construction for all barrier levee work south of levee station 79+95 will consist of excavating the top layers of very soft soils hydraulically using a small dredge to form the base for the hydraulic sand fill. As indicated on plates 11 through 15, the depth and width of excavation of unsuitable material will vary. A barge mounted dragline could be used for this excavation; however, since the spoil will be wasted in the swamp area southeast of the levee, as shown on plate 2, and to avoid rehandling, a small dredge is considered more suitable for this operation. Spoil will be so placed that the maximum elevation does not exceed 3.0.

88. Between the levee stations 79+95 and 108+41.99, the northern terminus, the ground surface materials are considered sufficient enough to preclude the necessity for replacing the levee foundation materials. In this north section where no mucking is required, an inspection ditch will be constructed as shown on plate 18.

89. The second stage of levee construction south of levee station 79+95 will involve the pumping by hydraulic dredge of sand fill secured from the borrow area in the Rigolets as shown on plate 2. In order to properly control the dredged material, and ensure the deposit of sand in the mucked out channel, spill boxes with adjustable weir elevations will be constructed approximately one thousand feet apart along the mucked channel. One weir will be required for the connecting levee between the Rigolets Closure Dam and the lock. By adjusting or regulating the weirs, the retention of sand fill can be held to its maximum, and less sand fill will be carried away through the weirs by dredge effluent. The sand will be deposited to the approximate depths shown on plates 11 through 18, and rough shaped prior to placement of the third stage clay blankets.

90. In the third stage of construction, materials for the clay blanket on the levee north of the lock to U.S. Highway 90 will be truck hauled from borrow pits. By means of turn-arounds, the trucks can back dump the clay material. The gulfside cofferdam will be constructed to permit truck travel to the connecting levee, which will permit the levee contractor to use the same methods of construction as described above.

Alternatively, the clay borrow materials may be barged in from the Howze Beach borrow area and deposited in selected stock pile areas for later placement, by dragline or truck, in the levee. Following placement in the levee, semi-compaction of each lift will be accomplished by a dozer or road patrol spreading the clay material in lifts approximately twelve to eighteen inches in depth. Final compaction of each lift will be accomplished by a sheeps-foot and rubber-tired wobbly wheel rollers with a road patrol affecting the final shaping of the levee section preparatory to placing the roadway shell.

91. The primary source of borrow for the clay blanket will be pits in the Pleistocene formation which is near the surface at locations in the vicinity. Borrow areas adjacent to U. S. Highway 90 East, approximately 1.3 miles from the northern terminus of the levee will be used. Additionally a borrow adjacent to Louisiana Highway 433 approximately six miles from the northern terminus of the levee will be used to supply the additional clay blanket material needed. For the connecting levee, the clay blanket materials may be barged in from a borrow area in Lake Ponchartrain, north of U. S. Highway 90, and opposite Howze Beach in St. Tammany Parish, Louisiana. The Howze Beach location will be used as only an optional source of borrow for the connecting levee due to the additional costs for rehandling and transport of the material. Locations and log of borings for the clay material are shown on plates 20 through 25.

92. The small magnitude of the predicted settlement indicated in paragraph 54 of this memorandum will permit the construction of the levee to proceed without a waiting period between the stages. The final lift will be overbuilt to compensate for the anticipated ultimate settlement.

93. In the fourth stage of construction, the levee will be given final grading to lines and elevations as indicated on plates 16 through 18, except that between levee stations 15+67.92 and 17+30 north of the lock and between levee stations 1+00 and 7+73.73 south of the lock, only the side slopes will be given final grading as the remainder of the levee is to be constructed under the lock contract. Upon completion of final grading, the levee will be seeded and riprap provided on those areas requiring erosion protection.

94. East Double Bayou Closure. During the third stage of construction, closure of East Double Bayou Channel will be effected. As indicated by the stability analysis on plate 35, the entire levee section at the closure is to be constructed of clay materials. This will be accomplished by hauling the clay materials in dump trucks from the borrow pits adjacent to U. S. Highway 90 East, and dumping into the closure area. Alternately, the material could be barged in from the Howze Beach borrow area through East Double Bayou to the levee, and placed by dragline or crane with bucket located on the completed levee section. Due to cost of dredging equipment, loading, barge rental, and crane rentals, unloading and placing versus cost of truck loading, truck haul, and dumping, the alternate method was not selected.

95. Erosion Protection. It is considered that levees constructed of semi-compacted clay and seeded on both slopes provides adequate protection against wave wash and erosion, and no erosion protection other than seeding is provided for the elevation 9.0 levee. However, the portion of the levee adjacent to the lock having a crown elevation of 14.0 is provided with riprap protection as shown on plate 19 from levee station 1+00 to 9+76 and from levee station 13+40 to 17+30.

SOURCES OF CONSTRUCTION MATERIALS

96. Construction Materials.

a. Fine and coarse aggregate for use in concrete, filter blankets and pervious fill are available by truck haul to the site from pits near Sun, Bogalusa and Franklinton, Louisiana. Design Memorandum No. 12 "Sources of Construction Materials" dated 27 June 1966, approved 30 August 1966, lists the following dealers who are within truck haul of the site.

Louisiana Industries, Bogalusa and New Orleans.

Jahncke Service, Inc., New Orleans.

Dixie Sand and Gravel Company, Bogalusa, Louisiana.

b. Shell. Clamshell can be supplied by the following local commercial sources:

Jahncke Service, Inc., New Orleans.

Louisiana Materials, New Orleans.

Radcliff Materials, New Orleans.

Ayers Material Co., Inc., U.S. 90 East Yard, New Orleans.

c. Cement. Cement is available from either the New Orleans plant or bulk storage facility of the following manufacturers:

Lone Star Cement Co., New Orleans, La.

Ideal Cement Co., New Orleans.

Oklahoma (Louisiana) Cement Co., Michoud, Louisiana.

Southern Cement Co., Chalmette, Louisiana.

d. Water. Water needed for the lock construction will be supplied from water well, 400 to 600 feet deep. Local contractors in the area are equipped to drill and case such wells.

COORDINATION WITH OTHER AGENCIES

97. General. As previously mentioned, the State of Louisiana, Department of Public Works was appointed project coordinator for the State by Governor McKeithen. This agency has functioned to coordinate the needs, desires, and interests of State agencies and the Corps of Engineers. The Orleans Levee District will provide the local cooperation for all features of the project other than those located in St. Bernard Parish. The project plan presented herein is acceptable to both of the above agencies.

98. U. S. Department of the Interior, Fish and Wildlife Service. Extensive coordination with the U. S. Fish and Wildlife Service was accomplished during preauthorization studies and subsequent to authorization of the project. By letter dated 2 April 1968, the Regional Director, U. S. Fish and Wildlife Service, Atlanta, Georgia was informed of the current layout for the Lake Pontchartrain Barrier Plan feature

of the Lake Pontchartrain, La. and Vicinity hurricane protection project and requested to furnish views and comments on the entire Lake Pontchartrain Barrier Plan. By letter dated 15 May 1968, the Acting Regional Director states "...We are of the opinion that hurricane control structures in the Rigolets and Chef Menteur tidal passes will have little appreciable effect on salinities in Lakes Maurepas, Pontchartrain, and Borgne. Therefore, no adverse effects on fish and wildlife resources in these areas are expected."

Any significant modification to the current plan will be forwarded to the Regional Director for further review and comment. Copies of the above letter and the response of the Acting Regional Director are contained in appendix G.

99. U. S. Department of the Interior, Federal Water Pollution Control Administration. By letter dated 8 April 1968, the Regional Director, Federal Water Pollution Control Administration, was informed of the current layout for the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, La. and Vicinity hurricane protection project and requested to furnish views and comments on the entire Lake Pontchartrain Barrier Plan. The Regional Director requested in his letter of response dated 15 May 1968, that consideration be given to the following:

a. Minimizing water quality degradation during construction.

b. Minimizing the accidental spillage of petroleum products or other harmful materials and maintenance of sanitary facilities to adequately treat domestic wastes.

c. Constructing and operating water quality control structures so as to ensure that ecological conditions remain unchanged.

100. Provisions relative to water quality degradation during construction, control of accidental spillages, and maintenance of adequate sanitary facilities by construction contractors will be incorporated into the construction plans and specifications. The Seabrook Lock will be operated to provide a desirable salinity regimen in Lake Pontchartrain to the end that deleterious alterations in lake ecology will be avoided. The Regional Director has been advised of the action to be taken in connection with his comments. Copies of correspondence with the Regional Director are included in appendix G.

REAL ESTATE REQUIREMENTS

101. General. All rights-of-way for the Rigolets Lock, channel and barrier embankment, and such borrow areas as may be located on private property 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.

102. Requirements. The area required for levee, lock and approach channels will be acquired in fee reserving all minerals to the Owner. Perpetual channel and levee rights-of-way and adjoining spoil disposal areas are shown on plate 2. Borrow areas along U.S. Highway 90 and Louisiana Highway 433 are shown on plate 20. Total areas involved are as follows:

Channel right-of-way	87.0 Acres
Levee right-of-way	38.0 Acres
Borrow area easements	10.1 Acres
Lock and channel spoil area easement	231.0 Acres
Levee spoil area easement	34.0 Acres
	400.1

103. Cost. The estimated costs to local interests for rights-of-way and easements for borrow areas and spoil disposal areas are as follows:

LANDS:	
Channel R/W:	
87.0 acres @ $300/acre	$26,100
Levee R/W:	
2.0 acres @ $7,500/acre	15,000
6.0 acres @ $300/acre	1,800
30.0 acres @ $100/acre	3,000
Borrow Area Easement:	
1.8 acres @ $3,500/acre	6,300
8.3 acres @ $7,500/acre	62,250
Spoil Disposal Easement (Lock):	
17.0 acres @ $225/acre (75% of $300 fee value)	3,825
214.0 acres @ $75/acre (75% of $100 fee value)	5,295

Spoil Disposal Easement (Levee):		
34 acres @ $75/acre		
(75% of $100 fee value)	2,550	
Total Land Value		$126,120
Improvements		None
Severance		None
Total Value - Land & Improvements		$126,120
Rounded to:		$130,000
Contingencies (20%)		25,800
Real Estate Hired Labor Costs (6 tracts)		150
Acquisition Costs by Other (6 tracts)		1,050
TOTAL REAL ESTATE COST		$157,000

RELOCATIONS

104. General. All relocations for the Lake Pontchartrain, La. and Vicinity project are the responsibility of local interest. However, no relocations are required for construction of the Rigolets Lock, channel and barrier embankment.

COST ESTIMATES

105. Summary of First Cost. Based on January 1969 price levels the estimated first cost for the Rigolets Lock feature of the Lake Pontchartrain, La. and Vicinity project is $11,000,000. This estimate consists of $157,000 for lands and damages, $7,565,000 for the lock, $1,397,000 for levees and floodwalls, $226,000 for channels and canals, $965,000 for engineering and design, and $690,000 for supervision and administration. Detailed estimates of first cost are shown in table 3.

106. Comparison of Cost.

a. The cost of $11,000,000 for the Rigolets Lock represents an increase of $5,088,000 over the latest PB-3 effective July 1968. Table 4 shows a comparison of the project document, PB-3, and general design memorandum estimates. Reasons for the difference between the design memorandum and PB-3 estimates are as follows:

(1) Lock. The increase of $3,483,000 reflects the added cost for (a) increasing the lock width from 84 feet to 110 feet, (b) raising one gate bay frame from elevation 6.0 to elevation 13.5, (c) including dolphins at the ends of guide walls and fender, (d) raising guide walls and fenders on one end of the lock from elevation 6 to elevation 13.5, (e) increases in price level between July 1968 and January 1969, and (f) general refinements in the cost estimate based on more detailed information available during preparation of supplement no. 2 to the general design memorandum.

(2) Channels and canals. The increase of $129,000 reflects (a) the added cost for channel enlargement based on a 110-foot wide lock, and (b) increases in price level between July 1968 and January 1969.

(3) Levees and floodwall. The increase of $602,000 reflects (a) modification of levee alignment north of lock and (b) increases in price level between July 1968 and January 1969.

(4) Engineering and design. The increase of $572,000 reflects (a) the addition as a result of applying to the increased construction cost the E&D percentage based on recent experience for similar-type projects, (b) the increased design effort as described in paragraph 106.a.(1) and (c) the increased design effort as a result of modifying the levee alignment north of the lock.

(5) Supervision and administration. The increase of $351,000 reflects the addition as a result of applying to the increased construction cost the S&A percentage based on recent experience for similar-type projects.

(6) Lands and damages. The decrease of $49,000 reflects the more detailed appraisals made during preparation of supplement no. 2 to the general design memorandum.

b. The estimate of $11,000,000 for the Rigolets Lock represents an increase of $7,224,000 over the project document estimate. Reasons for the difference between the design memorandum and project document estimates are as follows:

(1) Lock. The increase of $5,015,000 is comprised of (a) $3,483,000 as previously described in paragraph 106.a.(1), and (b) $1,532,000 as a result of escalating the project document estimate to reflect July 1968 price levels and using 20 percent contingencies in the PB-3 estimate in lieu of the 15 percent used in the project document.

(2) Channels and canals. The increase of $157,000 is comprised of (a) $129,000 as previously described in paragraph 106.a.(2), and (b) $28,000 as a result of escalating the project document estimate to reflect July 1968 price levels and using 20 percent contingencies in the PB-3 estimate in lieu of the 15 percent used in the project document.

Par. 106. b. (3)

(3) Levees and floodwalls. The increase of $844,000 is comprised of (a) the increase of $602,000 as previously described in paragraph 106.a.(3) and (b) an increase of $242,000 as a result of escalating the project document estimate to reflect July 1968 price levels and using 20 percent contingencies in the PB-3 estimate in lieu of the 15 percent used in the project document.

(4) Engineering and design. The increase of $773,000 is comprised of (a) $572,000 as previously described in paragrapgh 106.a.(4), and (b) $201,000 as a result of applying the E&D percentage to the project document construction cost escalated to reflect July 1968 price levels.

(5) Supervision and administration. The increase of $439,000 is comprised of (a) $351,000 as previously described in paragraph 106.a.(5), and (b) $88,000 as a result of applying the S&A percentage to the project document construction cost escalated to reflect July 1968 price levels.

(6) Lands and damages. The decrease of $4,000 is comprised of (a) a decrease of $49,000 as previously described in paragraph 106.a.(6), and (b) an increase of $45,000 as a result of escalating the project document estimate to reflect July 1968 price levels.

TABLE 3

LAKE PONTCHARTRAIN BARRIER PLAN
RIGOLETS LOCK AND ADJOINING LEVEES

ESTIMATE OF FIRST COST

(January 1969 price levels)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
CONTRACT NO. 2					
05 LOCK					
	MASONRY				
	Excavation, Intital (Hyd.)	155,500	c.y.	0.68	105,740
	Excavation, Chamber (Hyd.)	144,100	c.y.	0.68	97,988
	Excavation, Structural	23,000	c.y.	2.26	51,980
	Dewatering		l.s.		400,000
	Lakeside Cofferdam	18,500	c.y.	1.92	35,520
	Gulfside Cofferdam*	18,700	c.y.	1.92	35,904
	Disposal Area Dikes	48,500	c.y.	0.79	38,315
	Sand Fill	73,700	c.y.	1.07	78,859
	Backfill	67,800	c.y.	1.07	72,546
	Random Fill	39,700	c.y.	0.80	31,760
	Compacted Clay Fill	6,130	c.y.	6.00	36,780
	Soil Fill for Floodwalls	730	c.y.	3.60	2,628
	Riprap	41,200	ton	12.35	508,820
	Graded Filter Blanket	19,500	c.y.	12.85	250,575
	Concrete, Stabilization Slab	935	c.y.	37.50	35,063
	Concrete, Base Slab	14,970	c.y.	37.50	561,375
	Concrete, Walls	4,270	c.y.	53.50	228,445
	Concrete, Floodwalls	525	c.y.	53.50	28,088
	Portland Cement	28,470	bbl.	5.20	148,044
	Reinforcing Steel	2,767,000	lbs.	0.17	470,390
	Embedded Metal, Miscellaneous	51,500	lbs.	0.55	28,325
	Steel Pile, 14BP73	55,300	l.f.	9.45	522,585
	Steel Pile, 12BP53	660	l.f.	7.50	4,950
	Pile Load Test	10	ea.	5,000.00	50,000
	Steel Sheet Piling, MA-22	88,000	s.f.	3.80	334,400
	Steel Sheet Piling, Z-27	4,550	s.f.	4.35	19,793
	Steel Sheet Pile Dolphins	4	ea.	50,000.00	200,000
	Timber Piling (Guide Walls)	62,250	l.f.	3.90	242,775
	Timber Piling (Office)	1,040	l.f.	3.78	3,931
	Timber Chamber Guide Walls	1,514	l.f.	100.00	151,400
	Timber Approach Guide Walls	900	l.f.	100.00	90,000

*Construction of the gulfside cofferdam will be included with Contract No. 1.

TABLE 3 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
	Control Houses	4	ea.	12,500.00	50,000
	Office and Power House		l.s.		50,000
	Handrail	1,400	l.f.	9.40	13,160
	Fence	2,100	l.f.	4.00	8,400
	Drives and Parking	52,500	s.f.	0.17	8,925
	Utilities		l.s.		30,000
	Fire Protection System		l.s.		20,000
	Well		l.s.		13,000
	Needle Girders and Supports		l.s.		33,000
	Concrete Needles		l.s.		24,000
	Field Office		l.s.		3,500
	Paint Storage Building		l.s.		1,000
	Navigation Aids		l.s.		50,000
	Observation Platform		l.s.		6,000
	Subtotal				5,177,964
	Contingencies (20%)				1,045,036
	TOTAL, STRUCTURE				$6,223,000
	GATES AND OPERATING MACHINERY				
	Sector Gates		l.s.		702,000
	Electric System		l.s.		141,000
	Cathodic Protection		l.s.		75,000
	Operating Machinery		l.s.		200,000
	Subtotal				1,118,000
	Contingencies (20%)				224,000
	TOTAL, GATES AND OPERATING MACHINERY				$1,342,000
	TOTAL, LOCK				$7,565,000
09	CHANNELS AND CANALS				
	Excavation	387,600	c.y.	0.45	174,420
	Dolphin	4	ea.	3,500.00	14,000
	Subtotal				188,420
	Contingencies (20%)				37,580
	TOTAL, CHANNELS AND CANALS				$ 226,000

TABLE 3 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
11	LEVEES AND FLOODWALLS				
	EMBANKMENT (SOUTH OF LOCK)				
	Killing Grass	0.75	acre	1,300.00	975
	Sand Fill	10,790	c.y.	0.85	9,172
	Haul Fill	8,470	c.y.	1.75	14,822
	EMBANKMENT (NORTH OF LOCK)				
	Killing Grass	1.2	acre	1,300.00	1,560
	Sand Fill	10,950	c.y.	0.85	9,308
	Haul Fill	10,620	c.y.	1.75	18,585
	Subtotal				54,422
	Contingencies (20%)				10,578
	TOTAL, EMBANKMENT				$ 65,000
	SLOPE PROTECTION (SOUTH OF LOCK)				
	Riprap	4,450	ton	15.00	66,750
	Shell Blanket	1,860	c.y.	6.50	12,090
	SLOPE PROTECTION (NORTH OF LOCK)				
	Riprap	4,610	ton	15.00	69,150
	Shell Blanket	1,930	c.y.	6.50	12,545
	Subtotal				160,535
	Contingencies (20%)				32,465
	TOTAL, SLOPE PROTECTION				$ 193,000
	ROADWAY				
	Compacted Shell Surfacing				
	(South of Lock)	395	c.y.	6.50	2,568
	(North of Lock)	550	c.y.	6.50	3,575
	Subtotal				6,143
	Contingencies (20%)				1,857
	TOTAL, ROADWAY				$ 8,000
	TOTAL, LEVEE & FLOODWALLS - CONTRACT NO. 2				$ 266,000
	TOTAL, CONTRACT NO. 2 (Lock, Channels & Canals and Levees & Floodwalls)				$8,057,000

TABLE 3 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
CONTRACT NO. 1					
11	LEVEES & FLOODWALLS				
	EMBANKMENT (SOUTH OF LOCK)				
	Mucking	38,300	c.y.	0.60	22,980
	Sand Fill	47,500	c.y.	0.85	40,375
	Haul Fill	28,650	c.y.	1.75	50,138
	EMBANKMENT (NORTH OF LOCK)				
	Mucking	125,500	c.y.	0.60	75,300
	Sand Fill	166,700	c.y.	0.85	141,695
	Haul Fill	200,000	c.y.	1.75	350,000
	Clearing and Grubbing	8.4	acre	100.00	840
	Subtotal				681,328
	Contingencies (20%)				136,672
	TOTAL, EMBANKMENT				$ 818,000
	SLOPE PROTECTION (SOUTH OF LOCK)				
	Riprap	11,500	ton	15.00	172,500
	Shell Blanket	4,750	c.y.	6.50	30,875
	Fertilizing and Seeding	0.4	acre	200.00	80
	SLOPE PROTECTION (NORTH OF LOCK)				
	Riprap	980	ton	15.00	14,700
	Shell Blanket	430	c.y.	6.50	2,795
	Fertilizing and Seeding	16.5	acre	200.00	3,300
	Subtotal				224,250
	Contingencies (20%)				44,750
	TOTAL, SLOPE PROTECTION				$ 269,000

TABLE 3 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
	ROADWAY				
	Compacted Shell Surfacing				
	(South of Lock)	340	c.y.	6.50	2,210
	(North of Lock)	5,250	c.y.	6.50	34,125
	Subtotal				36,335
	Contingencies (20%)				7,665
	TOTAL, ROADWAY				$ 44,000
	TOTAL, CONTRACT NO. 1 - LEVEES & FLOODWALLS				$1,131,000
	TOTAL, CONTRACTS NO. 1 AND NO. 2				$9,188,000
30	ENGINEERING AND DESIGN (10.5%)				965,000
31	SUPERVISION AND ADMINISTRATION (7.5%)				690,000
01	LAND AND DAMAGES*				157,000
	TOTAL PROJECT COST				$11,000,000

*Refer to Page 56, Paragraph 103, for detailed estimate.

Table 4

RIGOLETS LOCK AND ADJOINING LEVEES

COMPARISON OF ESTIMATES

	Feature	Project document	PB-3 eff. 1 Jul 68	Design Memo No. 2 Supp. No. 2	Difference Supp. No. 2- PB-3	Difference Supp. No. 2- Project document
05	Lock	$2,550,000	$4,082,000	$ 7,565,000	+$3,483,000	+$5,015,000
09	Channels and canals	69,000	97,000	226,000	+129,000	+157,000
11	Levees and floodwalls	553,000	795,000	1,397,000	+602,000	+844,000
30	Engineering & design	192,000	393,000	965,000	+572,000	+773,000
31	Supervision & administration	251,000	339,000	690,000	+351,000	+439,000
	Subtotal	$3,615,000	$5,706,000	$10,843,000	+$5,137,000	+$7,228,000
01	Lands and damages	161,000	206,000	157,000	-49,000	-4,000
	TOTAL	$3,776,000	$5,912,000	$11,000,000	+$5,088,000	+$7,224,000

SCHEDULES FOR DESIGN AND CONSTRUCTION

107. Time of Construction. a. The work covered in this memorandum will be constructed in two contracts. Work in contract No. 1 will include construction of the levee north of the lock, which will provide land access to the lock site, the connecting levee south of the lock and the gulf side cofferdam. Contract No. 2 will include construction of the lock and related facilities, navigation channel, and completion of the levee sections adjoining the lock.

b. Contract No. 1. The estimated time required for construction of the levee work is approximately one year. Completion of bidding documents, including plans and specifications for this work, is scheduled for April, 1970. Allowing two months for award of this contract, the levee construction should be completed June, 1971, as shown in table 5.

c. Contract No. 2. The estimated construction time required for the work under this contract will be approximately two and one-half years. The critical items of preparing approach channels for construction, excavation for gate structures, dewatering, constructing the gate structures, installing gates and developing the lock chamber determine the schedule. Completion of bidding documents, including plans and specifications, is scheduled for May, 1971. Allowing three months for award of the contract, construction should commence in August, 1971, which is about two months after the scheduled completion of contract No. 1. The work under contract No. 2 should then be completed in February, 1974. Table 5 shows the sequence of contracts and schedule of design.

TABLE 5

SCHEDULE OF CONSTRUCTION CONTRACTS

Sequence	Description	Advertisement	Award	Completion	Est. Cost Including 20% Contingencies
1.	Levees (Sta. 1+00 to Sta. 7+40.92 and Sta. 15+67.92 to Sta. 108+41.99)	Apr. 1970	June 1970	June 1971	$1,131,000
2.	Lock, Channel and Levees (Sta. 7+40.92 to Lock and Lock to Sta. 15+67.92	May, 1971	Aug. 1971	Feb.1974	$8,057,000

SCHEDULE OF DESIGN

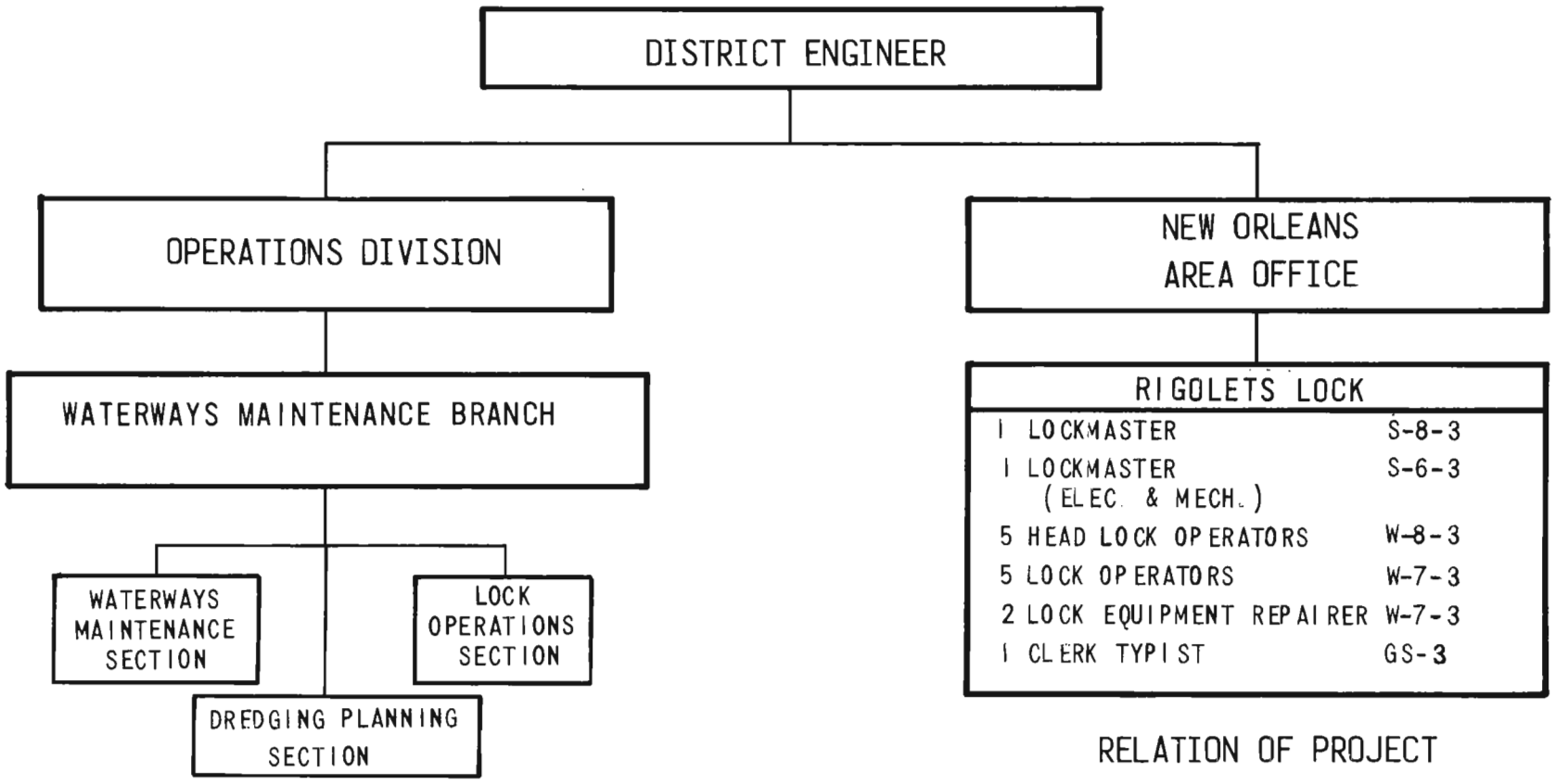
Sequence	Description	Completion of Bidding Documents
1.	Levees	Apr. 1970
2.	Lock and Channel	May, 1971

108. Funds. To maintain the schedule shown in table 5, the following funds by fiscal years will be required:

	FUNDS		
	CONSTRUCTION	PLANNING	TOTAL
F.Y. 70	$ 100,000	$139,000	$ 239,000
F.Y. 71	1,031,000	183,000	1,214,000
F.Y. 72	2,700,000	140,000	2,840,000
F.Y. 73	3,200,000	165,500	3,365,500
F.Y. 74	2,157,000	111,500	2,268,500
TOTAL	$9,188,000	$739,000	$9,927,000

CORPS OF ENGINEERS

U.S. ARMY



RELATION OF PROJECT
TO
NEW ORLEANS DISTRICT OFFICE
FOR
OPERATION AND MAINTENANCE

FIG. 1

FIG. 1

OPERATION AND MAINTENANCE

109. Lock. a. General. Operating and ordinary maintenance activities of the lock will be under the supervision of the Area Engineer with staff coordination by the Operations Division of the U. S. Army Engineer District, New Orleans, as shown on figure 1. Maintenance will consist generally of repair and upkeep of buildings, grounds and lock.

b. Operation. The navigation lock will be operated in accordance with standard operating procedures. Anticipated traffic will require that the lock be operated on a 24-hour basis. An operation and maintenance manual will be prepared for the guidance of lock personnel.

c. Organization for operation and maintenance. Based on the estimated traffic, the force required to operate and maintain the lock on a 24-hour basis is as follows:

1 Lockmaster	S-8-3
1 Lockmaster (Elect. and Mech.)	S-6-3
5 Head Lock Operators	W-8-3
5 Lock Operators	W-7-3
1 Lock Equipment Repairer	W-7-3
1 Clerk Typist	GS-3

d. Cost. The estimated total annual cost for operation and maintenance of the lock is $200,000. These estimates are based on January, 1969, prices and wage rates.

110. Channel. Maintenance of the channel is estimated at $28,000 annually. Maintenance will be under the supervision of the U. S. Army Engineer District, New Orleans.

111. Levees. Maintenance of the levees is estimated at $21,000 annually. Maintenance of the levees will be borne by local interests.

112. Navigational Aids (U.S. Coast Guard). Maintenance of navigational aids required for the project is the responsibility of the U.S. Coast Guard at an estimated cost of $5,000 annually.

113. Summary of Federal Operation and Maintenance Costs. While operation and maintenance of the lock and channel will be undertaken by the United States, a cash contribution equivalent to its estimated capitalized value will be provided by local interests. The total annual operation and maintenance charges, including $5,000 for navigational aids are estimated to be $233,000, based on the following:

Corps of Engineers	
Maintenance and operation, lock	$200,000
Maintenance, channel	28,000
Total, Corps of Engineers	$228,000
U.S. Coast Guard	
Maintenance of navigation aids	5,000
Total Federal	$233,000

114. Non-Federal Operation and Maintenance Costs. The estimated annual Non-Federal cost for maintenance of the levees is $21,000. In addition, local interests will provide a contribution equal to the capitalized value of the estimated annual operation and maintenance charge for the lock and channel.

JUSTIFICATION

115. But for three authorized structures for navigation through the barrier, completion of the authorized "Lake Pontchartrain, La., and Vicinity" project, would isolate Lake Pontchartrain from its important seaward water connections to the east and south. The openings presently authorized are as follows:

Type of Structure	Location	Width (feet)	Length (feet)
Navigation Lock	Rigolets	84	800
Navigation Floodgate	Chef Menteur	56	--
Navigation Lock	Seabrook	84	800

116. The controlling horizontal clearances for seaward ingress to and egrees from the lake will, upon completion of the scheduled modification of the existing Lake Pontchartrain Causeway bridges, be 106 feet via the Rigolets (see tables 6, 7, and 8). Construction of the "Lake Pontchartrain, Louisiana, and Vicinity" project, as authorized, would, therefore, substantially reduce the controlling horizontal clearance. This reduction would restrict the activity of existing shipbuilding yards at Madisonville, Louisiana, and Slidell, Louisiana, in that the capability of these yards would be limited, doubtless for many years to come, to ship and barge construction having maximum beams of approximately 80 feet. Rapid changes are taking place in shipbuilding activity

with larger sizes for both deep and shallow-draft vessels, as well as new demands for floating equipment for offshore oil activity. Shallow-draft floating equipment with dimensions of 350 feet in length and 100 feet in width are now operating from Gulf ports to the offshore oil areas. It is reasonable to assume that the Madisonville and Slidell firms would share in some of the larger shallow-draft construction. One of the yards has already constructed a piece of floating equipment (drilling barge) having dimensions of 320 feet by 70 feet.

117. Inasmuch as the restriction which construction of the authorized navigation structures would impose would seriously circumscribe the scope of operations for these yards in the future and militate against an orderly development of marine activity on the lake, it is considered essential that the hurricane project not operate to reduce the controlling horizontal clearance which will, upon completion of the aforementioned Causeway bridge modifications, be available, i.e. 106 feet via the Rigolets Pass.

118. The Inner Harbor Navigation Canal (Seabrook) and Chef Menteur Pass connections both have one or more existing bridges with horizontal clearances of less than 100 feet. In addition to three existing bridges with horizontal clearances of less than 100 feet, the Inner Harbor Navigation Canal connection is, by reason of the width of the Canal, unattractive as a route for moving wide traffic. The Chef Menteur Pass connection has a controlling depth of about 5 feet and the controlling section is in open water where maintenance of a channel would be

difficult and expensive. Further, the navigation floodgate authorized under the hurricane project, would have to be closed whenever a hurricane impended.

119. In view of the above, it is recommended that the horizontal width of the navigation lock at the Rigolets be increased from 84 feet to 110 feet so that the controlling horizontal clearance to and from Lake Pontchartrain, with the project in place, will be approximately that which is now available. This would ensure adequate connections from Lake Pontchartrain to the Gulf of Mexico, Gulf Intracoastal Waterway, Mississippi River, and other navigable waterways of the United States during the economic life of the project.

120. The work covered herein is not a separable unit of the Lake Pontchartrain barrier plan; therefore, an economic analysis is not practicable. The current economic analysis (LMV Form 23) for the entire Lake Pontchartrain, La., and Vicinity hurricane project, based on the July 1968 PB-3 costs, indicates a benefit-to-cost ratio of 12.3 to 1 for the overall project. The additional cost of the flood protective works covered herein over that shown in the current PB-3 will not significantly change the approved benefit-to-cost ratio.

TABLE 6

BRIDGE CROSSINGS
LAKE PONTCHARTRAIN (WEST) TO GULF INTRACOASTAL WATERWAY
(VIA RIGOLETS)

Bridge and Location	Clearance (feet) Horizontal	Vertical
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain		
North opening	76(1)	Unlimited
South opening	75(1)	Unlimited
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain (under construction)		
North opening	125	Unlimited
South opening	150	42.5 above H.W.
Southern Railway, Lake Pontchartrain		
North opening	105	Unlimited
South opening	106	Unlimited
La. Department of Highways, Highway 11, Lake Pontchartrain		
North opening	151	Unlimited
South opening	107	Unlimited
Interstate 10, Lake Pontchartrain	150	67.5 above m.s.l.
La. Department of Highways Highway 90, Rigolets Pass	152	Unlimited
L&NRR, Rigolets Pass	153	Unlimited

(1)These horizontal clearances are to be enlarged to agree with openings in new causeway bridge under construction.

TABLE 7

BRIDGE CROSSINGS
LAKE PONTCHARTRAIN (WEST) TO MISSISSIPPI RIVER
(VIA SEABROOK)

Bridge and Location	Clearance (feet) Horizontal	Vertical
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain		
North opening	76(1)	Unlimited
South opening	75(1)	Unlimited
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain (under construction)		
North opening	125	Unlimited
South opening	150	42.5 above H.W.
Southern Railway, Seabrook Inner Harbor Navigation Canal	95	Unlimited
City of New Orleans and Orleans Levee Board, Seabrook, Inner Harbor Navigation Canal	96	Unlimited
La. Department of Highways, U.S. 90, Inner Harbor Navigation Canal	100	Unlimited
L&NRR, Inner Harbor Navigation Canal	97	Unlimited
Interstate Highway 10, Inner Harbor Navigation Canal	200	120 above M.H.W.
Claiborne Avenue Bridge Inner Harbor Navigation Canal	305	156 above H.W.
Florida Avenue Bridge, Inner Harbor Navigation Canal	91.5	Unlimited
Industrial Canal Lock and St. Claude Avenue Bridge are not considered to be controlling elements due to changes now planned.		

(1)These horizontal clearances are to be enlarged to agree with openings in new causeway bridge under construction.

TABLE 8

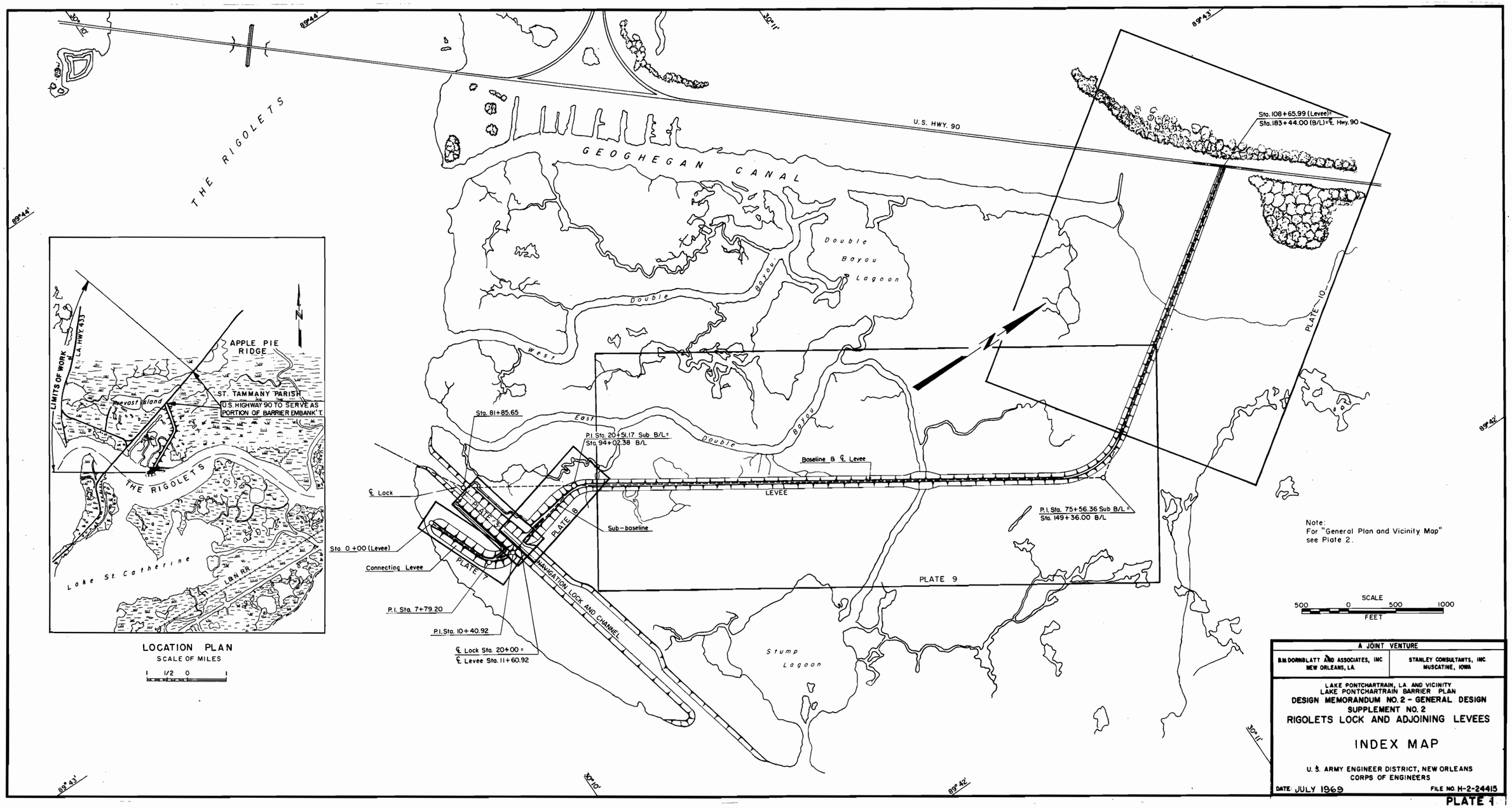
BRIDGE CROSSINGS
LAKE PONTCHARTRAIN (WEST) TO GULF INTRACOASTAL WATERWAY
(VIA CHEF MENTEUR PASS)

Bridge and Location	Clearance (feet) Horizontal	Vertical
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain		
North opening	76(1)	Unlimited
South opening	75(1)	Unlimited
Jefferson-St. Tammany Parishes Causeway, Lake Pontchartrain (under construction)		
North opening	125	Unlimited
South opening	150	42.5 above H.W.
Southern Railway Bridge, Lake Pontchartrain		
North opening	105	Unlimited
South opening	106	Unlimited
La. Department of Highways, Highway 11, Lake Pontchartrain		
North opening	151	Unlimited
South opening	107	Unlimited
Interstate 10, Lake Pontchartrain	150	67.5 above m.s.l.
La. Department of Highways, Highway 90, Chef Menteur Pass	97	Unlimited
L&RNN Bridge, Chef Menteur Pass	104	Unlimited

(1)These horizontal clearances are to be enlarged to agree with openings in new causeway bridge under construction.

RECOMMENDATION

121. Recommendation. The plan of improvement presented herein for the Rigolets lock, approach channels, levees and appurtenances based on a 110-foot lock width at an estimated first cost of $11,000,000 is considered the most practical means of accomplishing the work authorized by Congress, and is recommended for approval.



A JOINT VENTURE

B.M. DOMBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

INDEX MAP

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 1

VICINITY MAP

SCALE OF MILES

50 0 50

LEGEND

2A6 ● BORING LOCATION

C14 ⊕ SAND BORROW BORING LOCATION

SCALE

500 0 500 1000

FEET

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

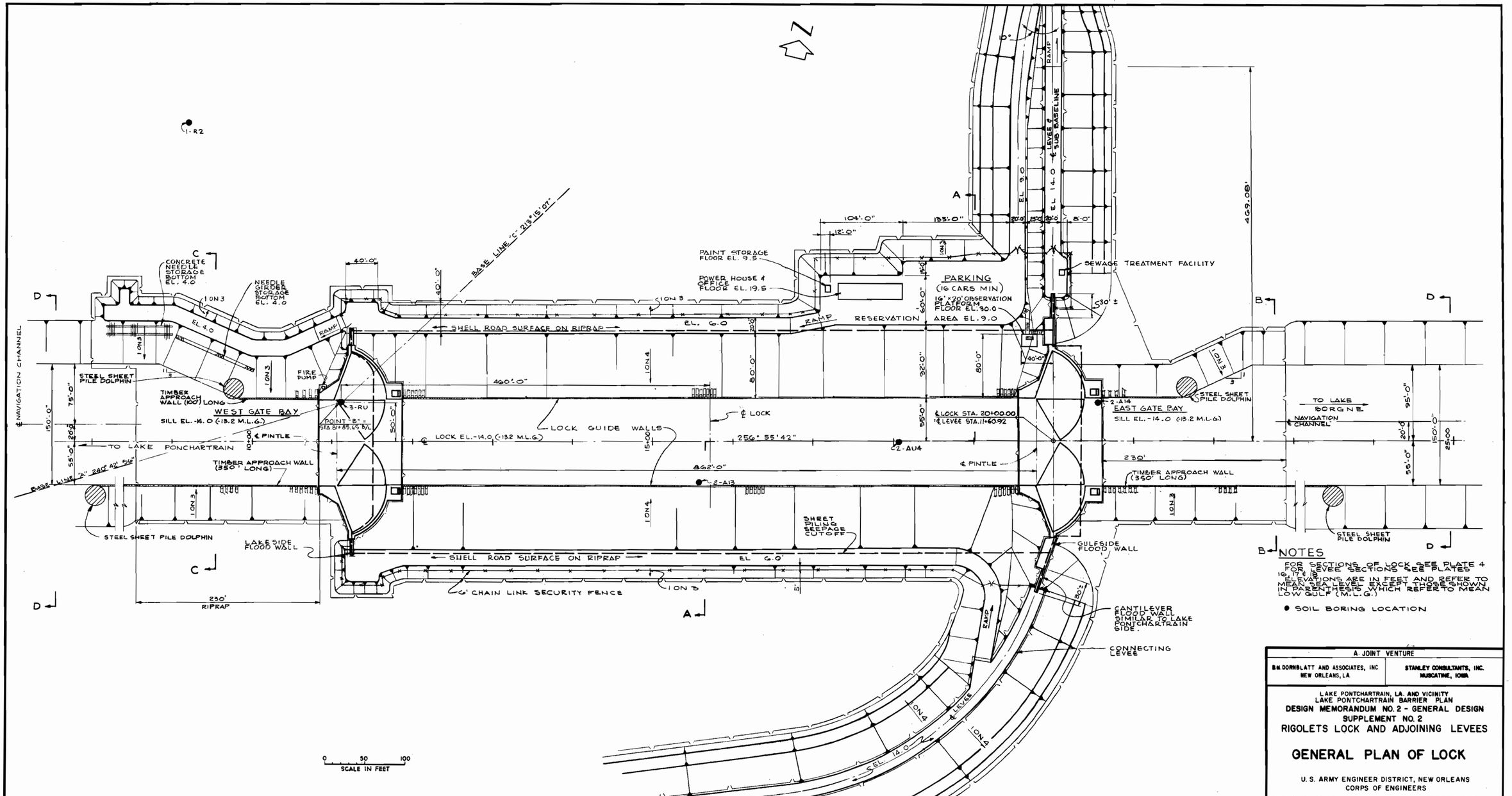
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

GENERAL PLAN AND VICINITY MAP

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

DATE JULY 1969 FILE NO H-2-24415

PLATE 2



NOTES

FOR SECTIONS OF LOCK SEE PLATE 4
FOR LEVEE SECTIONS SEE PLATES 16, 17 & 18
ELEVATIONS ARE IN FEET AND REFER TO MEAN SEA LEVEL EXCEPT THOSE SHOWN IN PARENTHESIS WHICH REFER TO MEAN LOW GULF (M.L.G.)

● SOIL BORING LOCATION

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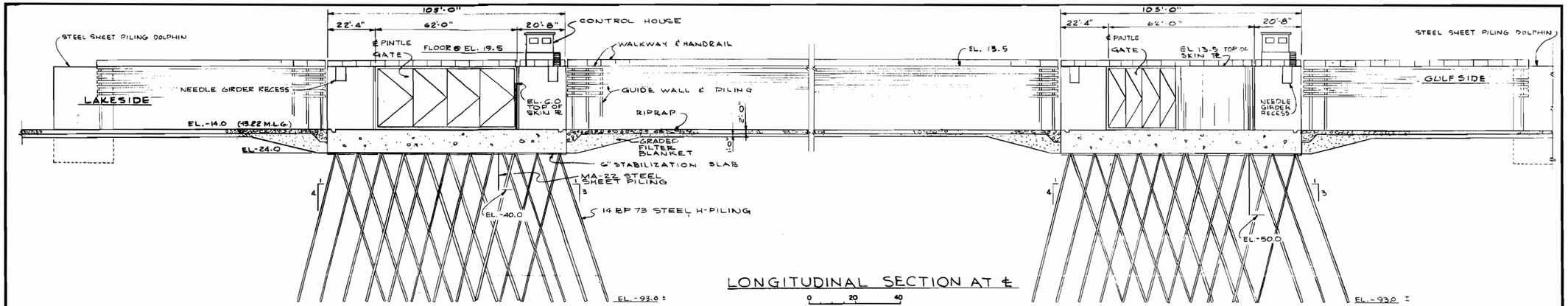
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

GENERAL PLAN OF LOCK

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

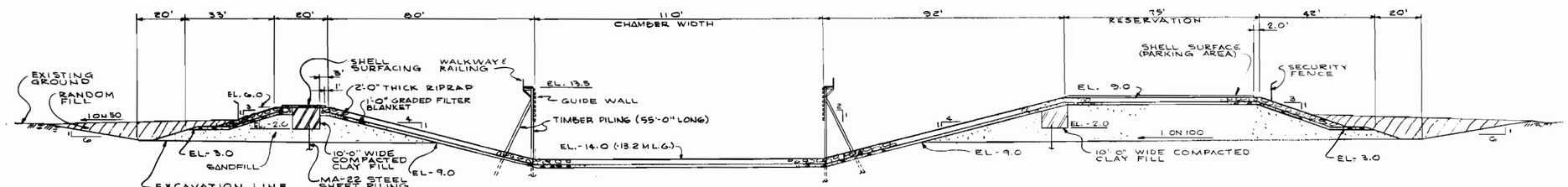
DATE: JULY 1969 FILE NO. H-2-24415

PLATE 3



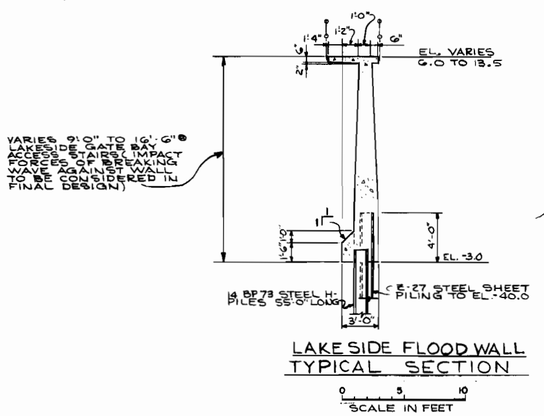
LONGITUDINAL SECTION AT ℄

0 20 40
SCALE IN FEET



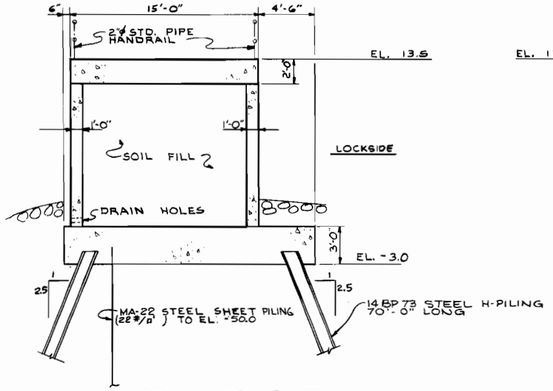
CROSS SECTION AA

0 20 40
SCALE IN FEET

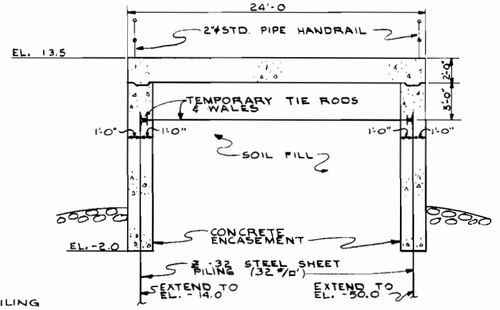


LAKE SIDE FLOOD WALL TYPICAL SECTION

0 5 10
SCALE IN FEET



PROPOSED SECTION



THIS SECTION NOT ADOPTED DUE TO HIGHER COSTS RESULTING FROM PROTECTION OF SHEET PILING AND ADDITIONAL FILL REQUIRED ABOVE ELEVATION -2.0. PRESTRESSED CONC. SHEET PILING IS NOT CONSIDERED DESIRABLE DUE TO DIFFICULTY IN PLACING TO ELEVATION -50.0'

ALTERNATE SECTION

GULFSIDE FLOOD WALL - TYPICAL SECTIONS

0 5 10
SCALE IN FEET

NOTES

REINFORCING NOT SHOWN ON SECTIONS
ELEVATIONS ARE IN FEET AND REFER TO MEAN SEA LEVEL EXCEPT THOSE SHOWN IN PARENTHESES WHICH REFER TO MEAN LOW GULF (M.L.G.)
FOR LOCATION OF SECTIONS SEE PLATE 3

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC
NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC.
MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

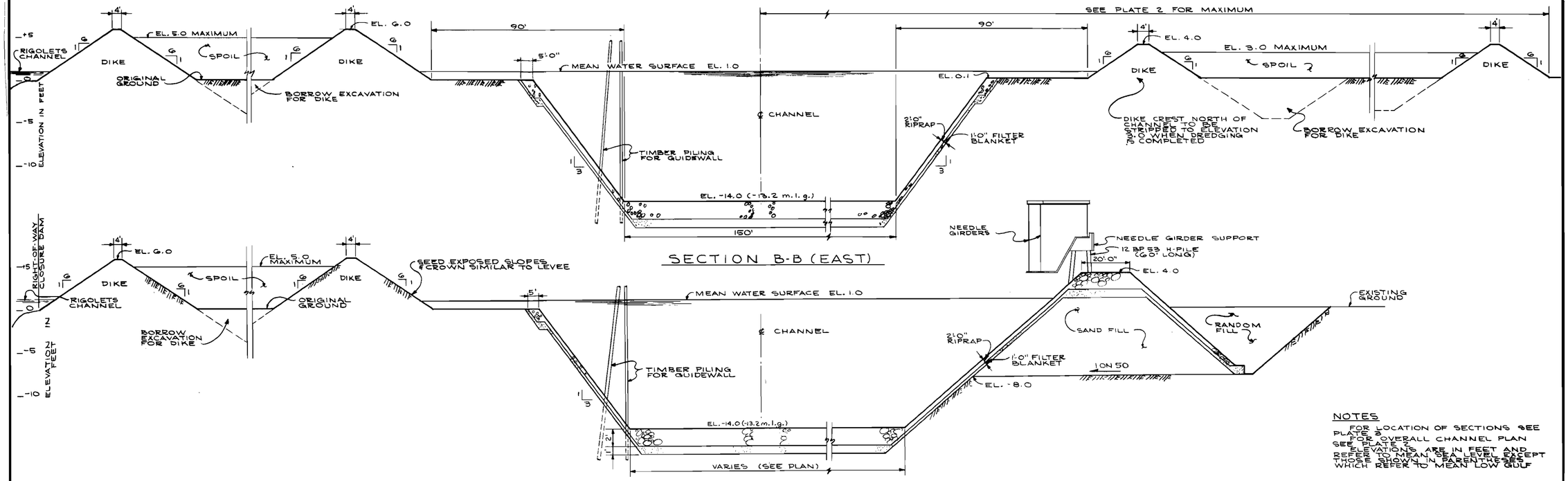
LOCK SECTIONS

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

DATE: JULY 1969

FILE NO. H-2-24415

PLATE 4



NOTES

FOR LOCATION OF SECTIONS SEE PLATE 3
FOR OVERALL CHANNEL PLAN SEE PLATE 2
ELEVATIONS ARE IN FEET AND REFER TO MEAN SEA LEVEL EXCEPT THOSE SHOWN IN PARENTHESES WHICH REFER TO MEAN LOW GULF

HORIZ. SCALE IN FEET 0 20 40
VERT. SCALE IN FEET 0 50 100

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

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LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

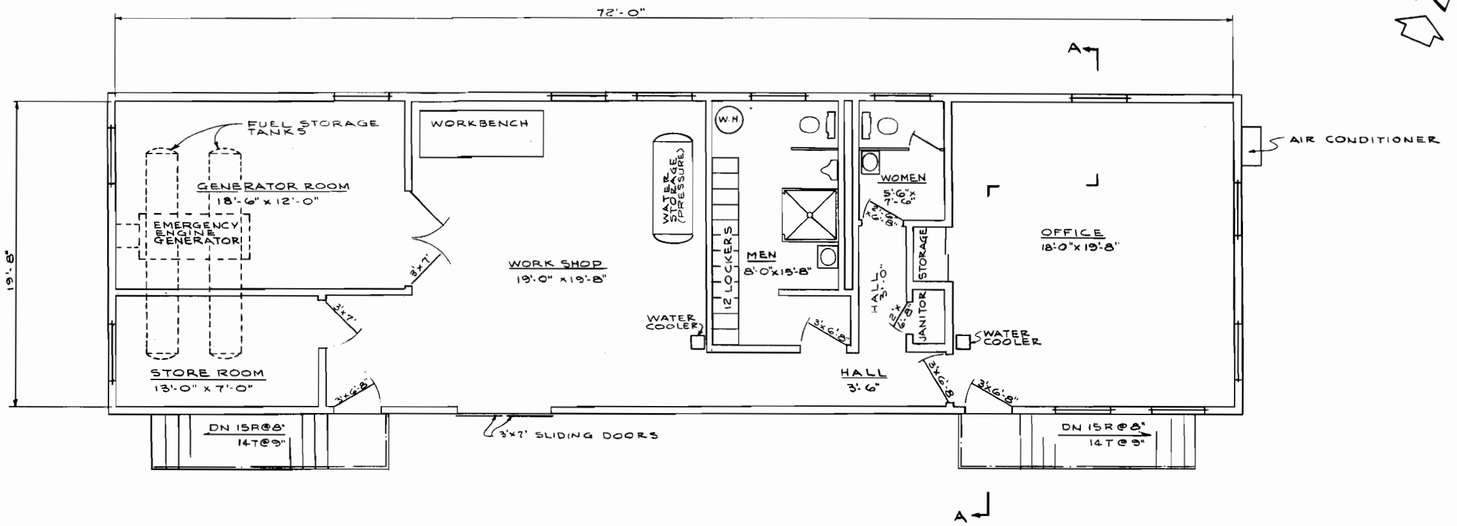
CHANNEL SECTIONS

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

DATE: JULY 1969

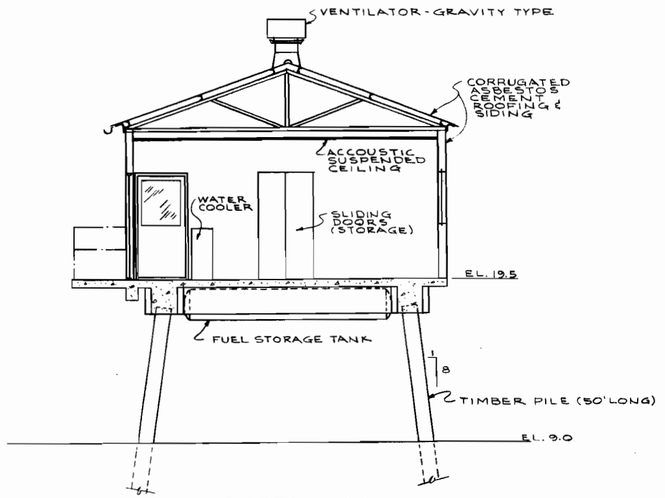
FILE NO. H-2-24415

PLATE 5



PLAN

1 0 2 4 6 8
SCALE IN FEET



SECTION AA

1 0 2 4 6 8
SCALE IN FEET

NOTES

FOR LOCATION OF PLAN SEE PLATE 3.
ELEVATIONS ARE IN FEET AND REFER TO MEAN SEA LEVEL.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC.
NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC.
MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

POWERHOUSE & OFFICE

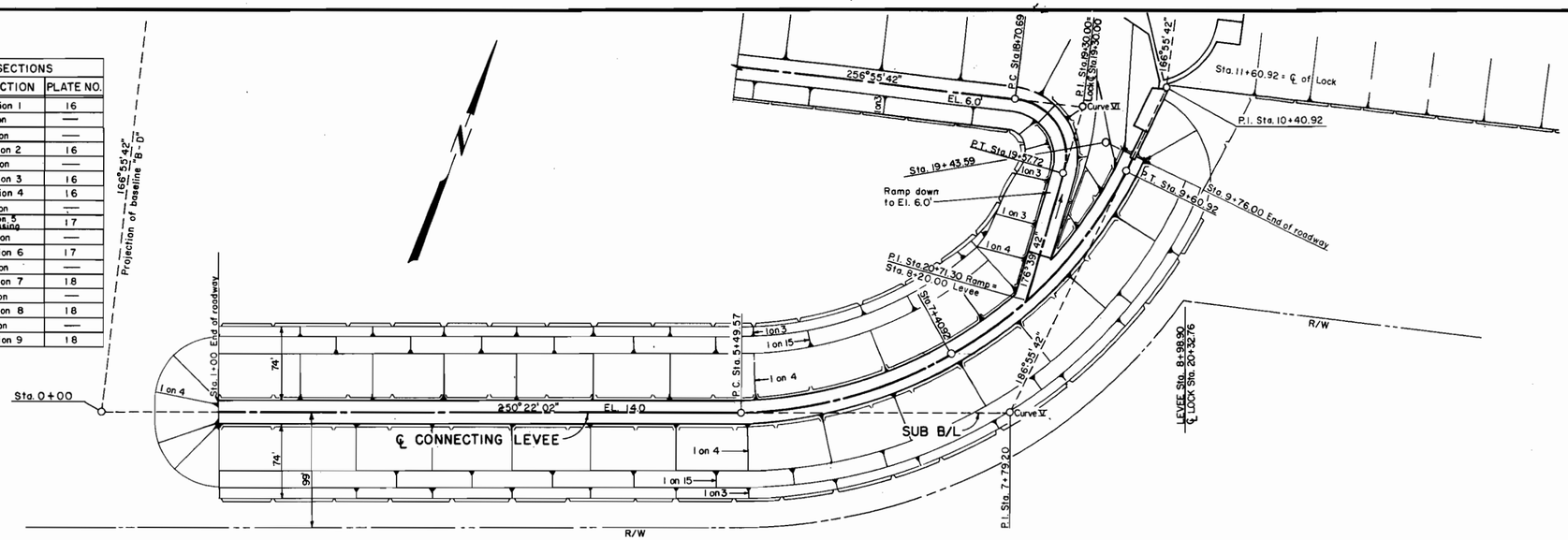
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969

FILE NO. H-2-24415

PLATE 6

TABULATION OF DESIGN SECTIONS			
STATION TO STATION		DESIGN SECTION	PLATE NO.
1+00	8+20	Levee section 1	16
8+20	9+76	Transition	—
13+40	14+50	Transition	—
14+50	15+3794	Levee section 2	16
15+3794	18+9841	Transition	—
18+9841	51+45	Levee section 3	16
51+45	54+52	Levee section 4	16
54+52	55+70	Transition	—
55+70	56+95	Levee Section 5 Stream Crossing	17
56+95	58+13	Transition	—
58+13	64+45	Levee section 6	17
64+45	64+55	Transition	—
64+55	76+45	Levee section 7	18
76+45	79+45	Transition	—
79+45		Levee section 8	18
79+45	79+95	Transition	—
79+95	108+41.99	Levee section 9	18

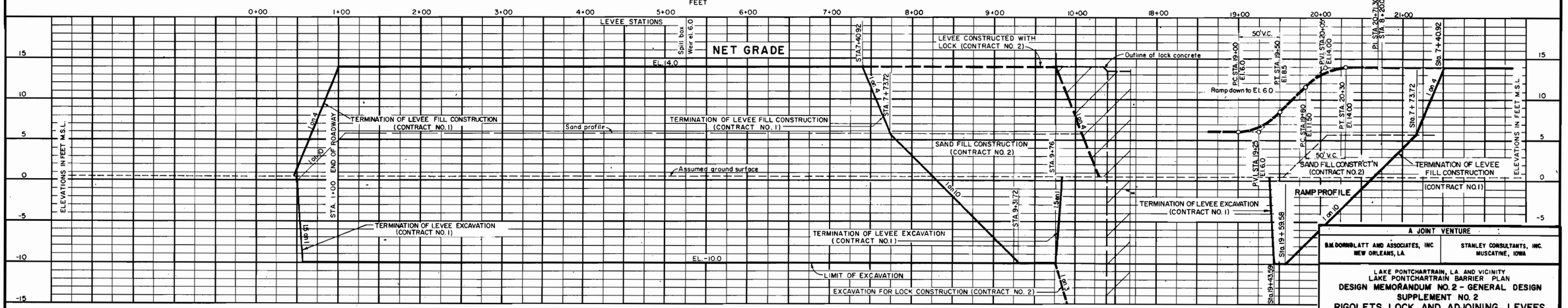


CURVE DATA

V		VI	
P.I.	Sta. 7+79.20	P.I.	Sta. 19+30.00
Δ	= 63° 26' 20"	Δ	= 99° 44' 00"
D	= 15° 25' 19"	D	= 114° 35' 30"
R	= 371.52'	R	= 50.00'
T	= 229.63'	T	= 59.31'
L	= 411.35'	L	= 87.03'

PLAN

SCALE 50 0 50 100 FEET



PROFILE

A JOINT VENTURE

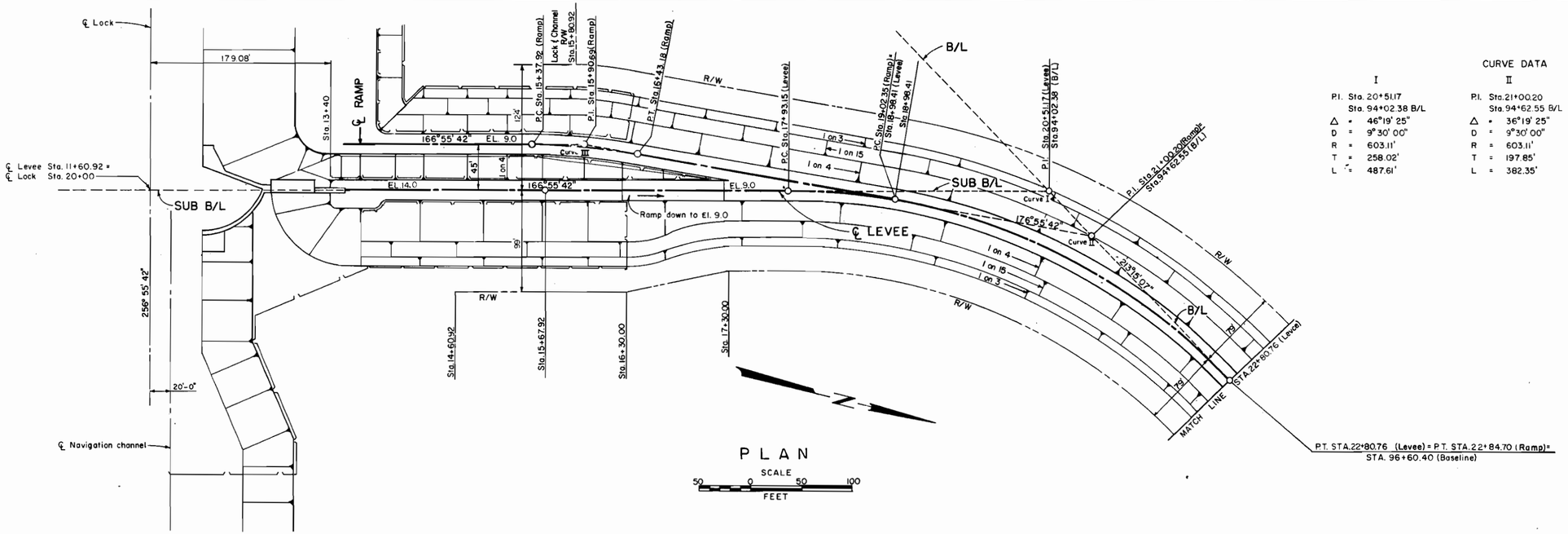
B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA. | STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
PLAN AND PROFILE
Sta. 0+00 to 10+40.92

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 7



CURVE DATA

	I	II	III
P.I.	Sta. 20+51.17 Sta. 94+02.38 B/L	P.I. Sta. 21+00.20 Sta. 94+62.55 B/L	P.I. Sta. 15+90.69
△	= 46°19' 25"	△ = 36°19' 25"	△ = 10°00' 00"
D	= 9°30' 00"	D = 9°30' 00"	D = 9°30' 00"
R	= 603.11'	R = 603.11'	R = 603.11'
T	= 258.02'	T = 197.85'	T = 52.77'
L	= 487.61'	L = 382.35'	L = 105.26'

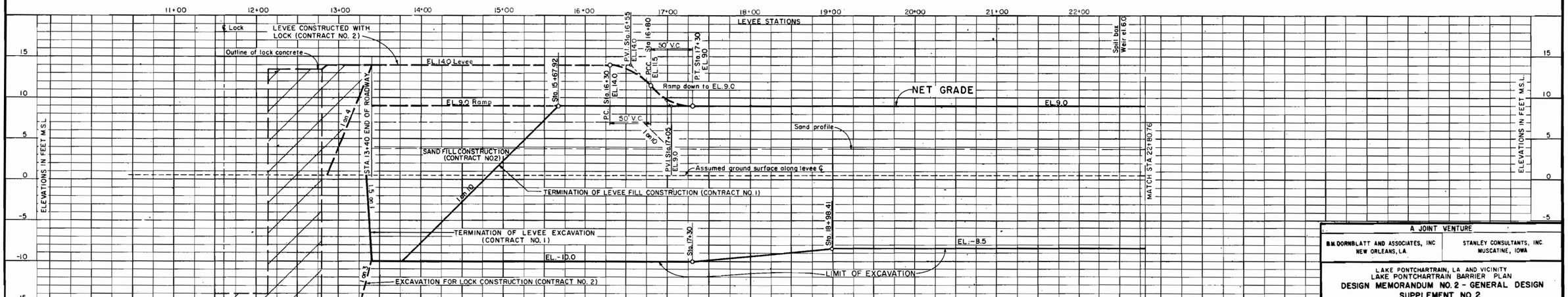
P.T. STA. 22+80.76 (Levee) = P.T. STA. 22+84.70 (Ramp) = STA. 96+60.40 (Baseline)

PLAN

SCALE

50 0 50 100

FEET



PROFILE

A JOINT VENTURE

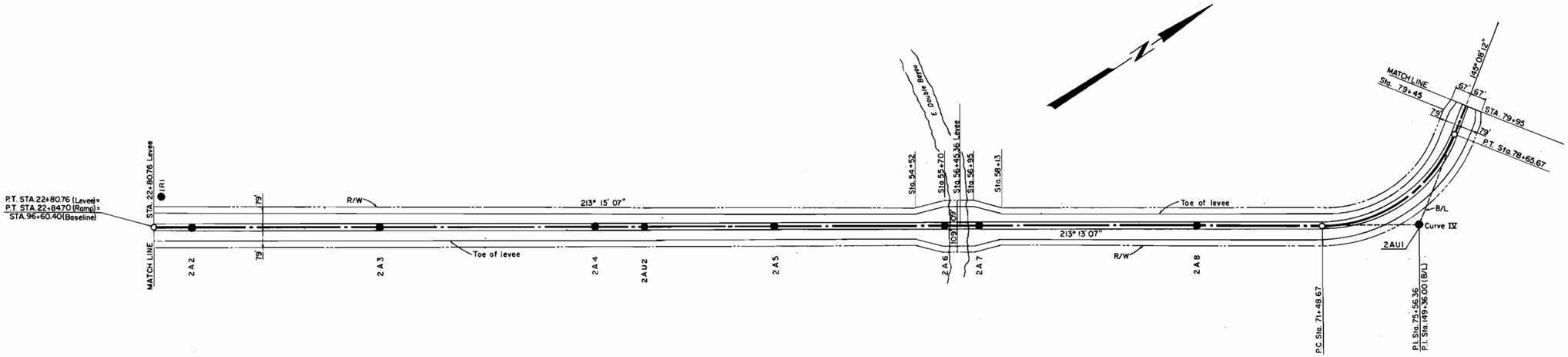
B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
PLAN AND PROFILE
Sta. 13+40 to Sta. 22+80.76

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 8



CURVE DATA
IV
P.I. Sta. 75+56.36
Δ = 68° 06' 55"
D = 9° 30' 00"
R = 603.11'
T = 407.69'
L = 717.00'

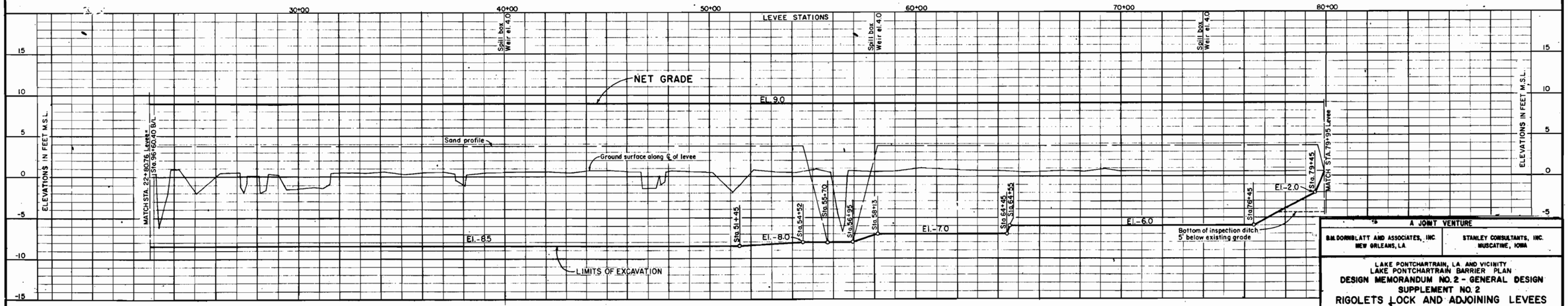
PLAN

SCALE
200 0 200 400 600
FEET

LEGEND

2A6 ● BORING LOCATION

Note: For boring log, see plates 26, 27, 28, and 31



PROFILE

A JOINT VENTURE

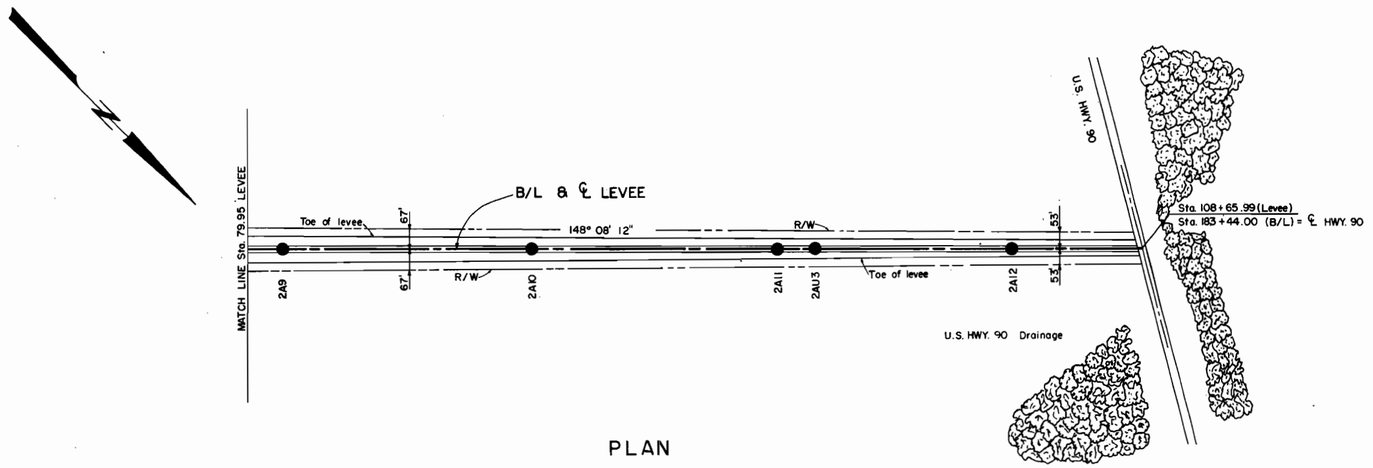
B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
PLAN AND PROFILE
Sta. 22+80.76 to Sta. 79+95

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 9

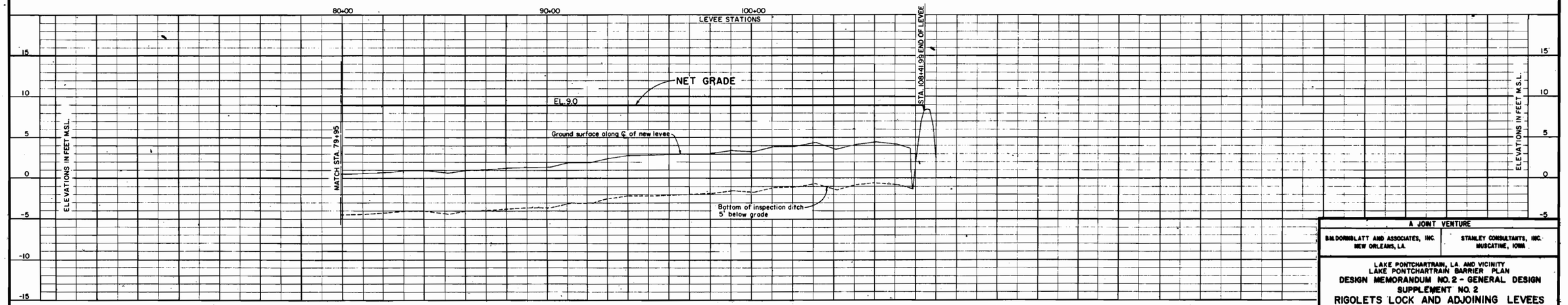


PLAN

LEGEND

2A12 ● BORING LOCATION

NOTE:
For soil data see plates 26,27 & 28.
For soil boring logs see plate 31.

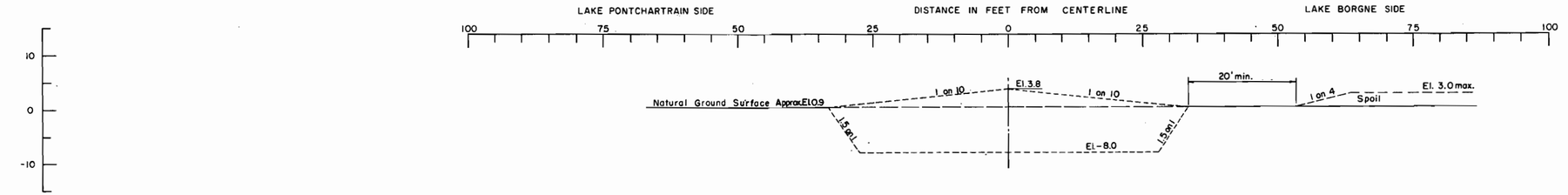


PROFILE

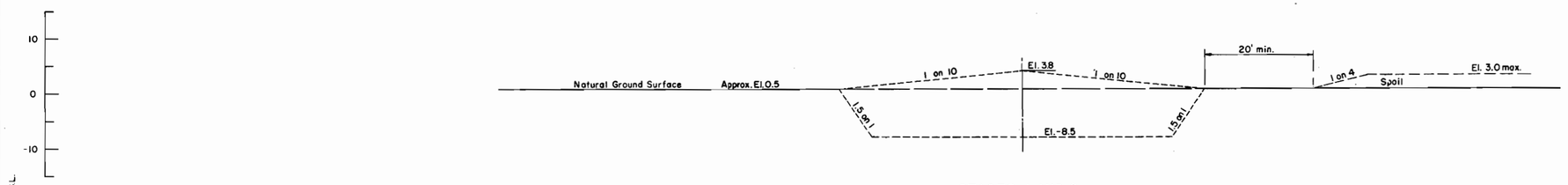
A JOINT VENTURE	
BALDORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
PLAN AND PROFILE
Sta. 79+95 to Sta. 108+65.99
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE: JULY 1969 FILE NO. H-2-24418

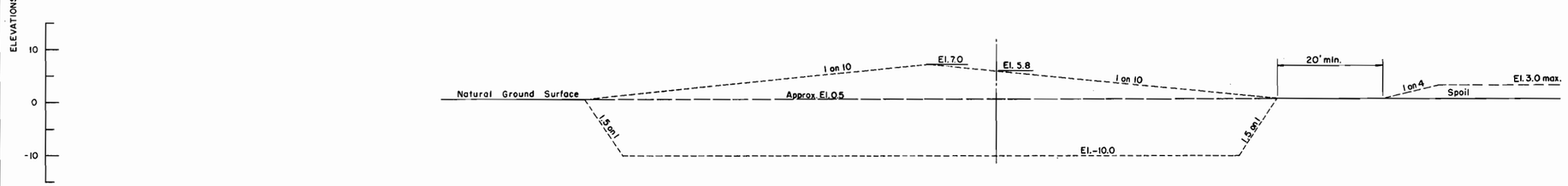
PLATE 10



STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 51+45 to Sta. 54+52

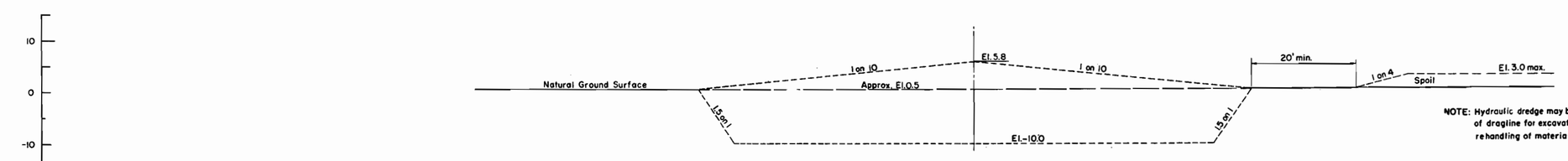


STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 18+98.41 to Sta. 51+45



STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 14+50 to Sta. 15+37.94

ALL ELEVATIONS ARE IN FEET AND REFER TO M.S.L.



NOTE: Hydraulic dredge may be used in lieu of dragline for excavation to avoid rehandling of material.

STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 1+00 to Sta. 8+20

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

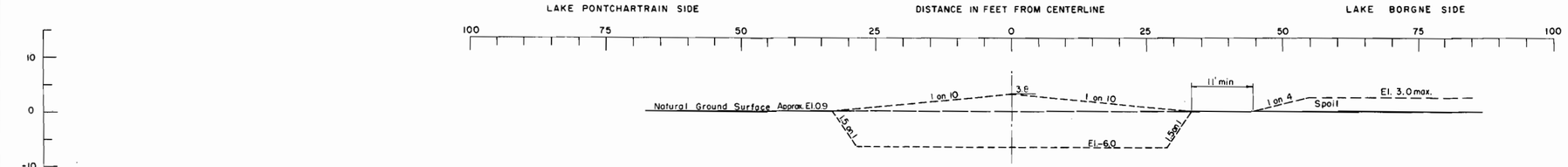
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

BARRIER LEVEE
STAGES OF CONSTRUCTION

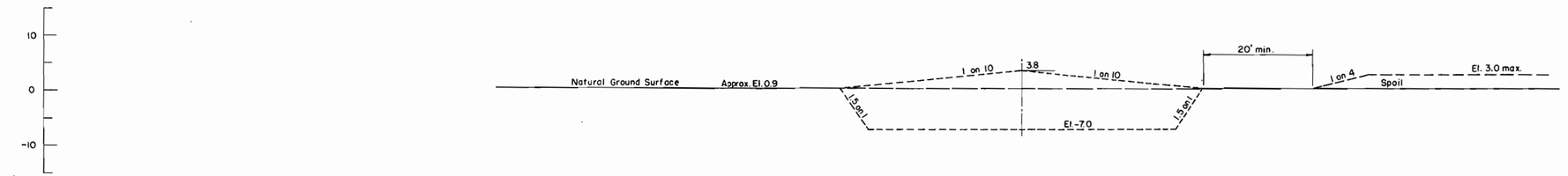
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 11

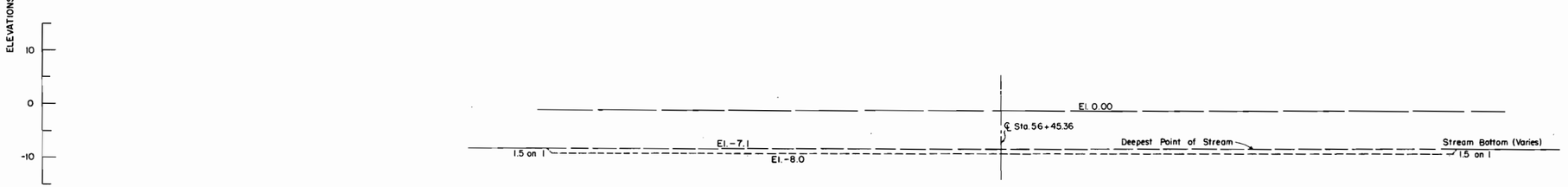


STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 64+55 to Sta. 76+45



STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 58+13 to Sta. 64+45

ELEVATIONS IN FEET M.S.L.



STAGE 1
DRAGLINE EXCAVATION
Sta. 55+70 to Sta. 56+95

ALL ELEVATIONS ARE IN FEET AND REFER TO M.S.L.

NOTE: Hydraulic dredge may be used in lieu of dragline for excavation to avoid rehandling of material.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

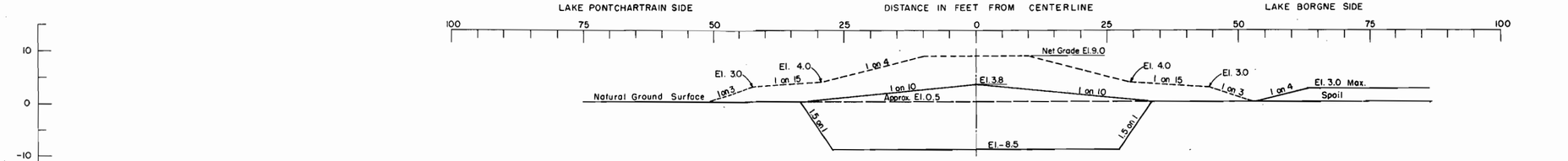
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

BARRIER LEVEE
STAGES OF CONSTRUCTION

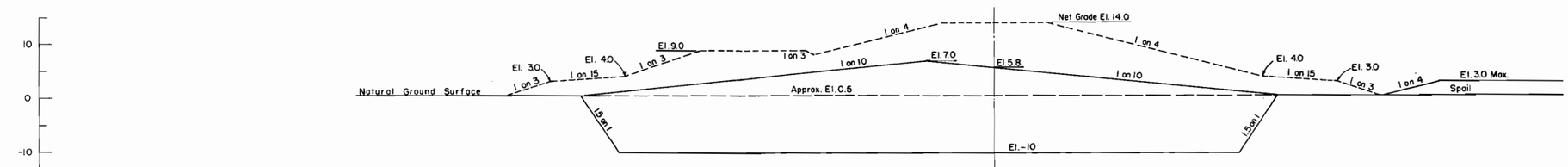
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO. H-2-24415

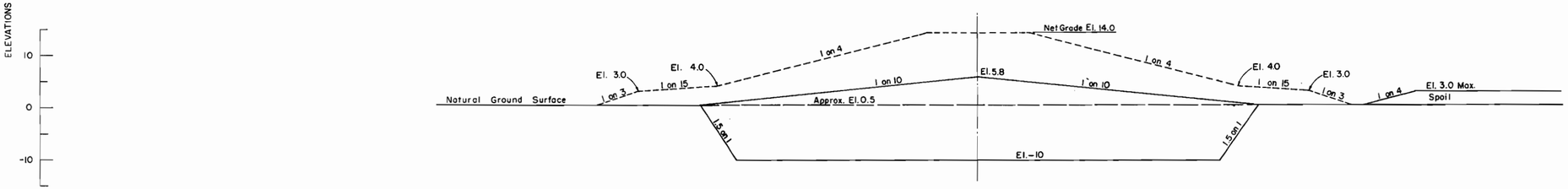
PLATE 12



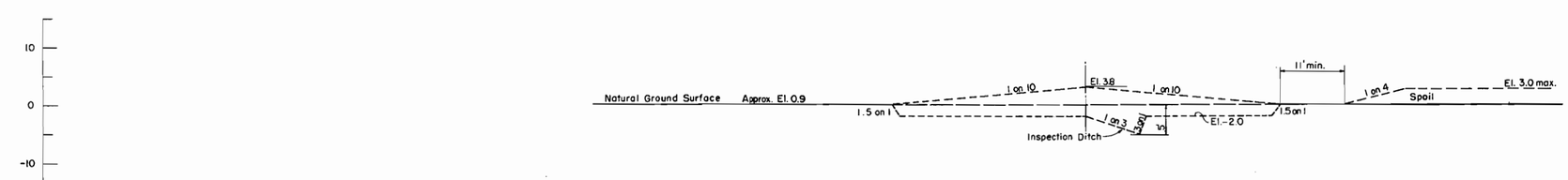
STAGE 3
HAULED CLAY FILL
Sta. 18+98.41 to Sta. 51+45



STAGE 3
HAULED CLAY FILL
Sta. 14 + 50 to Sta. 15+37.94



STAGE 3
HAULED CLAY FILL
Sta. 1+00 to Sta. 8+20



STAGES 1 AND 2
DRAGLINE EXCAVATION AND HYDRAULIC SAND FILL
Sta. 79+45

ALL ELEVATIONS ARE IN FEET AND RERER TO M.S.L.

NOTE: Hydraulic dredge may be used in lieu of dragline for excavation to avoid rehandling of material.

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

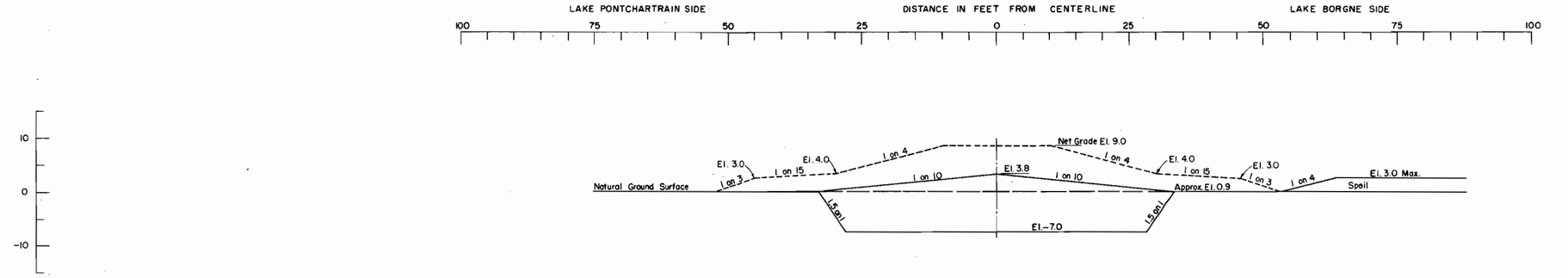
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

BARRIER LEVEE
STAGES OF CONSTRUCTION

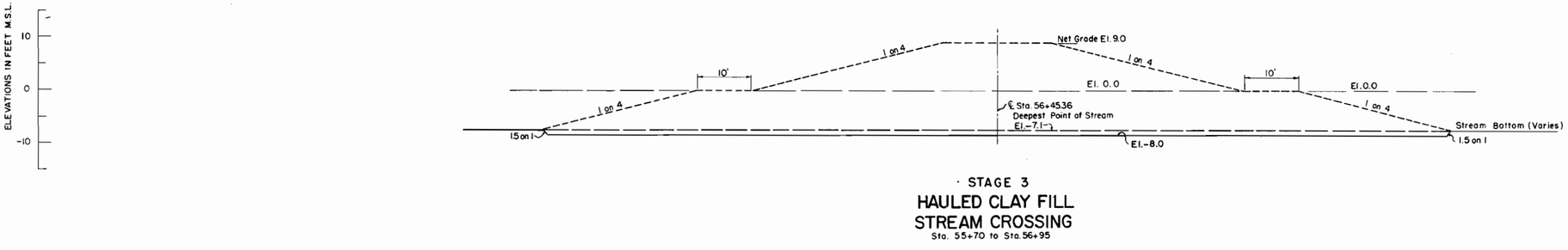
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO H-2-24415

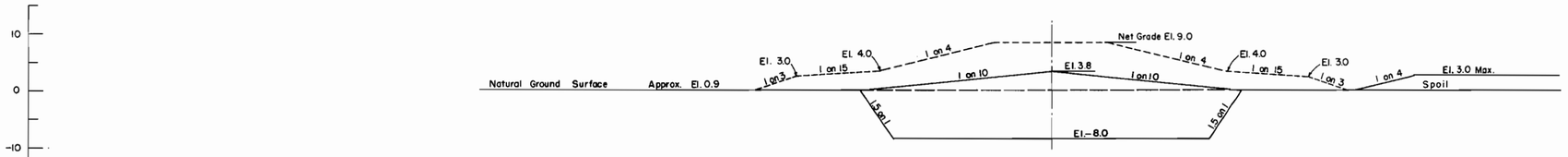
PLATE 13



STAGE 3
HAULED CLAY FILL
Sta. 58+13 to Sta. 64+45



STAGE 3
HAULED CLAY FILL
STREAM CROSSING
Sta. 55+70 to Sta. 56+95



STAGE 3
HAULED CLAY FILL
Sta. 51+45 to Sta. 54+52

ALL ELEVATIONS ARE IN FEET
AND REFER TO M.S.L.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC MUSCATINE, IOWA

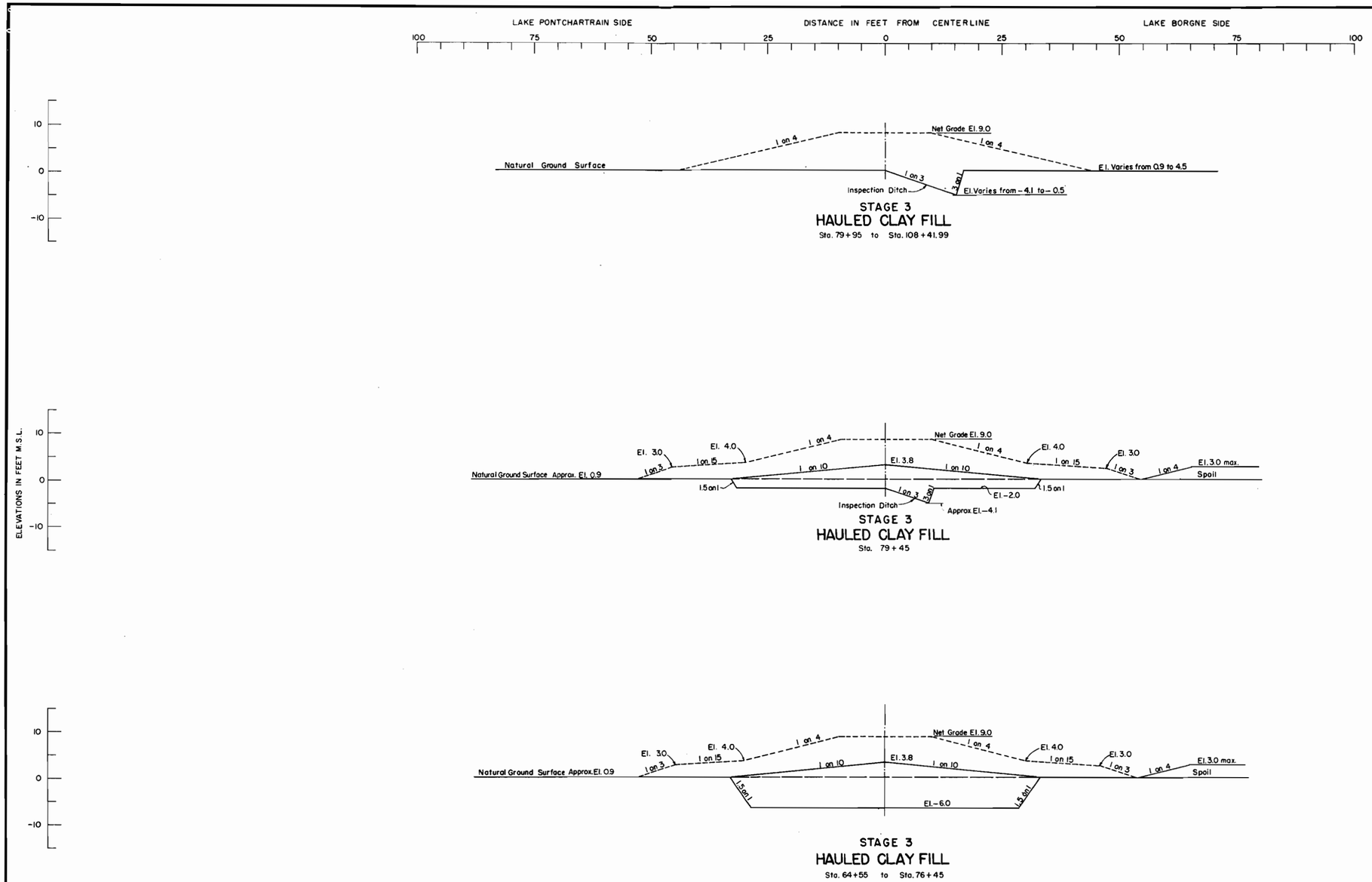
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

BARRIER LEVEE
STAGES OF CONSTRUCTION

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 14



ALL ELEVATIONS ARE IN FEET AND REFER TO M.S.L.

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

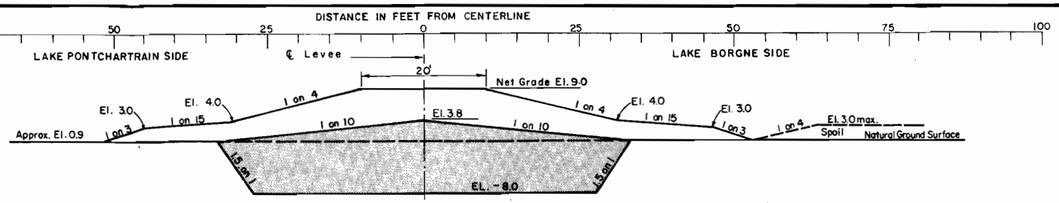
BARRIER LEVEE
STAGES OF CONSTRUCTION

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

DATE: JULY 1969 FILE NO H-2-24415

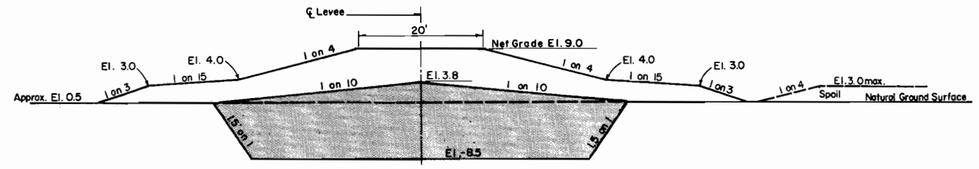
PLATE 15

ELEVATIONS IN FEET M.S.L.



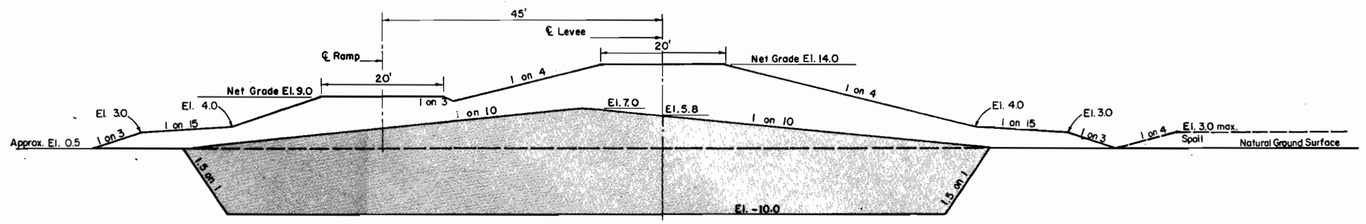
LEVEE SECTION 4

Sta. 51+45 to Sta. 54+52



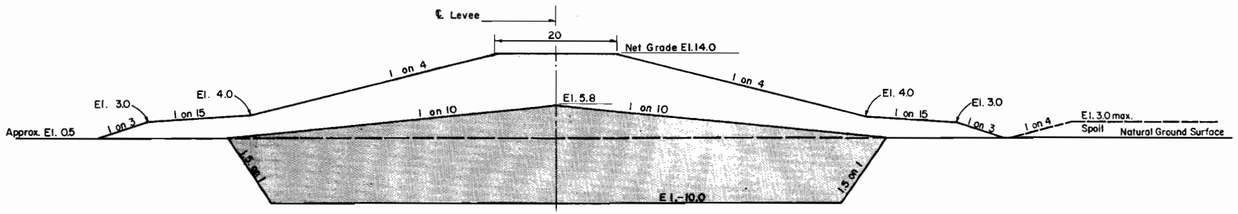
LEVEE SECTION 3

Sta. 18+98.41 to Sta. 51+45



LEVEE SECTION 2

Sta. 14+50 to Sta. 15+37.94



LEVEE SECTION 1

Sta. 1+00 to Sta. 8+20

ALL ELEVATIONS ARE IN FEET
AND REFER TO M. S.L.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
DESIGN SECTIONS
Sta. 1+00 to Sta. 54+52

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

DATE JULY 1969 FILE NO H-2-24415

PLATE 16

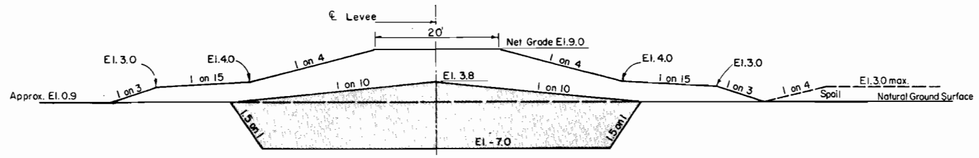
DISTANCE IN FEET FROM CENTERLINE

100 75 50 25 0 25 50 75 100

LAKE PONTCHARTRAIN SIDE — LAKE BORGNE SIDE

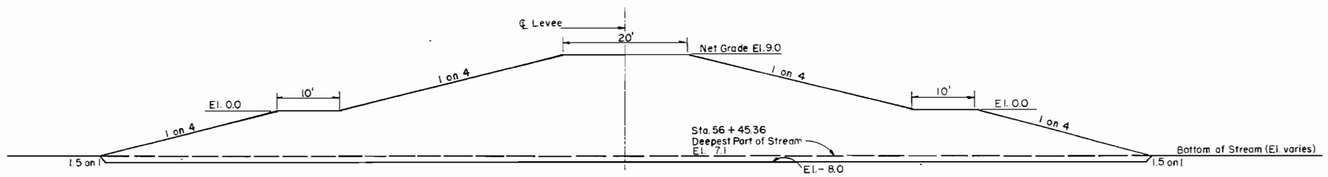
ELEVATIONS IN FEET M.S.L.

10 0 -10



LEVEE SECTION 6

Sta 58+13 to Sta. 64+45



LEVEE SECTION 5
STREAM CROSSING

Sta. 55+70 to Sta. 56+95

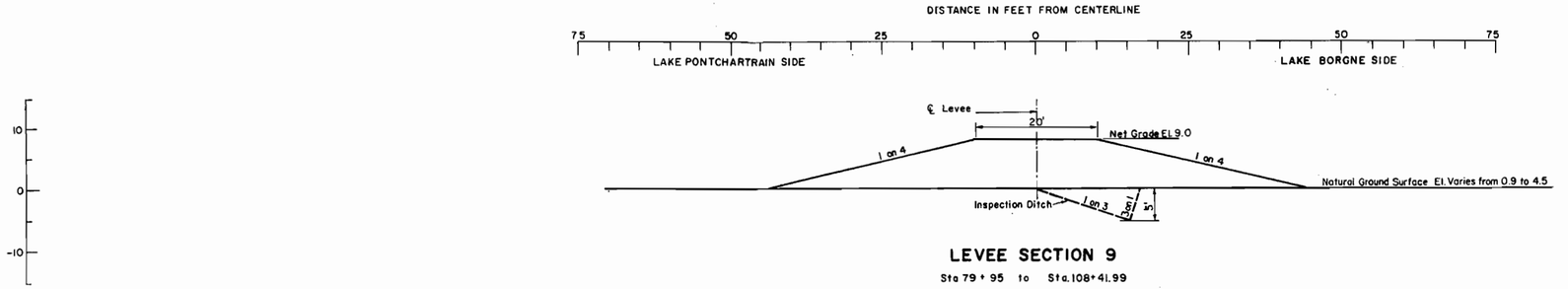
ALL ELEVATIONS ARE IN FEET
AND REFER TO MSL

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
DESIGN SECTIONS
Sta. 55+70 to 64+45
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

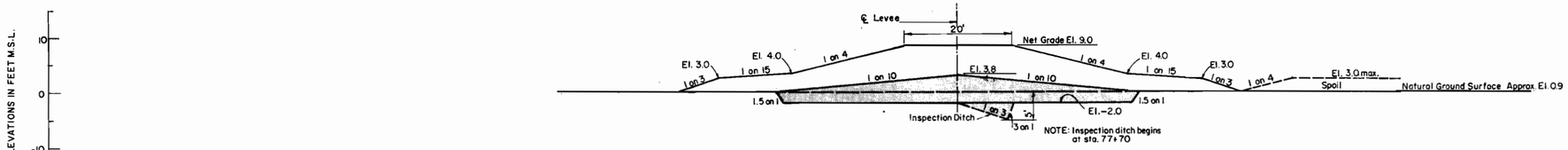
DATE JULY 1969 FILE NO H-2-24415

PLATE 17



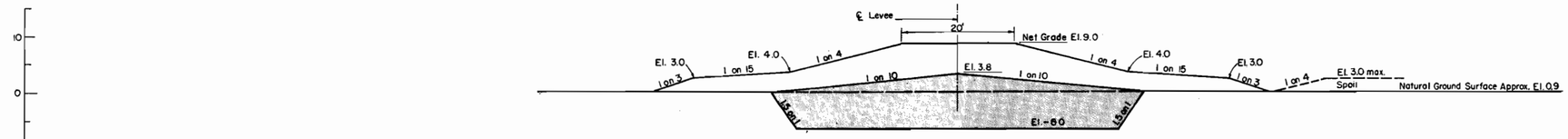
LEVEE SECTION 9

Sta 79 + 95 to Sta. 108+41.99



LEVEE SECTION 8

Sta. 79+45



LEVEE SECTION 7

Sta. 64+55 to Sta. 76+45

ALL ELEVATIONS ARE IN FEET AND REFER TO M.S.L.

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
BARRIER LEVEE
DESIGN SECTIONS
Sta. 64+55 to Sta. 108+41.99

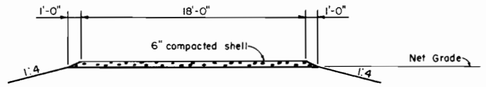
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1965 FILE NO. H-2-24415

PLATE 18

LAKE PONTCHARTRAIN SIDE

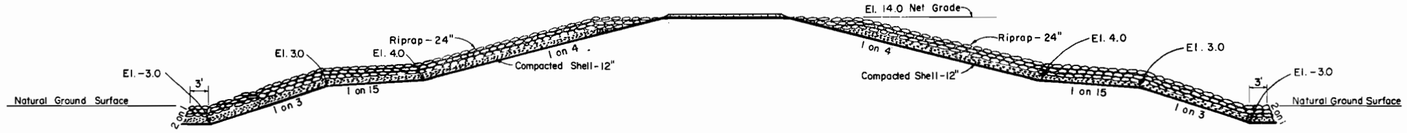
LAKE BORGNE SIDE



SECTION THRU ROADWAY ATOP BARRIER LEVEE

TYPICAL SECTION

9' LEVEE



TYPICAL SECTION

14' LEVEE

EROSION PROTECTION

NOTE:
Riprap is to be Type A with a unit weight of 150 pounds per cubic foot. Base material is to be shell.

ALL ELEVATIONS ARE IN FEET AND REFER TO M.S.L.

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

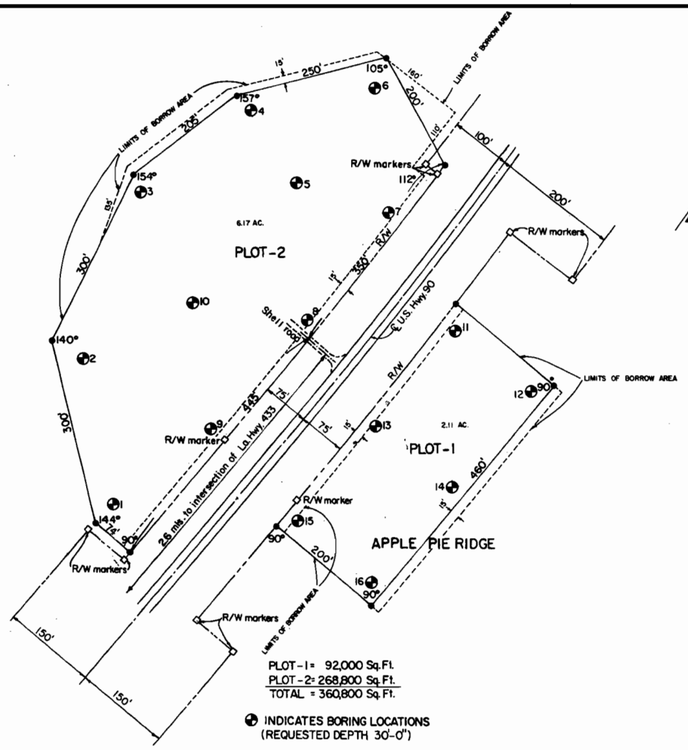
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SLOPE PROTECTION AND ROADWAY DETAILS

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

DATE: JULY 1969 FILE NO. H-2-24415

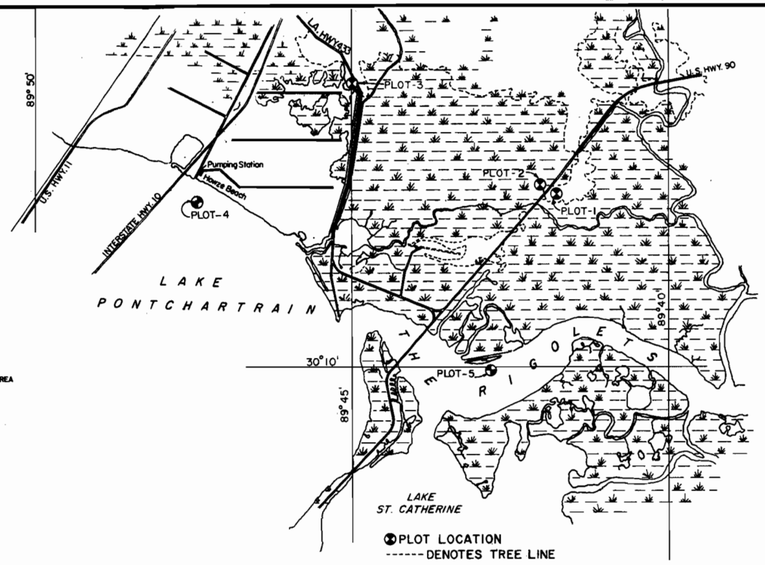
PLATE 19



PLOT-1 = 92,000 Sq.Ft.
PLOT-2 = 268,800 Sq.Ft.
TOTAL = 360,800 Sq.Ft.

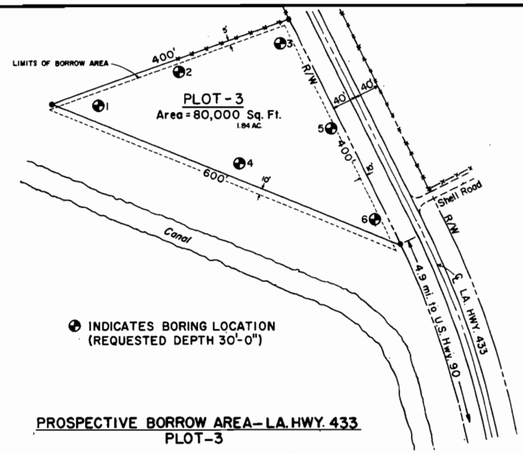
◐ INDICATES BORING LOCATIONS
(REQUESTED DEPTH 30'-0")

PROSPECTIVE BORROW AREA – U.S. HWY. 90
PLOTS 1 AND 2
FOR BORING LOGS SEE PLATES 21 & 22



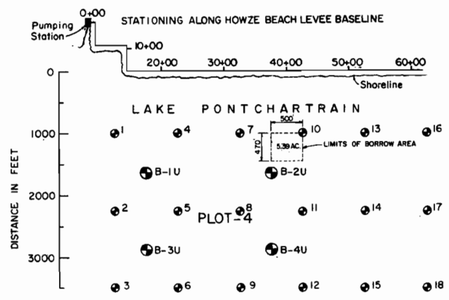
◐ PLOT LOCATION
----- DENOTES TREE LINE

VICINITY MAP



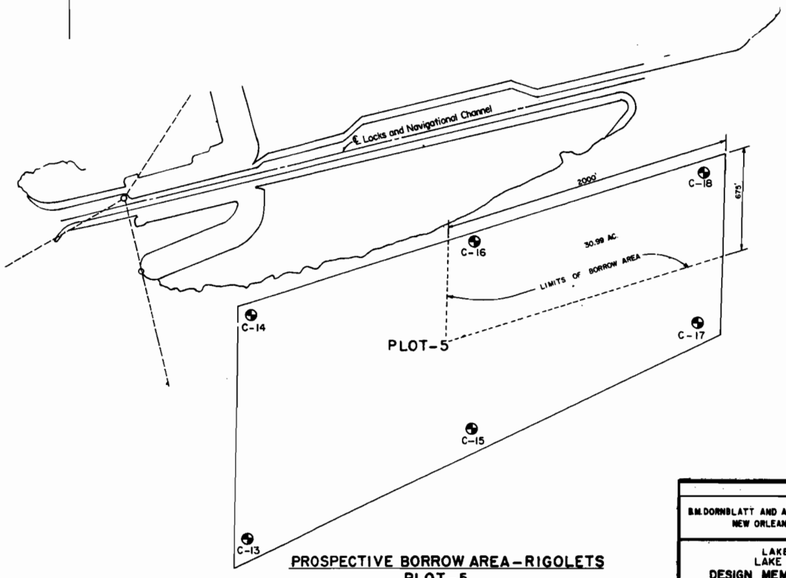
◐ INDICATES BORING LOCATION
(REQUESTED DEPTH 30'-0")

PROSPECTIVE BORROW AREA – LA. HWY. 433
PLOT-3
FOR BORING LOGS SEE PLATES 21 & 22



PROSPECTIVE BORROW AREA
LAKE PONTCHARTRAIN ALONG NORTH SHORE
PLOT-4

◐ INDICATES BORING LOCATIONS
FOR BORING LOGS SEE PLATES 23 & 24



PROSPECTIVE BORROW AREA – RIGOLETS
PLOT-5

◐ INDICATES BORING LOCATIONS
FOR BORING LOGS SEE PLATE 25

A JOINT VENTURE	
B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

BORROW AREA LOCATION

PLOTS 1, 2, 3, 4, & 5
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 20

PLOT 1

BORING NO. 11
85 FT. EAST OF HWY. 90 C/L

17 JAN 69

GROUND EL. 7.09

BORING NO. 12
200 FT. EAST OF HWY 90 C/L

17 JAN 69

GROUND EL. 6.79

BORING NO. 13
85 FT. EAST OF HWY 90 C/L

17 JAN 69

GROUND EL. 6.49

BORING NO. 14
200 FT. EAST OF HWY 90 C/L

21 JAN 69

GROUND EL. 6.49

BORING NO. 15
85 FT. EAST OF HWY 90 C/L

21 JAN 69

GROUND EL. 5.89

BORING NO. 16
200 FT. EAST OF HWY 90 C/L

21 JAN 69

GROUND EL. 4.89

ELEVATIONS IN FEET M.S.L.

PLOT 2

BORING NO. 1
90 FT. WEST OF C/L HWY 90

10 JAN 69

GROUND EL. 5.29

BORING NO. 2
275 FT. WEST OF C/L HWY 90

10 JAN 69

GROUND EL. 3.88

BORING NO. 3
350 FT. WEST OF C/L HWY 90

13 JAN 69

GROUND EL. 3.04

BORING NO. 4
330 FT. WEST OF C/L HWY 90

14 JAN 69

GROUND EL. 2.43

BORING NO. 5
200 FT. WEST OF C/L HWY 90

14 JAN 69

GROUND EL. 5.09

BORING NO. 6
200 FT. WEST OF HWY 90 C/L

15 JAN 69

GROUND EL. 2.03

BORING NO. 7
85 FT. WEST OF C/L HWY 90

15 JAN 69

GROUND EL. 5.49

BORING NO. 8
85 FT. WEST OF HWY 90 C/L

16 JAN 69

GROUND EL. 7.19

BORING NO. 9
85 FT. WEST OF HWY 90 C/L

16 JAN 69

GROUND EL. 6.39

BORING NO. 10
200 FT. WEST OF HWY 90 C/L

16 JAN 69

GROUND EL. 6.59

ELEVATIONS IN FEET M.S.L.

PLOT 3

BORING NO. 1
550 FT. FROM C/L HWY 433
50 FT. NORTH OF CANAL BANK
4.5 FT. BELOW C/L HWY
22 JAN. 1969

GROUND EL.

BORING NO. 2
225 FT. SOUTH OF C/L HWY 433
2.0 FT. BELOW C/L HWY
24 JAN. 1969

GROUND EL.

BORING NO. 3
50 FT. SOUTH OF HWY 433
2.3 FT. BELOW C/L HWY
23 JAN. 1969

GROUND EL.

BORING NO. 4
300 FT. FROM C/L HWY 433
50 FT. NORTH OF CANAL BANK
3.6 FT. BELOW C/L HWY
23 JAN. 1969

GROUND EL.

BORING NO. 5
50 FT. SOUTH OF C/L HWY 433
2.0 FT. BELOW C/L HWY
23 JAN. 1969

GROUND EL.

BORING NO. 6
75 FT. FROM C/L HWY 433
50 FT. NORTH OF CANAL BANK
4.0 FT. BELOW C/L HWY.
24 JAN. 1969

GROUND EL.

FOR LOCATION PLAN SEE PLATE 20

NOTE:
General type boring logs were taken with a 1-7/8 inch I.D. core barrel sampler.
See plate A for soil boring legend.
See plate 20 for location of borings.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING LOGS

BORROW AREA PLOTS 1,2,&3

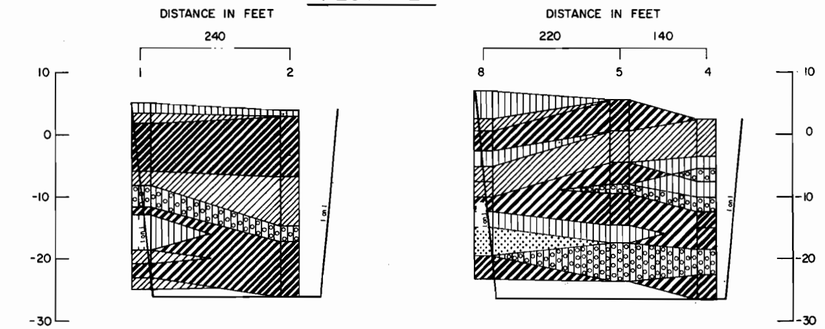
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969

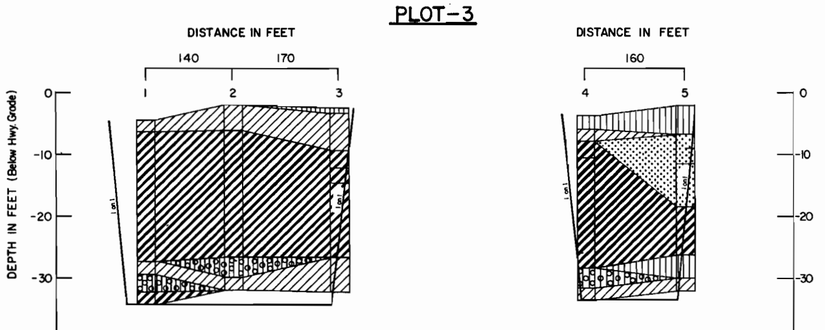
FILE NO. H-2-24415

PLATE 21

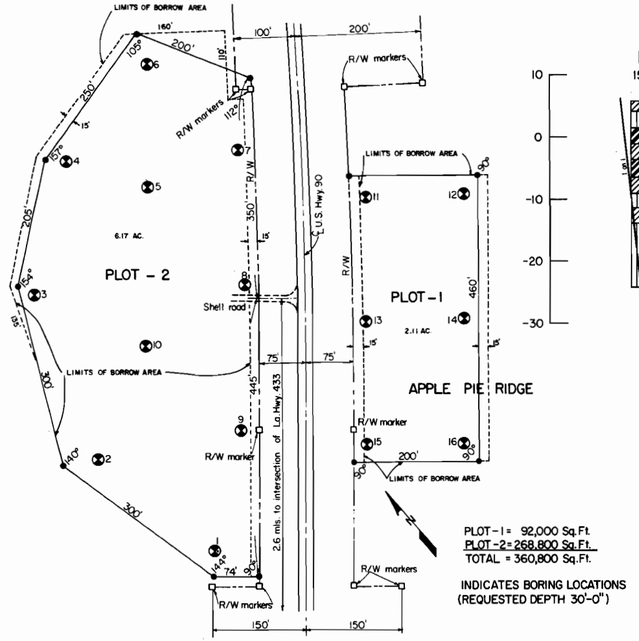
PLOT - 2



PLOT-3

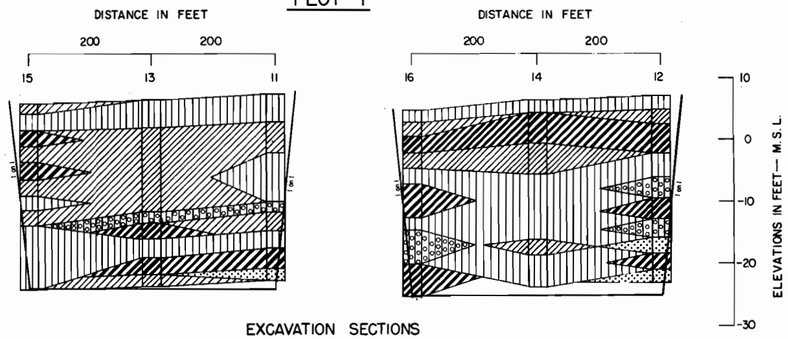


EXCAVATION SECTIONS

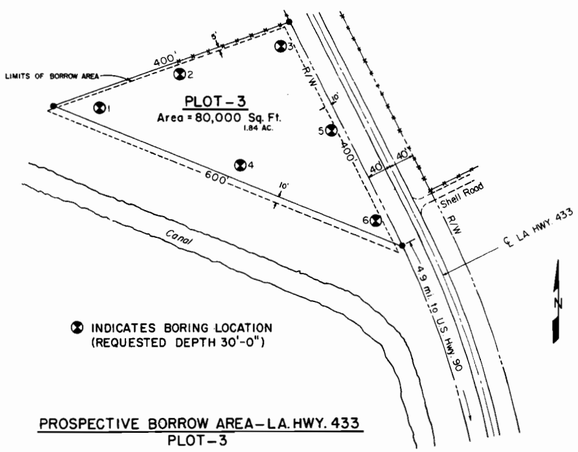


PROSPECTIVE BORROW AREA - U.S. HWY. 90
PLOTS 1 AND 2

PLOT-1



EXCAVATION SECTIONS



INDICATES BORING LOCATION
(REQUESTED DEPTH 30'-0")

PROSPECTIVE BORROW AREA - L.A. HWY. 433
PLOT-3

LEGEND

- CH - Fat clay
- CL - Lean clay
- ML - Silt
- SM - Silty sand
- SP - Fine sand

FOR LOCATION PLAN SEE PLATE 20.
FOR SOIL BORINGS SEE PLATE 21.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC
NEW ORLEANS, LA

STANLEY CONSULTANTS, INC
MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING DATA
BORROW AREAS 1, 2, & 3

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

DATE

FILE NO. H-2-24415

PLATE 22

PLOT NO.4

BORING NO. 1
Sta. 12+67 – 1000' Rt. of B/L

BORING NO. 2
Sta. 12+67 – 2250' Rt. of B/L

BORING NO. 3
Sta. 12+67 – 3500' Rt. of B/L

BORING NO. 4
Sta. 22+67 – 1000' Rt. of B/L

BORING NO. 5
Sta. 22+67 – 2250' Rt. of B/L

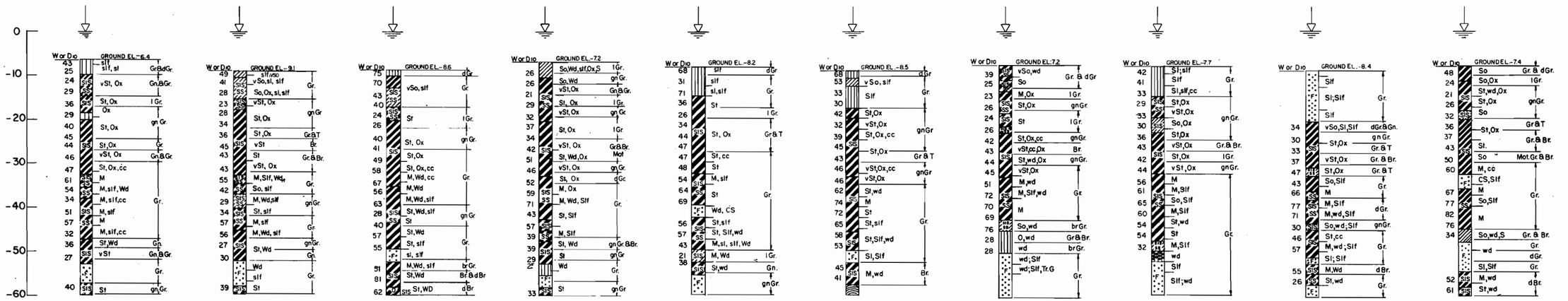
BORING NO. 6
Sta. 22+67 – 3500' Rt. of B/L

BORING NO. 7
Sta. 32+67 – 1000' Rt. of B/L

BORING NO. 8
Sta. 32+67 – 2250' Rt. of B/L

BORING NO. 9
Sta. 32+67 – 3500' Rt. of B/L

BORING NO. 10
Sta. 42+67 – 1000' Rt. of B/L



PLOT NO.4

BORING NO. 11
Sta. 42+67 – 2250' Rt. of B/L

BORING NO. 12
Sta. 42+67 – 3500' Rt. of B/L

BORING NO. 13
Sta. 52+67 – 1000' Rt. of B/L

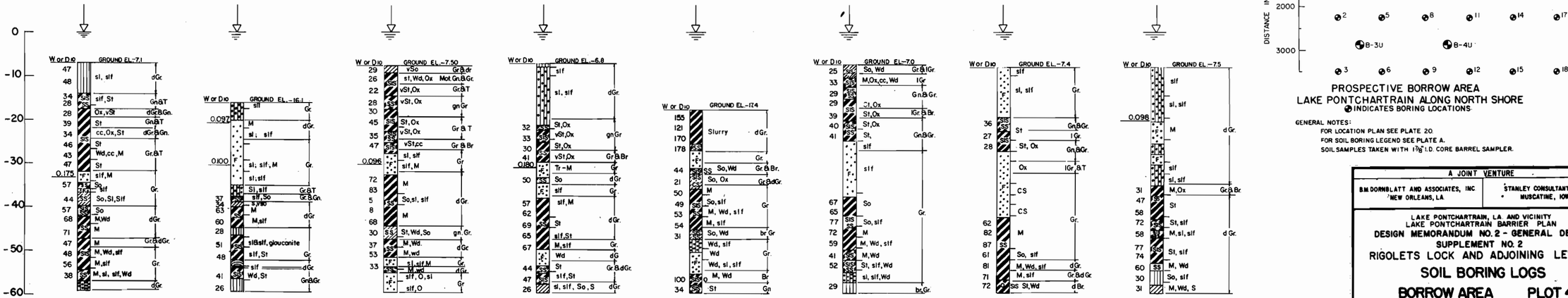
BORING NO. 14
Sta. 52+67 – 2250' Rt. of B/L

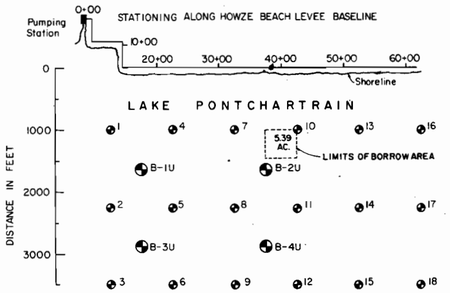
BORING NO. 15
Sta. 52+67 – 3500' Rt. of B/L

BORING NO. 16
Sta. 62+67 – 1000' Rt. of B/L

BORING NO. 17
Sta. 62+67 – 2250' Rt. of B/L

BORING NO. 18
Sta. 62+67 – 3500' Rt. of B/L





PROSPECTIVE BORROW AREA
LAKE PONTCHARTRAIN ALONG NORTH SHORE
INDICATES BORING LOCATIONS

GENERAL NOTES:
FOR LOCATION PLAN SEE PLATE 20
FOR SOIL BORING LEGEND SEE PLATE A.
SOIL SAMPLES TAKEN WITH 1⅞" I.D. CORE BARREL SAMPLER.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC.
NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC.
MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING LOGS

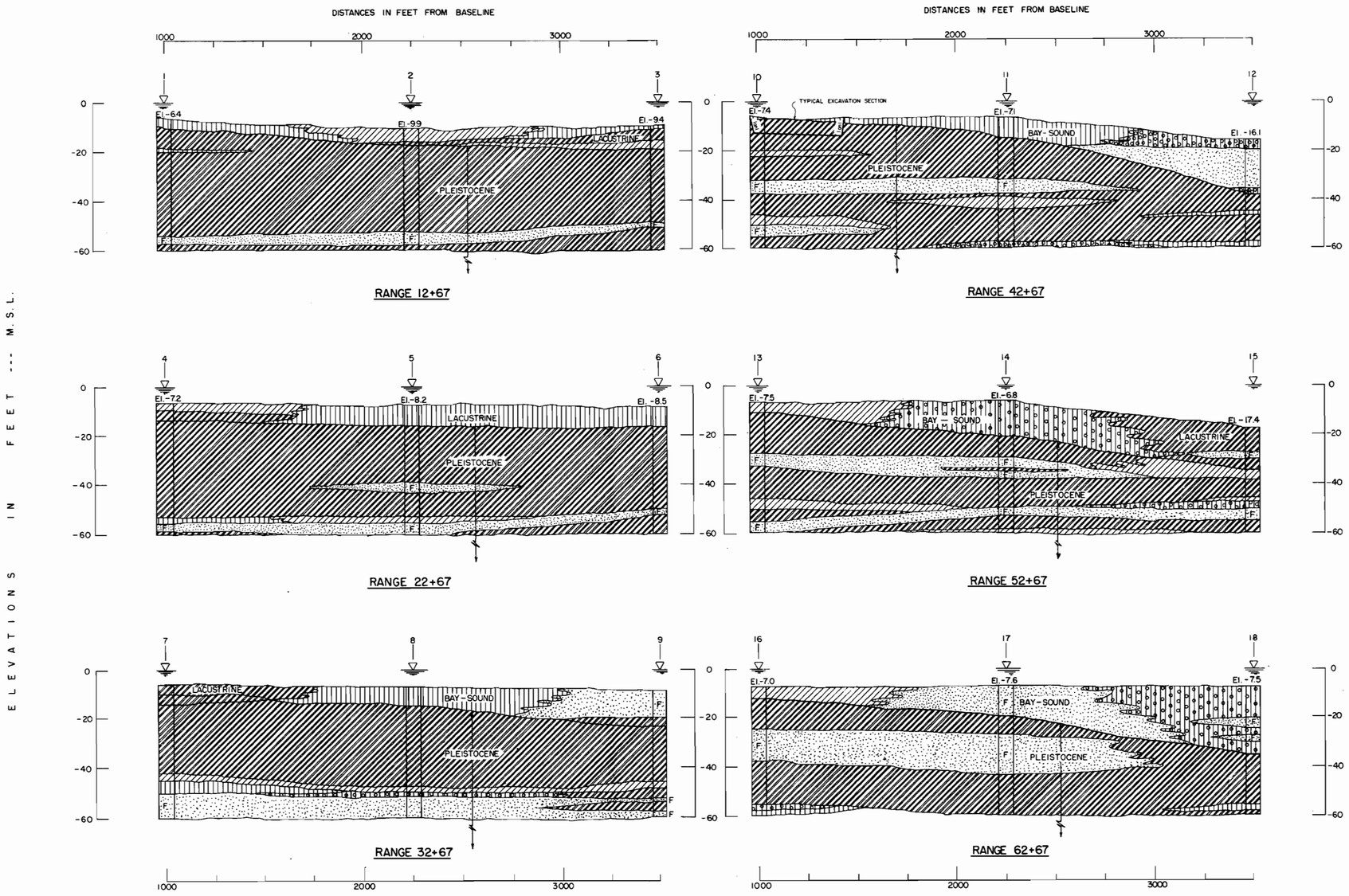
BORROW AREA PLOT 4

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

DATE: JULY 1969

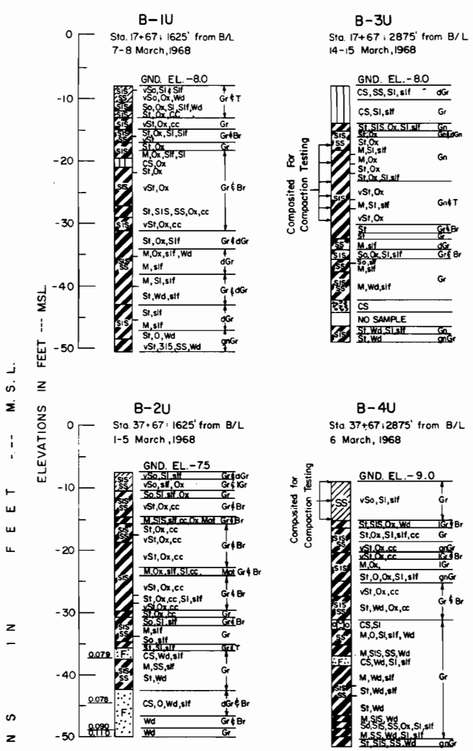
FILE NO. H-2-24415

PLATE 23



SOIL BORING SECTIONS

UNDISTURBED BORING



LEGEND (Soil Boring Sections)

- 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

Soil samples taken with 1 7/8 inch I.D. core barrel.

See PLATE A for soil boring legend.

See PLATE 20 for location of borings.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
SOIL BORING DATA
BORROW AREA PLOT 4

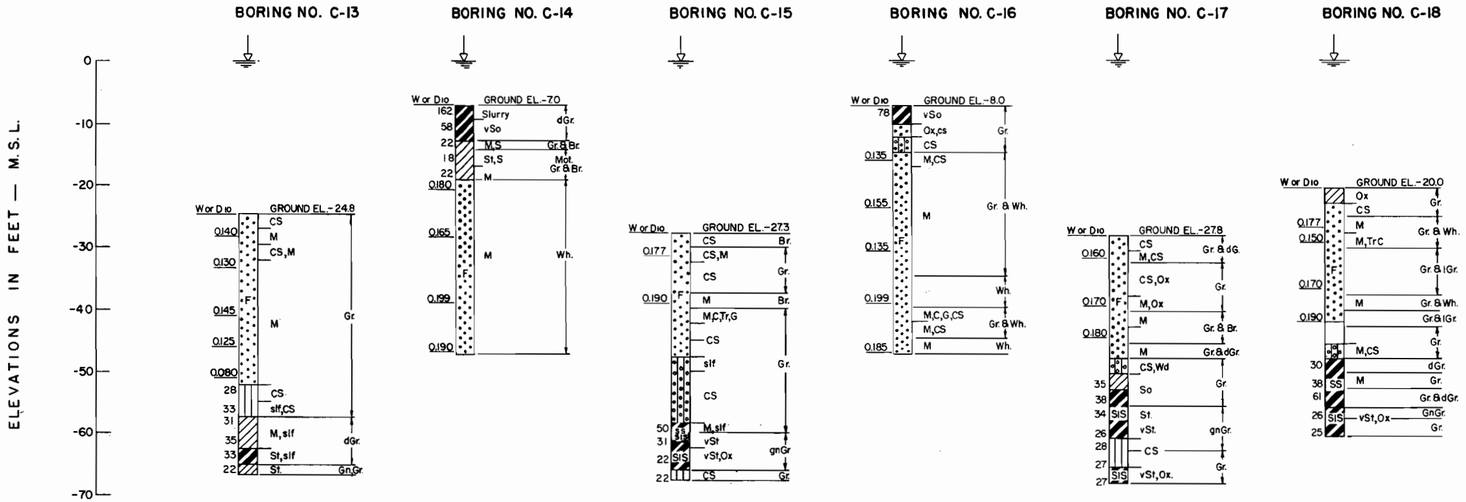
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

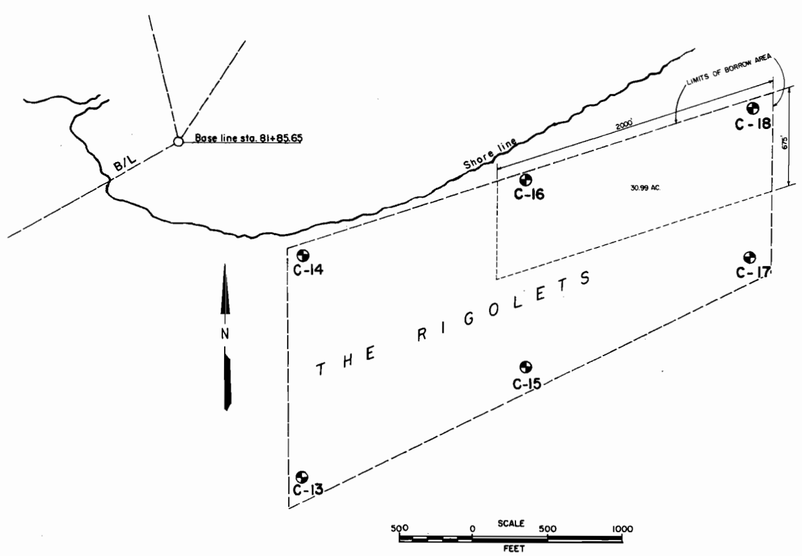
DATE: JULY 1969

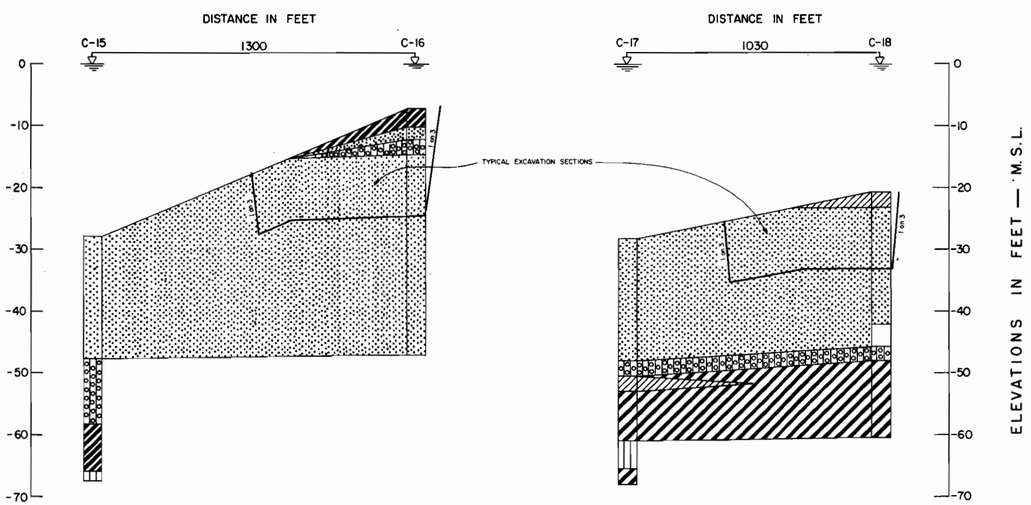
FILE NO. H-2-24415

PLATE 24

PLOT NO. 5







GENERAL NOTES:

FOR LOCATION SEE PLATES 2 AND 20.
FOR LEGEND SEE PLATE A.
Samples were taken with 1 7/8" I.D. Core barrel sampler.

LEGEND

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

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC
NEW ORLEANS, LA

STANLEY CONSULTANTS, INC.
MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING LOGS

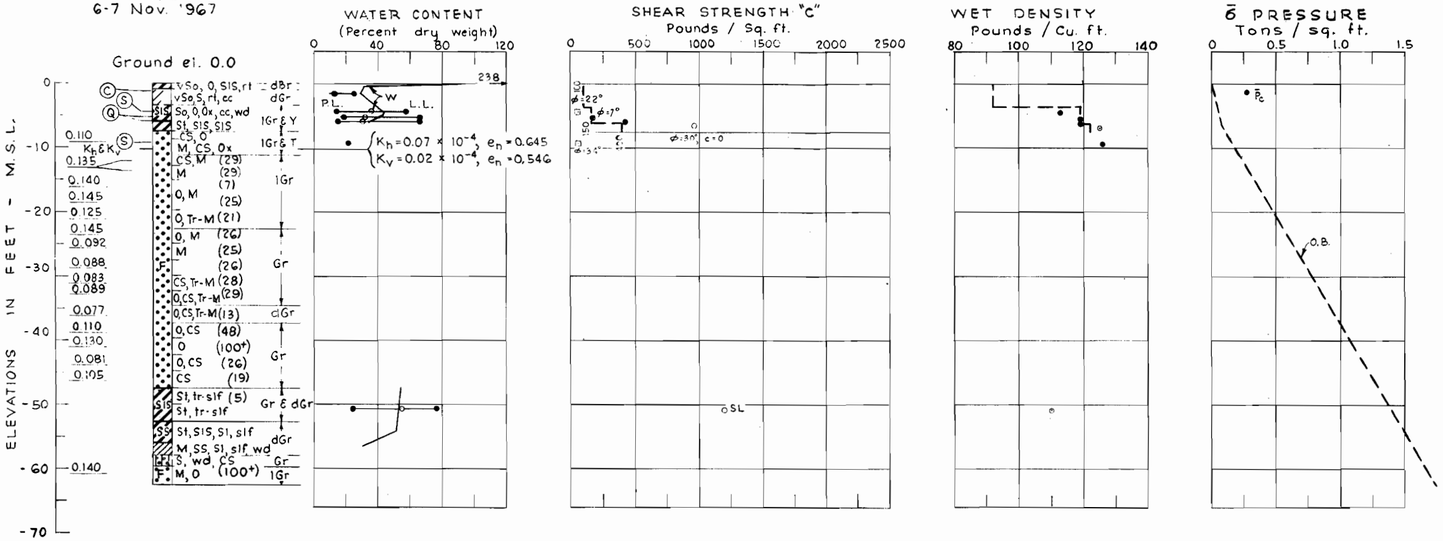
BORROW AREA PLOT 5

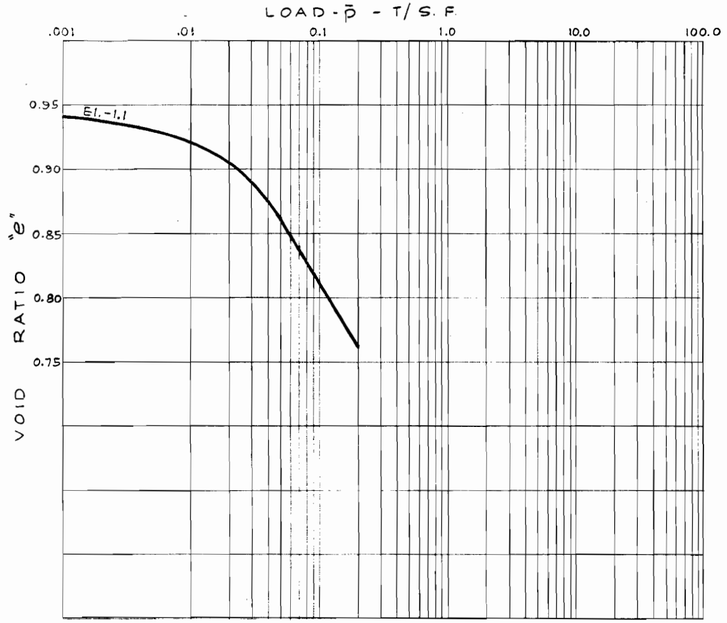
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO. H-2-24415

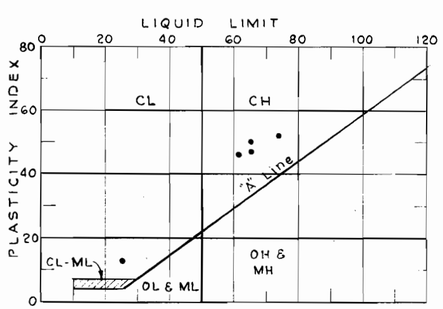
PLATE 25

2 AU 1
Sta. 149 + 36
On B/L
6-7 Nov. '967

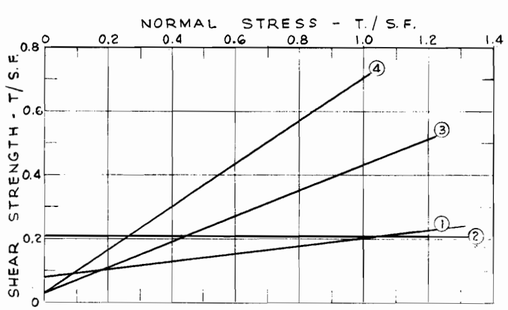




CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH ϕ°	STRENGTH c T.S.F.	CLASS.
1	-5.2	Q	7	0.08	CH
2	-5.9		0	0.21	
3	-4.4	S	22	0.03	CH
4	-9.3		34	0.05	SC

GENERAL NOTES

- UC ⊙ Unconfined compression shear test.
- (Q) ● Unconsolidated undrained triaxial shear test.
- (R) ▲ Consolidated undrained triaxial shear test.
- (S) ■ Consolidated drained direct shear test.
- (C) 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
- $\bar{o}$ Normal stress
- $\bar{P}_c$ Preconsolidation pressure
- e Void ratio
- C_c Compression index
- O.B. Overburden
- K_h Horizontal permeability cm/sec.
- K_v Vertical permeability cm/sec.
- e_n Natural void ratio

NOTE:

Undisturbed borings 2AU1 thru 2AU4 & 3RU were taken with a 5" diameter steel tube piston type sampler.

Where driving resistances are shown, samples were taken with a 1⅜" I.D., 2" O.D., split spoon sampler using a 140 lb. hammer and a 20" drop.

For location of boring see plate 2
For legend of soil types see plate A

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING 2 AU 1 DATA

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

DATE JULY 1968 FILE NO H-2-24415

PLATE 26

2 AU 2

Sta. 117+00 on B/L
Sta. 43+20.36 on Levee ℄
23 Feb. 1968

Ground el. 0.5

vSo, rt dBr
vSo, Wd, rt dGr & Br
vSo dGr & Br
vSo dBr
CS vSo Gr & dGr
M 1Gr
St 1Gr
St, Wd, Ox 1Gr & dGr
St, Wd Gn & Gr
Ox Gr

0.160
0.150
K_h & K_v

PL 160 LL 395
WC 436 LL 185
WC 285
WC 249 LL 158
PL
L.L.
W

$K_h = 208.76 \times 10^{-4}$, $e_n = 0.636$
$K_v = 152.66 \times 10^{-4}$, $e_n = 0.617$

291
376
238
196
270
517
163

SL 200 400
$\phi = 30°$, $c = 0$

O.B.
$\bar{P}_c$

2 AU 3

Sta. 173+05 on B/L
Sta. 98+21.99 on Levee ℄
26-27 Feb. 1968

Ground el. 3.0

So, SlS, Wd, rt 1Gr & Br
vSo, rt, Ox 1Gr & Br
So, rt, Ox Gr & R
St, Ox No sample
St, Wd Gr & T
St, SlS, SS
Wh & T
1Gr

0.135
0.135
K_h & K_v

PL
LL
W

$K_h = 4.53 \times 10^{-4}$, $e_n = 0.626$
$K_v = 3.30 \times 10^{-4}$, $e_n = 0.626$

SL 400 600
$\phi = 30°$, $c = 0$

O.B.

2 AU 4

Sta. 18+05 on Lock ℄
21 Feb. 1968

Ground el. 1.4

vSo, Wd, rt dGr & Br
So, Wd, rt Br
vSo, Wd, rt Gr & Br
CS Gr
CS Gr & Gn
CS Wh

0.165
0.075
0.140
K_h & K_v

PL
PL 82
WC 180 LL 162
WC 206 LL 238
LL
W

$K_h = 5.58 \times 10^{-4}$, $e_n = 0.625$
$K_v = 2.87 \times 10^{-4}$, $e_n = 0.652$

327
187
238
185
260

SL 200 400
$\phi = 30°$, $c = 0$

$\bar{P}_c$
O.B.

WATER CONTENT (Percent dry weight) 0 40 80 120
SHEAR STRENGTH (Pounds / sq. ft.) 0 500 1000 1500 2000
WET DENSITY (Pounds / cu. ft.) 80 100 120
$\bar{\sigma}$ PRESSURE (Tons / sq. ft.) 0 0.5 1.0 1.5 2.0
ELEVATIONS IN FEET - M. S. L. 10 0 -10 -20 -30

For soil boring legend see plate A.
For general notes see plate 2C
For detail shear test data see plates 29 & 30
For location of borings see plate 2

LOAD - $\bar{p}$ - T./S.F. .001 .01 0.1 1.0 10.0 100.0
VOID RATIO "e" 9.0 8.0 7.0 6.0 5.0 4.0 3.0

El. -5.9 (2 AU 2)
El. -4.6 (2 AU 4)
El. -0.5 (2 AU 4)

CONSOLIDATION DATA

NORMAL STRESS - T./S.F. 0 0.1 0.2 0.3 0.4 0.5 0.6
SHEAR STRENGTH - T./S.F. 0.4 0.3 0.2 0.1 0

Boring 2 AU 2
Boring 2 AU 3
Boring 2 AU 4

ENVELOPE NO.	EL.	TYPE	STRENGTH $\phi°$	STRENGTH t.s.f.	CLASS.
1	-2.2	Q	0	0.010	CHO
2	-4.8			0.015	CHO
3	-6.6			0.047	PT
4	-10.3			0.110	CL
5	-12.5			0.380	CL
6	+0.1			0.370	CH
7	-7.2			0.293	CL
8	-1.4			0.035	CHO
9	-3.7			0.068	CHO
10	-7.0			0.040	CH

SHEAR STRENGTH DATA

LIQUID LIMIT 0 20 40 60 80 100 120
PLASTICITY INDEX 80 60 40 20 0

CL
CH
"A" Line
OH & MH
CL-ML
OL & ML

PLASTICITY CHART

A JOINT VENTURE
B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.
STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

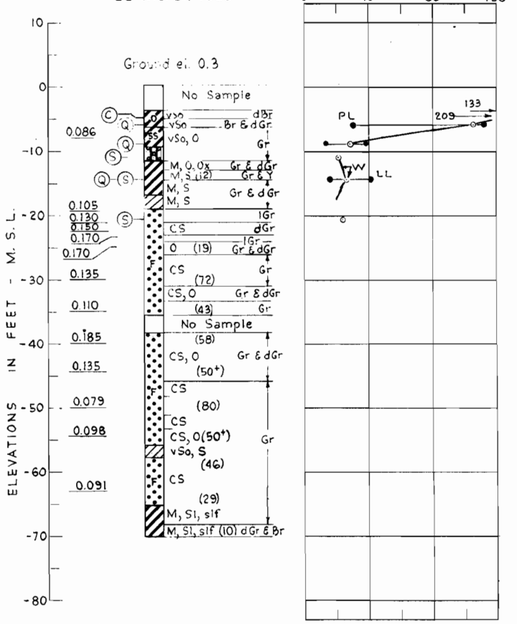
SOIL BORINGS 2 AU 2, 2 AU 3, AND 2 AU 4 DATA

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

DATE: JULY 1969 FILE NO. H-2-24415

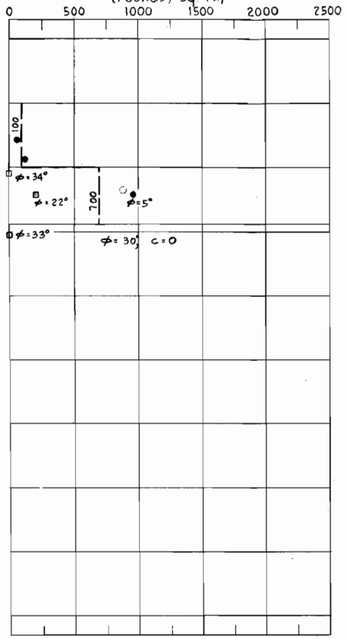
PLATE 27

3 RU
Sta. 81+95
On B/L
22 March 1968

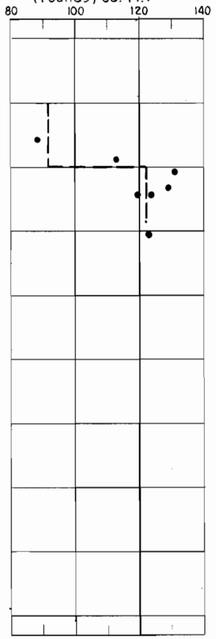


WATER CONTENT
(Percent dry weight)

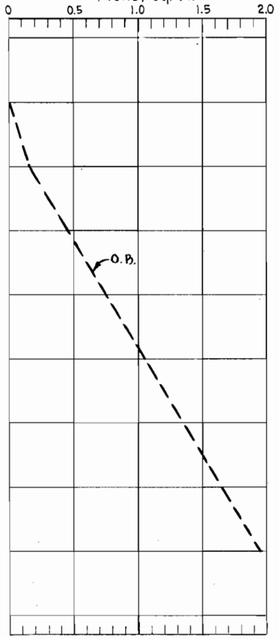
SHEAR STRENGTH "C"
(Pounds / sq. ft)



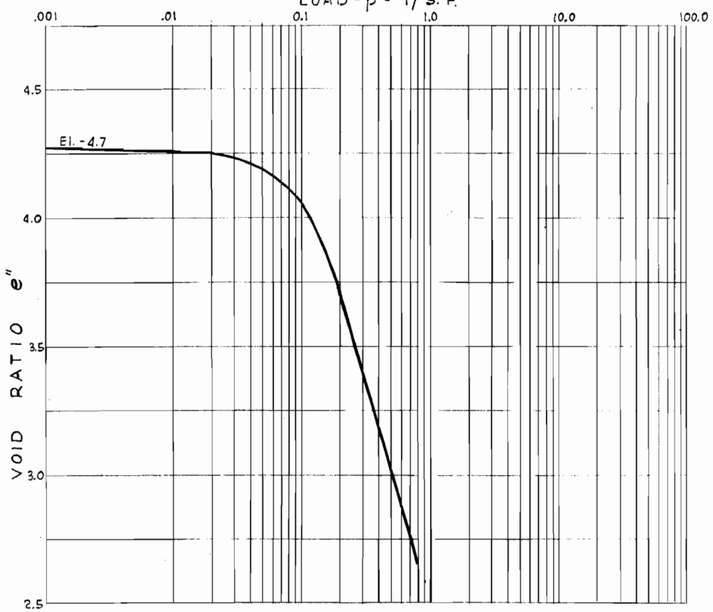
WET DENSITY
(Pounds / cu. ft.)



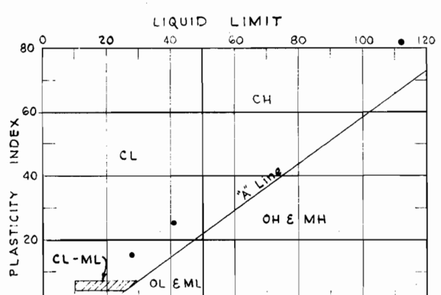
$\bar{\sigma}$ PRESSURE
Tons / sq. ft.



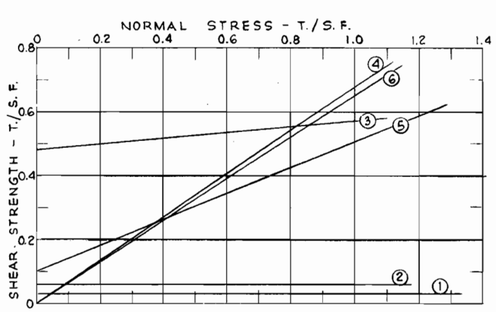
LOAD - $\bar{p}$ - T/S. F.



CONSOLIDATION DATA



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH φ°	STRENGTH t.s.f.	CLASS.
1	- 5.5	Q	0	0.03	CH
2	- 8.5	Q	0	0.06	CL
3	- 13.9	Q	5	0.48	CL
4	- 10.6	S	34	0	SM
5	- 13.9	S	22	0.10	CL
6	- 20.3	S	33	0	SM

For soil boring legend see plate A.
For general notes see plate 26
For detail shear test data see plate 29
For location of boring see plate 2

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING 3 RU DATA

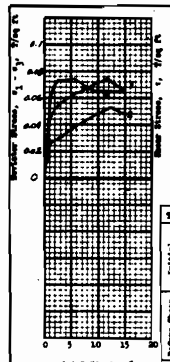
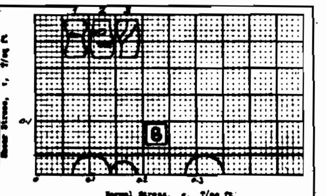
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE: JULY 1969 FILE NO H-2-24415

PLATE 28

DETAIL SHEAR STRENGTH DATA — BORINGS 2 AU4 AND 3 RU

Triaxial Compression Test Report — Ref. 8

Test No.		1	2	3	
Initial — Water content	w_o	182.5 %	133.0 %	125.2 %	%
Initial — Void ratio	e_o	4.31	3.09	3.15	
Initial — Saturation	S_o	104.09 %	105.90 %	97.69 %	%
Initial — Dry density, lb/cu ft	γ_d	28.92	37.54	36.96	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.07	0.14	0.28	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	0.07	0.05	0.07	
Time to failure, min	t_f	6.2	5.0	3.5	
Rate of strain, percent/min		0.72	0.72	0.72	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.	D_o	1.40	1.40	1.40	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 0°; tan ϕ = 0; c = 0.035 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test "Q" | Type of specimen 5" Undisturbed

Classification So (dGr) CH4-ob; dw & rts thru-out

LL 109 | PL 37 | PI 72 | G_s 2.46

Remarks ______

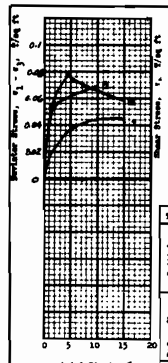
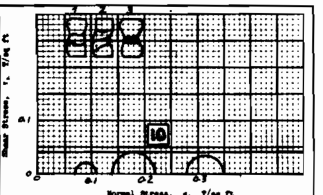
Project Lake Pont. La. & Vicinity 1968 (Additional Borings)
Area Sta. 7+00 on C/L
Boring No. 2-AU4 | Sample No. 1-D
Depth 2.0 / El -1.4 | Date 2 Mar 68

TESTING SECTION NOD

TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Triaxial Compression Test Report — Ref. 10

Test No.		1	2	3	
Initial — Water content	w_o	71.3 %	68.8 %	77.1 %	%
Initial — Void ratio	e_o	1.96	1.99	1.91	
Initial — Saturation	S_o	97.03 %	92.52 %	107.80 %	%
Initial — Dry density, lb/cu ft	γ_d	56.25	55.81	57.26	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.07	0.14	0.28	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	0.04	0.08	0.07	
Time to failure, min	t_f	20.1	6.2	13.0	
Rate of strain, percent/min		0.71	0.68	0.77	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.	D_o	1.40	1.40	1.40	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 0°; tan ϕ = 0; c = 0.04 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test "Q" | Type of specimen 5" Undisturbed

Classification VSo (Gr) CH3; lns & ars ML; org ars; rts

LL 48 | PL 17 | PI 31 | G_s 2.67

Remarks Sample #3 slumped under its own weight. Test stopped after 10% strain.

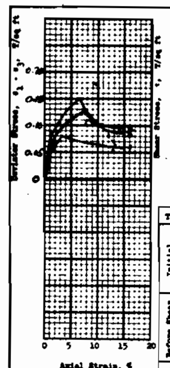
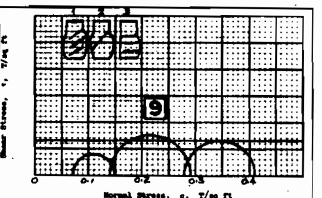
Project Lake Pont. La. & Vicinity 1968
Area Sta. 7+00 on C/L
Boring No. 2-AU4 | Sample No. 3-A
Depth [illegible] / El -7.0 | Date 2 Mar 68

TESTING SECTION

JER — TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Triaxial Compression Test Report — Ref. 9

Test No.		1	2	3	
Initial — Water content	w_o	141.4 %	2404	229.8 %	%
Initial — Void ratio	e_o	2.56	5.90	5.46	
Initial — Saturation	S_o	100.0 %	98.9 %	98.30 %	%
Initial — Dry density, lb/cu ft	γ_d	40.96	21.16	22.59	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.07	0.14	0.28	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	0.08	0.16	0.13	
Time to failure, min	t_f	4.4	9.8	10.9	
Rate of strain, percent/min		0.72	0.67	0.68	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$				
Initial diameter, in.	D_o	1.40	1.40	1.40	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 0°; tan ϕ = 0; c = 0.068 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test "Q" | Type of specimen 5" Undisturbed

Classification vSo (Br) CH4-ob; lns ML; dw; pcs wd thru-out; rt

LL 238 | PL 82 | PI 156 | G_s 2.34

Remarks ______

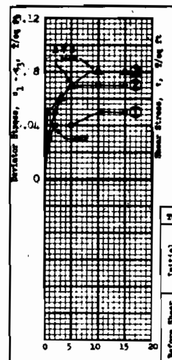
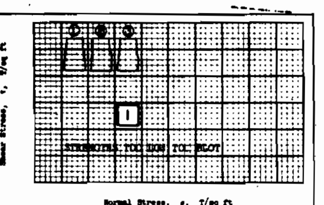
Project Lake Pont. La. & Vicinity 1968 (Additional Borings)
Area Sta. 7+00 on C/L Tentative Lock & Channel
Boring No. 2-AU4 | Sample No. 2-B
Depth [illegible] / El -3.? | Date

TESTING SECTION NOD

JZR — TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Triaxial Compression Test Report — Ref. 1

Test No.		1	2	3	
Initial — Water content	w_o	106.9 %	105.0 %	101.8 %	%
Initial — Void ratio	e_o	2.88	2.81	2.77	
Initial — Saturation	S_o	99.4 %	97.8 %	96.9 %	%
Initial — Dry density, lb/cu ft	γ_d	42.8	42.9	43.4	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	0.04	0.07	0.08	
Time to failure, min	t_f	2	11	11	
Rate of strain, percent/min		0.88	0.94	0.94	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$	0.04	0.07	0.08	
Initial diameter, in.	D_o	1.39	1.38	1.38	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 0°; tan ϕ = 0; c = 0.03 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification CLAY (CH), grey, w/organic matter and silt

LL 112 | PL 30 | PI 82 | G_s 2.68

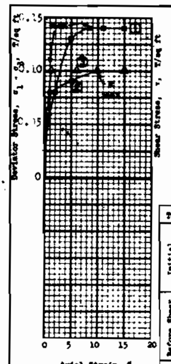
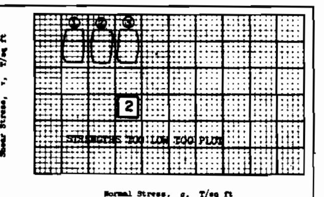
Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 2-C
Depth 5.8 | Date 12 JUNE 1967

RA — TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Triaxial Compression Test Report — Ref. 2

Test No.		1	2	3	
Initial — Water content	w_o	40.3 %	37.8 %	36.2 %	%
Initial — Void ratio	e_o	1.08	1.06	1.01	
Initial — Saturation	S_o	100 %	95.6 %	96.0 %	%
Initial — Dry density, lb/cu ft	γ_d	80.4	81.3	83.2	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	0.14	0.10	0.10	
Time to failure, min	t_f	19	26	4	
Rate of strain, percent/min		0.44	0.38	0.33	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$	0.14	0.10	0.10	
Initial diameter, in.	D_o	1.39	1.39	1.39	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 0°; tan ϕ = 0; c = 0.06 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification SILTY CLAY (CL), gray, w/fine sand

LL 28 | PL 13 | PI 15 | G_s 2.68

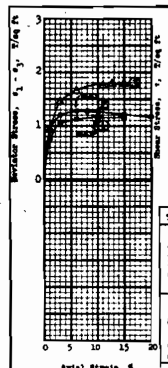
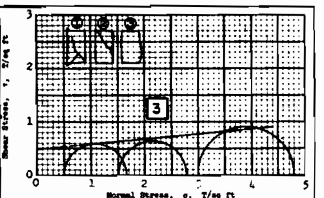
Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 3-B1
Depth 8.8 | Date 12 JUNE 1967

RA — TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Triaxial Compression Test Report — Ref. 3

Test No.		1	2	3	
Initial — Water content	w_o	26.8 %	28.2 %	23.6 %	%
Initial — Void ratio	e_o	0.751	0.777	0.653	
Initial — Saturation	S_o	95.3 %	96.9 %	96.5 %	%
Initial — Dry density, lb/cu ft	γ_d	95.2	93.8	100.8	
Before Shear — Water content	w_c	%	%	%	%
Before Shear — Void ratio	e_c				
Before Shear — Saturation	S_c	%	%	%	%
Before Shear — Final back pressure, T/sq ft	u_o				
Final — Water content	w_f	%	%	%	%
Final — Void ratio	e_f				
Minor principal stress, T/sq ft	σ_3	0.5	1.5	3.0	
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	1.16	1.28	1.79	
Time to failure, min	t_f	19	9	13	
Rate of strain, percent/min		0.53	0.68	0.94	
Ult deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{ult}$	1.16	1.28	1.79	
Initial diameter, in.	D_o	1.39	1.39	1.41	
Initial height, in.	H_o	3.00	3.00	3.00	

Axial Strain, %

Shear Strength Parameters: ϕ = 5°; tan ϕ = 0.088; c = 0.48 T/sq ft

Method of saturation ______

[ ] Controlled stress
[X] Controlled strain

Type of test Q | Type of specimen UNDISTURBED

Classification SANDY CLAY (CL), gray

LL 41 | PL 16 | PI 25 | G_s 2.67

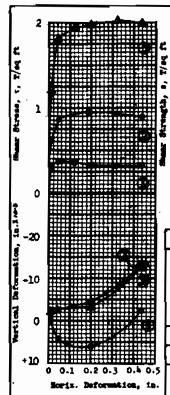
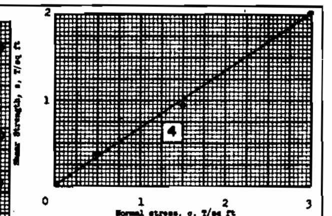
Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 4-C
Depth 14.2 | Date 13 JUNE 1967

RA — TRIAXIAL COMPRESSION TEST REPORT

ENG FORM 1 JUN 65 2089 (EM 1110-2-1902) PREVIOUS EDITIONS ARE OBSOLETE — TRANSLUCENT

Direct Shear Test Report — Ref. 4

Test No.		1	2	3	
Initial — Water content	w_o	21.1 %	20.4 %	20.7 %	%
Initial — Void ratio	e_o	0.515	0.546	0.516	
Initial — Saturation	S_o	100+ %	99.0 %	100+ %	%
Initial — Dry density, lb/cu ft	γ_d	109.2	107.0	109.1	
Void ratio after consolidation	e_c				
Time for 50 percent consolidation, min	t_{50}	<1	<1	<1	
Final — Water content	w_f	18.9 %	18.6 %	17.9 %	%
Final — Void ratio	e_f				
Final — Saturation	S_f	%	%	%	%
Normal stress, T/sq ft	σ	0.5	1.5	3.0	
Maximum shear stress, T/sq ft	τ_{max}	0.37	0.94	2.02	
Actual time to failure, min	t_f	360	1230	2040	
Rate of strain, in./min		.00012	.00015	.00016	
Ultimate shear stress, T/sq ft	τ_{ult}	0.32	0.89	1.98	

Horiz. Deformation, in.

Shear Strength Parameters: ϕ' = 34°; tan ϕ' = 0.674; c' = 0 T/sq ft

[ ] Controlled stress
[X] Controlled strain

Type of specimen UNDISTURBED | 3.01 in. square | 0.465 in. thick

Classification SILTY SAND (SM), gray

LL - | PL - | PI - | G_s 2.65

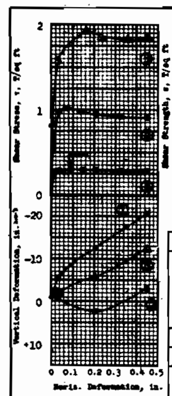
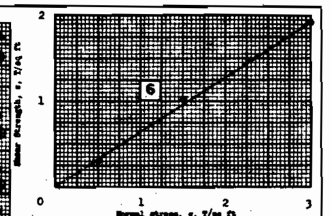
Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 3-D
Depth 10.9 | Date 5 June 1967

GDA — DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 66 2092 PREVIOUS EDITIONS ARE OBSOLETE — PLATE IX-3

Direct Shear Test Report — Ref. 6

Test No.		1	2	3	
Initial — Water content	w_o	24.4 %	24.0 %	24.5 %	%
Initial — Void ratio	e_o	0.709	0.651	0.651	
Initial — Saturation	S_o	91.2 %	97.7 %	99.7 %	%
Initial — Dry density, lb/cu ft	γ_d	96.8	100.2	100.2	
Void ratio after consolidation	e_c				
Time for 50 percent consolidation, min	t_{50}	<1	<1	<1	
Final — Water content	w_f	24.2 %	22.8 %	23.4 %	%
Final — Void ratio	e_f				
Final — Saturation	S_f	%	%	%	%
Normal stress, T/sq ft	σ	0.5	1.5	3.0	
Maximum shear stress, T/sq ft	τ_{max}	0.30	1.02	1.92	
Actual time to failure, min	t_f	660	540	1080	
Rate of strain, in./min		.00014	.00013	.00015	
Ultimate shear stress, T/sq ft	τ_{ult}	0.28	0.91	1.82	

Horiz. Deformation, in.

Shear Strength Parameters: ϕ' = 33°; tan ϕ' = 0.649; c' = 0 T/sq ft

[ ] Controlled stress
[X] Controlled strain

Type of specimen UNDISTURBED | 3.01 in. square | 0.465 in. thick

Classification SILTY SAND (SM), gray

LL - | PL - | PI - | G_s 2.65

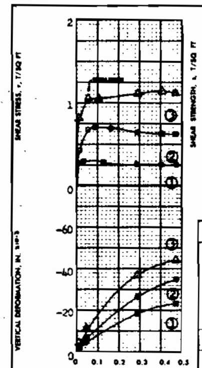
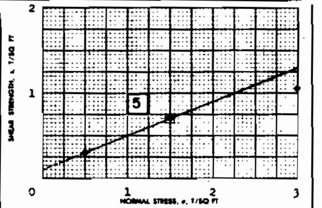
Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 7-B
Depth 20.6 | Date 5 June 1967

GDA — DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 66 2092 PREVIOUS EDITIONS ARE OBSOLETE — PLATE IX-3

Direct Shear Test Report — Ref. 5

Test No.		1	2	3	
Initial — Water content	w_o	27.2 %	27.1 %	25.5 %	%
Initial — Void ratio	e_o	0.708	0.711	0.682	
Initial — Saturation	S_o	100 %	100 %	99.8 %	%
Initial — Dry density, lb/cu ft	γ_d	97.6	97.4	99.1	
Void ratio after consolidation	e_c				
Time for 50 percent consolidation, min	t_{50}	1	3	2	
Final — Water content	w_f	27.4 %	25.1 %	23.6 %	%
Final — Void ratio	e_f				
Final — Saturation	S_f	%	%	%	%
Normal stress, T/sq ft	σ	0.5	1.5	3.0	
Maximum shear stress, T/sq ft	τ_{max}	0.30	0.70	1.05	
Actual time to failure, min	t_f	270	540	360	
Rate of strain, in./min		.00014	.00016	.00015	
Ultimate shear stress, T/sq ft	τ_{ult}	0.25	0.62	1.05	

Horiz. Deformation, in.

Shear Strength Parameters: ϕ' = 22°; tan ϕ' = 0.404; c' = 0.10 T/sq ft

[ ] Controlled stress
[X] Controlled strain

Type of specimen UNDISTURBED | 3.01 in. square | 0.465 in. thick

Classification SANDY CLAY (CL), gray, homogeneous

LL 41 | PL 16 | PI 25 | G_s 2.67

Remarks ______

Project LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION
Area RIGOLETS COMPLEX
Boring No. 3-RU | Sample No. 4-C
Depth 14.2 | Date 2 June 1967

GDA — DIRECT SHEAR TEST REPORT

ENG FORM 1 JUN 66 2092 (EM 1110-2-1906) PREVIOUS EDITIONS ARE OBSOLETE (TRANSLUCENT) — PLATE IX-3

NOTE:
[1] Indicates reference number shown under shear data on Plates
(Q) - Unconsolidated - undrained triaxial compression test.
(S) - Consolidated - drained direct shear test.

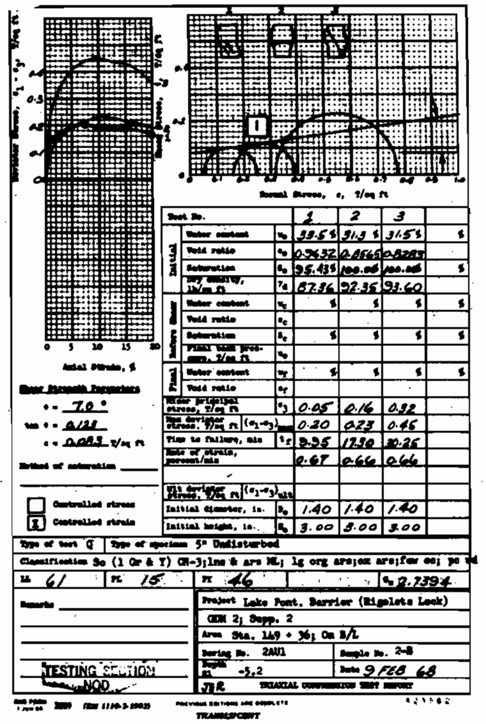
A JOINT VENTURE

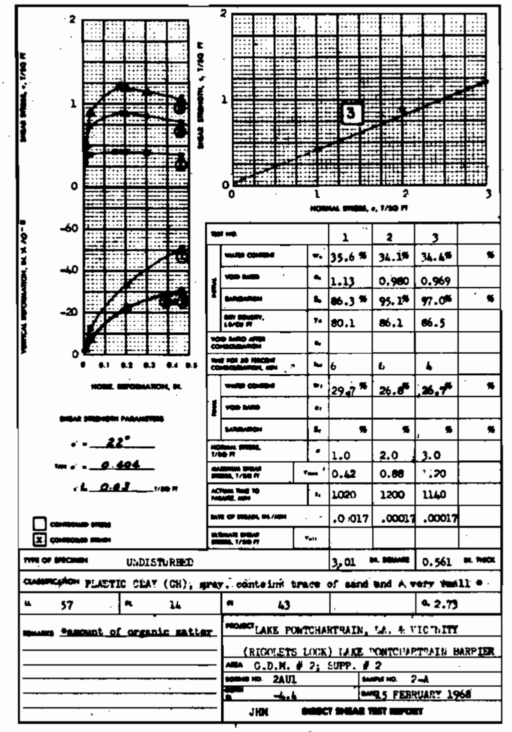
EUSTIS ENGINEERING... / B.M. DORNBLATT AND ASSOCIATES, INC — NEW ORLEANS, LA | STANLEY CONSULTANTS, INC. — MUSCATINE, IOWA

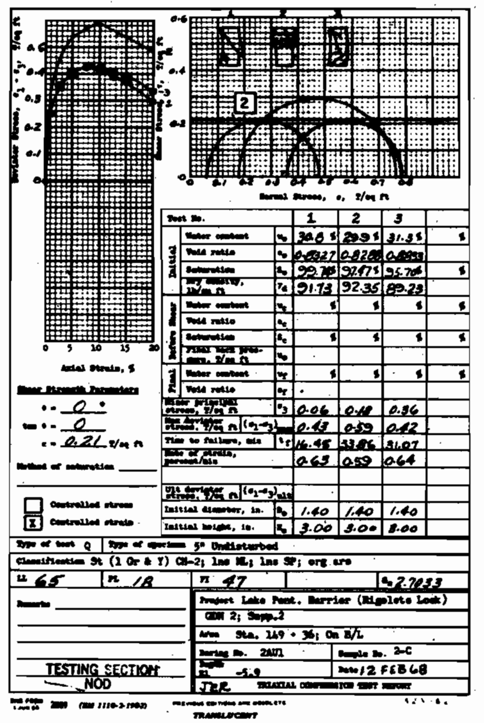
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
DETAIL SHEAR STRENGTH DATA
BORINGS 2 AU4 AND 3 RU

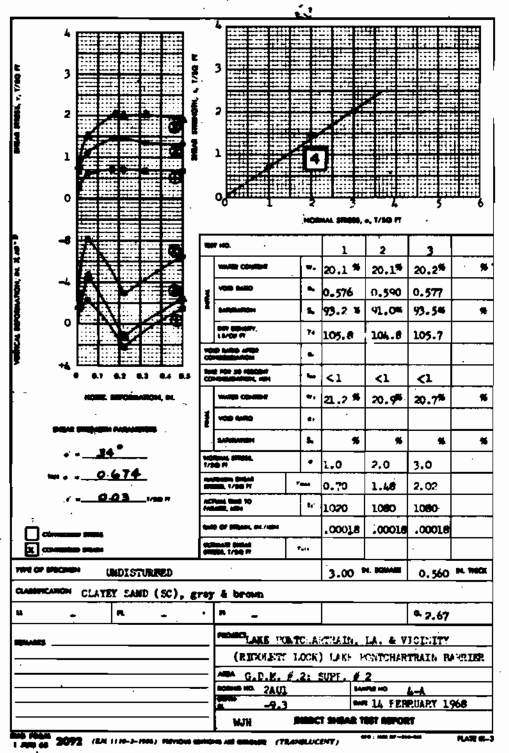
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

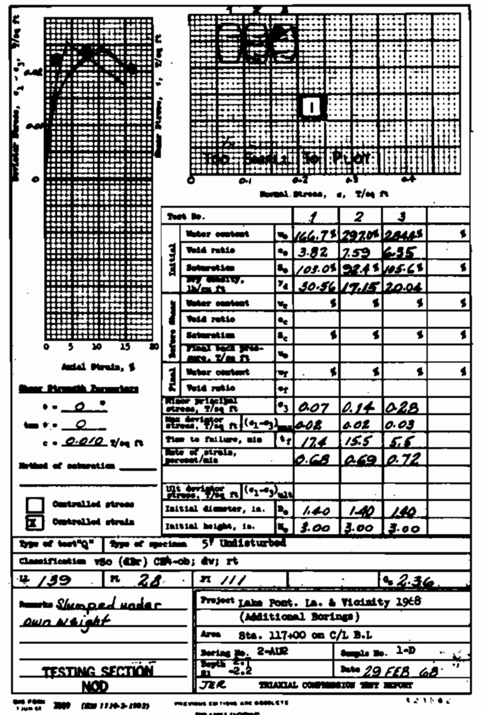
DATE JULY 1969 | FILE NO H-2-24415

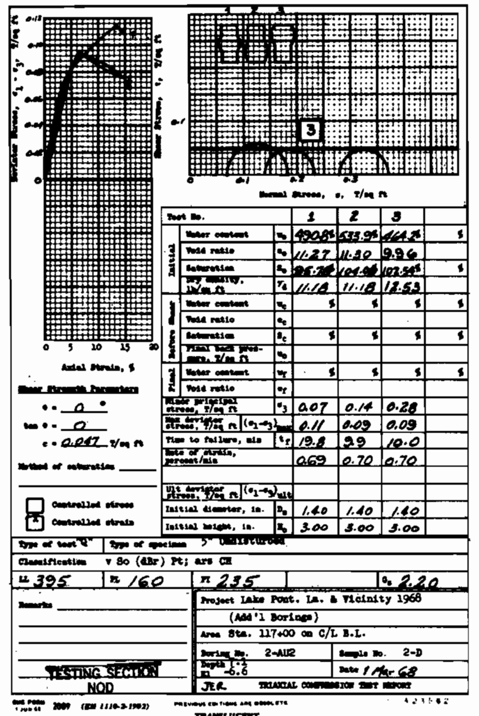


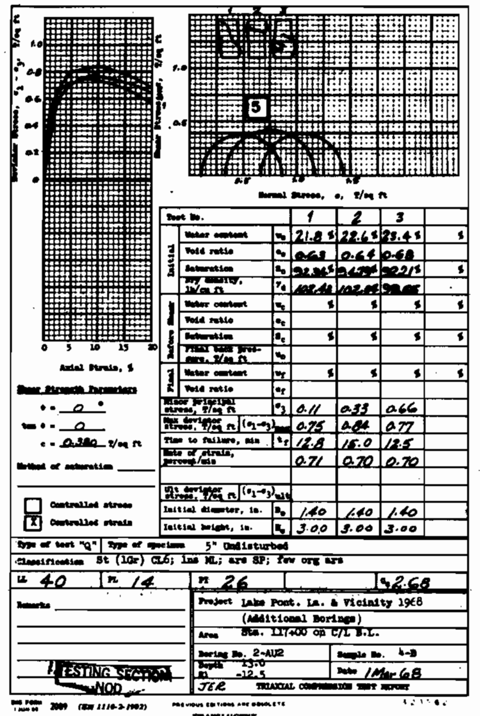


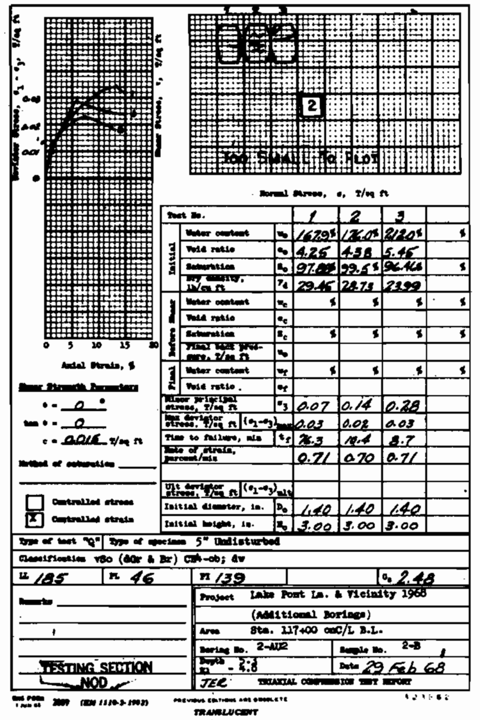


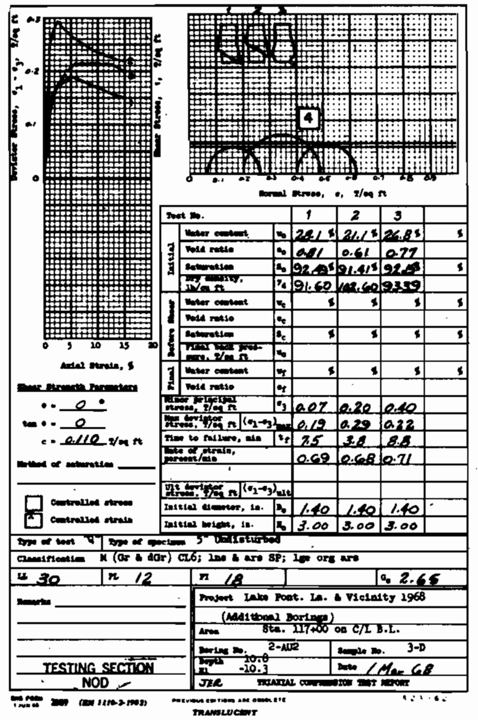


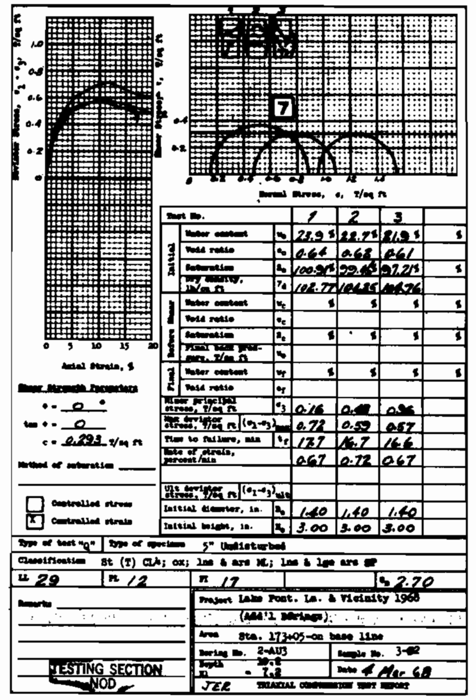


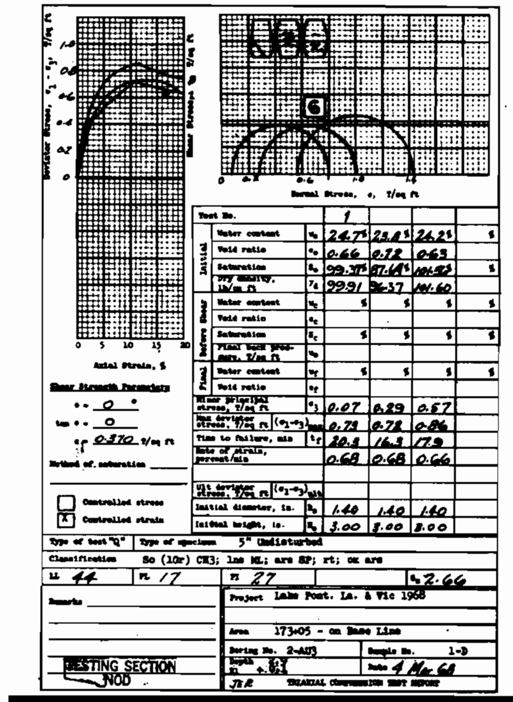












NOTE:
[3] Indicates reference number shown under shear data on Plates
(Q) - Unconsolidated - undrained triaxial compression test.
(S) - Consolidated - drained direct shear test.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

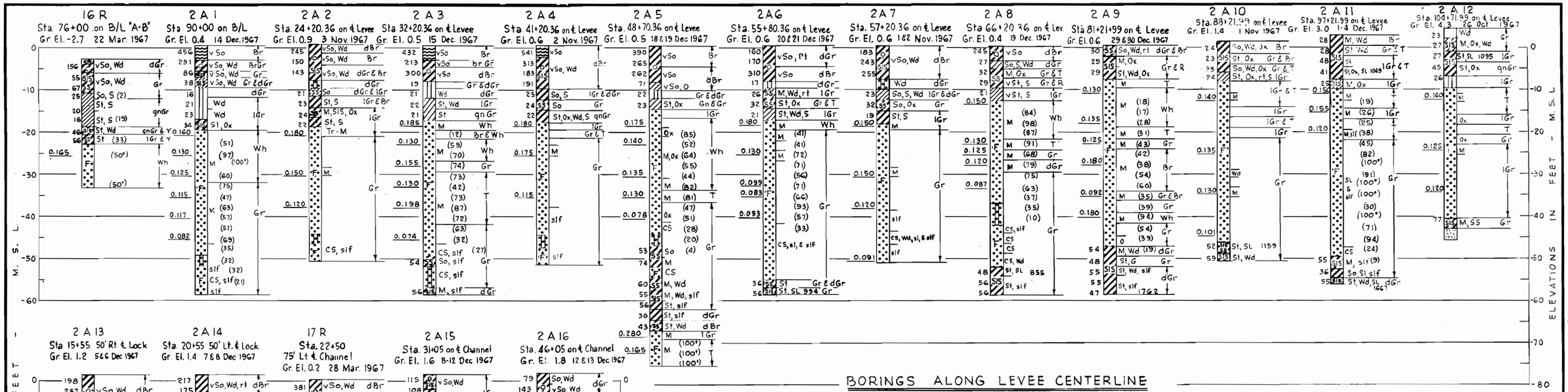
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

DETAIL SHEAR STRENGTH DATA
BORINGS 2 AU1, 2 AU2, AND 2 AU3

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

DATE JULY 1969 FILE NO H-2-24415

PLATE 30



GENERAL NOTES

For location of borings see plate 2
For soil boring legend see plate A
Soil samples were taken with a 1⅞" I.D. Core Barrel Sampler in the cohesive soils and a 1⅜" I.D., 2" O.D. standard Split Spoon Sampler in sandy soils where penetration resistances are shown.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA. | STANLEY CONSULTANTS, INC MUSCATINE, IOWA

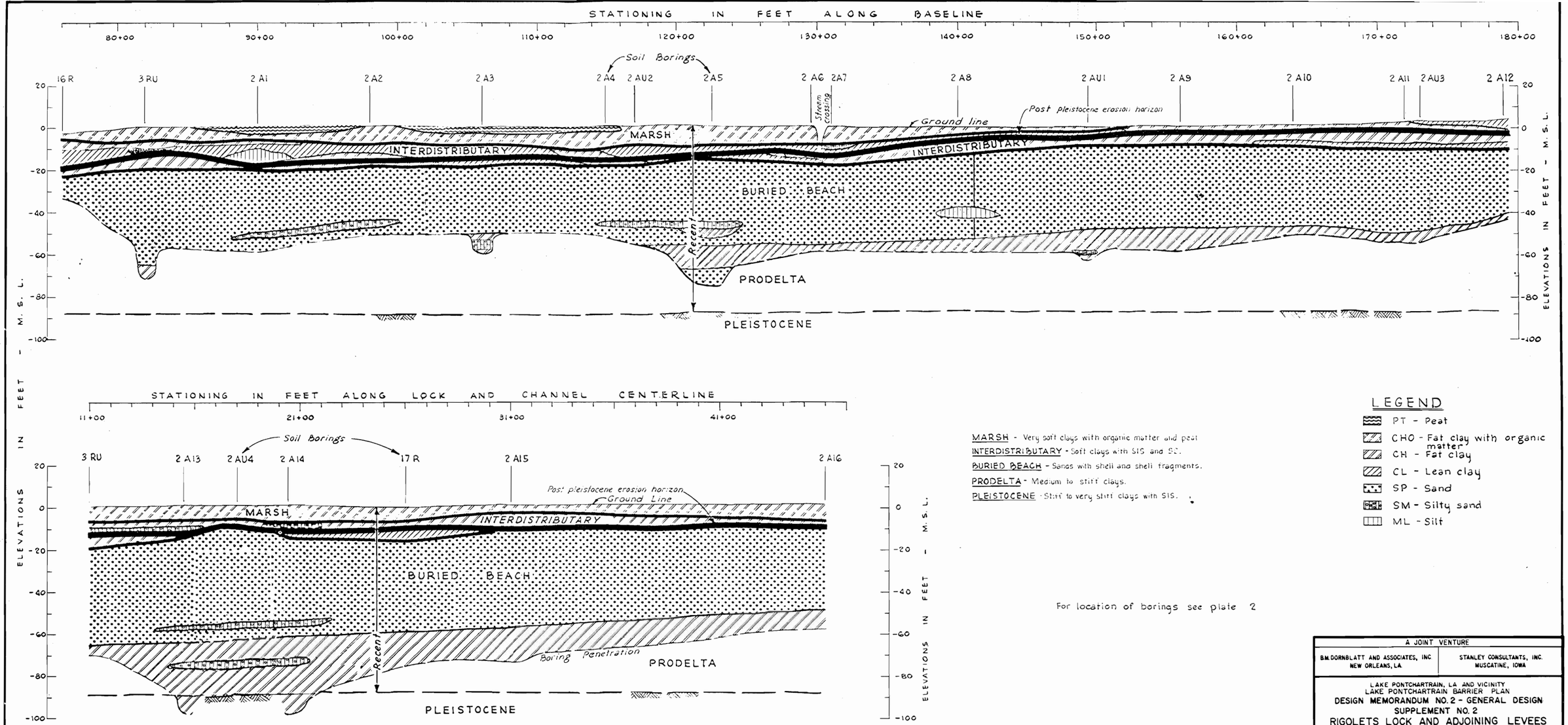
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

SOIL BORING LOGS

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

DATE: JULY 1969 FILE NO. H-2-24415

PLATE 31



MARSH - Very soft clays with organic matter and peat

INTERDISTRIBUTARY - Soft clays with SIS and SS.

BURIED BEACH - Sands with shell and shell fragments.

PRODELTA - Medium to stiff clays.

PLEISTOCENE - Stiff to very stiff clays with SIS.

LEGEND

- PT - Peat
- CHO - Fat clay with organic matter
- CH - Fat clay
- CL - Lean clay
- SP - Sand
- SM - Silty sand
- ML - Silt

For location of borings see plate 2

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

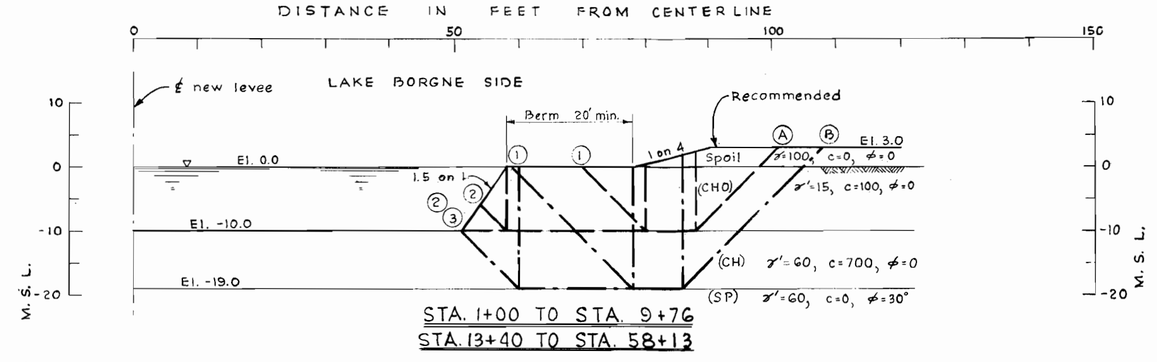
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

GENERALIZED SOIL PROFILES

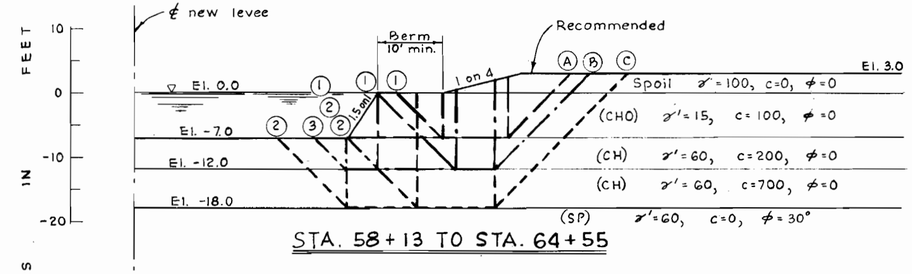
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

DATE JULY 1969 FILE NO. H-2-24415

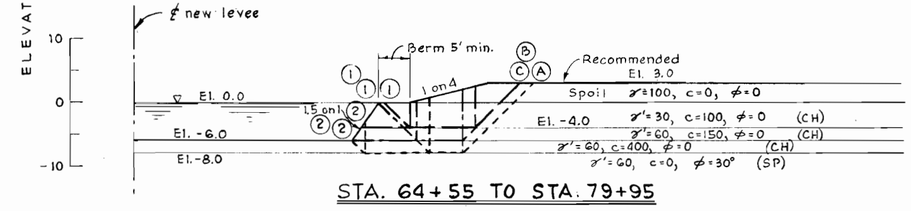
PLATE 32



STA. 1+00 TO STA. 9+76
STA. 13+40 TO STA. 58+13



STA. 58+13 TO STA. 64+55



STA. 64+55 TO STA. 79+95

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
15+25	A	1	-10.0	4,150	800	3,350		800	2,000	4,800	1.43
		2			300	3,850	2,000	3,000	800	5,800	1.51
		3			0	4,150		3,667	0	5,667	1.37
	B	1	-19.0	10,480	4,530	5,950		3,649	14,600	32,849	5.52
		2			3,230	7,250	14,600	10,820	12,600	38,020	5.24

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
62+45	A	1	- 7.0	2,868	368	2,500	1,400	1,000	1,400	3,800	1.52
		2			0	2,868		2,467	0	3,867	1.35
	B	1	-12.0	5,493	1,693	3,800	3,400	1,200	3,400	8,000	2.11
		2			945	4,548		3,600	2,000	9,000	1.98
		3			750	4,743		4,600	1,400	9,400	1.98
	C	1	-18.0	10,803	4,505	6,298	11,800	5,762	10,400	27,962	4.44
		2			3,630	7,173		10,469	10,400	32,669	4.35

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
76+45	A	1	-4.0	1,840	240	1,600	800	1,000	800	2,600	1.63
		2			0	1,840		1,767	0	2,567	1.39
	B	1	-6.0	2,650	613	2,037	1,400	1,050	1,400	3,850	1.89
		2			0	2,650		2,550	0	3,950	1.49
	C	1	-8.0	3,850	1,313	2,537	3,000	1,436	3,000	7,436	2.93
		2			290	3,560		3,173	1,600	7,773	2.18

NOTE:
See tabulations and levee sections on plates 28 29 & 30 for muck elevations and bottom widths applicable to various levee reaches.

For general notes see plate 26.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA. | STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

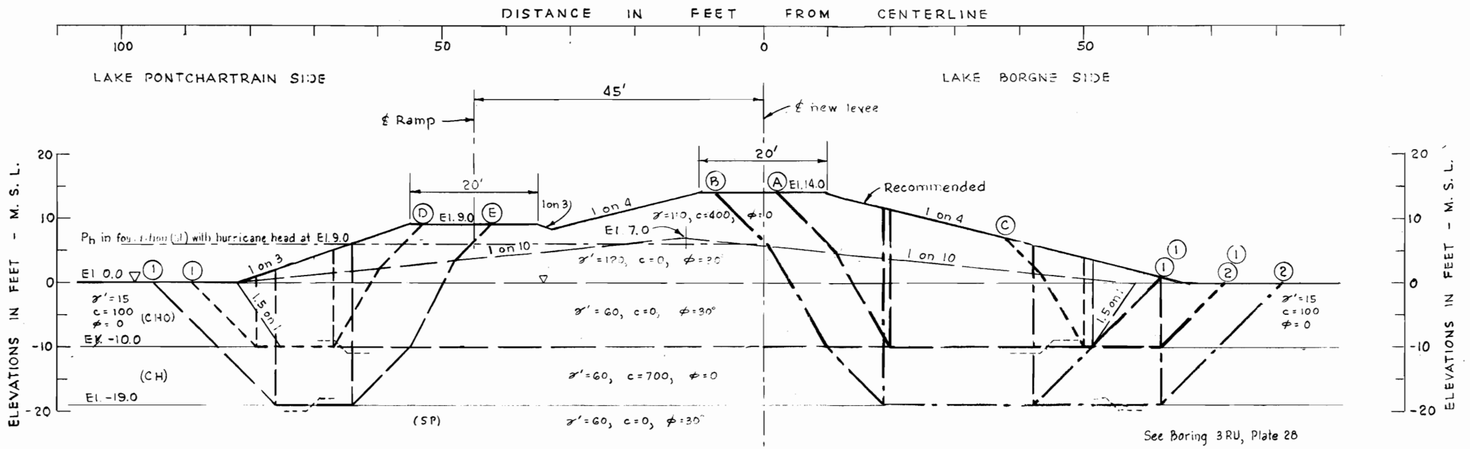
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

MUCK EXCAVATION (Q) STABILITY

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

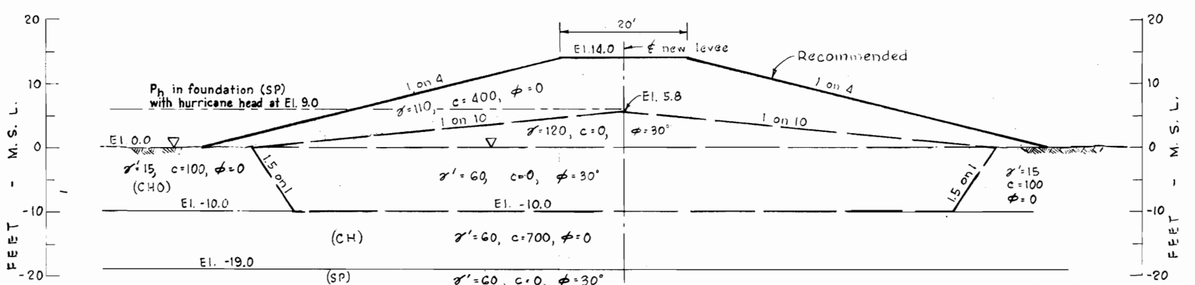
DATE JULY 1969 FILE NO H-2-24415

PLATE 33



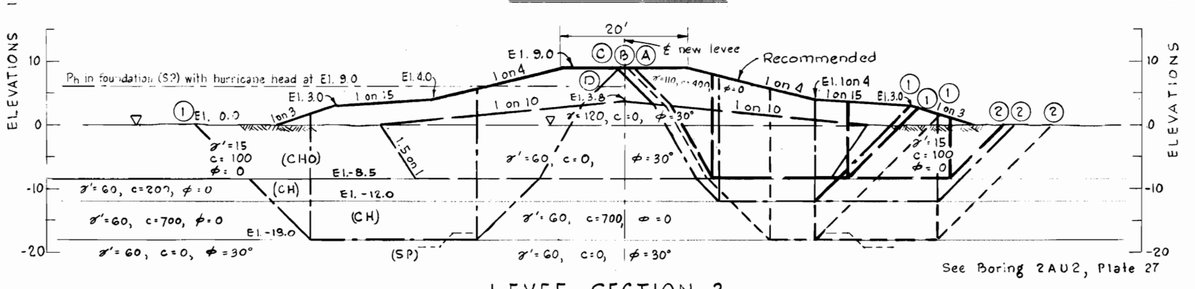
See Boring 3RU, Plate 28

LEVEE SECTION 2



See Boring 3RU, Plate 28

LEVEE SECTION 1



See Boring 2AU2, Plate 27

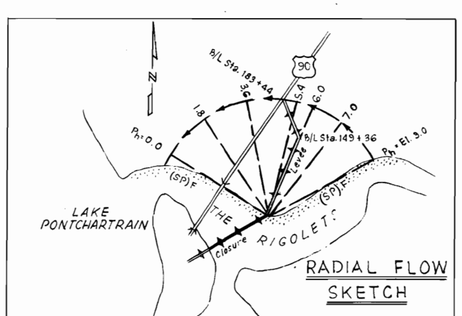
LEVEE SECTION 3

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
15+25	A	1	-10.0	26,294	4,990	21,304	21,664	21,504	2,747	45,915	2.16
		2			970	25,324		23,637	2,000	47,301	1.87
	B	1	-19.0	50,810	17,665	33,145	36,607	16,333	15,347	68,287	2.06
		2			4,750	46,060		29,170	14,600	80,377	1.74
	C	1	-10.0	10,585	970	9,615	10,669	1,820	2,000	14,489	1.51
	D	1	-10.0	13,446	1,223	12,223	12,961	5,215	2,000	20,176	1.65
	E	1	-19.0	33,389	6,423	26,966	27,847	8,145	14,600	50,592	1.88
43+20	A	1	- 8.5	15,068	4,455	10,613	13,485	3,933	3,800	21,218	2.00
		2			707	14,361		5,533	1,700	20,718	1.44
	B	1	-12.0	20,886	8,657	12,229	15,080	3,000	5,500	23,580	1.92
		2			1,813	19,073		6,800	3,100	24,980	1.31
	C	1	-18.0	30,005	13,237	16,768	23,244	4,900	12,700	40,844	2.44
		2			4,915	25,090		16,909	11,500	51,653	2.06
	D	1	-18.0	30,005	4,915	25,090	23,244	13,512	11,500	48,256	1.92

TABULATION OF LEVEE SECTIONS

LEVEE SECTION	STATIONS FROM	STATIONS TO	MUCK EL. M.S.L.	CROWN EL. M.S.L.	REMARKS
1	1+00	8+20	-10	14	
Transition	8+20	9+76	-10	14	
	13+40	14+50	-10	14	
2	14+50	15+37.94	-10	14	
Transition	15+37.94	16+30	-10	14	
	16+30	17+30	-10	-14 to 9	
	17+30	18+98.41	-10 to -8.5	9	
3	18+98.41	51+45	-8.5	9	
4	51+45	54+52	-8	9	Same as L.S. 3 except muck elevation.

NOTE:
Stability analysis for levee section 2 also applicable to levee section 1.
For general notes see plate 26.
For estimate of P_h in foundation sand, see sketch below.



A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

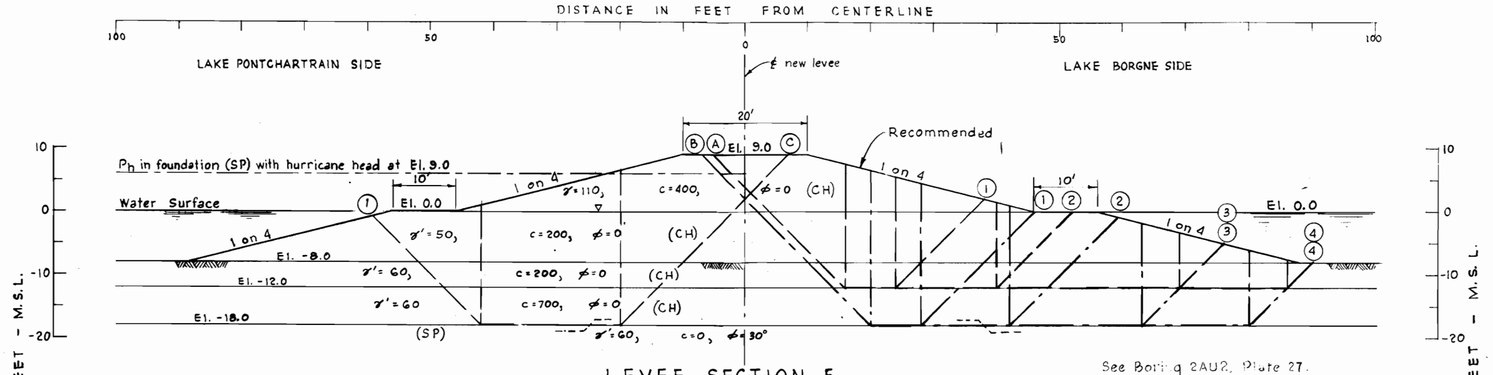
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

LEVEE (Q) STABILITY

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

DATE: JULY 1969 FILE NO. H-2-24415

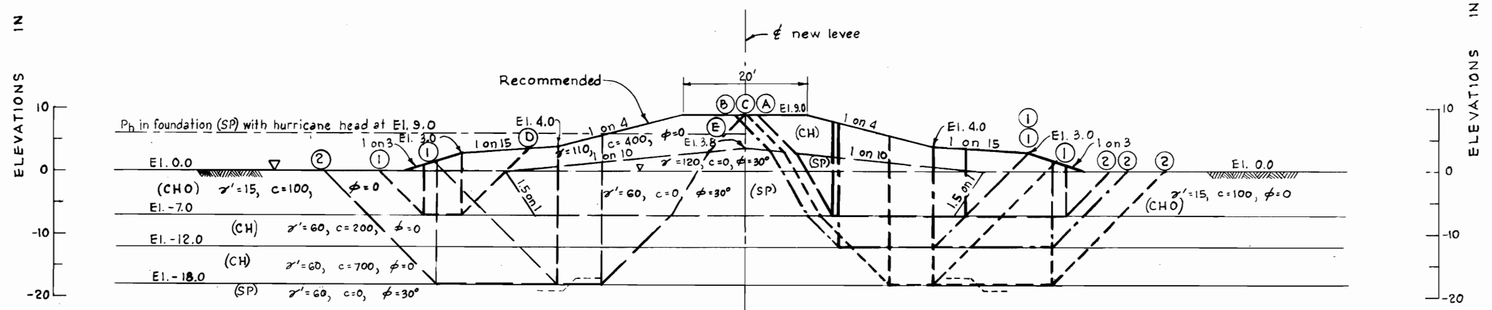
PLATE 34



LEVEE SECTION 5
STREAM CROSSING

See Boring 2AU2, Plate 27.

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING +$\bar{D}_A$	DRIVING -$\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING +R_A	RESISTING +R_B	RESISTING +R_P	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma\bar{D}$
56+70	A	1	-12.0	19,520	9,235	10,285	12,000	1,600	6,400	20,000	1.94
		2			4,175	15,345		4,800	4,800	21,600	1.41
		3			1,611	17,909		10,400	2,800	25,200	1.41
		4			480	19,040		14,000	1,600	27,600	1.45
	B	1	-18.0	29,500	13,055	16,445	20,400	5,600	13,200	39,200	2.38
		2			8,644	20,856		15,290	12,880	48,570	2.33
		3			6,006	23,494		27,363	11,200	58,963	2.50
		4			3,400	26,100		35,284	10,000	65,684	2.52
	C	1	-18.0	29,500	8,644	20,856	20,400	13,015	12,880	46,295	2.22



LEVEE SECTION 6

See Boring 2AU2, Plate 27

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING +$\bar{D}_A$	DRIVING -$\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING +R_A	RESISTING +R_B	RESISTING +R_P	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma\bar{D}$
62+45	A	1	- 7.0	12,742	3,847	8,895	11,975	3,702	4,600	20,277	2.28
		2			533	12,209		5,679	1,400	19,054	1.56
	B	1	-12.0	20,712	8,739	11,973	14,083	3,000	5,800	22,883	1.91
		2			2,210	18,502		6,800	3,400	24,283	1.31
	C	1	-18.0	30,144	13,734	16,410	22,483	4,900	13,000	40,383	2.46
		2			5,720	24,424		17,384	11,800	51,667	2.12
	D	1	- 7.0	3,565	367	3,198	4,371	600	1,400	6,371	1.99
	E	1	-18.0	30,144	13,734	16,410	22,483	4,864	13,000	40,347	2.45
		2			5,720	24,424		14,383	11,800	48,666	1.99

TABULATION OF LEVEE SECTIONS

LEVEE SECTION	STATIONS FROM	STATIONS TO	MUCK EL. M.S.L.	CROWN EL. M.S.L.	REMARKS
Transition	54+52	55+70	-8	9	Transition from sand core to all clay
5	55+70	56+95	-8	9	Stream Crossing
Transition	56+95	58+13	-8 to -7	9	Transition from all clay to sand core.
6	58+13	64+45	-7	9	
Transition	64+45	64+55	-7 to -6	9	

For general notes see plate 26.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

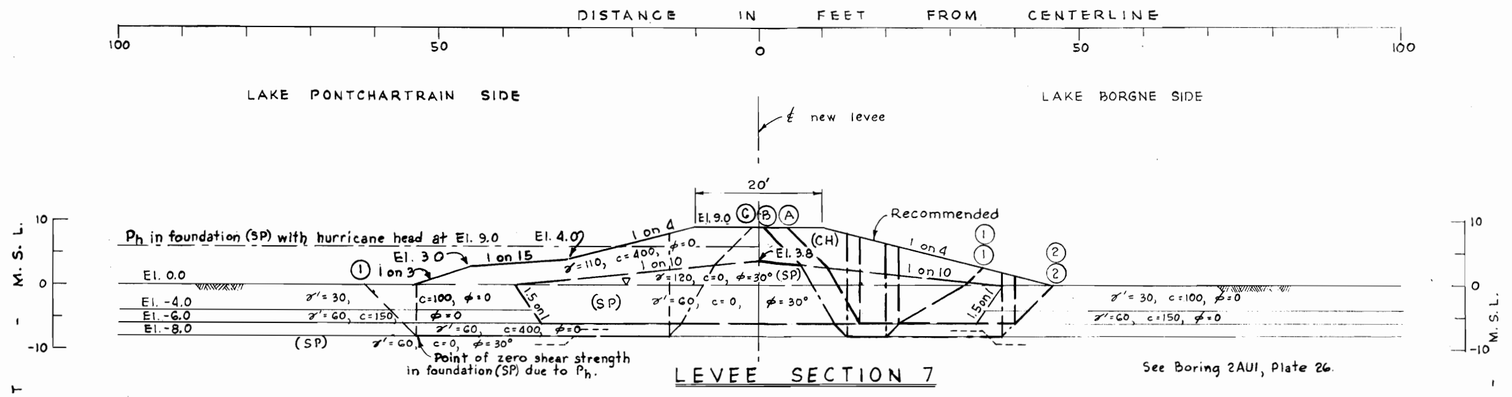
LEVEE (Q) STABILITY

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

DATE: JULY 1969

FILE NO. H-2-24415

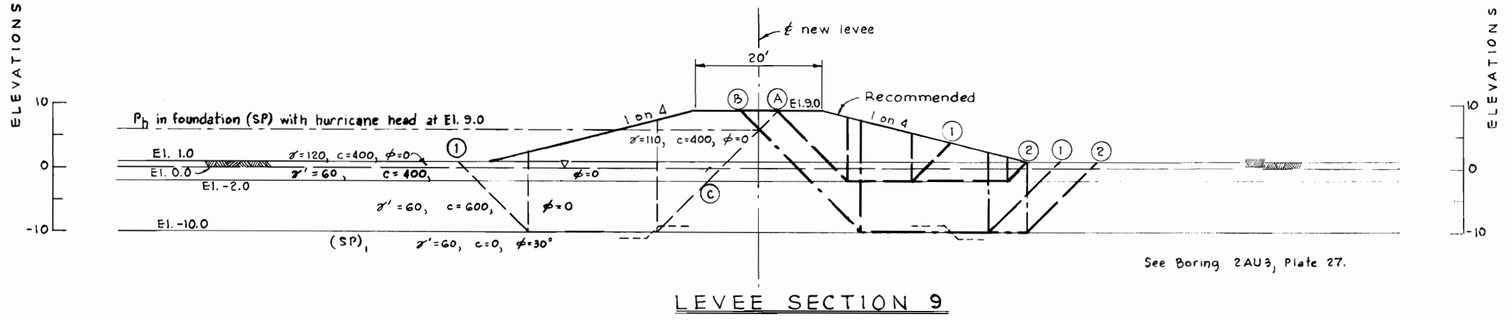
PLATE 35



LEVEE SECTION 7

See Boring 2AU1, Plate 26.

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-D_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
76+45	A	1	- 6.0	10,804	4,767	6,067	10,795	2,400	10,633	23,828	3.95
		2			1,095	9,709		7,800	1,400	19,995	2.06
	B	1	- 8.0	13,948	7,016	6,932	12,636	2,400	12,233	27,269	3.93
		2			2,080	11,868		9,520	3,000	25,156	2.12
	C	1	- 8.0	13,948	0	13,948	12,636	10,812	0	23,448	1.68



LEVEE SECTION 9

See Boring 2AU3, Plate 27.

LEVEE STATION	SLIP SURFACE NUMBER		EL.	DRIVING $+\bar{D}_A$	DRIVING $-D_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
86+45	A	1	- 2.0	6,360	2,400	3,960	8,800	4,000	4,800	17,600	4.44
		2			544	5,816		10,000	2,400	21,200	3.64
	B	1	-10.0	16,965	4,755	12,210	18,400	11,750	12,000	42,150	3.46
		2			4,260	12,705		14,528	12,000	44,928	3.53
	C	1	-10.0	16,965	4,755	12,210	18,400	9,080	12,000	39,480	3.23

For general notes see plate 26.

TABULATION OF LEVEE SECTIONS

LEVEE SECTION	STATIONS FROM	STATIONS TO	MUCK EL. M.S.L.	CROWN EL. M.S.L.	REMARKS
7	64+55	76+45	-6	9	
Transition	76+45	79+45	-6 to -2	9	
9	79+45		-2	9	Same as L.S. 7 except muck elevation
Transition	79+45	79+95	-2 to Ground Surf.	9	Transition from sand core to all clay.
9	79+95	108+41.99	No mucking	9	

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

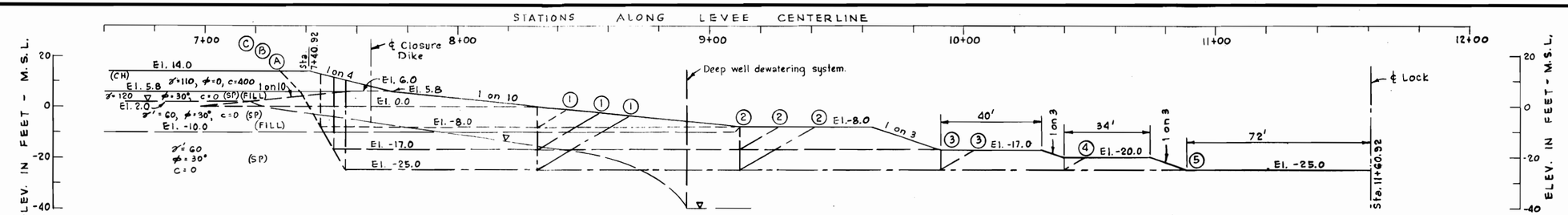
LEVEE (Q) STABILITY

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

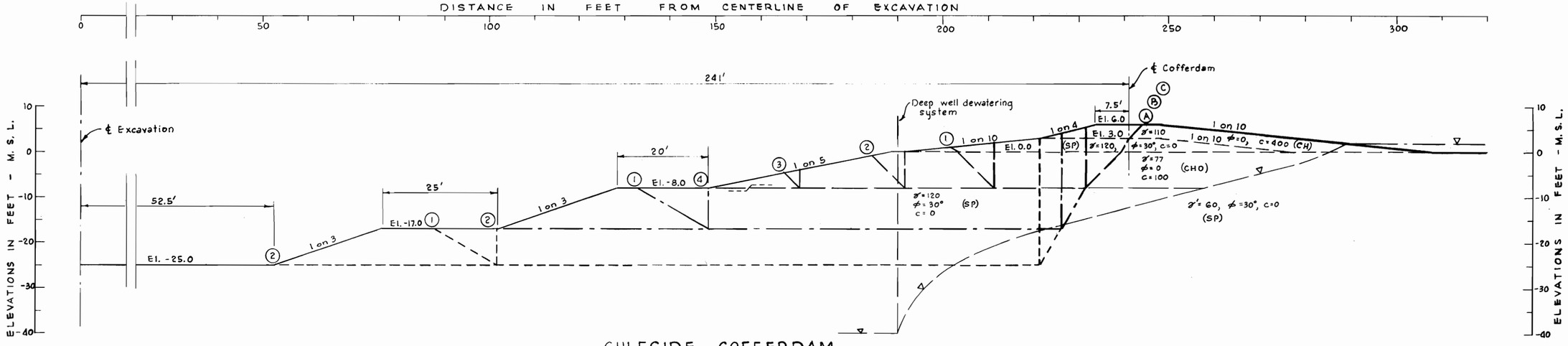
DATE JULY 1969

FILE NO H-2-24415

PLATE 36



LEVEE AT SOUTH SIDE OF GULFSIDE GATE BAY EXCAVATION



GULFSIDE COFFERDAM

LEVEE STATION	SLIP SURFACE NUMBER		SLIP SURFACE EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R / \Sigma D$
LEVEE AT SOUTH SIDE OF GULFSIDE GATE BAY EXCAVATION	A	1	- 8	26,227	3,273	22,954	21,579	73,783	6,546	101,908	4.44
		2			0	26,227		95,953	0	117,532	4.48
	B	1	-17	53,163	14,781	38,382	39,537	100,010	29,563	169,110	4.41
		2			4,860	43,303		171,726	9,720	220,983	4.57
		3			0	53,163		212,568	0	252,105	4.74
	C	1	-25	75,774	29,589	46,185	54,610	113,827	59,177	227,614	4.93
		2			17,340	58,434		222,262	34,680	311,552	5.33
		3			3,840	71,934		306,890	7,680	369,180	5.13
		4			1,500	74,274		333,113	3,000	390,724	5.26
		5			0	75,774		347,490	0	402,100	5.31

LEVEE STATION	SLIP SURFACE NUMBER		SLIP SURFACE EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R / \Sigma D$
GULFSIDE COFFERDAM	A	1	- 8	8,629	4,096	4,533	5,020	2,027	1,844	8,891	1.96
		2			2,272	6,177		4,000	1,400	10,420	1.65
		3			513	8,116		6,300	633	11,953	1.47
		4			0	8,629		7,867	0	12,887	1.49
	B	1	-17	24,164	4,860	19,304	15,337	74,121	9,720	99,178	5.14
		2			0	24,164		95,010	0	110,347	4.57
	C	1	-25	43,140	3,840	39,300	27,987	163,556	7,680	199,223	5.07
		2			0	43,140		184,064	0	212,051	4.92

For general notes see plate 26.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

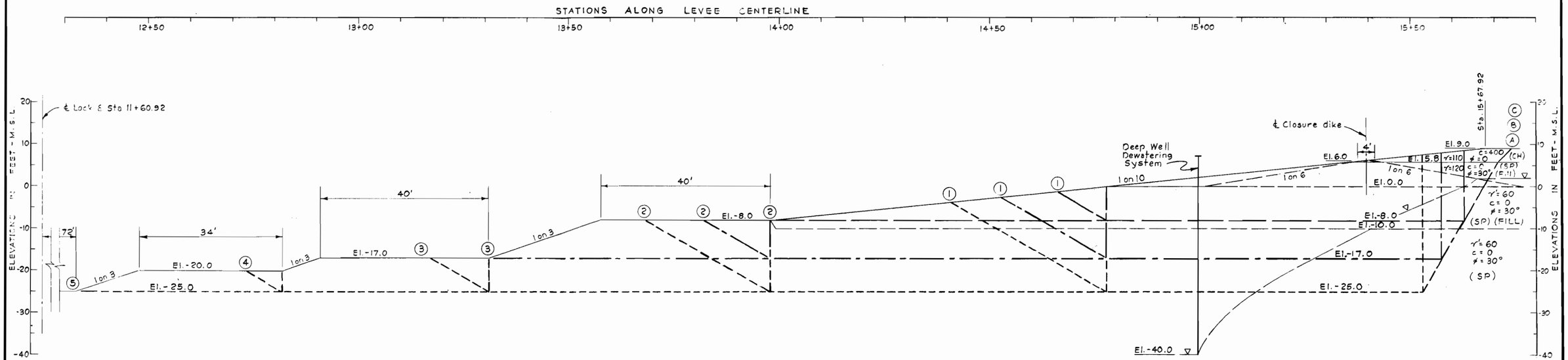
LEVEE (Q) STABILITY

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

DATE: JULY 1969

FILE NO. H-2-24415

PLATE 37



LEVEE AT NORTH SIDE OF GULFSIDE GATE BAY EXCAVATION

LEVEE STATION	SLIP SURFACE NUMBER		SLIP SURFACE EL.	DRIVING $+\bar{D}_A$	DRIVING $-\bar{D}_P$	DRIVING $\Sigma\bar{D}$	RESISTING $+R_A$	RESISTING $+R_B$	RESISTING $+R_P$	RESISTING ΣR	FACTOR OF SAFETY $\Sigma R/\Sigma D$
LEVEE AT NORTH SIDE OF GULFSIDE GATE BAY EXCAVATION	A	1	- 8	13,798	3,273	10,525	11,383	68,978	6,546	86,907	8.26
		2			0	13,798		91,148	0	102,531	7.43
	B	1	- 17	29,361	14,781	14,580	21,753	106,450	29,563	157,766	10.82
		2			4,860	24,501		178,503	9,720	209,976	8.57
		3			0	29,361		211,862	0	233,615	7.96
	C	1	- 25	47,925	31,965	15,960	34,134	135,018	63,912	233,064	14.60
		2			17,340	30,585		251,412	34,680	320,226	10.47
		3			3,840	44,085		321,906	7,680	363,720	8.25
		4			1,500	46,425		348,130	3,000	385,264	8.30
		5			0	47,925		362,506	0	396,640	8.28

For general notes see plate 26.

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA | STANLEY CONSULTANTS, INC MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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RIGOLETS LOCK AND ADJOINING LEVEES

LEVEE (Q) STABILITY

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

DATE JULY 1969 FILE NO H-2-24415

PLATE 38

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					

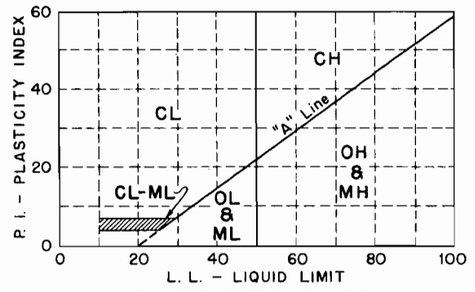
NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

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

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



PLASTICITY CHART

For classification of fine - grained soils

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 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.D. 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

PLATE A

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX A
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
REPORT ON EVALUATION
OF ALTERNATE PLANS INVOLVING
MODIFICATION IN THE ALIGNMENT
OF THE LAKE PONTCHARTRAIN BARRIER

LMVED-TD (NOD 13 Mar 67) 3d Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity - Evaluation of Alternate Plans Involving Modifications in the Alignment of the Lake Pontchartrain Barrier

DA, Lower Miss. Valley Div, CE, Vicksburg, Miss. 39180 19 May 67

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

13 March 1967

SUBJECT: Lake Pontchartrain, La. and Vicinity - Evaluation of Alternate Plans Involving Modifications in the Alignment of the Lake Pontchartrain Barrier

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

1. Scope. This report was prepared in accordance with paragraph 9.b. of ER 1110-2-1150 dated 1 July 1966. Its purpose is to establish the bases for adopting a barrier alignment, other than that specified in the project document, and for providing wavewash protection for portions of the barrier, as departures from the project document plan within the discretionary authority of the Chief of Engineers.

2. Project authorization. The "Lake Pontchartrain, La. and Vicinity," project was authorized by the Flood Control Act of 1965 (Public Law 89-298, approved 27 October 1965), substantially in accordance with the recommendations of the Chief of Engineers in his report printed as House Document No. 231, 89th Congress.

3. Project description. The project consists of two independent features--the Lake Pontchartrain Barrier Plan and the Chalmette Area Plan. The Chalmette Area Plan comprises a protection levee extending along the east bank of the Inner Harbor Navigation Canal (IHNC) from the IHNC lock to the Mississippi River-Gulf Outlet (MR-GO), then along the MR-GO to Bayou Lawler, then tieing into the Mississippi River levee at Violet, La., with floodgates in Bayous Bienvenue and Dupre. The Lake Pontchartrain Barrier Plan will serve to protect areas contiguous to the shores of Lake Pontchartrain from flooding by hurricane surges, and has, as its salient segment, the Lake Pontchartrain barrier--a system of levees and control structures extending from New Orleans East to high ground east of the Rigolets, the purpose of which is to limit uncontrolled entry of hurricane tides into Lake Pontchartrain, while preserving navigation access. The barrier, which utilizes the existing U. S. Highway 90 embankment wherever the grade of that embankment is at or above elevation 9(1), also includes new embankment to elevation 9 and regulating

(1) Unless otherwise specified, elevations are in feet and refer to mean sea level.

tidal and/or navigation structures at Chef Menteur Pass, the Rigolets, and Seabrook. In addition to the barrier, the Lake Pontchartrain Barrier Plan includes 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 (see incl 1).

4. Detailed description of the authorized Lake Pontchartrain barrier. The barrier alignment, as authorized, extends generally eastward from the existing New Orleans East levee for a distance of about 2.4 miles along the north banks of Bayou Sauvage and Chef Menteur Pass, thence southeast across Chef Menteur Pass to the embankment of U. S. Highway 90, thence along the highway embankment to a point about 0.6 mile from the highway bridge crossing the Rigolets, thence across the Rigolets about 0.7 mile southeast of the bridge, thence back to the highway embankment and along that embankment to Apple Pie Ridge (see plate 1). The controlling elevation of the barrier is 9.

5. The structural complex at Chef Menteur Pass consists of a gated control structure of eight bays, each 50 feet wide with invert at elevation -25; a navigable floodgate 56 feet wide with sill at elevation -12; a closure dam in the Pass with crown at elevation 14; and connecting channels for the control and navigation structures. The Rigolets complex consists of a gated control structure of 23 bays, each 50 feet in width, with invert at elevation -20; a navigation lock 860 feet long (pintle to pintle) by 84 feet wide with sill at elevation -14; a closure dam in the Rigolets with crown at elevation 14; and connecting channels for the control structure and navigation lock. U. S. Highway 90 will be rerouted over the control structure.

6. The embankment of U. S. Highway 90 is generally at or above 9 and serves, without modification, as the barrier for a total distance of 7 miles between the closure dam in Chef Menteur Pass and Apple Pie Ridge (see plate 1). For a distance of about 1.5 miles along the northwest shore of Lake St. Catherine, however, the highway is substantially below 9. In this area, a levee with net grade of 9 will be provided adjacent to the highway on the Lake St. Catherine side.

7. Erosion protection will be provided at the structure abutments, on the slopes of the closure dams, and adjacent to the structures in the connecting channels.

8. The authorized barrier is, in some locations, subject to overtopping by hurricane surges which exceed elevation 9. The highway embankment has, in the past, demonstrated marked resistance to erosion damage when overtopped, and erosion is not expected to be a problem in the future. The new barrier embankment will undoubtedly be somewhat more vulnerable; however, experience in hurricane "Betsy," when numerous levees of various descriptions were overtopped without a single instance of what could be described as a structural failure or crevasse, indicates that any damage which might occur during the infrequent instances of short duration overtopping would be of such nature as could be dealt with adequately in connection with maintenance operations. An allowance for such work has been included in the estimated costs for maintenance and operation. All structures and closure dams have top elevations of 14, which elevation is above the surge produced by the standard project hurricane on a path critical to the barrier.

9. Provisions of authorizing legislation pertaining to alterations in levee locations. The project authorization is based on the report of the Chief of Engineers which states, inter alia, that "...The Board of Engineers for Rivers and Harbors concurs in general in the views and recommendations of the reporting officers....Subject to re-examination of the levee alignment in the preconstruction planning stage with a view to protecting additional lands, and to certain requirements of local cooperation, the Board recommends authorization for construction of the improvements....Subject to these modifications, I concur in the recommendations of the Board of Engineers for Rivers and Harbors...." (ENGCW-PD letter dated 4 March 1964 subject "Lake Pontchartrain and Vicinity, La.")

10. Alterations in standard project hurricane parameters subsequent to project authorization. Revised parameters for the standard project hurricane were received from the Weather Bureau, Environmental Science Services Administration, on 3 November 1965. The revised parameters are more severe than those used in studies leading to project authorization. Studies utilizing the revised parameters indicate, however, that a controlling elevation of 9 for the barrier remains the optimum value. The more severe parameters do, however, result in a requirement for increased grades on confining levees, and such grades have been used in evaluating the Plan C alternate considered herein.

11. Alternate plans considered. Three plans involving modification of the Lake Pontchartrain barrier have been considered. Descriptions of these alternate plans follow:

Plan A. Elements of this plan are shown on plate 2. The plan is a modification of the authorized barrier location in the vicinity of Chef Menteur Pass. Consideration of this plan was prompted by vociferous objections to the project document alignment by the firm of New Orleans East, Inc., which is constructing improvements in a 1,533-acre tract located between the Gulf Intracoastal Waterway (GIW) and Bayou Sauvage and extending from the existing New Orleans East levee to Chef Menteur Pass. The 1,533 acres comprise 75 acres of residential developments, 218 acres of future residential development, and 1,240 acres of future recreational and industrial development. The modification consists of relocating the barrier embankment to the south or gulfward side of the above area, and shifting the Chef Menteur Pass structural complex to accommodate the revised alignment. The revised alignment crosses the GIW at two points and requires relocation of that waterway between mile 22 and mile 26 (east of Harvey Lock) as shown on plate 2. Use of this alignment will permit future construction of a lock in lieu of a floodgate, when and if justified, by the addition of another set of gates. Riprap foreshore protection, as authorized for the New Orleans East back levee, will be provided for the revised alignment adjacent to the GIW extending from the New Orleans East levee to the Chef Menteur Pass control structure. Typical cross sections for the relocated barrier embankment and closure dam are shown on plates 5 and 6, respectively. Plan A will provide some measure of protection to the area being developed by New Orleans East as well as to an area east of Chef Menteur Pass. It must be pointed out, however, that these areas remain subject to flooding from lesser hurricanes than the SPH, which overtop the barrier, and in addition, are vulnerable to overflow from Lake Pontchartrain.

Plan B. Plan B was derived from a plan suggested for consideration by Mr. W. S. Nelson, a local consulting engineer, formerly retained by New Orleans East, Inc. The plan proposed by Mr. Nelson located the barrier on the north bank of the GIW as far east as Big Deedle Lake, from whence it turned northward to cross the Rigolets and tie into the U. S. Highway 90 embankment at Apple Pie Ridge. The Nelson plan proposed to locate combination control, navigation, and closure structures in the existing channels of Chef Menteur Pass and the Rigolets. These structures were to be constructed in shipyards on huge barge-like hulls, towed to the selected sites, and there sunk, anchored, and outfitted. For various reasons, this method of construction is not considered feasible in the instant locations. Conventional construction would not be possible at Chef Menteur Pass with the Nelson alignment as existing and potential improvements in the area so restrict the space available for construction as to make impracticable a satisfactory

layout of the overall structural complex. By substituting the Plan A alignment in the Chef Menteur area for that of the Nelson plan, and providing for conventional construction of the Rigolets structural complex, a physically feasible plan, equivalent to Mr. Nelson's original plan, can be realized. Economic analyses of this plan must, however, be based on incremental comparison of that portion of Plan B east of Chef Menteur Pass with the corresponding portion of the authorized plan. The Plan B layout is shown on plate 3. Typical sections of the relocated barrier embankment and closure dams for this plan are shown on plates 5 and 6, respectively.

Plan C. As can be seen on plate 4, Plan C involves a radical departure from the project document plan and involves not only modifications in the Lake Pontchartrain barrier, but in the overall Lake Pontchartrain Barrier Plan and the Chalmette Area Plan as well. In effect, Plan C moves the primary line of hurricane defense for Orleans and St. Bernard Parishes eastward to the western shore of Lake Borgne. The modified levee alignment would cross both the MR-GO and the GIW. An opening 400 feet wide by 40 feet deep below mean low gulf would be provided where the alignment crosses the MR-GO, with closure during hurricanes to be effected by a floating gate. A navigation lock 110 feet by 1,200 feet with sill at elevation -14, located in a bypass channel, would provide for uninterrupted use of the GIW. This plan would eliminate much of the levee required for the Chalmette Area Plan and drastically reduce the grade requirements for the Citrus and New Orleans East back levees and the IHNC. Plan C was advanced by an employee of this District. Consideration of a very similar plan was recommended by a local group.

12. Costs. Cost estimates for all work of the authorized Lake Pontchartrain barrier between New Orleans East and Apple Pie Ridge and the Plans A and B modifications are shown on tables I, II, and III, respectively. Derivation of net additional first and annual operation and maintenance costs for Plans A and B, as compared with the authorized plan, is shown on tables IV and V. Cost estimates for the Plan C modification and the portions of the authorized plan it eliminates are shown on tables VI and VII, respectively. Summarized net additional first and annual operation and maintenance costs for Plan C are shown on table VIII. Summarized data on additional annual charges for the various plans are shown on table IX. The total additional annual charges for Plans A, B, & C, respectively, are $38,700, $464,200, and $247,000.

13. Benefits. Discussion of the added benefits, incremental to the project document plan, for the three alternate plans follows:

a. Plan A. (1) The modified barrier alignment in the Chef Menteur area would provide protection to improvements south of Bayou Sauvage and U. S. Highway 90 against hurricanes not overtopping the barrier embankment. These improvements include homes, camps, and commercial establishments. Of particular importance is the Venetian Isles development of New Orleans East, Inc., a Florida-type subdivision located west of Chef Menteur Pass between U. S. Highway 90 and Bayou Sauvage which features waterfront homes in the $50,000 and up price class and miscellaneous commercial establishings (including land). When complete, the development will include 639 homes and 52 commercial establishments having an aggregate value, exclusive of land, in excess of $25,000,000.

(2) The building sites in the Venetian Isles development are raised to elevation 8.5, and damage, under the authorized barrier alignment, would not begin until the hurricane surge reached about 10. Based on damage-frequency analyses, the average annual damage to existing and future development would be $134,700. With the Plan A modification, these damages would be eliminated.

(3) Damage to other homes, camps, and businesses south of U. S. Highway 90 from the New Orleans East area to the tie-in of the Plan A alignment modification and the authorized barrier would begin, under the authorized plan, when the hurricane surge reached 15. Damage-frequency analyses indicate that the average annual damage to existing improvements outside the Venetian Isles area would be $4,900. The Plan A modification would eliminate these damages. Future development outside the Venetian Isles area, with the authorized barrier alignment, would be very limited, and such development was ignored in computing the above damages.

(4) A total of 1,830 acres enclosed by Highway 90 and the Plan A modification in the barrier alignment would be relieved of the threat of direct hurricane overflow from Lake Borgne, and would be enhanced to some extent thereby. Most of this acreage would, however, remain subject to overflow from ordinary high tides, and all would be vulnerable to damage from overflow by storm-driven waters from Lake Pontchartrain. It was estimated that land values would increase from 10% to 25%, depending upon the location. The average annual enhancement was taken to be 5% of the gross increase in land value. On this basis, the average annual enhancement attributable to the Plan A alignment modification is $14,600.

(5) Under existing conditions, the Louisville and Nashville Railroad embankment is subject to damage from overtopping by hurricane surges. With the authorized barrier in place, however, the area between the railroad and U. S. Highway 90 will, with the barrier structural complexes closed, be without an outlet until the barrier embankment begins to overtop. Thus, stages will tend to rise on the Lake Pontchartrain side of the railroad embankment as the surge approaches and thereby limit the stage differential across that embankment. Studies indicate that the maximum velocity of flow over the railroad embankment for the SPH critical to the barrier would be about 2.5 feet per second and that the velocity of flow would exceed one foot per second for only three hours, resulting in negligible damage to the railroad embankment. With the Plan A barrier alignment modification, the flow overtopping the barrier embankment would be diverted to Lake Pontchartrain through Chef Menteur Pass and overtopping of the railroad embankment in the area enclosed by the highway and Plan A modified barrier alignment would not occur. There would, accordingly, be no appreciable damage to this section of the railroad embankment for either the authorized or Plan A barrier alignments. Inasmuch as portions of the railroad embankment will remain directly exposed to hurricane surges under all plans, none of the plans will provide any alleviation of railway traffic delays.

(6) Based on benefit analyses described in (1) through (4) above, Plan A will produce a total average annual benefit of $154,200.

b. Plan B. (1) Plan B would provide, in addition to the benefits described for Plan A, benefits attributable to the protection to improvements located between U. S. Highway 90 and the Plan B barrier alignment east of Chef Menteur Pass. Based on analyses similar to those previously described, the average annual damages in this area with the authorized barrier in place would be $69,300. The Plan B alignment would eliminate these damages.

(2) In addition to the above, the value of 7,497 acres of land within the above area would be enhanced. The increase in land value would average about 10%. The average annual value of enhancement, computed as 5% of the gross increase in land value, would be $33,000.

(3) For the same reasons described in paragraph 13.a.(5) above, average annual damages to the L&N Railroad embankment with the authorized barrier in place would be negligible. With the Plan B modified barrier alignment east of Chef Menteur, however, due to the limited openings in the railroad embankment, the area between the GIW

and the railroad embankment will fill rapidly with water after overtopping of the barrier embankment occurs, and the railroad embankment may be expected to overtop while stages in the Lake St. Catherine area are relatively depressed. Velocities over the railroad embankment would approach a maximum of 6 feet per second for the SPH on a path critical to the barrier and velocities in excess of 2.5 feet per second would be sustained for about four hours. The railroad embankment is constructed of slag and its vulnerability to damage by overflow has been demonstrated several times in the past, particularly in hurricane "Betsy," when a total of $1,095,900 in damages was sustained between the existing New Orleans East levee and the vicinity of Big Deedle Lake. Based on damage-frequency analyses, the average annual damage to the L&N Railroad embankment east of Chef Menteur Pass to its crossing with the Plan B barrier alignment modification would be $11,700. Since these damages would be induced by the Plan B alignment modification, they would reduce the additional benefit attributable to that plan.

(4) Based on benefit analyses described in (1) through (3) above, Plan B would produce, in addition to those produced by Plan A, average annual benefits in the amount of $90,600.

c. Plan C. (1) Plan C would provide benefits similar to those described for Plan A in the Venetian Isles development, and to homes, camps, and commercial establishments located south of U. S. Highway 90 between the existing New Orleans East levee and the Plan C levee. In addition, Plan C would provide protection from the hurricane surge to industrial development adjacent to the IHNC located outside the authorized levee and to lands bounded by the GIW, MR-GO, and the Plan C levee.

(2) Damage to the homes, camps, and commercial developments located in the area described above would begin, under the authorized plan, when the hurricane surge reached elevation 5. Based on damage-frequency analyses, the average annual damage on existing and future development would be $329,600.

(3) Operation of two features of Plan C, namely the floating gate in the MR-GO and the lock in the GIW, would impede seagoing and inland navigation. Studies indicate that the floating gate, along with the other structures in Plan C, would be closed an average of 9 days per year, and in some years, the closure period might be as long as two weeks. At such times, traffic could reach the Port of New Orleans from seaward via the Mississippi River only. Use of the longer route would result in an average annual loss of $210,600. Traffic through the lock

in the GIW would have to be locked through during the 9 days per year the barrier would be closed. In addition, there would be occasional periods in which normal tidal action would cause velocities through the lock to reach magnitudes considered unsafe for navigating the open lock. Studies indicate that the lock would have to be operated an average of 24 days per year to pass traffic during these periods. Under normal operation, traffic would make direct transit of the open lock. All vessels with tows, however, would have to reduce speed and proceed with caution. Based on a loss of 15 minutes per transit, the annual loss is estimated to be approximately 1,280 hours per year. The delay to traffic in the GIW, as a result of the lock being operated an average of 33 days per year, would generate an average annual loss of $83,700, and the delays due to slow transit would generate an additional annual loss of $174,000. The total loss attributable to delays to navigation would, therefore, average $468,300 annually.

(4) Plan C would enhance approximately 4,339 acres of land located south of Highway 90 and located between the Plan C alignment and the MR-GO. The present land value would be increased from 15% to 25% depending on location. The average annual enhancement of Plan C, computed as 5% of the increased land value, is $57,700.

(5) Based on (1) through (4) above, Plan C would result in a net increase in benefits of $53,700 (134,700 + 329,600 + 57,700 -468,300) annually as compared with the authorized plan.

(6) Beyond the fact that it would involve additional costs in excess of the additional benefits it could produce, Plan C is undesirable for a number of other reasons. Its adoption would mean that none of the work already accomplished by local interests subsequent to project authorization would be incorporated into the Federal project and no credit for such work could be allowed. Further, the modifications involved in Plan C are so broad in scope as to be beyond the discretionary authority of the Chief of Engineers to adopt, so that project review and subsequent Congressional action would be required. During the time that this process was being accomplished, progress in planning and constructing some of the most urgently needed project features would be discontinued. Assuming that the plan is authorized and funded, substantially greater planning and construction times would be involved. In view of the extended delay in realizing protection under the Federal project, it is likely that local interests would find it necessary to proceed independently and at great cost with improvements to the existing levee systems for interim protection. For these reasons, the Orleans

Levee District, the agency designated by the Governor to provide the local cooperation required for the project, and the State of Louisiana, Department of Public Works, local coordinator for the project, have expressed their opposition to the plan. (See incl 17, 18, (19.)

14. Conclusions. In accordance with the information presented herein, it is concluded that:

a. Altering the authorized barrier alignment, in the vicinity of Chef Menteur Pass, to that of Plan A is engineeringly feasible, economically justifiable, and desirable. Plan A is the most suitable plan to provide some protection from hurricane surges to the 1,533 acres belonging to New Orleans East, Inc. Plan A would have an additional average annual cost of $38,700 over the portion of the authorized plan it replaces and would provide an additional average annual benefit of $154,200, resulting in a favorable incremental benefit-cost ratio of 4.0 to 1. The change involved is clearly within the discretionary authority of the Chief of Engineers.

b. Altering the authorized barrier alignment east of Chef Menteur Pass to that of Plan B is not economically justifiable. The portion of Plan B east of Chef Menteur Pass would have an additional average annual cost of $464,200 over the portion of the authorized plan it replaces and would provide an additional average annual benefit of $90,600, resulting in an unfavorable incremental benefit-cost ratio of 0.2 to 1.

c. Adoption of Plan C in lieu of the Chalmette Area Plan and the Lake Pontchartrain Barrier Plan as now authorized is not economically justifiable and is considered impracticable. The portion of Plan C between the floating gate in the GIW to the authorized barrier east of Chef Menteur Pass would have an additional average annual cost of $247,000 over the portion of the authorized plan it replaces and would provide an additional average annual hurricane protection benefit of $53,700, resulting in an unfavorable incremental benefit-cost ratio of 0.22 to 1.

15. Recommendations. It is recommended that the authorized plan of improvement for the Lake Pontchartrain Barrier Plan be modified to provide for construction of the Lake Pontchartrain barrier as described herein under Plan A; that this change be covered in the general design

LMNED-PP 13 March 1967

SUBJECT: Lake Pontchartrain, La. and Vicinity - Evaluation of Alternate Plans Involving Modifications in the Alignment of the Lake Pontchartrain Barrier

memorandum for the Lake Pontchartrain Barrier Plan as a departure from the project document plan within the discretionary authority of the Chief of Engineers; and that this report be included as an appendix to that design memorandum.

Thomas J. Bowen

THOMAS J. BOWEN
Colonel, CE
District Engineer

19 Incl
1. Map file H-2-23693
2-7 Plates 1 through 6
8-16 Tables I through IX
17. Ltr of DPW dtd 8 Feb 67
18. Ltr of Orleans Levee Dist, dtd 22 Feb 67
19. Ltr of Orleans Levee Dist, dtd 22 Feb 67

LEGEND

- LOCK
- FLOODGATE
- CONTROL STRUCTURE
- APPROACH CHANNEL
- CLOSURE DAM
- BARRIER EMBANKMENT (NEW)
- LEVEE

U. S. HIGHWAY 90 TO SERVE AS PORTION OF BARRIER EMBANKMENT

U. S. HIGHWAY 90 TO SERVE AS PORTION OF BARRIER EMBANKMENT

Line of demarcation between salt marsh and fresh marsh not determined

Line of demarcation between fresh and salt water marsh not determined

NEW ORLEANS EAST

APPLE PIE RIDGE

SCALE OF MILES

1 ½ 0 1

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER AND CHALMETTE AREA PLANS

LAKE PONTCHARTRAIN BARRIER

PROJECT DOCUMENT PLAN

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

FEBRUARY 1967 FILE NO. H-2-24066

PLATE I

LEGEND

LOCK

FLOODGATE

CONTROL STRUCTURE

APPROACH CHANNEL

CLOSURE DAM

BARRIER EMBANKMENT (NEW)

LEVEE

U. S. HIGHWAY 90 TO SERVE AS PORTION OF BARRIER EMBANKMENT

U. S. HIGHWAY 90 TO SERVE AS PORTION OF BARRIER EMBANKMENT

Line of demarcation between salt marsh and fresh marsh not determined

Line of demarcation between fresh and salt water marsh not determined

APPLE PIE RIDGE

SOUTH TAMMANY

NEW ORLEANS EAST

RABBIT ISLAND

SCALE OF MILES

1 ½ 0 1

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER AND CHALMETTE AREA PLANS

LAKE PONTCHARTRAIN BARRIER

ALTERNATE PLAN A

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

FEBRUARY 1967 FILE NO. H-2-24066

PLATE 2

LEGEND

- LOCK
- FLOODGATE
- CONTROL STRUCTURE
- APPROACH CHANNEL
- CLOSURE DAM
- BARRIER EMBANKMENT (NEW)
- LEVEE

NEW ORLEANS EAST

APPLE PIE RIDGE

SCALE OF MILES

LAKE PONTCHARTRAIN, LA. AND VICINITY

LAKE PONTCHARTRAIN BARRIER AND CHALMETTE AREA PLANS

LAKE PONTCHARTRAIN BARRIER

ALTERNATE PLAN B

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

FEBRUARY 1967 FILE NO. H-2-24066

PLATE 3

LOUISIANA

ORLEANS PARISH

ST. BERNARD PARISH

PLAQUEMINES PARISH

LAKE BORGNE

SEABROOK LOCK

NEW ORLEANS AIRPORT

NEW ORLEANS EAST

CITRUS

CHALMETTE

Line of demarcation between fresh & salt water marsh not determined

FLOATING GATE
400' by -40' MLG

MISSISSIPPI RIVER - GULF OUTLET

SCALE OF MILES

LEGEND

- LOCK
- FLOODGATE
- CONTROL STRUCTURE
- APPROACH CHANNEL
- CLOSURE DAM
- ALTERNATE PLAN "C"
- PROJECT DOCUMENT PLAN

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER AND CHALMETTE AREA PLANS
IMPROVEMENTS ON AND TO THE EAST OF INNER HARBOR NAVIGATION CANAL

PROJECT DOCUMENT PLAN AND ALTERNATE PLAN "C"

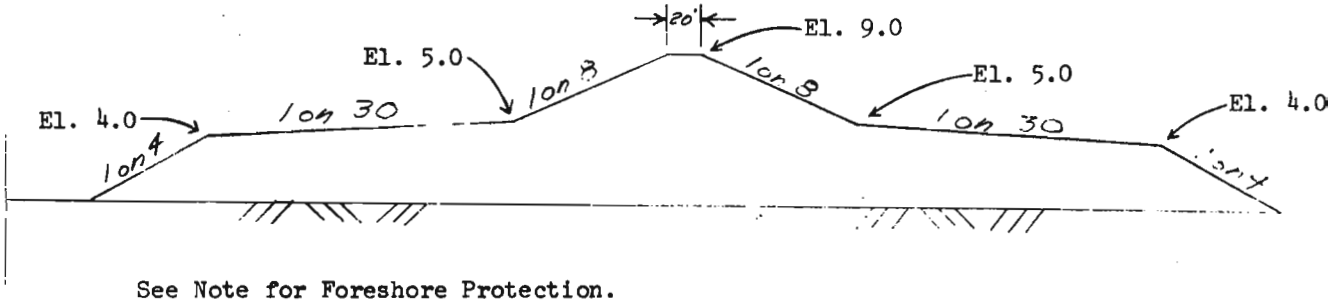
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

FEBRUARY 1967 FILE NO. H-2-24066

PLATE 4

Lake Pontchartrain, La. & Vicinity
Typical Section - Barrier Embankment

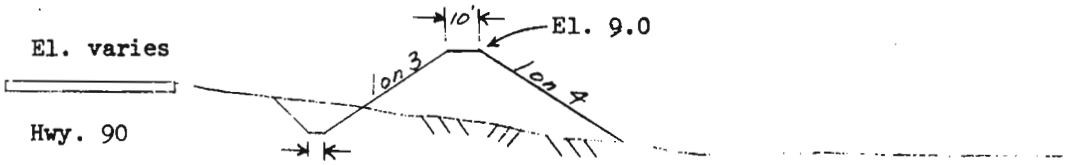
New Embankment - Authorized and
Plans A & B



See Note for Foreshore Protection.

Crown width for portion of Plan B between Chef Menteur Pass and the Rigolets is 10 feet.

Embankment Enlargement - Authorized
and Plan A, South of
Rigolets Control Structures



Elevations are in feet referred to m.s.l.

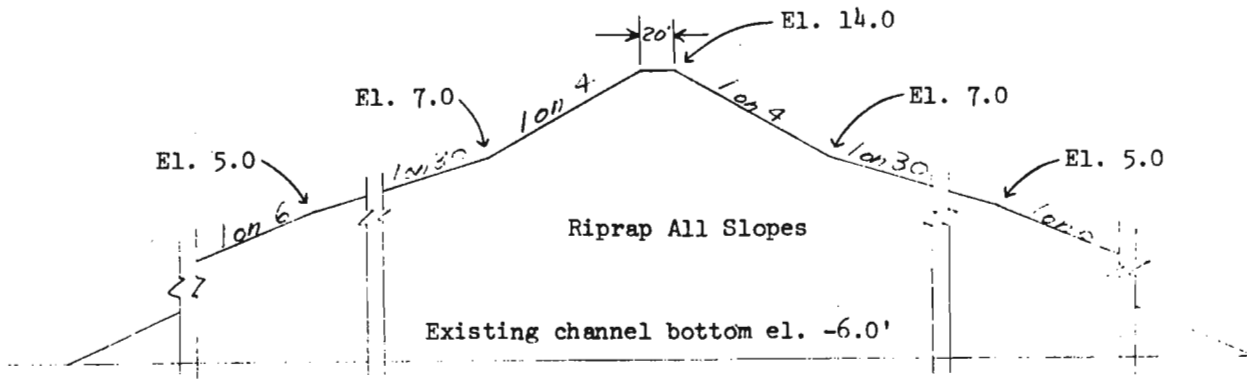
Note: Foreshore protection, extending from el. -3.0 to +3.0 feet m.s.l., will be provided for the portions of Plans A & B adjacent to the GIWW.

Feb 1967
Plate 5

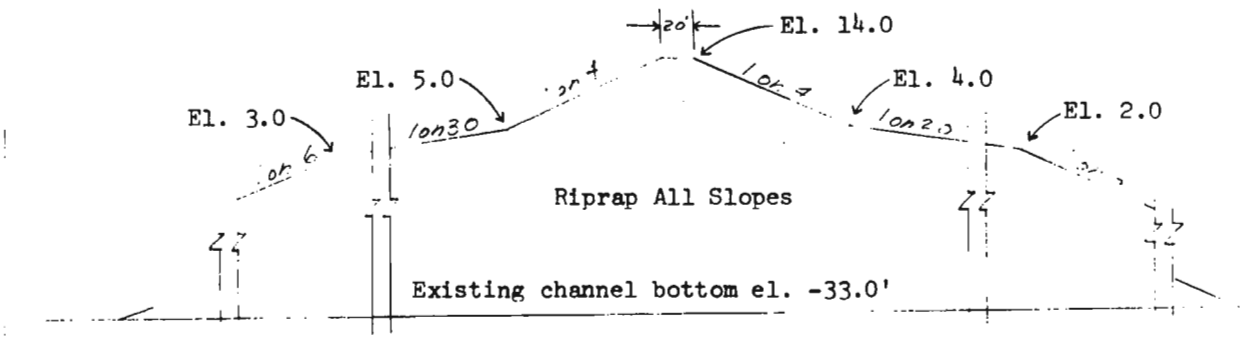
Incl 6

Lake Pontchartrain, La. & Vicinity
Typical Sections - Closure Dams
Authorized and Plans A & B

Chef Menteur Pass Closure



Rigolets Closure



Elevations are in feet referred to m.s.l.

Feb 1967
Plate 6

Incl 7

TABLE I

Lake Pontchartrain Barrier (Authorized)
Cost Estimate
(Jul 1966 price level)
New Orleans East to U. S. Highway 90 Embankment East of Chef Menteur Pass

Item	Quantity	Unit	Unit price	Cost
Structures, Chef Menteur (Project Document Estimate) (Dec 1961 price level)				
Drainage culvert				$ 3,060
Navigation floodgate				875,847
Control structure				2,097,270
Subtotal				$2,976,177
Contingencies 15%				447,427
Subtotal				$3,422,604
Escalated to Jul 1966 price level				4,083,200
E&D				445,100
S&A				351,200
Total				$4,879,500
Channels, Chef Menteur (Project Document Estimate) (Dec 1961 price level)				
Navigation - floodgate				$ 174,960
Approach - control structure				1,213,560
Subtotal				$1,388,520
Contingencies				208,278
Subtotal				$1,596,798
Escalated to Jul 1966 price level				1,905,000
E&D				207,600
S&A				163,800
Total				$2,276,400
Closure dam, Chef Menteur				
1st lift pump	1,560,000	cu.yd.	$ 0.80	1,248,000
2d lift pump	780,000	cu.yd.	0.80	624,000
3d lift shaping	234,000	cu.yd.	0.50	117,000
4th lift shaping	140,000	cu.yd.	0.50	70,000
5th lift shaping	94,000	cu.yd.	0.50	47,000
Riprap	71,400	ton	8.00	571,200
Shell	20,400	cu.yd.	4.50	91,800
Subtotal				$2,769,000
Contingencies				415,350
Subtotal				$3,184,350
E&D				347,100
S&A				273,900
Total				$3,805,400

TABLE I (cont'd)

Item	Quantity	Unit	Unit price	Cost
Levee, Chef Menteur				
Barrier				
1st lift pump	575,300	cu.yd.	$ 0.70	$ 402,700
2d lift pump	288,100	cu.yd.	0.70	201,700
3d lift shaping	120,500	cu.yd.	0.50	60,300
4th lift shaping	51,800	cu.yd.	0.50	25,900
Shell	3,000	cu.yd.	8.00	24,000
Seeding & fertilizing	42	acre	100.00	4,200
Subtotal				$ 718,800
Contingencies				107,800
Subtotal				$ 826,600
E&D				90,100
S&A				71,100
Total				$ 987,800
Levee, New Orleans East (Extending between GIW & U.S. Highway 90) (Project Document Estimate) (Dec 1961 price level)				
1st lift pump	452,900	cu.yd.	0.76	344,200
2d lift pump	188,700	cu.yd.	0.76	143,400
3d lift pump	113,200	cu.yd.	0.76	86,000
4th lift shaping	37,700	cu.yd.	0.40	15,100
5th lift shaping	22,600	cu.yd.	0.40	9,000
6th lift shaping	15,200	cu.yd.	0.40	6,100
Seeding	36	acre	75.00	2,700
Subtotal				$ 606,500
Contingencies				91,000
Subtotal				$ 697,500
Escalated to Jul 1966 price level				832,100
E&D				62,000
S&A				53,000
Total				$ 947,100
Lands and damages				
Chef Menteur complex				123,700
Levees				806,400
Subtotal				$ 930,100
Contingencies				139,500
Total				$1,069,600
First cost				$13,965,800
Operation and maintenance - annual				
Chef Menteur complex				$ 63,400
Levee				5,000
Total				$ 68,400

TABLE I (cont'd)

U. S. Highway 90 Embankment East of
Chef Menteur Pass to Apple Pie Ridge

Item	Quantity	Unit	Unit price	cost
Structures, Rigolets (Project Document Estimate) (Dec 1961 price level)				
Drainage culvert				$ 4,700
Navigation lock				2,217,100
Control structure				4,581,300
Subtotal				$ 6,803,100
Contingencies				1,020,500
Subtotal				$ 7,823,600
Escalated to Jul 1966 price level				9,333,600
E&D				989,400
S&A				793,400
Total				$11,116,400
Channels, Rigolets (Project Document Estimate) (Dec 1961 price level)				
Control structure & lock	21,626,000	cu.yd.	0.18	3,892,600
Contingencies				583,900
Subtotal				$ 4,476,500
Escalated to Jul 1966 price level				5,340,500
E&D				566,100
S&A				453,900
Total				$ 6,360,500
Closure dam, Rigolets				
1st lift pump	2,377,000	cu.yd.	0.80	1,901,600
2d lift pump	1,188,000	cu.yd.	0.80	950,400
3d lift shaping	356,500	cu.yd.	0.50	178,300
4th lift shaping	213,900	cu.yd.	0.50	106,900
5th lift shaping	142,600	cu.yd.	0.50	71,300
Riprap	198,000	ton	8.00	1,584,000
Shell	59,000	cu.yd.	4.50	265,500
Subtotal				$ 5,058,000
Contingencies				758,700
Subtotal				$ 5,816,700
E&D				616,600
S&A				494,400
Total				$ 6,927,700

TABLE I (cont'd)

Item	Quantity	Unit	Unit price	Cost
Levee, Rigolets				
Barrier - North of Rigolets				
1st lift pump	465,700	cu.yd.	$ 0.70	$ 326,000
2d lift pump	233,200	cu.yd.	0.70	163,200
3d lift shaping	97,500	cu.yd.	0.50	48,800
4th lift shaping	41,900	cu.yd.	0.50	21,000
Shell	2,400	cu.yd.	8.00	19,200
Seeding & fertilizing	34	acre	100.00	3,400
Barrier - South of Rigolets				
Cast	244,800	cu.yd.	0.60	146,900
Seeding & fertilizing	30	acre	100.00	3,000
Subtotal				$ 731,500
Contingencies				109,700
Subtotal				$ 841,200
E&D				61,400
S&A				58,000
Total				$ 960,600
Highway relocation, Rigolets (Project Document Estimate) (Dec 1961 price level)				
Embankment pump	220,000	cu.yd.	0.76	167,200
1st lift shaping	15,400	cu.yd.	0.40	6,160
2d lift shaping	6,600	cu.yd.	0.40	2,640
Concrete surface	15,500	sq.yd.	5.50	85,250
Seeding	15	acre	75.00	1,125
Subtotal				$ 262,375
Contingencies				39,625
Subtotal				$ 302,000
Escalated to Jul 1966 price level				360,600
E&D				38,200
S&A				30,700
Total				$ 429,500
Lands and damages				
Rigolets complex				$ 858,800
Levees				413,500
Relocations - Vicinity Rigolets control structure				
Aerial powerline				$ 30,000
AT&T coaxial cable				83,200
Telephone cable				10,000
First cost				$27,190,200
Operation and maintenance - annual				
Rigolets complex				$ 167,800
Barrier levee				12,800
Total O&M				$ 180,600

TABLE II

Lake Pontchartrain Barrier
Alternate Plan "A"
Cost Estimate
(Jul 1966 price level)
New Orleans East to U. S. Highway 90 Embankment East of Chef Menteur Pass

Item	Quantity	Unit	Unit price	Cost
Structures, Chef Menteur (Project Document Estimate) (Dec 1961 price level)				
Navigation floodgate				$ 875,847
Control structure				2,097,270
Subtotal				$ 2,973,100
Contingencies				446,000
Subtotal				$ 3,419,100
Escalated to Jul 1966 price level				4,079,000
E&D				444,600
S&A				350,800
Total				$ 4,874,400
Channels, Chef Menteur				
Navigation floodgate				196,300
Approach control structure				1,440,000
Subtotal				$ 1,636,300
Contingencies				245,400
Subtotal				$ 1,881,700
E&D				205,100
S&A				161,800
Total				$ 2,248,600
Closure dam				
Chef Menteur				
1st lift pump	1,560,000	cu.yd.	0.80	$ 1,248,000
2d lift pump	780,000	cu.yd.	0.80	624,000
3d lift shaping	234,000	cu.yd.	0.50	117,000
4th lift shaping	140,000	cu.yd.	0.50	70,000
5th lift shaping	94,000	cu.yd.	0.50	47,000
Riprap	71,400	ton	8.00	571,200
Shell	20,400	cu.yd.		91,800
GIW (2 dams)				
1st lift pump	153,000	cu.yd.	0.70	107,100
2d lift pump	77,000	cu.yd.	0.70	53,900
3d lift shaping	24,000	cu.yd.	0.50	12,000
4th lift shaping	14,000	cu.yd.	0.50	7,000
5th lift shaping	8,000	cu.yd.	0.50	4,000
Riprap	15,800	ton	8.00	126,400
Shell	4,600	cu.yd.	4.50	20,000

TABLE II (cont'd)

Item	Quantity	Unit	Unit price	Cost
Closure dam (cont'd)				
Subtotal				$ 3,099,400
Contingencies				464,900
Subtotal				$ 3,564,300
E&D				388,500
S&A				306,500
Total				$ 4,259,300
Levee, barrier Chef Menteur				
1st lift pump	1,356,000	cu.yd.	$ 0.70	949,200
2d lift pump	679,000	cu.yd.	0.70	475,300
3d lift shaping	284,000	cu.yd.	0.50	142,000
4th lift shaping	122,000	cu.yd.	0.50	61,000
Riprap	39,200	ton	13.00	509,500
Shell	16,200	cu.yd.	8.00	129,600
Seeding & fertilizing	100	acre	100.00	10,000
Subtotal				$ 2,276,600
Contingencies				341,500
Subtotal				$ 2,618,100
E&D				191,100
S&A				180,600
Total				$ 2,989,800
Lands and damages				
Chef Menteur complex				128,100
Relocated GIW				70,800
Barrier levee				292,400
Subtotal				$ 491,300
Contingencies				73,700
Total				$ 565,000
First cost				$14,937,100
Operation and maintenance - annual				
Chef Menteur complex				$ 63,400
Levees				8,000
Total O&M				$ 71,400

U. S. Highway 90 Embankment East of
Chef Menteur Pass to Apple Pie Ridge
Same as Authorized Plan
($27,190,200)

TABLE III

Lake Pontchartrain Barrier
Alternate Plan "B"
Cost Estimate
New Orleans East to North Bank of GIW East of Chef Menteur Pass

Item	Quantity	Unit	Unit price	Cost
Structures - Same as Plan "A" ($4,874,400)				
Channels - Same as Plan "A" ($2,248,600)				
Closure dams - Same as Plan "A" ($4,259,300)				
Levee				
1st lift pump	1,139,000	cu.yd.	$ 0.70	$ 797,300
2d lift pump	570,400	cu.yd.	0.70	399,300
3d lift shaping	238,600	cu.yd.	0.50	119,300
4th lift shaping	102,500	cu.yd.	0.50	51,300
Riprap	39,200	ton	13.00	509,500
Shell	16,200	cu.yd.	8.00	129,600
Seeding & fertilizing	100	acre	100.00	10,000
Subtotal				$ 2,016,300
Contingencies				302,400
Subtotal				$ 2,318,700
E&D				176,200
S&A				160,000
Total				$ 2,654,900
Lands and damages				
Chef Menteur complex				$ 128,100
Relocated GIW				70,800
Barrier levee				245,600
Total				$ 444,500
First cost				$14,481,700
Operation and maintenance - annual				
Chef Menteur complex				$ 63,400
Barrier levee				6,000
Total O&M				$ 69,400

Incl 10

TABLE III (cont'd)

North Bank of GIW East of Chef Menteur Pass to Apple Pie Ridge

Item	Quantity	Unit	Unit price	Cost
Structures (Project Document Estimate) (Dec 1961 price level)				
Navigation lock				$ 2,217,100
Control structure				4,581,300
Floodgates (3)				2,115,000
Subtotal				$ 8,913,400
Contingencies				1,337,000
Subtotal				$10,250,400
Escalated to Jul 1966 price level				12,228,700
E&D				1,296,200
S&A				1,039,400
Total				$14,564,300
Closure dam, Rigolets				
1st lift pump	2,415,000	cu.yd.	0.80	1,932,000
2d lift pump	1,076,000	cu.yd.	0.80	860,800
3d lift shaping	300,000	cu.yd.	0.50	150,000
4th lift shaping	200,000	cu.yd.	0.50	100,000
5th lift shaping	110,000	cu.yd.	0.50	55,000
Riprap	198,000	ton	8.00	1,584,000
Shell	59,000	cu.yd.	4.50	265,500
Subtotal				$ 4,946,800
Contingencies				742,000
Subtotal				$ 5,688,800
E&D				603,000
S&A				483,500
Total				$ 6,775,300
Channels, Rigolets				
Control structure & lock	18,750,000	cu.yd.	0.20	3,750,000
Contingencies				562,500
Subtotal				$ 4,312,500
E&D				457,100
S&A				366,600
Total				$ 5,136,200

TABLE III (cont'd)

North Bank of GIW East of Chef Menteur Pass to Apple Pie Ridge

Item	Quantity	Unit	Unit price	Cost
Levee				
1st lift pump	5,615,700	cu.yd.	$ 0.70	$ 3,931,000
2d lift pump	2,834,500	cu.yd.	0.70	1,984,200
3d lift shaping	1,101,900	cu.yd.	0.50	551,000
4th lift shaping	473,400	cu.yd.	0.50	236,700
Riprap	130,500	ton	13.00	1,696,500
Shell	53,900	cu.yd.	0.80	43,100
Seeding & fertilizing	388	acre	100.00	38,800
Subtotal				$ 8,481,300
Contingencies				1,272,200
Subtotal				$ 9,753,500
E&D				712,000
S&A				673,000
Total				$11,138,500
Lands and damages				
Barrier levee				620,800
Rigolets complex				230,000
Subtotal				$ 850,800
Contingencies				127,600
Total				$ 978,400
First cost				$38,592,700
Operation and maintenance - annual				
Levee				$ 31,300
Rigolets complex				167,800
Floodgates (3)				35,600
Boat to service structures				5,000
Total O&M				$ 239,700

Incl 11

TABLE IV

Derivation of Additional First Cost for Barrier
(Jul 1966 price level)
Plans A & B as compared with Authorized Plan

Plan	Segment: New Orleans East to East of Chef Menteur	Segment: East of Chef Menteur to Apple Pie Ridge	Total cost	Difference Plan vs. Authorize
Authorized	$13,965,800	$27,190,200	$41,156,000	-
Plan "A"	14,937,100	27,190,200	42,127,300	$ +971,300
Plan "B"	14,481,700	38,592,700	53,074,400	+11,918,400

Incl 12

TABLE V

Derivation of Additional O&M Cost for Barrier
(Jul 1966 price level)
Plans A & B as compared with Authorized Plan

Plan	Segment: New Orleans East to East of Chef Menteur	Segment: East of Chef Menteur to Apple Pie Ridge	Total cost	Difference Plan vs. Authorized
Authorized	$68,400	$ 180,600	$249,000	-
Plan "A"	71,400	180,600	252,000	$ 3,000
Plan "B"	69,400	239,700	309,100	60,100

TABLE VI

Lake Pontchartrain Barrier Plan and Chalmette Area Plan
Alternate Plan "C"

Cost Estimate
Floating Gate to Authorized Barrier Levee
East of Chef Menteur Pass
(Jul 1966 price level)

Construction cost for portion of Plan "C" from the floating gate to Highway 90	
Levee	
Hydraulic fill and shaping	$15,650,300
Structures	
Floating gate - MR-GO	20,610,200
Chef Menteur control structure and navigable floodgate including associated channels and closure dams	10,560,700
Bayou Bienvenue navigable floodgate and associated channel	1,691,300
GIW lock including associated channels	6,874,000
L&N RR ramp	25,000
Lands and damages	1,200,300
First cost	$56,611,800
Operation and maintenance	
Levee	60,900
Structures	118,400
Subtotal	$ 179,300
Replacement - Annual	$ 142,700

TABLE VII

Lake Pontchartrain Barrier Plan and Chalmette Area Plan

Costs for Items Which Would Be Eliminated by Plan "C"
(Jul 1966 price level)

Chalmette(1)	
IHNC to floating gate	
Levee and floodwall including bank stabilization	$10,972,900
Bayou Bienvenue navigable floodgate and associated channels	1,691,300
Lake Pontchartrain barrier plan (2)	
New Orleans	
IHNC - levee and floodwall	4,978,200
Citrus	
IHNC and back levee and floodwall	8,977,300
New Orleans East	
Back levee	7,841,200
Chef Menteur barrier struct. floodgate	1,720,800
Chef Menteur barrier struct. levee	1,666,700
Chef Menteur barrier control struct.	5,429,000
Barrier levee	
New Orleans East to Highway 90 embankment east of Chef Menteur Pass	987,800
Lands and damages	
Chef Menteur barrier structures	123,700
Citrus - IHNC and back levee	1,823,750
New Orleans East - back levee	331,250
Barrier levee	763,800
New Orleans	1,038,800
Chalmette	1,823,000
Relocations	
New Orleans East - back levee	274,600
Chalmette	100,000
First cost	$50,544,100
Operation and maintenance - annual	
Chalmette	$ 60,200
Chef Menteur complex	63,400
Barrier levee	5,000
New Orleans East - back	11,700
Citrus - back	10,100
Total O&M	$ 150,400

Incl 14

TABLE VII (cont'd)

Replacement - annual	
New Orleans - IHNC	$ 77,300
Citrus - IHNC	41,300
Chalmette	5,400
Total	$ 124,000

(1) All work along Inner Harbor Navigation Canal and Mississippi River-Gulf Outlet to floating gate would be eliminated. Costs of eliminated work are taken from "Design Memorandum No. 3, General Design, Chalmette Area Plan," dated 1 November 1966.

(2) Existing levees and floodwalls on the Inner Harbor Navigation Canal and the Citrus and New Orleans East back levees are of sufficient height to provide protection from non-hurricane high tides and would require no further work under the authorized project. The authorized Chef Menteur barrier complex, including the levee along Bayou Sauvage, would be replaced by the Plan "C" complex. Costs are from PB-3 dated 1 July 1966.

Incl 15

TABLE VIII

Lake Pontchartrain Barrier Plan and Chalmette Area Plan

Derivation of Additional First Cost and O&M for Plan "C"
Plan "C" as compared with Authorized Plan
(Jul 1966 price level)

Features	Authorized Plan Eliminated by Plan "C"	Plan "C"	Difference Plan "C" vs. Authorized
	Chalmette - MR-GO at floating gate to IHNC lock; Barrier Plan - IHNC levees; Citrus back levee; New Orleans East back levee; Barrier, New Orleans East to U. S. Highway 90 embankment east of Chef Menteur Pass	Floating gate to authorized barrier levee east of Chef Menteur Pass	
First cost	$50,544,100	$56,611,800	$+6,067,700
Operation & maintenance - annual	150,400	179,300	+28,900
Replacement - annual	124,000	142,700	+18,700

TABLE IX

Summarized Additional Annual Charges
Plans "A," "B," & "C"

Plan "A" vs. Authorized Plan

Item	Authorized plan	Plan "A"	Additional ann. charges
Interest and amortization (3-1/8%, 100 yrs.)	$1,564,200	$1,599,900	$ 35,700
Operation and maintenance	249,000	252,000	3,000
Replacement	0	0	0
Total annual charges	$1,813,200	$1,851,900	$ 38,700

Plan "B" vs. Authorized Plan(1)

Item	Authorized plan	Plan "B"	Additional ann. charges
Interest and amortization (3-1/8%, 100 yrs.)	$ 943,600	$1,348,700	$ 405,100
Operation and maintenance	180,600	239,700	59,100
Replacement	0	0	0
Total annual charges	$1,124,200	$1,588,400	$ 464,200

Plan "C" vs. Authorized Plan(2)

Item	Authorized plan	Plan "C"	Additional ann. charges
Interest and amortization (3-1/8%, 100 yrs.)	$1,800,600	$2,000,000	$ 199,400
Operation and maintenance	150,400	179,300	28,900
Replacement	124,000	142,700	18,700
Total annual charges	$2,075,000	$2,322,000	$ 247,000

(1) Plans "A" & "B" are essentially the same between New Orlans East and east of Chef Menteur Pass. Accordingly, evaluation of Plan "B" must be based on a comparison of the portion of that plan between east of Chef Menteur Pass and Apple Pie Ridge with the corresponding portion of the authorized plan. The figures tabulated are those for the increments east of the Chef Menteur Pass for both the authorized plan and Plan "B."
(2) Costs are for elements of Plan "C" and features of authorized plan which would be eliminated by construction of Plan "C."

1507-03 (Lake Pontchartrain)

STATE OF LOUISIANA
DEPARTMENT OF PUBLIC WORKS
BATON ROUGE

LEON GARY
DIRECTOR

February 8, 1967

Colonel Thomas J. Bowen
District Engineer
New Orleans District
Corps of Engineers, U.S. Army
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Bowen:

Reference is made to your letter of January 27, 1967, relative to the proposed modified plan for the "Lake Pontchartrain, Louisiana and Vicinity" project. Reference is also made to the enclosed letter to Mr. A. L. Willoz, Chief Engineer, Orleans Levee District, dated January 24, 1967, and accompanying drawing entitled "Lake Pontchartrain, La. and Vicinity - Lake Pontchartrain Barrier and Chalmette Area Plans, Improvements on and to the East of Inner Harbor Navigation Canal - Project Document Plan and Alternate Plan "C", File No. H-2-24066.

The Department of Public Works has carefully examined Alternate Plan "C" and is of the firm opinion that this plan should not be adopted. We believe that the delay that would be entailed in a restudy of the authorized plan would be unthinkable in view of the urgent need for hurricane protection for the City of New Orleans and adjacent parishes.

We further believe that the proposed 400' x minus 40' MGL floating gate in the Mississippi River Gulf Outlet would not be a safe or a practical means of closing this channel. Also, we believe that this gate could be a serious obstacle to the navigation interests who use this channel.

The lock which would be required in the Intracoastal Canal east of Chef Menteur would be a definite obstacle to the users of this navigation channel. We further believe that the construction of the embankment leading from the location of the 400' barge gate to Chef Menteur would take much too long.

For these reasons, we object to the proposed adoption of Alternate Plan "C".

Sincerely yours,

Calvin T. Watts

CALVIN T. WATTS
Assistant Director

/an
cc - Orleans Levee District
Mr. Arthur R. Theis

Encl 17

1507-03 (Lake Pontchartrain)

The Board of Levee Commissioners

OF THE

Orleans Levee District

200 WILDLIFE AND FISHERIES BUILDING
418 ROYAL STREET

New Orleans, La.
70130

February 22, 1967

Colonel Thomas J. Bowen
District Engineer
U. S. Army Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Colonel Bowen:

The management of the Orleans Levee Board objects to the suggested modification to the Lake Pontchartrain, Louisiana and Vicinity project because it is not in the best interest of our community.

The proposed modification would mean to stop work on the existing project. The modification plan also would cause the present plan to be delayed even though the modification would be rejected by Congress.

If the plan was approved, it could possibly be as much as 20 years in the building. I am sure that the citizens of our community and the Orleans Levee Board would not agree to this condition.

There are many other reasons why we are opposed to this plan being submitted to Congress for consideration, however, you have received a letter from Armand L. Willoz, Chief Engineer for the Orleans Levee Board, that more clearly states our position.

I am forwarding a copy of Mr. Willoz's letter and my letter to our congressional delegation and I will certainly seek their assistance in getting the modification plan rejected.

Incl 18

In the best interest of the people of New Orleans, I ask that you, as District Engineer for the U. S. Army Corps of Engineers, recommend against the suggested modification to the Lake Pontchartrain, Louisiana and Vicinity Project.

Sincerely,

Milton E. Dupuy
President

MED:baf

cc: Armand L. Willoz, Chief Engineer, Orleans Levee Board
The Honorable Hale Boggs, Member of the House of Representatives
The Honorable Allen J. Ellender, United States Senator
The Honorable Russell B. Long, United States Senator
The Honorable F. Edward Hebert, Member of the House of Representatives
The Honorable John R. Rarick, Member of the House of Representatives

1507-03 (Lake Pontchartrain)

523-5041

The Board of Levee Commissioners

OF THE

Orleans Levee District

200 WILDLIFE AND FISHERIES BUILDING
418 ROYAL STREET

New Orleans, La.
70130

22 February 1967

Colonel Thomas J. Bowen, CE
District Engineer - Dept. of the Army
New Orleans District,
Corps of Engineers
P. O. Box 60267
New Orleans, La. 70160

RE: LMNED-PP

Dear Colonel Bowen:

Reference is made to our recent discussions with yours Messrs. Chatry and Mask, of your office, on 18 January 1967, and your letter of 24 January 1967, relative to an evaluation study of suggested modification to the "Lake Pontchartrain, La. and Vicinity," project.

Consideration of the proposed modification would mean an instant stopping of all planning and work on the existing project by the U. S. Corps of Engineers until Congress had acted.

Should Congress reject the modification, it would mean several years of unnecessary delay in the execution of the present plan.

Should Congress approve the modification it may be as much as twenty years before the new plan be completely executed.

The use of a floating gate, we are certain, will be strongly opposed by the navigation interests, because it will necessitate the closing of the Mississippi River-Gulf Outlet for several days, whenever the area is threatened by a hurricane.

Should the modified plan be adopted, the local agencies would be pressed by the public to provide interim protection along the Industrial Canal, the Mississippi River-Gulf Outlet and the Intracoastal Canal, which would mean an expenditure of about $29,000,000. In addition, the local agencies would be required to contribute 30% of the cost of the modified plan, which would amount to about $15,000,000. The total of the interim protection and the contribution to the modified plan would mean a total local expenditure in excess of $44,000,000. This expenditure would be difficult to finance by local interest, particularly, in view, that $29,000,000. would be spent on interim protection.

Incl 19

Board of Levee Commissioners
Orleans Levee District

It is our view that the modification of the Lake Pontchartrain, La. and Vicinity Project is not to the best interest of the City of New Orleans, because we feel certain that the citizens would strongly oppose any delay in execution of the hurricane protection in this area, and expose a great part of the City to hurricane tides for a long period of years.

It would not be within the present authority of this Board, to finance such a large local contribution.

Under the circumstances, we must oppose any modification to the present plans as it would be against the best interest of our Community.

Sincerely yours,

A. L. WILLOZ
CHIEF ENGINEER

ALW:mgl

cc: Mr. M. E. Dupuy

LMVED-TD (NOD 13 Mar 67) 1st Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity - Evaluation of Alternate Plans Involving Modifications in the Alignment of the Lake Pontchartrain Barrier

DA, Lower Miss. Valley Div, CE, Vicksburg, Miss. 39180 28 Mar 67

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

1. Subject report is forwarded for review and approval pursuant to para 9b, ER 1110-2-1150. The recommendations of the District Engineer, in para 15, are concurred in.

2. The last sentence under Plan A, page 4, would be clearer if written as follows:

"It must be pointed out that these areas will remain subject to flooding by overtopping of the barrier from lesser hurricanes than the SPH, and in addition will be vulnerable to overflow from Lake Pontchartrain."

FOR THE DIVISION ENGINEER:

George B. Davis

19 Incl (10 cy)
wd 1 cy ea

GEORGE B. DAVIS
Acting Chief, Engineering Division

Copy furnished:
NOD, ATTN: LMNED-PP

ENGCW-EZ (LMNED-PP 13 Mar 67) 2d Ind
SUBJECT: Lake Pontchartrain, La. and Vicinity - Evaluation of Alternate Plans Involving Modifications in the Alignment of the Lake Pontchartrain Barrier

DA, CofEngrs, Washington, D. C., 20315, 15 May 1967

TO: Division Engineer, Lower Mississippi Valley Division

The recommendations of the District Engineer in paragraph 15 of the basic letter are approved, subject to the comment of the Division Engineer in the 1st indorsement.

FOR THE CHIEF OF ENGINEERS:

wd incl

WENDELL E. JOHNSON
Chief, Engineering Division
Civil Works

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX B
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
LAKE PONTCHARTRAIN BARRIER
TIDAL HYDRAULICS

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX B
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
LAKE PONTCHARTRAIN BARRIER
TIDAL HYDRAULICS

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LAKE PONTCHARTRAIN BARRIER
TIDAL HYDRAULICS

SECTION I - DESIGN DIFFERENTIAL HEADS

1. General. The Hydrology and Hydraulic Analysis Design Memorandum No. 1 is being presented in a series of four separate reports subtitled Part I - Chalmette, Part II - Barrier, Part III - Lakeshore, and Part IV - Chalmette Extension. Parts I, II, and IV have been approved, and Part III - Lakeshore was submitted 30 September 1968. These documents present detailed descriptions and analyses of the procedures used in the tidal hydraulic design of the plan; include the essential data, assumptions, and criteria; and give results of studies which provide the bases for determining surges, routings, wind tides, wave runup, overtopping volumes, and design storm frequencies. However, specific design criteria will be developed for each structure to include design differential heads, wave data, and, where pertinent, critical design velocities.

2. Design considerations. Maximum surge elevations at the barrier site on the Lake Borgne side were determined in DM No. 1, Part II - Barrier. However, maximum and minimum elevations on the Lake Pontchartrain side and minimum stages on the Lake Borgne side are determined herein to indicate the conditions producing the most critical differential heads between Lakes Pontchartrain and Borgne. The net grade of 9.0 feet* for the barrier embankment restricts major overflow from either side until overtopping occurs. The rate of discharge over the barrier embankment increases as the upstream stage increases. The hurricane winds, which generate the wind setup on one side of the lock, blow in such a direction as to cause setdown on the opposite side; consequently, a critical differential head will result across the lock. The differential head is a function of wind velocity, wind direction, and barrier elevation, as these factors affect the upstream stage, downstream controlling stage, and overtopping discharge. Computations of wind setdown at

*Elevations refer to mean sea level datum unless otherwise noted.

the eastern end of Lake Pontchartrain, to determine the controlling Lake Pontchartrain stage for any corresponding stage in Lake Borgne, indicated that before major overtopping of the barrier levee began, the Lake Pontchartrain bed near the barrier became exposed for some hurricanes of intensity equal to or less than the SPH (Standard Project Hurricane) following tracks C and F (see plate 1). This illustrated a possible condition for which an 8- to 10-foot stage could occur on the Lake Borgne side of the lock and approximately a -6-foot stage on the Lake Pontchartrain side exposing the lake bed near the barrier. With passage of the hurricane, the stage on the Lake Borgne side of the barrier will increase, and the stage on the Lake Pontchartrain side of the barrier will decrease until overtopping of the barrier floods the lock approach channel and lake bottom increasing the protected side stage.

3. Methods of computation. In order to determine the stage on the downstream side of the lock for any given rate of discharge, the location of a control section was determined. The average depth of a cross section of Lake Pontchartrain downstream from the lock is -6.0 feet (see plate 1). The lake is deeper upstream and downstream from this section.† Consequently, the control section was determined to govern backwater conditions when flow over the barrier began. Since the portion of the lake bed represented by this section is extremely wide and nearly horizontal, fluid mechanics governing horizontal rectangular channels of great width were assumed to apply. For a horizontal channel, slope $S_o=0$, the normal depth is infinite and flow may be either below critical depth or above critical depth. The equation for water surface slope has the form:

$$\frac{dL}{dy} = \frac{1 - Q^2 T/gA^3}{S_o - n^2Q^2/2.22A^2R^{4/3}} \qquad (1)$$

where Q = discharge
T = width of channel at surface
A = cross-sectional area
R = hydraulic radius, equal to the depth y for wide channels
n = Manning roughness coefficient
g = acceleration due to gravity

†As referred to hereinafter in this appendix, upstream of the control section refers to the easterly or barrier side of the control section, and downstream of the control section refers to the westerly side of the control section.

Flow below critical depth y_c would give lower stages and produce greater differential heads across the lock than flow above critical depth. For depths y less than critical, dL/dy is positive, the depth increases in the downstream direction[1‡], and the average velocity V is greater than the critical velocity V_c. The critical velocity V_c is equal to $(gy_c)^{1/2}$ and the critical depth may be computed by the equation:

$$y_c^3 = q^2/g \qquad (2)$$

where q = unit width discharge $\frac{Q}{T}$.

For a peak discharge over the barrier levee of 887,000 cubic feet per second caused by the SPH traveling along track F, the critical depth and velocity at the control section are 2.48 feet and 8.93 feet per second, respectively. The average width T at this section is 40,000 feet. However, a wind shear stress τ_s is imposed upon the water surface along the axis of flow. It can be shown that if the bottom shear stress τ_b is equal to the surface wind shear stress, the energy slope is constant and equal to zero.[2] The resisting force along a short reach of channel L (see plate 2) is equal to the relation $\tau_b LP_b$, where P_b is the wetted perimeter. The driving forces are the force resulting from a difference in hydrostatic pressure $(p_1-p_2)A$, the axial weight component $\gamma A\Delta y$, and the wind force $\tau_s LP_s$, where gamma γ is the unit weight of water and P_s equals surface width. Equating these together and assuming $P_s \simeq P_b$ gives the following:

$$\tau_b LP = \tau_s LP + \Delta pA + \gamma Ady \qquad (3)$$

$$(\tau_b-\tau_s)LP = A(\Delta p+\gamma dy) \qquad (4)$$

If $\frac{(\Delta p+\gamma dy)}{\gamma}$ = head losses h_f, and $\tau_s=\tau_b$

then $(\tau_b-\tau_s) = \frac{\gamma Ah_f}{PL}$

Since $R = \frac{A}{P}$, $S = \frac{h_f}{L}$, and $\tau_b-\tau_s = 0$; $\gamma RS = 0$ (5)

‡Superscribed numbers refer to references in Section III - Bibliography.

where S represents the energy gradient and equals the head loss per unit length. The exact value of τ_s is not known but is related to the wind velocity U by the expression $k\rho_a U^2$, where the coefficient k must be evaluated experimentally or estimated from past observations, and ρ_a is the density of air.[3] Hunt[4,5] has determined $k\rho_a$ to be equal to 8.65×10^{-6} for a deep bounded channel (y>3 feet) where setup can occur and reach a steady state. It is believed that $k\rho_a$ would be greater than 8.65×10^{-6} for a shallow unbounded channel.[6,7] If the shear stress is constant throughout the depth, then τ_b equals τ_s, and the average instantaneous velocity V may be computed by using Hunt's equation for τ_s and equating it to the bottom stress function τ_b:

$$\tau_b = \frac{f}{4} \rho \frac{V^2}{2} \qquad \tau_s = k\rho_a (U-8)^2$$

$$\frac{f}{4} \rho \frac{V^2}{2} = k\rho_a (U-8)^2 \qquad (6)$$

and solving for the water velocity gives

$$V = \sqrt{\frac{8k\rho_a (U-8)^2}{f\rho}}$$

where ρ = density of water, 1.94 slugs/ft.^{3}

$k\rho_a = 8.65 \times 10^{-6}$

f = Darcy-Weisbach roughness coefficient evaluated from a Moody Diagram using the procedure for open channel flow.

The Lake Pontchartrain bed is composed of clays and silts and is free of ripples and dunes; therefore, a silt diameter of 0.061 millimeters (where 90% by weight is assumed finer[8]) was chosen as representative of the boundary roughness diameter ε. Assuming an average depth y of 2.0 feet and a peak instantaneous windspeed of 125 miles per hour (183.25 feet per second), $\frac{\varepsilon}{4y} = 0.000025$ and f is taken as 0.009; the peak instantaneous velocity would be:

$$V = \sqrt{\frac{8 \times 8.65 \times 10^{-6}}{1.94 \times 0.009} (183.25-8)^2}$$

$$= 11.06 \text{ feet per second}$$

Therefore, V = 11.06 > V_c = 8.93 and flow would be below critical depth y_c as follows:

$$y = \frac{Q}{VT} \qquad (8)$$

$$= \frac{887000 \text{ c.f.s.}}{11.06 \text{ f.p.s.} \times 40{,}000 \text{ feet}}$$

$$= 2.00 \text{ feet}$$

The average water surface elevation at the control section for the SPH would be -4 feet (-6 feet + 2 feet). For the conditions mentioned above, i.e., S=0, the water surface elevation was extended from the lake upstream through Rigolets Pass to the downstream end of the lock approach channel. Backwater computations were made from the end of the approach channel to the lock gates using relations for spatially varied flow.[9] The discharge over the barrier flows over the marsh and enters the approach channel from the side as shown on plate 3. The solution of steady spatially variable flow into the lock approach channel was accomplished using the following differential equation:

$$S_o - S - \frac{\partial y}{\partial X} = \frac{V}{g}\frac{\partial V}{\partial X} + \frac{\partial Q}{\partial X}\frac{V}{ga} \qquad (9)$$

The form was changed so that the differentials became finite differences as shown in the following equation:

$$a_{av}\,(y_1 - y_2) + a_{av}\,\Delta X\,S_{av} = \frac{a_1 V_1 (V_2 - V_1)}{g} + \frac{q V_2 \Delta X}{g} \qquad (10)$$

where a_{av} = average approach channel cross section
g = acceleration due to gravity
q = unit width discharge along channel entering from one side
S_{av} = average slope of energy gradient
V = average velocity
y = depth of flow
ΔX = finite length of channel
S_o = channel slope equal to zero

in which the subscripts 1 and 2 apply to the upstream and downstream ends, respectively, for reaches of length X. This procedure was performed for several different discharge rates and controlling elevations coinciding with the different hypothetical hurricane intensities. A water surface profile for the SPH on track F is shown on plate 4. Similar computations were made to determine stages at the lock gates on the Lake Borgne side for a reverse head condition.

4. Design differential heads. For a 10.70-foot stage in Lake Borgne, a coincidental -4.75-foot stage was determined on the Lake Pontchartrain side and for a 12.8-foot stage on the Lake Borgne side, a coincidental -1.0-foot stage was determined at the Lake Pontchartrain end of the lock. These stages correspond, respectively, to Moderate and Standard Project Hurricanes on track F. A stage-frequency curve, based on four hypothetical moderate and severe hurricanes, was derived in order to determine the differential heads for any hurricane likely to occur. The minimum stages on the Lake Pontchartrain side, coincidental to maximum stages on the Lake Borgne side, were plotted at the frequency positions corresponding to the different hypothetical hurricanes. This plot provided a lower limit of points through which an envelope curve of minimum stages could be drawn. The maximum and minimum stage-frequency curves thus provided a means of determining coincident stages for any hurricane of an intensity equal to or less than the SPH. A study of these curves indicated that differential heads which fell between those actually computed were more critical than the less frequent differential caused by the SPH, and should be used for design of certain features. This procedure as illustrated on plate 5 was used to determine the differentials in both directions across the lock. Plates 6 and 7, respectively, illustrate stage-frequency curves for hurricanes following track C, and for hurricanes on any track producing higher stages on the Lake Pontchartrain side equal to or less than the SPH. Differentials produced by hurricanes which generate stages equal to or greater than 9.0 feet may prevail for 15 to 20 hours. Durations of this magnitude should be used in structural design considerations.

SECTION II - DESIGN WAVES

5. Wave data. The parameters which determine wave characteristics are fetch length, windspeed, duration of wind, and the average depth of water over the fetch. In determining the design wave characteristics, it was assumed that steady state conditions prevail; i.e., the windspeed is constant in one direction over the fetch and blows long enough to develop a fully risen sea. The windspeed U is an average velocity over the fetch length F and is obtained from the isovel patterns for the synthetic hurricane chosen as being critical to the location of interest. The average depth of fetch d is the average depth of water as shown by the charts and maps for the area, plus the increase in water elevation caused by wind. Data necessary to determine design wave characteristics in the vicinity of the structures are shown in table -1 as follows:

TABLE B-1
DATA USED TO DETERMINE WAVE CHARACTERISTICS
DESIGN HURRICANE

	Lake Borgne side	Lake Pontchartrain side
F - Length of fetch (mi.)	5	1.4
U - Windspeed (m.p.h.)*	88	64
swl - Stillwater level (ft.m.s.l.)	12.8	6.0
d - Average depth of fetch (ft.)	11.3	35.0

*Represents a 5-minute average referenced to 30 feet above the boundary surface.

The significant wave height H_s and wave period T were determined from the data in table -1 above. The deep water wave length L_o was determined from the equation: $L_o = 5.12T^2$. The equivalent deep water wave height H_o' was determined from table D-1 of the Coastal Engineering Research Center Technical Report No. 4, June 1966, which relates the relative depth d/L_o to H_s/H_o'. Wave characteristics for the design hurricane which are pertinent to the design of the structures are shown in table -2 below.

TABLE B-2
WAVE CHARACTERISTICS - DESIGN HURRICANE

		Lake Borgne side	Lake Pontchartrain side
H_s	- Significant wave height(ft.)	4.9	4.00
T	- Wave period (sec.)	5.4	7.8
L_o	- Deep water wave length(ft.)	149	311
d/L_o	- Relative depth	0.07584	0.1125
H_s/H_o'	- Shoaling coefficient	0.9610	0.9242
H_o'	- Deep water wave height(ft.)	5.10	4.30
H_o'/T^2	- Wave steepness	0.189	0.071
d_b	- H_o' breaking depth (ft.)	5.97	6.90
H_b	- Wave height on breaking(ft.)	4.66	5.40
H_{10}	- Average of highest 10% of all waves (ft.)	6.22	5.08
H_1	- Average of highest 1% of all waves (ft.)	8.18	6.68

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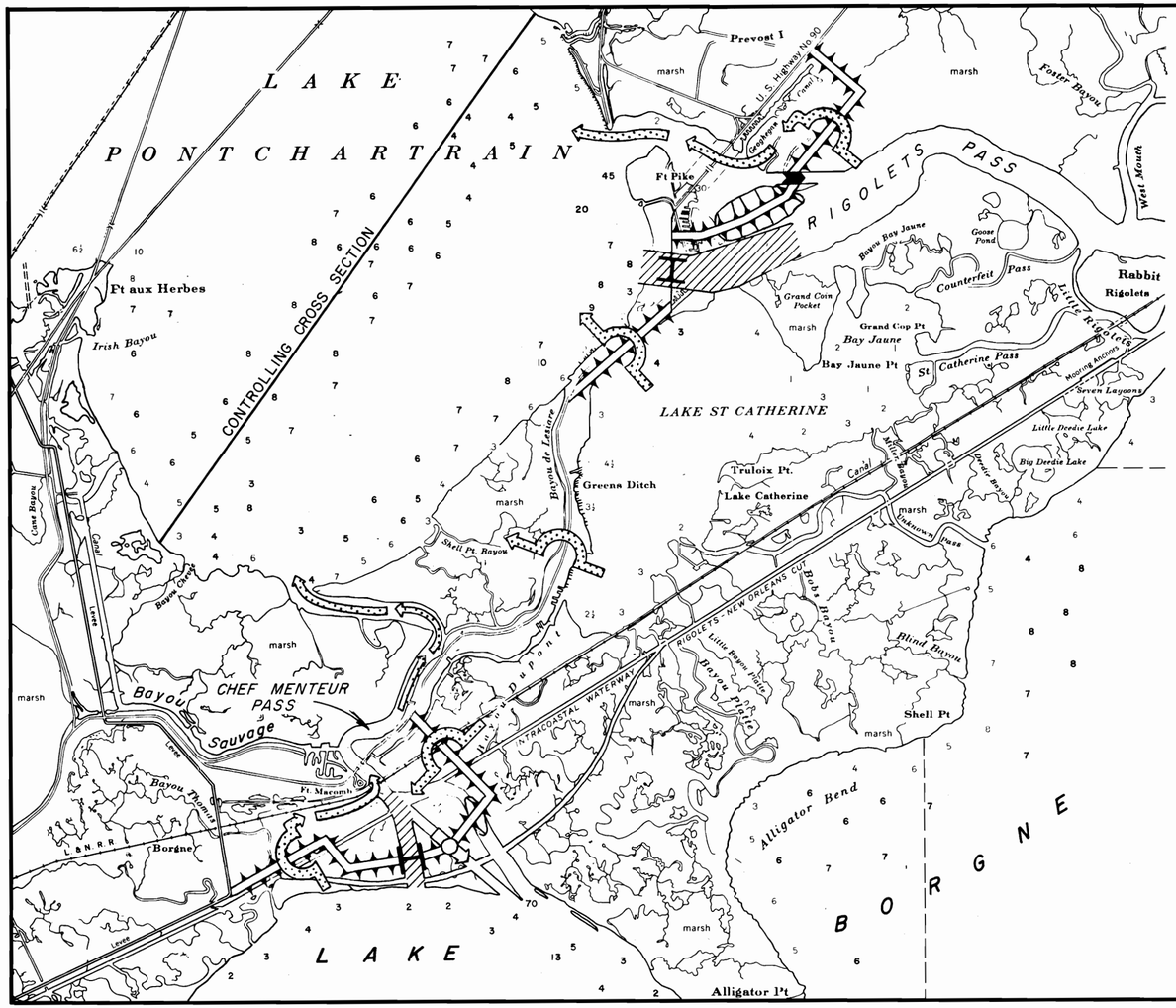
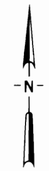
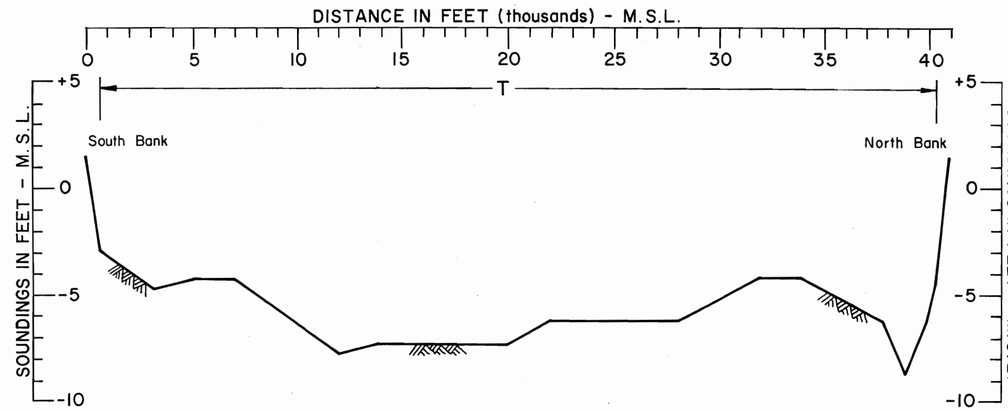




LEGEND

- Lock
- Floodgate
- Control Structure
- Approach Channel
- Closure Dam
- Highway Embankment
- Barrier Embankment (new)
- Railroad Embankment
- Direction of Flow

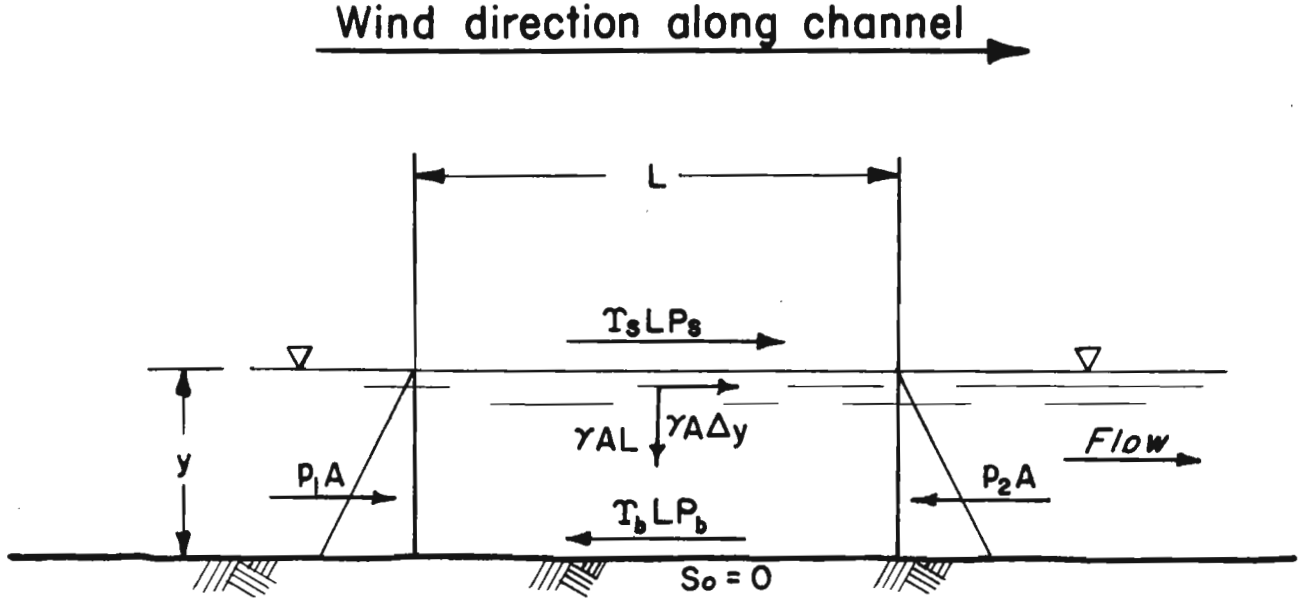


LAKE PONTCHARTRAIN CONTROLLING CROSS SECTION

NOTE:
Soundings obtained from C. & G.S. Chart No. 1268.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
CONTROLLING CROSS SECTION
TRACKS C&F AND FLOW REGIMEN
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
SEPT. 1968 FILE NO. H-2-24719

APPENDIX "B" PLATE 1



Note:

Resisting force is $T_b L P_b$

Driving forces are $(p_1 - p_2)A + \gamma A \Delta y + T_s L P_s$

Equating forces gives $T_b L P_b = (\Delta p + \gamma \Delta_y) A + T_s L P_s$

Transposing wind stress term gives $(T_b P_b - T_s P_s) L = (\Delta p + \gamma \Delta_y) A$

Assuming $T_b = T_s$ and $P_b \simeq P_s$ then $(\Delta p + \gamma \Delta_y) \frac{A}{P} = 0$

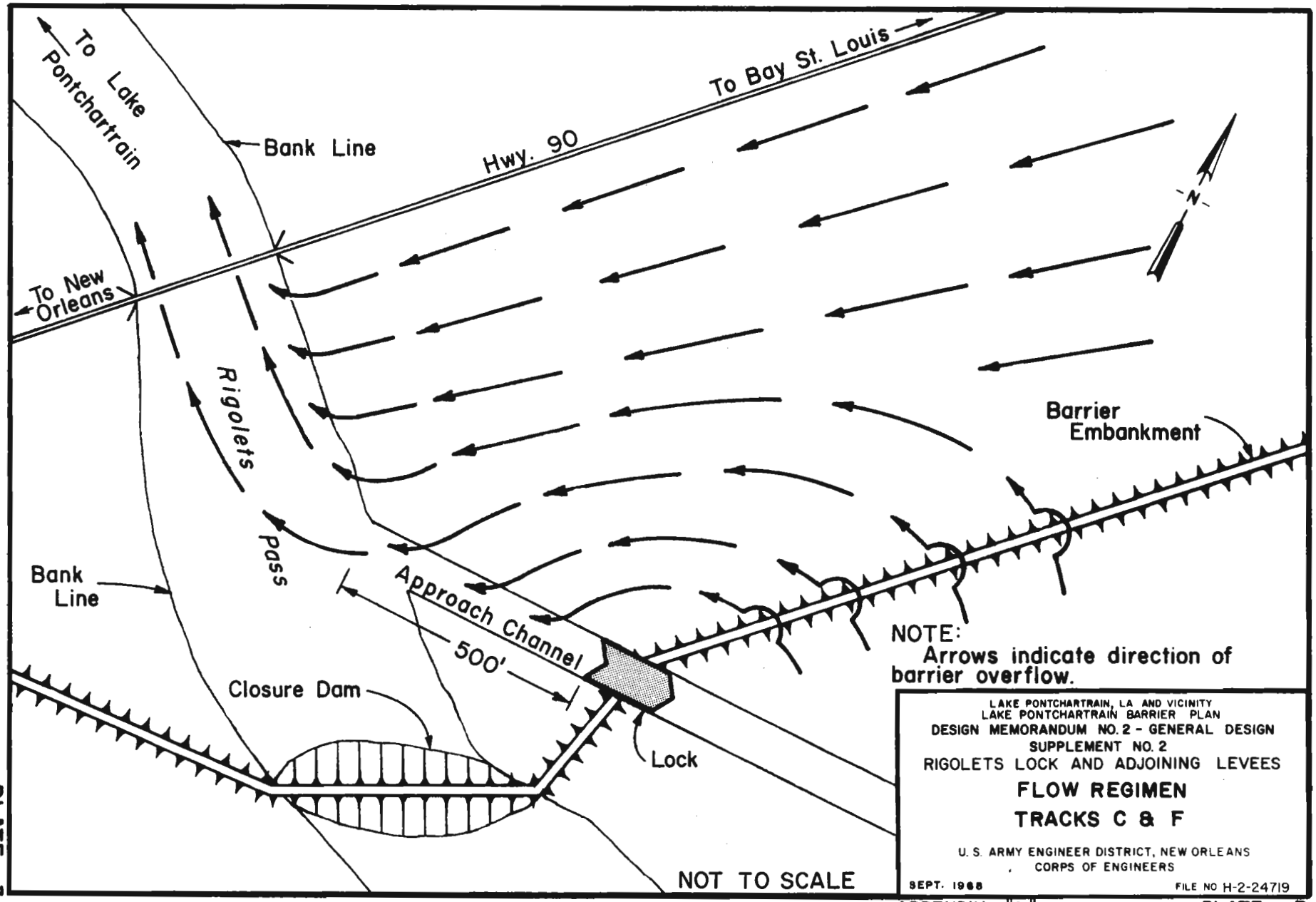
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

EFFECT OF SURFACE WIND STRESS ON WATER PROFILES

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

SEPT. 1968 FILE NO H-2-24719

PLATE 2



LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

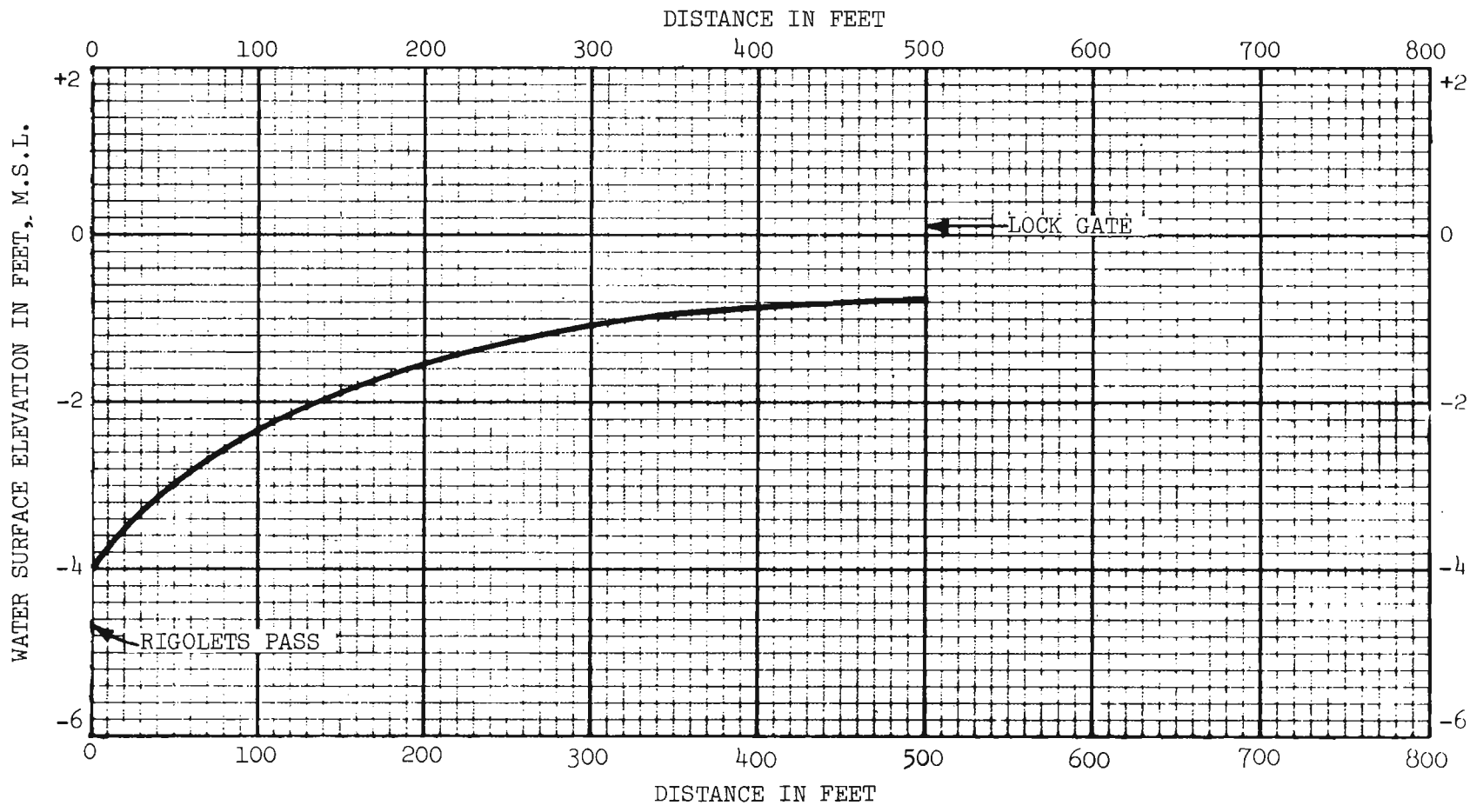
FLOW REGIMEN

TRACKS C & F

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

SEPT. 1968 FILE NO H-2-24719

PLATE 3



LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

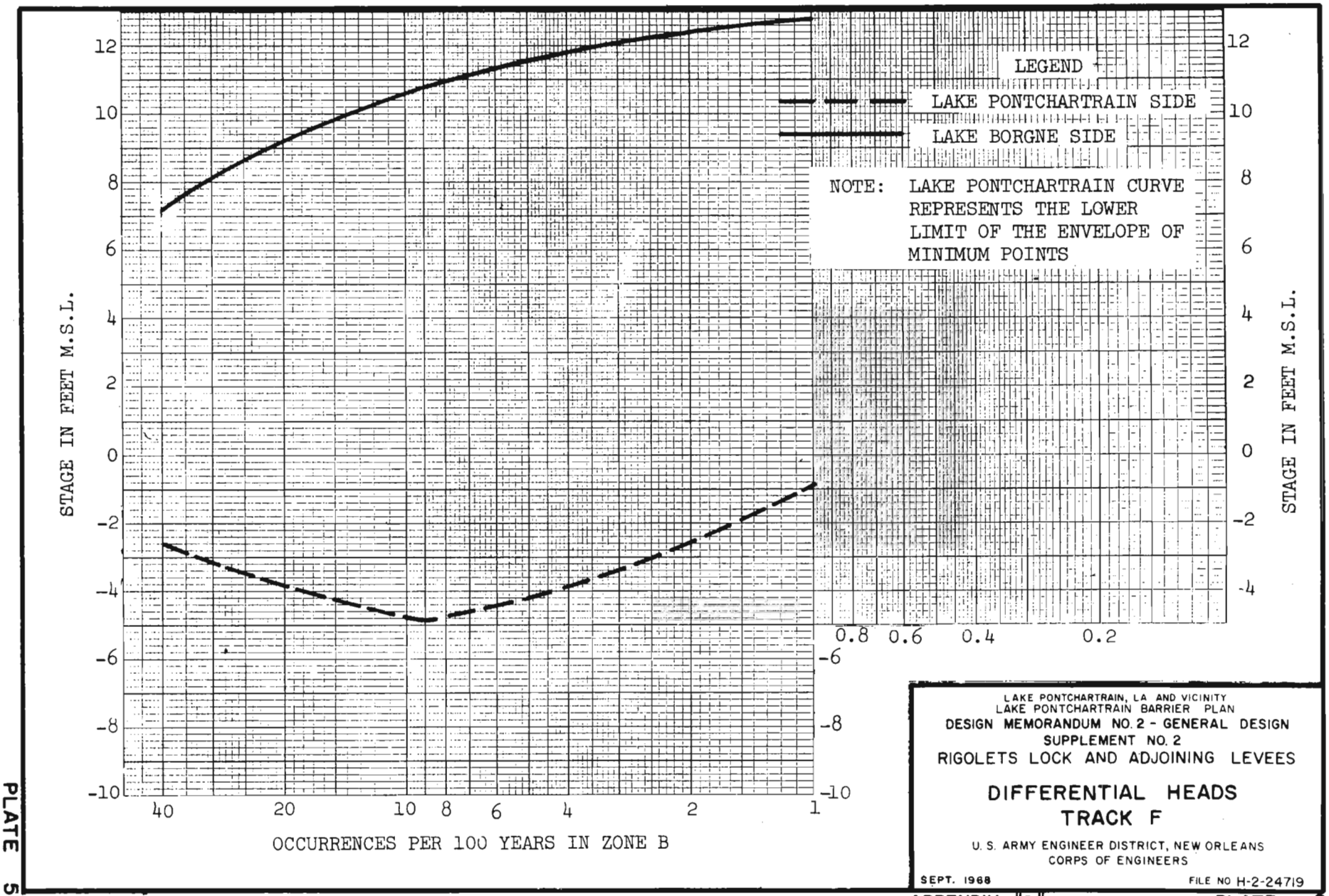
RIGOLETS LOCK
SPH WATER SURFACE PROFILE NORTHWEST APPROACH CHANNEL

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

SEPT. 1968 FILE NO H-2-24719

APPENDIX "B" PLATE 4

PLATE 4



LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

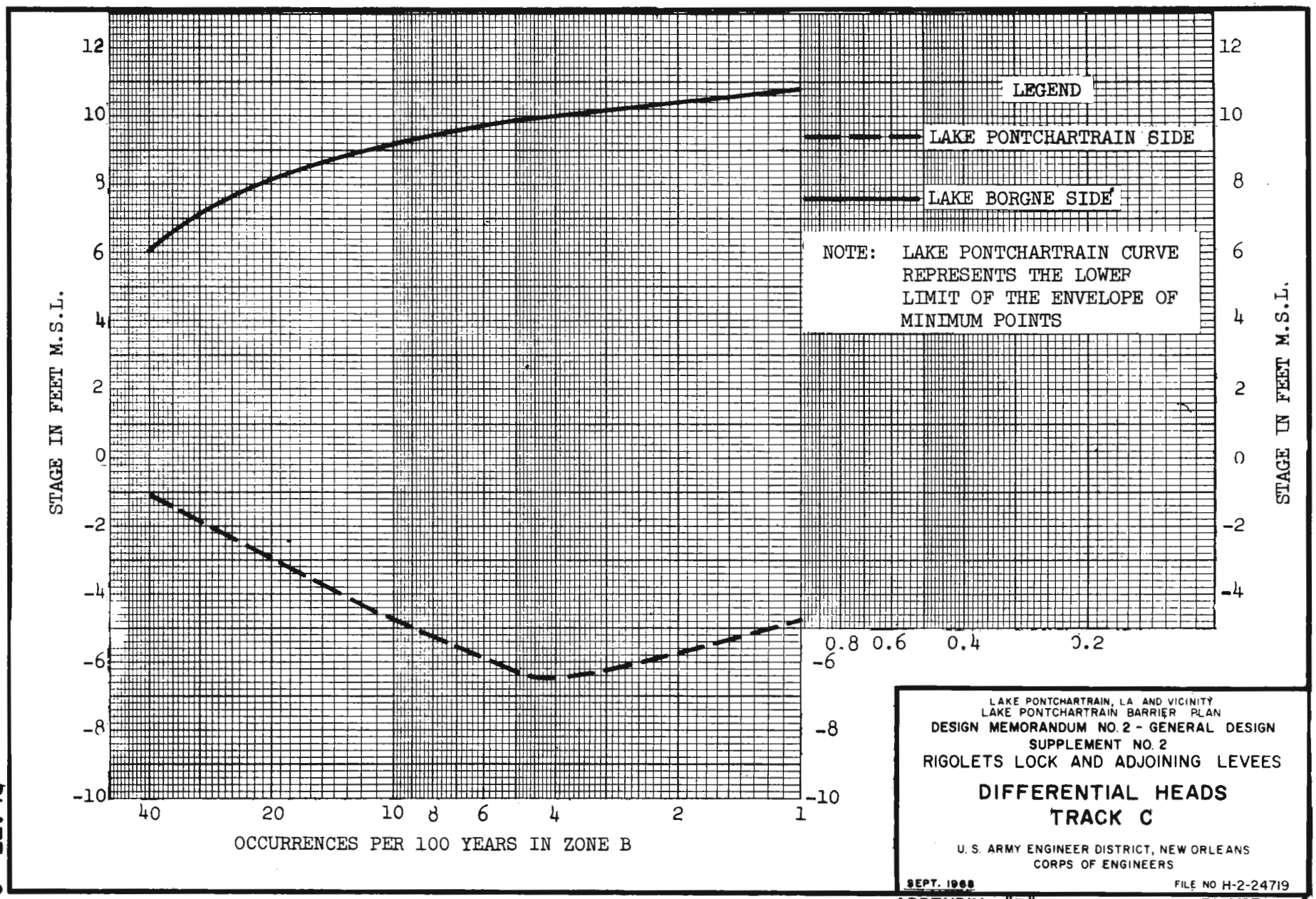
DIFFERENTIAL HEADS
TRACK F

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

SEPT. 1968

FILE NO H-2-24719

PLATE 5



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LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

DIFFERENTIAL HEADS TRACK C

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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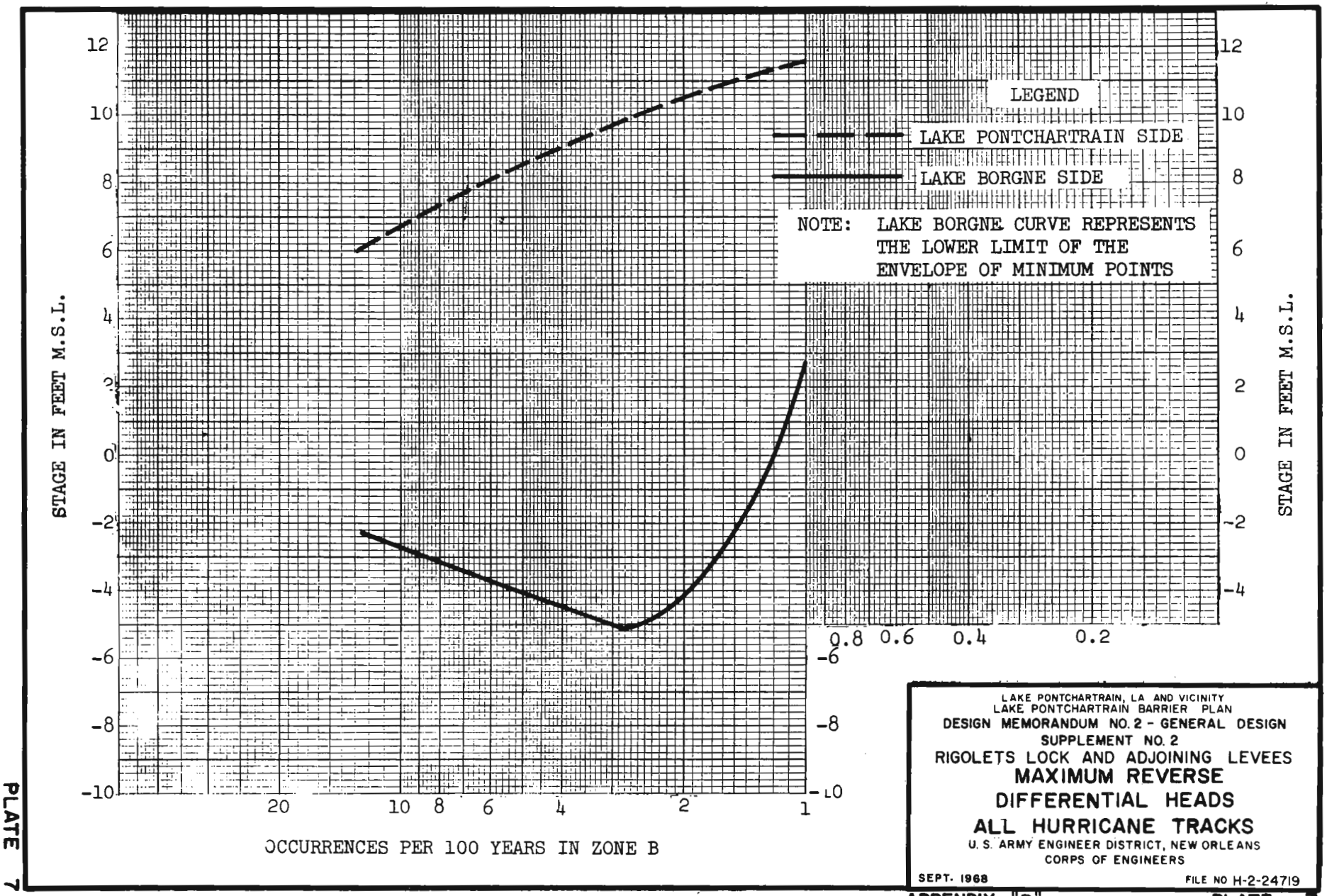
SEPT. 1968 FILE NO H-2-24719

PLATE 6



LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

MAXIMUM REVERSE DIFFERENTIAL HEADS ALL HURRICANE TRACKS

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

SEPT. 1968 FILE NO H-2-24719

APPENDIX "B" PLATE 7

PLATE 7

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX C
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
84-FOOT WIDE LOCK

APPENDIX C

84-FOOT WIDE LOCK

This appendix summarizes the pertinent data and cost estimate for a lock 84 feet wide, an associated navigation channel with a bottom width of 125 feet and adjoining levees. Except for size differences, the features of the 84-foot lock project are identical with those of the 110-foot lock project recommended in this supplement. Pertinent data is provided in table C-1 and the detailed estimate of first cost is provided in table C-2.

TABLE C-1

PERTINENT DATA - 84-FOOT WIDE LOCK

LOCK STRUCTURE

"U" frame reinforced concrete base
Earth embankment sidewalls protected by riprap

Gates - Sector Type

Guidewalls - Timber

Dimensions	Feet
Width of lock	84
Usable length of lock	800
Length of lock center to center gate pintles	848
Total overall length of lock (excluding approach guide walls)	938
Length of approach guide walls, gulf and Lake Pontchartrain ends	
South side	350
North side	100

Elevations

Datum	mean sea level
Top of chamber walls	6.0
Top of guide walls and gate bays	13.5
Gate sills	-14.0 (-13.2 m.l.g.)
Lock floor	-14.0 (-13.2 m.l.g.)
Top of skin plate, gulf end gates	13.5
Top of skin plate, lake end gates	6.0
Floor elevation of control house	19.5
Ground elevation of reservation area	9.0
Floor elevation of office	19.5
Limiting grade, spoil disposition north of channel	3.0

TABLE C-1 (Continued)

Hydraulic Design Criteria (Elevations in mean sea level)

Maximum tide, gulf	12.8
Maximum tide, Lake Pontchartrain	11.5
Minimum water level at gate, gulf end	- 5.25
Minimum water level at gate, Lake Pontchartrain end	- 6.5
Maximum differential, gulf to lake	16.5
Maximum differential, lake to gulf	15.25
Maximum storm tide elevation at which lock will be operated	4.0
Minimum water surface at which lock will be operated	- 3.0

CHANNELS

West Channel

Length	0.11 miles
Bottom width	125 feet
Bottom elevation	- 14.0 (-13.2 m.l.g.)
Side Slopes	1 on 3

East Channel

Length	0.51 miles
Bottom width	125 feet
Bottom elevation	-14.0 (-13.2 m.l.g.)
Side slopes	1 on 3

TABLE C-2

LAKE PONTCHARTRAIN BARRIER PLAN
RIGOLETS LOCK AND ADJOINING LEVEES
84-FOOT WIDE LOCK

ESTIMATE OF FIRST COST

(January 1969 price levels)

COST ACCOUNT No.	Item	Quantity	Unit	Unit Price	Total Cost
CONTRACT NO. 2					
05 LOCK					
	Masonry				
	Excavation, Initial (hyd)	129,300	c.y.	0.68	87,924
	Excavation, Chamber (hyd)	119,800	c.y.	0.68	81,464
	Excavation, Structural	19,100	c.y.	2.26	20,566
	Dewatering		l.s.		400,000
	Lakeside Cofferdam	18,500	c.y.	1.92	35,520
	Gulfside Cofferdam*	18,700	c.y.	1.92	35,904
	Disposal Area Dikes	48,500	c.y.	0.79	38,315
	Sand Fill	73,100	c.y.	1.07	78,217
	Backfill	45,400	c.y.	1.07	48,578
	Random Fill	39,400	c.y.	0.80	31,520
	Compacted Clay Fill	6,030	c.y.	6.00	36,180
	Soil Fill for Floodwalls	865	c.y.	3.60	3,114
	Riprap	38,200	ton	12.35	471,770
	Graded Filter Blanket	18,000	c.y.	12.85	231,300
	Concrete, Stabilization Slab	570	c.y.	37.50	21,375
	Concrete, Base Slab	7,700	c.y.	37.50	288,750
	Concrete, Walls	3,395	c.y.	53.50	181,633
	Concrete, Floodwalls	630	c.y.	53.50	33,705
	Portland Cement	16,910	bbl.	5.20	87,932
	Reinforcing Steel	1,641,500	lbs.	0.17	279,055
	Embedded Metal, Miscellaneous	46,800	lbs.	0.55	25,740
	Steel Pile, 14BP73	38,290	l.f.	9.45	361,841
	Steel Pile, 12BP53	660	l.f.	7.50	4,950
	Pile Load Test	10	ea.	5,000.00	50,000
	Steel Sheet Piling, MA-22	85,700	s.f.	3.80	325,660
	Steel Sheet Piling, Z-27	5,600	s.f.	4.35	24,360
	Steel Sheet Pile Dolphins	4	ea.	50,000.00	200,000
	Timber Piling (Guide Walls)	62,250	l.f.	3.90	242,775
	Timber Piling (Office)	1,040	l.f.	3.78	3,931
	Timber Chamber Guide Walls	1,526	l.f.	100.00	152,600
	Timber Approach Guide Walls	900	l.f.	100.00	90,000

*Construction of the gulfside cofferdam will be included with contract No. 1.

TABLE C-2 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
	Control Houses	4	ea.	12,500.00	50,000
	Office and Power House		l.s.		50,000
	Handrail	1,350	l.f.	9.40	12,690
	Fence	2,050	l.f.	4.00	8,200
	Drives and Parking	52,500	s.f.	0.17	8,925
	Utilities		l.s.		30,000
	Fire Protection System		l.s.		20,000
	Well		l.s.		13,000
	Needle Girders and Supports		l.s.		25,000
	Concrete Needles		l.s.		18,000
	Field Office		l.s.		3,500
	Paint Storage Building		l.s.		1,000
	Navigation Aids		l.s.		50,000
	Observation Platform		l.s.		6,000
	Subtotal				4,270,994
	Contingencies (20%)				855,006
	TOTAL, STRUCTURE				$5,126,000
	Gates and Operating Machinery				
	Sector Gates		l.s.		512,000
	Electric System		l.s.		135,000
	Cathodic Protection		l.s.		65,000
	Operating Machinery		l.s.		180,000
	Subtotal				892,000
	Contingencies (20%)				178,000
	TOTAL, GATES AND OPERATING MACHINERY				$1,070,000
	TOTAL, LOCK				$6,196,000
09	CHANNELS AND CANALS				
	Excavation	342,300	c.y.	0.45	154,035
	Dolphin	4	ea.	3,500.00	14,000
	Subtotal				168,035
	Contingencies (20%)				33,965
	TOTAL, CHANNELS AND CANALS				$ 202,000

TABLE C-2 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
11	LEVEE & FLOODWALLS				
	Embankment (South of Lock)				
	Killing Grass	0.75	acre	1,300.00	975
	Sand Fill	11,140	c.y.	0.85	9,469
	Haul Fill	8,830	c.y.	1.75	15,453
	Embankment (North of Lock)				
	Killing Grass	1.2	acre	1,300.00	1,560
	Sand Fill	11,300	c.y.	0.85	9,605
	Haul Fill	10,980	c.y.	1.75	19,215
	Subtotal				56,277
	Contingencies (20%)				11,723
	TOTAL, EMBANKMENT				$ 68,000
	Slope Protection (South of Lock)				
	Riprap	4,700	ton	15.00	70,500
	Shell Blanket	1,980	c.y.	6.50	12,870
	Slope Protection (North of Lock)				
	Riprap	4,860	ton	15.00	72,900
	Shell Blanket	2,050	c.y.	6.50	13,325
	Subtotal				169,595
	Contingencies (20%)				33,405
	TOTAL, SLOPE PROTECTION				$ 203,000
	Roadway				
	Compacted Shell Surfacing				
	(South of Lock)	400	c.y.	6.50	2,600
	(North of Lock)	550	c.y.	6.50	3,575
	Subtotal				6,175
	Contingencies (20%)				1,825
	TOTAL, ROADWAY				$ 8,000
	TOTAL, LEEVES & FLOODWALLS - CONTRACT NO. 2				$ 279,000
	TOTAL, CONTRACT NO. 2 (Lock, Channels & Canals and Levees & Floodwalls)				$6,677,000

TABLE C-2 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
CONTRACT NO. 1					
11	LEVEES & FLOODWALLS				
	Embankment (South of Lock)				
	Mucking	38,300	c.y.	0.60	22,980
	Sand Fill	47,500	c.y.	0.85	40,375
	Haul Fill	28,650	c.y.	1.75	50,138
	Embankment (North of Lock)				
	Mucking	125,500	c.y.	0.60	75,300
	Sand Fill	166,700	c.y.	0.85	141,695
	Haul Fill	200,000	c.y.	1.75	350,000
	Clearing and Grubbing	8.4	acre	100.00	840
	Subtotal				681,328
	Contingencies (20%)				136,672
	TOTAL, EMBANKMENT				$ 818,000
	Slope Protection (South of Lock)				
	Riprap	11,500	ton	15.00	172,500
	Shell Blanket	4,750	c.y.	6.50	30,875
	Fertilizing and Seeding	0.4	acre	200.00	80
	Slope Protection (North of Lock)				
	Riprap	980	ton	15.00	14,700
	Shell Blanket	430	c.y.	6.50	2,795
	Fertilizing and Seeding	16.5	acre	200.00	3,300
	Subtotal				224,250
	Contingencies (20%)				44,750
	TOTAL, SLOPE PROTECTION				$ 269,000

TABLE C-2 (Continued)

Cost Account No.	Item	Quantity	Unit	Unit Price	Total Cost
	Roadway				
	Compacted Shell Surfacing				
	(South of Lock)	340	c.y.	6.50	2,210
	(North of Lock)	5,250	c.y.	6.50	34,125
	Subtotal				36,335
	Contingencies (20%)				7,665
	TOTAL, ROADWAY				$ 44,000
	TOTAL, CONTRACT NO. 1 - LEVEES & FLOODWALLS				$1,131,000
	TOTAL, CONTRACTS NO. 1 AND NO. 2				$7,808,000
30	ENGINEERING AND DESIGN (10.5%)				820,000
31	SUPERVISION AND ADMINISTRATION (7.5%)				586,000
01	LAND AND DAMAGES				157,000
	TOTAL PROJECT COST				$9,371,000

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX D
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
ALTERNATIVE LOCK CHAMBER WALL DESIGNS

APPENDIX D

ALTERNATIVE LOCK CHAMBER WALL DESIGNS

The itemized cost of alternative lock chamber wall designs is included below. For sections through the lock chamber wall for each alternate, see plate D-1.

TABLE D-1

ITEMIZED COSTS FOR ALTERNATIVE LOCK CHAMBER WALL DESIGNS
(January, 1969 Price Level)

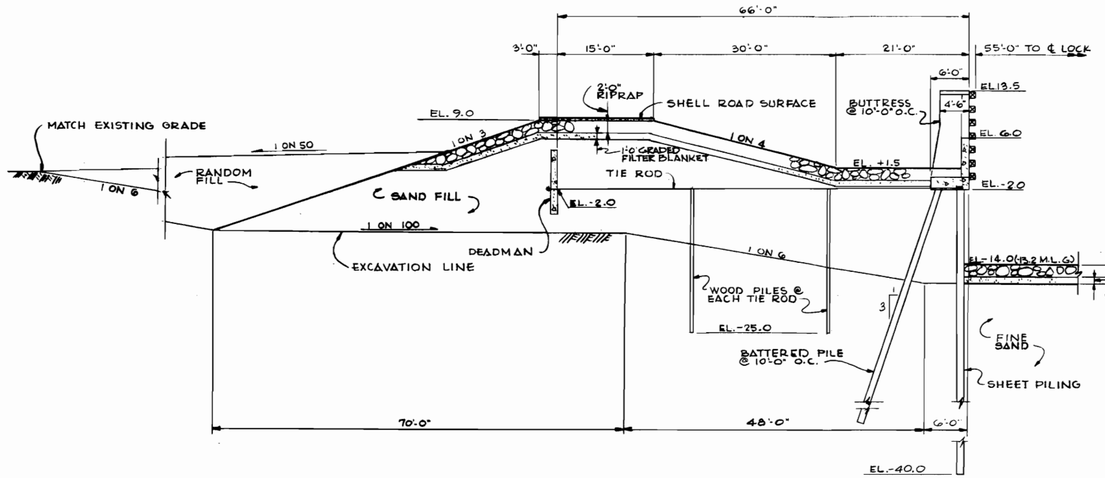
Item	Quantity	Unit	Unit Price	Total Cost
Open Chamber with Earth Side Levees				
Excavation, Hydraulic	102,500	c.y.	0.68	69,700
Sand Fill	55,900	c.y.	1.07	59,813
Compacted Clay Fill	5,700	c.y.	6.00	34,200
Random Fill	29,730	c.y.	0.80	23,784
Riprap	16,560	Ton	12.35	204,516
Graded Filter Blanket	7,470	c.y.	12.85	95,990
Shell Road Surfacing	32,000	s.f.	0.17	5,440
Concrete Floodwalls (Lakeside)	28	c.y.	53.50	1,498
Portland Cement	40	bbl.	5.20	208
Reinforcing Steel	3,950	lb.	0.17	672
Steel Pile, 14 BP73	700	l.f.	7.50	5,250
Steel Sheet Piling, MA-22	70,800	s.f.	3.80	269,040
Timber Pile	51,600	l.f.	3.90	201,240
Timber Chamber Guidewalls	1,526	l.f.	100.00	152,600
Galvanized Flexible Cable	1,530	l.f.	0.56	857
Pipe Post, 2" Diameter	50	ea.	5.50	275
Subtotal				1,125,083
Contingencies (20%)		l.s.		224,917
TOTAL, OPEN CHAMBER WITH EARTH SIDE LEVEES				$1,350,000
Tied Sheet Piling Walls				
Excavation, Hydraulic	94,950	c.y.	0.68	64,566
Sand Fill	86,840	c.y.	1.07	92,919
Random Fill	28,120	c.y.	0.80	22,496
Riprap	14,400	ton	12.35	177,840

TABLE D-1 (Continued)

Item	Quantity	Unit	Unit Price	Total Cost
Graded Filter Blanket	6,280	c.y.	12.85	80,698
Shell Road Surfacing	32,800	s.f.	0.17	5,576
Concrete				
Deadmen	890	c.y.	37.50	33,375
Pile Cap	280	c.y.	37.50	10,500
Lock Wall	1,710	c.y.	53.50	91,485
Portland Cement	3,960	bbl.	5.20	20,592
Reinforcing Steel	403,200	lb.	0.17	68,544
Steel Pile: 10BP42	7,840	l.f.	6.70	52,528
Steel Sheet Piling, Z-27	60,800	s.f.	4.35	264,480
Tie Rods	10,560	l.f.	13.80	145,728
Pile Anchorage & Misc. Steel	91,200	lb.	1.10	100,320
Timber Pile: 12" Diameter	3,680	l.f.	3.90	14,352
Treated Timber	131,000	b.f.	0.65	85,150
Light Poles	329	l.f.	3.66	1,204
Check Posts	32	ea.	55.00	1,760
Galvanized Flexible Cable	1,530	l.f.	0.56	857
Pipe Posts, 2" Diameter	50	ea.	5.50	275
Subtotal				1,335,245
Contingencies (20%)				266,755
TOTAL, TIED SHEET PILING WALLS				$1,602,000
Precast Gravity Wall Sections				
Excavation	71,000	c.y.	0.68	48,280
Sand Fill	55,900	c.y.	1.07	59,813
Random Fill	22,400	c.y.	0.80	17,920
Riprap	5,475	ton	12.35	67,616
Graded Filter Blanket	4,300	c.y.	12.85	55,255
Shell Surfacing	32,800	s.f.	0.17	5,576
Precast Concrete	94	ea.	10,210.00	959,740
Precast Concrete Slab	140	c.y.	122.00	17,080
Concrete Wall	280	c.y.	53.50	14,980
Concrete Sheet Pile Cap	2,180	c.y.	37.50	81,750
Portland Cement	3,385	bbl.	5.20	17,602
Reinforcing Steel	344,400	lbs.	0.17	58,548
Grout	115	c.y.	55.50	6,383
Plates	136,000	lbs.	1.40	190,400
Pvc Waterstop	8,700	l.f.	2.25	19,575
Caulking	1,817	l.f.	3.50	6,360
Steel Sheet Piling, MA-22	40,000	s.f.	3.80	152,000

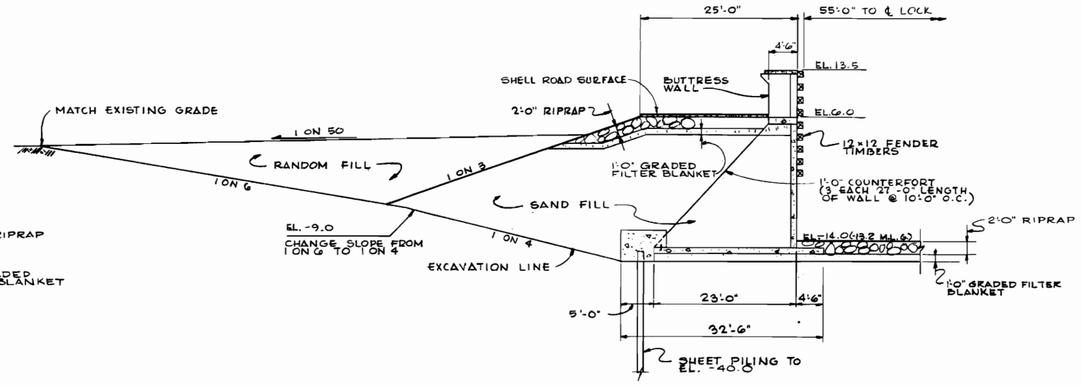
TABLE D-1 (Continued)

Item	Quantity	Unit	Unit Price	Total Cost
Bolts				
1 1/4" Diameter Dome Hd. x 1'-9"	1,574	ea.	19.25	30,300
3/4" Diameter x 1'-0"	2,392	ea.	4.25	10,166
Treated Timber	131,000	b.f.	0.65	85,150
Check Post	32	ea.	55.00	1,760
Light Poles	329	l.f.	3.66	1,204
Galvanized Flexible Cable	1,530	l.f.	0.56	857
Pipe Post, 2" Diameter	50	ea.	5.50	275
Subtotal				1,908,590
Contingencies (20%)		l.s.		381,410
TOTAL, PRECAST CONCRETE GRAVITY WALL				$2,290,000



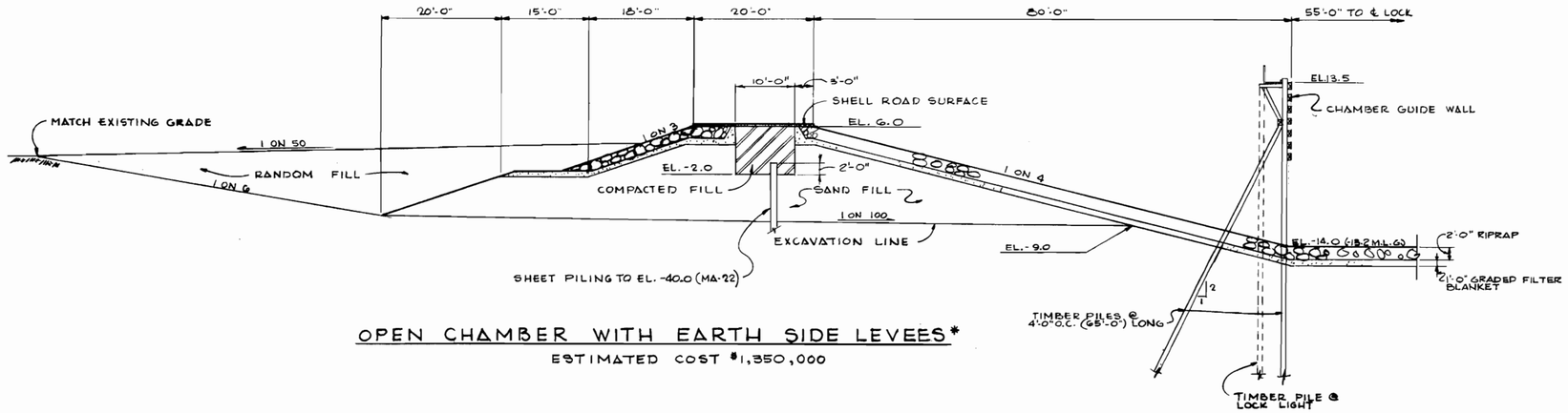
TIED SHEET PILING WALLS

ESTIMATED COST $1,602,000



PRECAST CONCRETE GRAVITY WALL SECTIONS

ESTIMATED COST $2,290,000



OPEN CHAMBER WITH EARTH SIDE LEVEES*

ESTIMATED COST $1,350,000

* ADOPTED DESIGN

NOTES:

ELEVATIONS ARE IN FEET AND REFER TO MEAN SEA LEVEL EXCEPT THOSE SHOWN IN PARENTHESES WHICH REFER TO MEAN LOW GULF. (M.L.G.)

0 10 20
SCALE IN FEET

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC. NEW ORLEANS, LA.

STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES

ALTERNATIVE LOCK CHAMBER WALL DESIGNS

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

DATE: JULY 1969 FILE NO. H-2-24415

APPENDIX D PLATE D-1

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX E
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
PILING COST COMPARISON

APPENDIX E

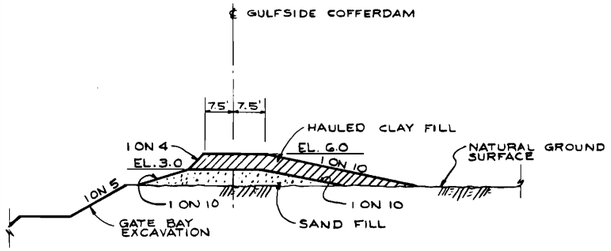
PILING COST COMPARISON

	84' Lock Width			110' Lock Width		
	Lin Feet	Unit Price	Cost	Lin Feet	Unit Price	Cost
Steel H-Piling						
14 BP	35,555	$8.50	$302,218	51,350	$8.50	$436,475
12 BP	1,700	6.75	11,475	1,700	6.75	11,475
Total			$313,693			$447,950
Concrete Piling						
16" Square	25,480	8.25	210,210	36,470	8.25	300,878
12" Square	1,780	7.00	12,460	1,700	7.00	11,900
Predrilling	14,384	2.75	39,556	19,956	2.75	54,879
Total			$261,226			$367,657
Estimated Savings *			$52,467			$80,293

* The cost and feasibility of predrilling to facilitate concrete pile placement are uncertain without placement tests and load tests. For these reasons the cost estimate at this stage is based upon the use of steel H-piles.

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX F
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
GATE STRUCTURES CONSTRUCTION METHOD

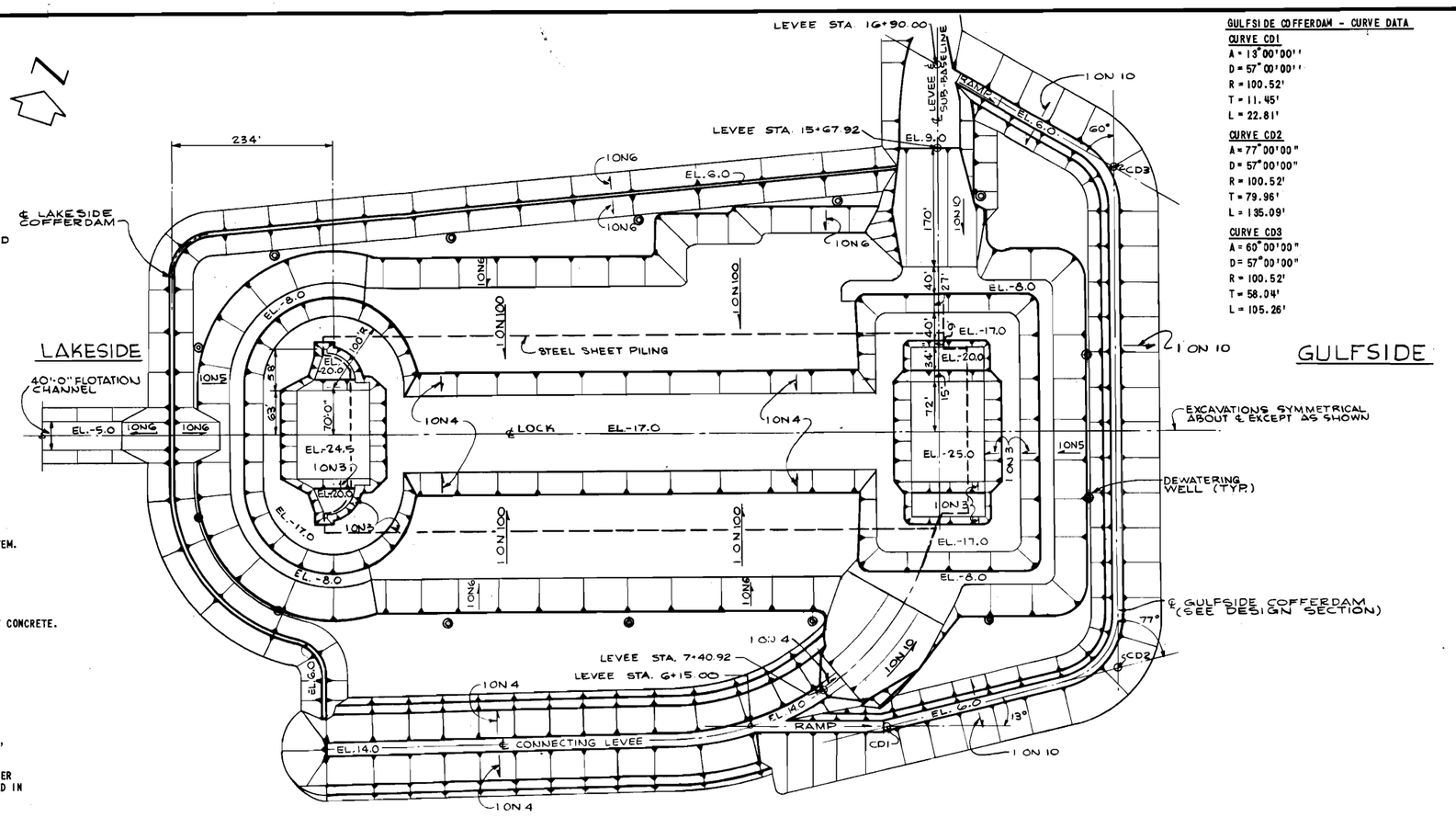
(Plan is shown on drawing designated as plate F-1)



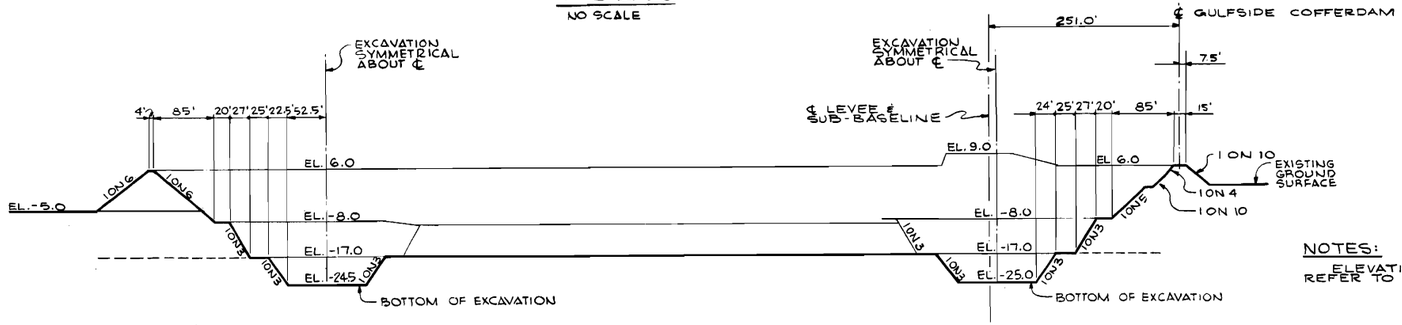
GULFSIDE COFFERDAM DESIGN SECTION

CONSTRUCTION SEQUENCE

1. CONSTRUCTION OF MAIN LEVEE, CONNECTING LEVEE AND GULFSIDE COFFERDAM ARE COMPLETE PRIOR TO START OF LOCK WORK.
2. PERFORM ALL THE HYDRAULIC EXCAVATION REQUIRED FOR CONSTRUCTION OF THE LOCK CHAMBER, RESERVATION AREA AND GATE BAYS. CONSTRUCT LAKESIDE COFFERDAM AND INSTALL WELL SYSTEM.
3. HYDRAULICALLY PLACE SAND FILL FOR LOCK CHAMBER SIDE LEVEES AND STOCKPILE SAND FILL REQUIRED TO COMPLETE BACKFILL AND FILLS.
4. REMOVE DREDGE, CLOSE COFFERDAM AND DEWATER ENTIRE LOCK AREA WITHIN THE COFFERDAMS.
5. PERFORM STRUCTURAL EXCAVATION, DRIVE PILING AND SHEET PILING AND CONSTRUCT GATE BAY CONCRETE.
6. BACKFILL AT STRUCTURES, DRIVE SHEET PILING FOR FLOOD WALLS AND SIDE LEVEES.
7. CONSTRUCT FLOODWALLS, COMPACTED CLAY SEEPAGE CUTOFF. CLOSURE LEVEES WITH THE GATE BAY STRUCTURES AND SHAPE EARTHWORK.
8. PLACE RIP-RAP PROTECTION IN LOCK CHAMBER TO ELEVATION 2.0± AND DRIVE PILING FOR CHAMBER GUIDE WALLS AND POWER HOUSE AND OFFICE.
9. AFTER RIP-RAP PROTECTION IS COMPLETED TO ELEVATION 2.0±, PERMIT STRUCTURE TO FLOOD, REMOVE COFFERDAM AND COMPLETE CHANNEL EXCAVATION NEAR THE LOCK.
10. REMOVE THE DEWATERING SYSTEM. ALL OTHER WORK TO BE ACCOMPLISHED IN AN ORDERLY MANNER ABOVE THE WATER SURFACE OR IN THE WET AS NECESSARY. SECTOR GATES SHALL BE INSTALLED IN THE DRY USING THE CONCRETE NEEDLES AS A BARRIER DURING DEWATERING AT EACH GATE BAY.



PLAN
NO SCALE



℄ SECTION
NO SCALE

NOTES:
ELEVATIONS ARE IN FEET & REFER TO MEAN SEA LEVEL

GULFSIDE COFFERDAM - CURVE DATA

CURVE CD1
A = 13°00'00"
D = 57°00'00"
R = 100.52'
T = 11.45'
L = 22.81'

CURVE CD2
A = 77°00'00"
D = 57°00'00"
R = 100.52'
T = 79.96'
L = 135.09'

CURVE CD3
A = 60°00'00"
D = 57°00'00"
R = 100.52'
T = 58.04'
L = 105.26'

A JOINT VENTURE

B.M. DORNBLATT AND ASSOCIATES, INC NEW ORLEANS, LA.	STANLEY CONSULTANTS, INC. MUSCATINE, IOWA

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
GATE STRUCTURES - CONSTRUCTION METHOD

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

DATE: JULY 1969 FILE NO. H-2-24415

APPENDIX F PLATE F-1

LAKE PONTCHARTRAIN BARRIER PLAN
APPENDIX G
TO
SUPPLEMENT NO. 2, GENERAL DESIGN MEMORANDUM NO. 2
RIGOLETS LOCK AND ADJOINING LEVEES
CORRESPONDENCE RELATIVE
TO COORDINATION WITH
OTHER AGENCIES

LMMED-PP 2 April 1968

Mr. C. Edward Carlson, Regional Director
U. S. Department of the Interior
Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Carlson:

Please refer to our letter dated 21 April 1967 requesting your views and comments on the general design memorandum for the Lake Pontchartrain Barrier Plan feature of the "Lake Pontchartrain, La. and Vicinity" project.

Our letter dated 21 April 1967 indicated that your views and comments would be requested for each supplement to the general design memorandum. However, we now feel that your views on the entire Lake Pontchartrain Barrier Plan would be preferable. The layout of the Lake Pontchartrain Barrier Plan, as described in House Document No. 231, 89th Congress, 1st Session, is shown on inclosure 1. The plan, layout of which is shown on inclosure 2, now under consideration is essentially the same as that presented in the House Document, with the following exceptions:

a. Barrier. The Chief of Engineers has approved a change in the alignment of the barrier in the Chef Menteur Pass area to that shown on inclosure 3. The barrier elevation will be 9 feet mean sea level or the elevation of existing U. S. Highway 90, whichever is higher. The remaining structures sites will remain as specified in the House Document, except that consideration is being given to widening the Rigolets Lock from 84 feet to 110 feet. The modification of the width of the Rigolets Lock is not for public release.

b. Seabrook Lock. The Chief of Engineers has approved a change in the controlling elevation of the Seabrook Lock from 13.2 feet to 7.2 feet mean sea level. This change will be effected by lowering the crown of the rock dike which will tie the lock to the levee system. In addition, auxiliary control structures, located on each side of the

Mr.Hardy/dal/430

LMMED-PP 2 April 1968
Mr. C. Edward Carlson

lock, will be added to provide for passage of flows for salinity control and riparian use when the lock is passing traffic.

c. Levees. Based on revised parameters for the standard project hurricane, as developed by the U. S. Weather Bureau, the levee grades recommended in House Document No. 231 were increased by as much as 1 to 2 feet.

d. St. Charles Parish Levees. The St. Charles Parish Lakefront levee will extend across the Parish Line Canal and tie into the Jefferson Parish Lakefront levee, rather than having a levee extending south approximately 3.5 miles along the west side of the Parish Line Canal to the Illinois Central Railroad. Drainage structures will be provided in the Lakefront levee to allow gravity drainage of the area.

We have received your comments on Seabrook Lock and the Citrus Back Levee, i.e., the levee along the north bank of the Gulf Intracoastal Waterway from the Inner Harbor Navigation Canal to the Michoud Canal, by letters dated 7 June 1967 and 22 June 1967, respectively. Your views, recommendations, and comments on the remainder of the Lake Pontchartrain Barrier Plan are requested.

Because of the urgency of providing protection to the areas vulnerable to hurricane flooding, we are operating on a much compressed planning schedule. Accordingly, it would be very much appreciated if your comments are provided not later than 1 June 1968.

Sincerely yours,

WBS
Seale

Mask

Audson

Exec Ofc

THOMAS J. COLEN
Colonel, CE
District Engineer

3 Incl
1. Gen map (file N-2-23693) dtd Nov 65
2. Gen map (file N-2-23693) rev May 67
3. Map - barrier alignment (file N-2-24066, plate 2)

Copies furnished: w/incl
U. S. Fish & Wildlife Service
315 Peeples-Newman Bldg.
Vicksburg, Miss. 39180

La. Wild Life & Fisheries Commission
400 Royal Street
New Orleans, La. 70130

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
PEACHTREE-SEVENTH BUILDING
ATLANTA, GEORGIA 30323

May 15, 1968

District Engineer
U. S. Army, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to your letter of April 2, 1968, (LMNED-PP), requesting our views on the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana, and Vicinity project.

The overall barrier plan and its influence on fish and wildlife resources have been discussed in prior Bureau reports, most recently our letter report of June 21, 1967.

As indicated in past reports, we are of the opinion that hurricane control structures in the Rigolets and Chef Menteur tidal passes will have little appreciable effect on salinities in Lakes Maurepas, Pontchartrain, and Borgne. Therefore, no adverse effects on fish and wildlife resources in these areas are expected.

Previous model tests have indicated that acceptable salinity levels for the preservation of fish and wildlife resources in Lake Pontchartrain can be obtained by utilization of the Seabrook Lock facility, which includes an auxiliary control structure on each side of the lock. Use of these auxiliary structures should insure that adequate diversion flows for salinity control and riparian use can be provided. The capability for adjusting salinities as may be required for fish and wildlife would tend to prevent the occurrence of detrimental effects.

New levee construction and levee enlargement works as planned, including the modified St. Charles Parish levee, are not expected to directly affect fish and wildlife resources to any great degree. Indirectly, the levee system will hasten urban and industrial development of additional marshland that now provides moderate quality habitat for wildlife. Your staff has indicated that the Parish Line Canal is no longer classed as a navigable waterway. Blockage of the channel, however, will inconvenience boat owners who now use the canal.

We are pleased with your previous recognition of the need for a salinity surveillance system at the Seabrook Lock upon its completion. This Bureau and the Louisiana Wild Life and Fisheries Commission will be glad to participate in the development and monitoring of such a system.

We appreciate the opportunity to provide these comments at this time. If current plans are modified, we request the opportunity for further review and comment.

A copy of this letter has been sent to the Louisiana Wild Life and Fisheries Commission. Any comments that agency wishes to make will be forwarded to you.

Sincerely yours,

W. L. Towns
Acting Regional Director

LMNED-PP 8 April 1968

Mr. William C. Galegar, Regional Director
Federal Water Pollution Control Administration
Third Floor--1402 Elm Street
Dallas, Texas 75202

Dear Mr. Galegar:

Please refer to our letter dated 21 April 1967 requesting your views and comments on the general design memorandum for the Lake Pontchartrain Barrier Plan feature of the "Lake Pontchartrain, La. and Vicinity" project.

Our letter dated 21 April 1967 indicated that your views and comments would be requested for each supplement to the general design memorandum. However, we now feel that your views on the entire Lake Pontchartrain Barrier Plan would be preferable. The layout of the Lake Pontchartrain Barrier Plan, as described in House Document No. 231, 89th Congress, 1st Session, is shown on inclosure 1. The plan, layout of which is shown on inclosure 2, now under consideration is essentially the same as that presented in the House Document, with the following exceptions:

a. Barrier. The Chief of Engineers has approved a change in the alignment of the barrier in the Chef Menteur Pass area to that shown on inclosure 3. The barrier elevation will be 9 feet mean sea level or the elevation of existing U. S. Highway 90, whichever is higher. The remaining structures sites will remain as specified in the House Document, except that consideration is being given to widening the Rigolets Lock from 84 feet to 110 feet. The modification of the width of the Rigolets Lock is not for public release.

b. Seabrook Lock. The Chief of Engineers has approved a change in the controlling elevation of the Seabrook Lock from 13.2 feet to 7.2 feet mean sea level. This change will be effected by lowering the crown of the rock dike which will tie the lock to the levee system. In addition, auxiliary control structures, located on each side of the lock, will be added to provide for passage of flows for salinity control and riparian use when the lock is passing traffic.

1507-03 (Lake Pontchartrain) Gen Design Memo
Mr. Hardy/jlf/430
xMrxKempx/jlf/kls

LMNED-PP 8 April 1968
Mr. William C. Galegar

c. Levees. Based on revised parameters for the standard project hurricane, as developed by the U. S. Weather Bureau, the levee grades recommended in House Document No. 231 were increased by as much as 1 to 2 feet.

d. St. Charles Parish Levees. The St. Charles Parish Lakefront levee will extend across the Parish Line Canal and tie into the Jefferson Parish Lakefront levee, rather than having a levee extending south approximately 3.5 miles along the west side of the Parish Line Canal to the Illinois Central Railroad. Drainage structures will be provided in the Lakefront levee to allow gravity drainage of the area.

We have received your comments on Seabrook Lock and the Citrus Back Levee, i.e., the levee along the north bank of the Gulf Intracoastal Waterway from the Inner Harbor Navigation Canal to the Michoud Canal, by letter dated 23 June 1967. Your views, recommendations, and comments on the remainder of the Lake Pontchartrain Barrier Plan are requested.

Because of the urgency of providing protection to the areas vulnerable to hurricane flooding, we are operating on a much compressed planning schedule. Accordingly, it would be very much appreciated if your comments are provided not later than 1 June 1968.

Sincerely yours,

WBS
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WSM
Mask

Hudson

Exec Ofc

THOMAS J. BOWEN
Colonel, CE
District Engineer

3 Incl
1. Gen map (file H-2-23693) dtd Nov 65
2. Gen map (file H-2-23693) rev May 67
3. Map - barrier alignment (file H-2-24066, plate 2)

CF:
La. State Bd of Health
P. O. Box 60630
N.O., La. 70160

La. Stream Control Comm
P.O. Drawer FC
Baton Rouge, La. 70803

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH CENTRAL REGION
1402 ELM STREET, 3RD FLOOR
DALLAS, TEXAS 75202

May 15, 1968

Your Ref: LMNED-PP

Colonel Thomas J. Bowen, District Engineer
Department of the Army
New Orleans District, Corps of Engineers
P. O. Box 60267
New Orleans, Louisiana 70160

Dear Sir:

Reference is made to your letter of April 8, 1968 requesting review and comment on the remainder of the Lake Pontchartrain Barrier Plan.

We have reviewed the information submitted in accordance with Executive Order 11288, Sections 1(3) and 1(7) in regard to water pollution control measures and find as follows:

a. All contractors should perform construction operations in a manner that will reduce turbidity and siltation to the lowest practicable level.

b. All contractors should take precautions to prevent water pollution by accidental spillage of hazardous materials which would result in substantial harm to fish or shellfish. Also, all contractors should provide and maintain sanitation facilities that will adequately treat domestic wastes to conform with Federal and local health regulations.

c. It is desirable that the water quality control structures be constructed and operated so as to prevent changes in the present water quality and to ensure that ecological conditions remain unchanged.

The comments of the Louisiana Stream Control Commission have been incorporated in our review.

Colonel Thomas J. Bowen
C/E, New Orleans, Louisiana

5/15/68

Your cooperation in carrying out the requirements of the Order is appreciated.

Sincerely yours,

for WILLIAM C. GALEGAR
Regional Director

cc: Louisiana Stream Control Commission

LMNED-PP 26 June 1968

Mr. William C. Galegar, Regional Director
U. S. Department of the Interior
Federal Water Pollution Control Administration
Third Floor--1402 Elm Street
Dallas, Texas 75202

Dear Mr. Galegar:

This is in reply to your letter dated 15 May 1968 relative to the general design memorandum for the Lake Pontchartrain Barrier Plan feature of the "Lake Pontchartrain, Louisiana and Vicinity" project.

Our proposed plan for implementation of water pollution control measures is as follows:

a. Provisions relative to water quality degradation during construction, minimizing the accidental spillage of petroleum products or other harmful materials, will be incorporated into the construction plans and specifications.

b. With respect to construction contractors providing and maintaining sanitation facilities that will adequately treat domestic wastes, the following provisions, as appropriate, will be incorporated into the construction plans and specifications:

(1) For construction sites accessible by road, collection of domestic waste will be by means of portable containment toilets or similar facilities and wastes deposited in a municipal sewerage system which will provide effective treatment. Location of municipal plant will be subject to approval of the Government and will generally follow the approved list published on 6 February 1968 by your agency.

(2) For hydraulic dredge operations, all domestic waste material will be collected and periodically discharged into the spoil area through the discharge line or otherwise buried in the spoil area.

Mr.Powell/kn/430

LMNED-PP 26 June 1968
Mr. William C. Galegar

(3) For small construction sites not accessible by land and a crew not exceeding 25 personnel, domestic waste will be disposed of by use of a Macerator-chlorinator unit, or similar equipment.

c. The Seabrook Lock will be operated to provide a desirable salinity regimen in Lake Pontchartrain to the end that deleterious alterations in lake ecology will be avoided. The plan of operation has been developed with the advice of the State and Federal fish and wildlife agencies. Further, our current data collection program includes extensive coverage of Lake Pontchartrain salinities. Upon completion of the lock we shall expand this coverage, if necessary, to permit an adequate evaluation of the effects of lock operation on the salinity regimen, and a determination as to the extent that the lock operation is producing the salinity regimen indicated by model test data.

Your cooperation in providing comments on the project is very much appreciated.

Sincerely yours,

THOMAS J. BOWEN
Colonel, CE
District Engineer

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Baehr
Exe Ofc

68-1158