

TC202  
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no. 1-C  
1959

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U. S. ARMY, CORPS OF ENGINEERS

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MISSISSIPPI RIVER - GULF OUTLET  
LOUISIANA

MR-2-10  
PLATE 5-8  
MRGO "B" series

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DESIGN MEMORANDUM NO. 1-C

CHANNELS

MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)

MILE 0 TO MILE -9.75 (38 FT. CONTOUR)

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PREPARED IN THE OFFICE OF THE DISTRICT ENGINEER  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
NEW ORLEANS, LOUISIANA

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November 1959

TC202  
N46M562  
10.1-C  
1959

Mississippi River-Gulf Outlet, Louisiana  
Design Memorandum No. 1-C, Channels

LMNGY

Director, WES  
AFEN: Research Center Library

NOD

6 June 62  
Harrington/239/km

1. Reference is made to our letter dated 24 July 1961, subject as above.
2. Revised plate 16, dated 3-62, is forwarded for insertion in subject design memorandum.

FOR THE CHIEF, ENGINEERING DIVISION:

1 Incl.  
Plate 16, File No.  
H-2-21657

J. C. BAHHR  
Chief, Planning & Reports Branch  
Engineering Division

84

ENGCW-E(7 Apr 61) 2nd Ind  
SUBJECT: Revisions to Design Memorandum No. 1-C, Mississippi River-  
Gulf Outlet

Office, Chief of Engineers, Washington 25, D. C. 26 May 1961

TO: Division Engineer, U. S. Army Engineer Division, Lower Mississippi  
Valley, VICKSBURG, MISSISSIPPI

1. The revised material forwarded with first indorsement is approved subject to the minor corrections by the Division Engineer and the comment in the following paragraph.

2. Reference is made to the dike cross-section described in revised DM paragraph 18 and shown on revised Plate 16. The planned dike section consists of shell core with 18 inches of riprap (of undefined size) along the sides and top, and a cap of 2-4 ton stone. If protection for that part of the dike in the greater depths is not extended over the entire area exposed to wave forces (to one wave height below still water elevation) there is a danger of the small stone being removed from beneath the crest stone with subsequent subsidence of the cap. However, if this part of the dike settles a minimum of 2 feet, there-after the riprap would be in a relatively safe depth of water. Maintenance estimates should include a contingency item to cover the cost of some additional replacement of stone due to storm damage during the early life of the project.

FOR THE CHIEF OF ENGINEERS:

Incls w/d

WENDELL E. JOHNSON  
Chief, Engineering Division  
Civil Works

LMVGU (NOD 7 Apr 61) 3d Ind

U. S. Army Engineer Division, Lower Mississippi Valley, Vicksburg,  
Mississippi 31 May 1961

TO: District Engineer, ATTN: LMNVE, U. S. Army Engr Dist, New Orleans

Referred to note approval of revisions to Design Memorandum No. 1 subject to comments in preceding indorsements.

FOR THE DIVISION ENGINEER:

NORMAN R. MOORE  
Chief, Engineering Division

12067

LMVGU (NOD 7 Apr 61)

1st Ind

SUBJECT: Revisions to Design Memorandum No. 1-C, Mississippi River -  
Gulf Outlet

U. S. Army Engr Div, Lower Mississippi Valley, Vicksburg, Miss., 8 May 61

TO: Chief of Engineers, ATTN: ENGCW-V and ENGCW-E, Department of the  
Army, Washington 25, D. C.

1. Revisions to Design Memorandum No. 1-C are forwarded for  
review and approval pursuant to paragraph 16, EM 1110-2-1150. Approval  
is recommended subject to the minor alterations in red on text pages  
4 and 7 and on plate 16.

2. Correspondence cited in paragraph 1 of basic communication is  
inclosed for your information.

FOR THE ACTING DIVISION ENGINEER:

7 Incl

1-6. wd 3 cy ea

added 1 incl

7. NOD ltr 11/8/60

w/1st ind (dup)

NORMAN R. MOORE

Chief, Engineering Division

Copy furnished New Orleans District, ATTN: LMNVE

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
Foot of Prytania Street  
New Orleans 9, Louisiana

7 April 1961

LMNVE

SUBJECT: Revisions to Design Memorandum No. 1-C, Mississippi River-Gulf Outlet

TO: Division Engineer  
U.S. Army Engineer Division  
Lower Mississippi Valley  
Vicksburg, Mississippi

ATTN: LMVGU and LMVKM

1. Reference is made to 1st Indorsement from your office dated 23 November 1960, subject: "Mississippi River-Gulf Outlet Stone Dike-Chandeleur Sound", requesting certain revisions to Design Memorandum No. 1-C.

2. Revised sheets and plates are inclosed providing for additional capping stone and clarification of the apparent conflict noted in paragraph 3 of the 2nd Indorsement by OCE dated 2 February 1960, subject: "Design Memorandum No. 1-C, Channels, Mississippi River-Gulf Outlet, La."

3. The dike is designed to have an ultimate crown width of 5 ft. after settlement. Since it is estimated that settlement will not be completed during the project construction period, the final capping will be performed as an item of deferred construction. It is estimated that 7 to 10 years will be required for settlement to take place after the initial placement of the capping stone and that the deferred capping will cost \$267,000.

4. Approval of inclosed revised sheets and plates is recommended. Sufficient copies of the revised sheets and plates are inclosed for insertion in the copies of Design Memorandum No. 1-C, now in your possession.

6 Incl. (8 cys)

1. Pages 3 & 4, Rev. Feb. 61
2. Pages 7 & 8, Rev. Feb. 61
3. Plate 12, Rev. Feb. 61
4. Plate 13, Rev. Feb. 61
5. Plate 14, Rev. Feb. 61
6. Plate 16, Rev. Feb. 61

G.M. COOKSON  
Colonel, CE  
District Engineer

ENGWE 2nd Ind  
SUBJECT: Design Memorandum No. 1-C, CHANNELS  
Mississippi River - Gulf Outlet Louisiana

Office, Chief of Engineers, Washington 25, D.C. 2 February 1960

TO: Division Engineer, U.S. Army Engineer Division, Lower Mississippi Valley, Vicksburg, Mississippi

1. The design memorandum for the outer 46 miles of channel is approved subject to the comments of the Division Engineer in the 1st indorsement and to the paragraphs which follow.
2. The selected stone sizes for the dike cover stone should be checked by the revised version of Hudson's formula as given in Waterways Experiment Station Research Report No. 2-2, Design of Quarry Stone Cover Layers for the Rubble-Mound Breakwaters, July 1958. This version is now in current use.
3. The references to "a 5 ft. crown at elevation +5.0 ft. mlg" in paragraphs 6b and 18 appear to be in conflict with the detail on plate 16. Clarification is requested.
4. The location of the underwater earth retention dikes, referred to in paragraph 5c and shown in cross-section on plate 17, should be indicated on plates 6 and 7.
5. On plate 14, it is noted that the inner limit of the spoil disposal area paralleling the channel extends through the reach of channel to be constructed by a hopper dredge. Since the hopper dredge will dump in the Gulf of Mexico in depths of over 50 ft. this limit is without significance.
6. With reference to paragraph 28, page 10, sufficient justification has not been presented to conclude that performance of the work by leased pipeline dredges between stations 3160+00 and 3820+00 is necessary. It is considered that the design memorandum should provide for construction by contract. Lease of plant should be considered when and if required in accordance with the provision of paragraph 12 EM 1125-2-305 dated 16 December 1959.

FOR THE CHIEF OF ENGINEERS:

Incl w/d

F.B. SLICHTER  
Chief, Engineering Division  
Civil Works

LMVGU (NOD 16 Nov 59) 1st Ind 5 January 1960  
SUBJECT: Design Memorandum No. 1-C, CHANNELS  
Mississippi River-Gulf Outlet, Louisiana

U. S. Army Engr Div, Lower Mississippi Valley, Vicksburg, Miss.

TO: Chief of Engineers, DA, Washington, D. C.  
ATTN: ENGMR and ENGWE

Approval of Design Memorandum No. 1-C is recommended subject to the following comments:

a. Par 5c, Page 2. During the preparation of plans and specifications, consideration should be given to the elimination of the side and rear underwater retention dikes proposed in lines 12 to 15 and shown on plate 17.

b. Par 5d, page 3. (1) Delete first sentence.

(2) With reference to the last two sentences of this paragraph, the basis for discarding an angle in the channel alignment should be supported by the views of ship operators prior to preparation of plans and specifications.

c. Par 6b, page 3. Analyses of dikes on Plate 16 show that side slopes of 1 on 3 instead of 1 on 1.5 are required for the channelside portion of the rock dike.

d. Par 19, page 8. Need for a permit should be ascertained and a positive statement made.

e. Par 26, page 9. Suggest this paragraph indicate that sources of stone at Sicily Island, La., are being investigated for possible use in Old River closure and, if suitable, would be used for riprap at this project.

f. Plates 3-13. Dates of boring and method of sampling should be shown for all borings.

g. Plate 6. Spoil disposal areas between Miles 21.5 and 23.0 should be shown.

h. Plates 12 through 14. Add the following footnote:  
"The alignment beyond Station 3484+80 will be determined from detailed surveys taking into consideration the preference of ship operators for an angular or straight channel alignment with respect to the channel across Breton Sound."

LMVGU (NOD 16 Nov 59) 1st Ind  
SUBJECT: Design Memorandum No. 1-C, CHANNELS  
Mississippi River-Gulf Outlet, Louisiana

i. Plate 16. (1) It is understood that the limiting depths of failure shown were determined by analyses and that failure planes deeper than those shown had higher factors of safety.

(2) The factor of safety of the 1 on 1.5 spoil side dike slope should be reported. It is understood that this factor of safety was found to be adequate.

(3) Computations for the most critical failure surface should be included in accordance with EM 1110-2-1805 of 15 October 1958.

FOR THE ACTING DIVISION ENGINEER:

1 Incl  
3 cy w/d

NORMAN R. MOORE  
Chief, Engineering Division

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
Foot of Prytania Street  
New Orleans 9, Louisiana

LMNGY

16 November 1959

SUBJECT: Design Memorandum No. 1-C, CHANNELS  
Mississippi River - Gulf Outlet, Louisiana

TO: The Division Engineer  
U. S. Army Engineer Division  
Lower Mississippi Valley  
Vicksburg, Mississippi

1. In accordance with the provisions of EM 1110-2-1150, eight copies of subject design memorandum are forwarded herewith for review and approval.

2. The detail alignment indicated in this design memorandum corresponds to the general alignment of Route "B" shown in the previously approved General Design Memorandum No. 2. The adoption of Route "B" necessitated new surveys and the revision of the mileages shown on previous drawings. Design Memorandum No. 3 "Dikes and Jetties" will not be submitted as previously scheduled since the route adopted does not require jetties, and construction of the dike across Chandeleur Sound is to be deferred. Construction of the stone retention dikes to the 6 ft. contour in Chandeleur Sound is covered in this design memorandum.

3. Approval of subject design memorandum is recommended.

1 Incl (8 cys)  
Design Memorandum  
No. 1-C - CHANNELS  
Miss. River-Gulf Outlet

G. M. COOKSON  
Colonel, CE  
District Engineer

MISSISSIPPI RIVER - GULF OUTLET

LOUISIANA

DESIGN MEMORANDUM NO. 1-C

CHANNELS

STATUS OF DESIGN MEMORANDA

<u>Number</u>	<u>Title</u>	<u>Status</u>
1-A	CHANNELS, Mile 63.77* - Mile 68.85*	Approved 11 Sept. 1957
1-B	CHANNELS, Mile 39.01* - Mile 63.77*	Approved 27 Jan. 1959
1-C	CHANNELS, Mile 0 - Mile 36.43, Mile 0 - Mile -9.75	Scheduled 15 Nov. 1959
2	GENERAL DESIGN	Approved 16 Sept. 1959
2-A	LOCK STUDIES	Scheduled 31 Dec. 1960

\* Mileage Revised 10/7/59

MISSISSIPPI RIVER - GULF OUTLET  
LOUISIANA

DESIGN MEMORANDUM NO. 1-C

CHANNELS

MILE 0 to 36.43 (BAYOU LA LOUITRE)  
MILE 0 to -9.75 (38 FT. CONTOUR )

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Appendix I Views of U. S. Fish and Wildlife Service

MISSISSIPPI RIVER - GULF OUTLET  
LOUISIANA

DESIGN MEMORANDUM NO. 1-C

CHANNELS

MILE 0 - MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 - MILE -9.75 (38 FT. CONTOUR)

GENERAL

1. Project Authorization. The Mississippi River-Gulf Outlet, La., a modification of the existing project, "Mississippi River, Baton Rouge to the Gulf of Mexico," was authorized by the River and Harbor Act 29 March 1956 (Public Law 455, 84th Congress, 2nd Session), substantially in accordance with the report of the Chief of Engineers dated 5 May 1948 printed in House Document No. 245, 82nd Congress, 1st Session.

2. Project Location. The general location of the project and its various features, situated in the southeast portion of the State of Louisiana, are as shown on Plate 1.

3. Design Memorandum Authorization. This design memorandum is prepared pursuant to paragraph 2 of letter from the Division Engineer, U. S. Army Engineer Division, Lower Mississippi Valley, dated 24 May 1946, subject: "Responsibility for Preparation of Design Memoranda and Plans and Specifications."

4. Purpose. The purpose of this design memorandum is to present pertinent information and data compiled and utilized in the design of the channel and retention dikes for that portion of the seaway canal extending from Bayou La Loutre to the -38 ft. contour in the Gulf of Mexico. The portion of the route between New Orleans and Bayou La Loutre was presented in approved Design Memoranda 1-A and 1-B.

CHANNEL AND DIKES

5. Channel.

a. General. The general location of the proposed channel is shown on Plate 1. Details of the channel below Bayou La Loutre, the segment considered in this design memorandum, are presented on Plates 3 through 14, "Plan, Profile and Soil Borings." The channel will have theoretical side slopes of 1 on 2 and have a bottom width of 500 feet from Bayou La Loutre to the Gulf and a bottom width of 600 ft. in the Gulf. The authorized channel depth is 36 ft. below mlg; however, an additional 2 feet of depth will be provided for advance maintenance and an additional 2 feet of depth will be allowed as overdepth to compensate for tidal fluctuations and inaccuracies in dredging.

b. Land Reach (Bayou La Loutre, Station 1560 + 96 to Chandeleur Sound, Station 2262 + 00). The channel in this reach runs in a southeasterly direction thru low swamp and marsh lands which are traversed by numerous bayous, small streams, sloughs, lagoons and small lakes. It is planned to place all of the spoil from the channel excavation in this reach on the south side of the channel right-of-way. The spoil will be confined by earth retention dikes to prevent the spoil from entering existing drainage outlets, from extending beyond the designated disposal areas, and to minimize detrimental effects on fish and wildlife resources of the area. The rear retention dike will be constructed from an inside borrow pit so as not to interfere with or change the existing drainage pattern. The front retention dike will be constructed to elevation + 6 mlg and have a 30 foot crown width at elevation + 5 mlg. Typical sections of the channel cut, retention dikes and spoil disposal area for this reach are shown on Plate 17. The detail location of the channel and the spoil areas are shown on Plates 3 thru 6.

c. Chandeleur Sound Reach (Station 2262 + 00 to Station 3484 + 80). The channel in this reach (Plates 6 through 12) continues in a southeasterly direction on a projection of the "land reach" alignment, crossing the southern extremity of Chandeleur Sound and the adjacent Breton Sound (the exact line of demarkation between Chandeleur Sound and Breton Sound is indefinite). From the shore (Station 2262 + 00 to the 6 foot contour in the Sound (Station 2420 + 00)) the channel will be protected by a stone retention dike on each side of the channel. The locations of the dikes are shown on Plates 6 and 7 and cross sections of the dikes are shown on Plate 16. Spoil will be deposited behind the stone dikes between Stations 2262 + 00 and Station 2410 + 00, and will be retained as much as practicable by the construction of side and rear underwater earth retention dikes in order to minimize damage to the valuable fish and wildlife resources in the vicinity, principally oysters. No spoil disposal will be permitted within 2000 feet of the channel between Stations 2410 + 00 and 2420 + 00. This restriction will aid in keeping the spoil from passing around the end of the stone retention dikes and re-entering the channel. Between the 6 foot contour (Station 2420 + 00) and the Gulf, retention dikes will not be required. Within these limits the height of the spoil will be limited to elevation -3 feet mlg where the Sound is less than 10 feet deep and will be limited to elevation -6 feet mlg where the Sound is more than 10 feet deep in order to minimize the return of the spoil to the channel by wave action, to reduce the interference with present circulation patterns for fish and wildlife purposes and to avoid obstructions to navigation. The littoral drift is generally from north to south in the Sound. All spoil in the Sound will be deposited a minimum distance of 2000 feet from the channel and on the south side. It is anticipated that this procedure will minimize the return of spoil to the channel which is not protected by retention dikes.

d. Entrance Channel (Station 3484 + 80 to Station 4000 + 00). The Channel in this reach (Plates 12 through 14) continues in a southeasterly direction into the Gulf of Mexico for a distance of 9.75 miles to the 38 foot contour, the outer limit of the project. Similar to the Chandeleur Sound reach, the spoil will be placed on the south side and 2,000 feet from the channel. It is anticipated that beyond the 25 foot contour, the channel excavation will be by a hopper dredge and the spoil will be deposited in deep water in the Gulf of Mexico (beyond the 50 foot contour). The channel in this reach will have a 600 foot bottom and a 38 foot depth to facilitate the entrance of ships. A short transitions section from the 38' x 600' channel to the 36' x 500' channel will be provided at the junction of the Chandeleur Sound reach and the entrance channel. The alignment of the entrance channel, offset 8° 11' with respect to the channel alignment across Chandeleur Sound, provides the means for establishing entrance range lights and dredging ranges for hopper dredge operations.

## 6. Stone Retention Dikes

a. General. In order to protect the channel in the shallow open waters of Chandeleur Sound, stone retention dikes will be constructed 700 feet from the channel centerline on both sides of the channel from Station 2262 + 00 to Station 2420 + 00 (6 foot contour in Chandeleur Sound) as shown on Plates 6 and 7. The stone dike on the north side of the channel will be constructed first, immediately preceding the excavation of the interim channel (36' x 250'). The dike on the south side of the channel will not be constructed until the excavation of the channel to project dimensions (36' x 500') becomes imminent.

b. Description. The dikes will be constructed of a clam shell core protected by an 18 in. layer of rip-rap capped with cover stone weighing from 2 to 4 tons per stone. Construction of these dikes will be in stages to allow for consolidation as discussed later in paragraph 18 of this design memorandum. The ultimate section of the upper part of the dikes after final consolidation will be a 5 ft. crown at elevation +5.0 ft. mlg and side slopes of 1 on 1.5. The final dike capping, due to the time required for settlement, cannot be placed during the scheduled project construction period. It will be accomplished as soon as the settlement is complete, (7-10 yrs.) as an item of deferred construction at an estimated cost of \$267,000.

c. Cover Stones. The relationship between dike side slopes and weight of cover stone is calculated by the revised version of Hudson's formula as given in Waterways Experiment Station Research Report No. 2-2, "Design of Quarry-Stone Cover Layers for Rubble-Mound Breakwaters", dated July 1958. This formula is as follows:

$$W_r = \frac{y_r H^3}{k_D (S_r - 1)^3} \cot \phi$$

Where  $W_r$  - weight of armor unit in pounds

$Y_r$  = specific weight of armor unit, lb/ft<sup>3</sup>

H = design wave height in feet

$k_D$  = damage coefficient

$S_r$  = specific gravity of armor unit

$\cot \alpha$  = reciprocal of breakwater slope

In solving the equation, the following numerical values were used:

$Y_r$  = 165 pounds per cu. ft. (stone)

$H = \frac{D+6}{1.3} = 9.23$  ft at 6' depth; 6.923 ft. at 3' depth;

D = depth below mlg

$k_D = 3.2$

$S_r = \frac{165}{64} = 2.578$

$\cot \alpha = 1.5$

The minimum weight for cover stone for the dikes at the 6 foot contour as calculated by the formula above is 3.4 tons, and the minimum weight at the 3 foot contour is 1.5 tons. It is proposed that 2 to 4 tons cover stones be used, utilizing the smaller stones in shallow water and the larger stones in deeper water at the outer ends of the dikes.

#### HYDROLOGY

7. Tidal Fluctuations. A recording tide gage is located near the western limit of the work on Bayou La Loutre at Hopedale, La. Two tide gages are operated in the general vicinity of the approved route, one at Chicot Island and the other at Breton Island. These gages, locations of which are shown on Plate 2, have records of from 2 1/2 to 3 years. No significant storms have occurred during the period of record, however, the records are considered adequate for judging average or normal conditions. Normal tides in the project vicinity are 1 to 2 feet; maximum tidal range is approximately from zero to five feet mlg. The channel will have little influence on the normal tide of 1 to 1 1/2 feet at Bayou La Loutre, however, the higher tides at this location will probably be increased slightly. Since adequate records are not available for hurricane tides, these were computed for a standard project hurricane (100-year-frequency) from wind fields, using tested theoretical methods and routing procedures. Computed maximum tides would be approximately six feet mlg at the 6 foot contour.

8. Currents. A net work of hydrologic data collection stations was established in January 1957 and operated through December 1958 to supplement existing meager hydrological data. Continuous recording meters were set at 3 fixed towers in Chandeleur Sound and weekly measurements were taken by boat at 7 other stations in the Sound.

Records from these observations show that currents are small (less than one half foot per second) most of the time and exceed this velocity only 10-15 percent of the time. Current directions range throughout 360 degrees, but are in a southerly direction about 60 percent of the time.

9. Salinity. Water sampling was initiated at some 30 odd stations in the sound and scattered through the affected marsh area. These were analyzed for salt content, and after September 1957 five of the stations were also analyzed for silt content. The water samples were taken at mid-depth after it had been established by measurements that there was no pronounced change of salinity with depth. Salinity inside Chandeleur Sound varies from 10,000-15,000 p.p.m. of chlorine. There is a steep salinity gradient from the edge of the marsh to Bayou Yscloskey, the latter station being 30 to 50 percent of the former. Variations of salinity in the marsh are pronounced. Suspended sediment concentrations generally are between 50 and 150 p.p.m., occasionally being as much as 500 p.p.m. in the Sound due to storm disturbances. Beginning in May 1957 water temperature was taken in conjunction with the suspended sediment sampling. The indicated temperature range is 40 to 90 degrees F.

10. Waves. A wave gage has been operated intermittently at Battledore Reef in Breton Sound. Maximum waves are normally 1 to 2 feet, infrequently 3 to 5 feet. Computed maximum waves for the project hurricane are 9 feet at the 6 foot contour and 12 feet over deep water in Chandeleur Sound. Maximum waves in the entrance channel offshore would range from 18 to 30 feet.

#### GEOLOGY

11. General Geology of the Area. The portion of the Mississippi River - Gulf Outlet covered by this design memorandum commences at Bayou La Loutre crossing (Mile 36.43) and extends to the end of the project at the -38.0 mlg contour in the Gulf (Mile -9.75). The route extends through marshlands between Miles 36.4 and 23.2; across Chandeleur Sound between Miles 23.2 and 0; and in the Gulf between Miles 0 and -9.75. At mile 0 it crosses (at an oblique angle) a tidal channel situated between Breton Island and Grand Gosier Island near the southern end of the Chandeleur chain of islands. The region is an ancient delta of the Mississippi River. After it was abandoned by the river, the region received little sediment. Wave action along the outer fringes of the abandoned delta and regional subsidence formed the Chandeleur Islands and the sound between the islands and the marshlands. The marshland deposits and the bay bottom deposits of Chandeleur Sound are composed of Recent marsh and marine deltaic sediments which were accumulated as sea level rose during the waning of the late Wisconsin Glacial Stage and since sea level reached its present stand. The Recent soil deposits are underlain by stiff clays of the Pleistocene age. The top of the Pleistocene varies from about 90 feet below the ground surface at Bayou La Loutre to about 180 feet below sea level at Chandeleur Island.

The Recent deposits in the marshlands are predominantly clay with a highly organic layer about 10 feet thick at the surface and silty and sandy soils at the base. The bay bottom deposits of Chandeleur Sound are predominantly fat clay. A more detailed geology treatise on the area appears in Miscellaneous Paper No. 3-259, dated February 1958, "Geological Investigation of the Mississippi River - Gulf Outlet Channel," prepared by the U. S. Army Engineer Waterways Experiment Station.

12. Faulting. There is no indication of active faulting along the channel route that would be detrimental to construction of the waterway.

### SOILS

13. Field Exploration. General type soil borings extending to depths of from 50 to 130 feet below mlg were made along, and in the vicinity of, the proposed channel location as shown on Plates 3 through 13. One undisturbed boring, 5-U, extending to a depth of 140 feet below mlg, was made in Chandeleur Sound. This boring is not along the proposed location, but is included in this design memorandum because it is considered to be generally representative of the soils in the Sound and because of the laboratory test data available on the samples from this boring. The log of this boring is shown on Plate 15. Locations and logs of other reconnaissance borings that were made for selection of a route during the preliminary planning stage are shown in the "Geological Investigation of the Mississippi River - Gulf Outlet Channel," referred to in the paragraph on Geology and are not reproduced in this report. Two 2-inch diameter vane tests were made to depths of 55 and 63 feet below mlg. The locations and resulting shear strengths from these tests are shown on Plate 15.

14. Laboratory Tests. Visual classification and water content determinations were made on all soil samples obtained from the general type and undisturbed borings. Unconfined compression tests were made on undisturbed clay samples from boring 5-U. In addition, numerous unconfined compression tests were run on cores from the general type borings and some of the results of these tests are shown on Plate 15. Consolidation tests were run on typical clay samples from undisturbed boring 5-U. The water contents, liquid and plastic limits, shear strengths, densities and consolidation data for undisturbed boring 5-U are shown on Plate 15. Strength versus depth plots, (CD) strengths, and consolidation test data shown on Plate 15 include test data published in Design Memorandum 1-B, and soil boring test data obtained from the reconnaissance boring made in Chandeleur Sound. These test results are considered representative of soil conditions along the proposed route and were used in the design for applicable portions of the route.

15. Soil Conditions. The borings shown on Plate 15 disclose that the soils along this portion of the proposed waterway are pre-eminently fat clay containing thin layers of lean clay, silt, and silty sand. The water contents of the clays range from about 60 to 200% based on dry soil weight. The clays with water contents over about 100% are the highly organic clays which occur generally at the upper end of the project between approximate stations 1560 + 00 and 2075 + 00 where there is a surface layer of peat 2 to 5 feet thick with water contents of 300 to 900% overlying the organic clay. There is generally a surface layer of silty sand and fine sand overlying the clay at the lower end of the proposed route below station 3400 + 00.

16. Stability Analysis. The strengths shown on Plate 15 were assigned to the soils for stability analyses. The stability of the excavation slopes were investigated by the method of planes, and factors of safety determined for the construction condition applying the (UC) and (UU) strengths. The factors of safety for sloughing of the slopes were determined by the circular arc method applying the (CD) strengths of the soils. The stability of the dikes, spoil banks and spoil distances were determined by the method of planes based on the (UC) and (UU) strength of the soils. All factors of safety are based upon analyses with respect to the strength of the soils. The results of the stability analyses and the critical failure surfaces and factors of safety are shown on Plate 16.

17. Channel Protection. No protection for the channel slopes is recommended initially. However, erosion due to wave wash along the upper portion of the route in the marsh areas can be expected where peat and highly organic clays will be exposed to wave action caused by passing ships. Protection for this area can be provided if and when necessary. However, sufficient rights-of-way are being provided by local interests to preclude need for channel protection, and no protection is included in the overall cost estimate of the project.

18. Stone Retention Dikes. Retention dikes will be provided in Chandeleur Sound between the mainland and the -6.0 mlg contour to protect the channel in this shallow area from excessive shoaling during storms. The dikes will be constructed, as shown on Plate 16, of clam shells, riprap, and derrick stone. Because of the low shear strength of the foundation, the dikes will be constructed in two stages. In the initial construction stage, the shell and riprap will be placed as shown to elevation +2.0 mlg. To prevent loss of shell during construction, the placement of the riprap will follow immediately behind placement of the shell. The spoil from the channel excavation will be placed behind the retaining dikes, from the mainland to within 1,000 feet of the end of the dikes. After placement of the hydraulic dredged spoil is completed, derrick stones will be placed to elevation +5 mlg with a crown 12 feet wide to provide for placement of additional derrick stone. It is estimated that settlement (due to consolidation and displacement) will be approximately 2 feet during placement of the shell and riprap and during the period preceding placement of the derrick stone, and approximately 2 feet during and after placing the second stage derrick stone to elevation +5 mlg with a 12-foot crown. The dike is designed to

have a 5-foot crown at elevation +5 mlg under ultimate conditions. It is estimated that 7 to 10 years after second stage construction is completed, additional derrick stone will be required to raise the dike to provide the ultimate sections. To add to the stability of the dikes, and help retain the shell during construction, material from adjacent flotation channels will be placed in the form of berms on the channel side of the dikes where hydraulic spoil is placed behind the dikes, and on both sides where there is no hydraulic spoil.

#### RIGHTS-OF-WAY

19. Requirements. The rights-of-way for the channel, the permanent spoil areas, and the temporary spoil areas required for the reach included in this design memorandum are as indicated on Plates 3 through 14. The channel right-of-way across the land cut will be 1,500 ft. wide centered 750 ft. on each side of the channel centerline. In the land-cut portion of the channel a permanent spoil area 2,000 feet wide adjacent to the south limits of the channel right-of-way will be provided for initial excavation disposal and future maintenance disposal. A temporary spoil disposal area generally 2,000 feet wide (See Plates 3 through 6 for details) will be provided adjacent to the permanent spoil area. This temporary area will be used for the disposal of material during initial construction and the easement will expire upon completion of project construction. In the open waters of Chandeleur Sound and in the Gulf of Mexico the Federal government will exercise its paramount rights for navigational purposes. However, since the Board of Commissioners of the Port of New Orleans are obligated to furnish all required rights-of-way it will be requested that they furnish a right-of-entry for the channel across the Chandeleur Sound and the entrance channel in the Gulf of Mexico. This is deemed necessary to have the various pipelines altered or relocated and due to claims from possible damages to wildlife resources.

20. Status. Local interests, represented by the Board of Commissioners of the Port of New Orleans, have furnished satisfactory assurances that they will provide the necessary rights-of-way required for the project. Real estate requirements for the reach covered by this design memorandum have been completely fulfilled.

#### RELOCATIONS

21. General. One 6-inch and two 4-inch gas pipelines cross the channel covered by this design memorandum. The relocation of these pipelines are the responsibility of local interests."

22. Southern Natural Gas Company, 6-inch Pipeline. The 6-inch gas pipeline owned by the Southern Natural Gas Company crosses the channel at Station 2236 + 00 (approx.) as indicated on Plate 6. The Board of Commissioners of the Port of New Orleans, in acquiring the necessary right-of-way, will arrange with the Southern Natural Gas Company for the alteration of this pipeline. The pipeline will be altered to provide a minimum bottom clearance of 600 feet at elevation -50.0 mlg.

23. Kerr-McGee Oil Industries, Inc., 4-inch Pipelines. The two 4-inch pipelines (4.5" O.D.) owned by the Kerr-McGee Oil Industries, Inc. cross the channel in Chandeleur Sound near Breton Island as indicated on Plates 11 and 12. These pipelines connect oil and/or gas wells to a gathering station on Breton Island. The Board of Commissioners of the Port of New Orleans, in acquiring the necessary right-of-entry through Chandeleur Sound, will arrange with the Kerr-McGee Oil Industries, Inc. for the relocation of these pipelines. These pipelines will be relocated or altered to provide a minimum bottom clearance of 600 feet at elevation -50 mlg.

#### VIEWS OF OTHER AGENCIES

24. General. Various Federal and State Agencies and others who had expressed interest in the project were informed of the selection of the route below Bayou La Loutre. No objections to the location of this reach of the project has been received to date.

25. U. S. Department of Interior Fish and Wildlife Service. By letter dated 20 October 1959 the Regional Director, Fish and Wildlife Service, Atlanta, Georgia, requested the opportunity to continue review of detail construction plans for the purpose of recommending remedial measures, such review to be accomplished by Service personnel at Slidell, Louisiana. Recommendations by the Service for the mitigation of fish and wildlife losses in the project below Bayou La Loutre are given in Appendix I of this design memorandum. These recommendations were developed in consultation with this office, and are incorporated in the plans presented herein.

#### CONSTRUCTION

26. General. The clays, silts, and sands to be encountered in excavating the channel do not present any unusual problems and can be readily excavated by hydraulic pipeline dredges, and by hopper dredges in the deep water sections of the Gulf. The size of the channel makes dragline equipment impractical for this work. Shell for the dikes will be obtained locally. Riprap and stone for the dikes are not available in this area and will have to be obtained from acceptable sources in Alabama (Alabama Aggregate Co.) and Tennessee (West Tennessee Limestone Co.) and Kentucky (Reed Crush Stone Co.).

27. Stream Closures. All streams, bayous, shallow lakes, ponds and sloughs that lie within the spoil disposal areas south of the channel as indicated on Plates 3 through 6 will be closed by earth retention dikes and the disposition of spoil into the designated areas. If found desirable, by the U. S. Fish and Wildlife Service studies now being made for the mitigation of losses, any of the streams, bayous, and sloughs that cross the north right-of-way line of the channel will be closed by placing suitable plugs between the channel and right-of-way line. Bayou La Loutre, which is a navigable stream, will be kept free of spoil.

28. Sequence of Construction. It is proposed to excavate the channel between Bayou La Loutre (Station 1560 + 96) and Chandeleur Sound (Station 2262 + 00) in three phases. The first phase will be to excavate an access channel 18 feet deep by 140 feet bottom as indicated on Plate 17 Typical Sections. This will provide ready access to all parts of the project, allow sufficient dredging equipment to be utilized economically on succeeding contracts, and provide ready refuge for construction equipment from inclement weather and rough seas in the open water reaches. It will also provide a small initial spoil deposit which will have time to consolidate in the marshes prior to the deposition of greater spoil loads. This will permit better control of the dredge effluent and reduce the turbidity of the waste water. While the access channel is being completed, construction will commence on the initial stage (See Plate 16) of the north side stone retention dike. The second phase will consist of the enlargement of the access channel to a interim channel (36' x 250') usable by ships. The excavation of the interim channel will be continued across Chandeleur Sound and to the 38 ft. contour in the Gulf. All channel excavation will be by hydraulic pipeline dredges except beyond the 25' contour in the Gulf where hopper dredges will be utilized. From approximate Station 3160 + 00 to 3820 + 00 (25' contour) the work will be performed by leased hydraulic pipeline dredges. After the spoil is placed beyond the north stone retention dike this dike will be capped with jetty stone as indicated as "Final Stage" on Plate 16. Work will then commence on the initial stage of the south stone retention dike. Upon completion of the second phase, widening of the interim channel to the full project width will commence.

29. Schedule of Contracts. Subject to the availability of funds, it is proposed to prepare plans and specifications and award contracts for the various items as listed in Table "A".

TABLE A  
SCHEDULE OF CONTRACTS

Item	Description	Est. Yardage	Est. Date of			Est. Cost (includes 12% Cont.)
			Advertisement	Award	Completion	
	ACCESS CHANNEL (18' x 140')					
6A	Bayou LaLoutre to Vicinity Bayou Pointe en Pointe	5,664,000	4 Jan. '60	11 Feb. '60	1 Dec. '60	\$ 1,142,000
7A	Vicinity Bayou Pointe en Pointe to Chandeleur Sound	4,014,000	1 Feb. '60	15 Mar. '60	1 Nov. '60	809,000
	INTERIM CHANNEL (36' x 250')					
6U	Bayou LaLoutre to Vicinity Bayou Pointe en Pointe	13,836,000	1 Feb. '61	15 Mar. '61	1 Oct. '62	2,789,000
7U	Vicinity Bayou Pointe en Pointe to Sta. 2420+00 (Chandeleur Sound)	16,829,000	1 June '61	15 July '61	1 Sept. '63	3,535,000
8U	Sta. 2420+00 to Sta. 3160+00 (Chandeleur Sound)	24,290,000	1 Apr. '62	15 May '62	1 Dec. '63	5,440,700
9U	Sta. 3160+00 (Chandeleur Sound) to -25' contour in Gulf of Mexico	15,897,000	1 Aug. '62	15 Sept. '62	1 Nov. '63	3,561,000
10U	-25' contour to -38' contour (Gulf of Mexico)	1,164,000	---	1 Sept. '63 (initiate)	1 Nov. '63	261,000
	PROJECT CHANNEL (36' x 500')					
6P	Bayou LaLoutre to Vicinity Bayou Pointe en Pointe	14,530,000	1 Jan. '64	15 Aug. '64	1 Apr. '66	2,929,000
7P	Vicinity Bayou Pointe en Pointe to Sta. 2420+00 (Chandeleur Sound)	16,610,000	1 Sept. '64	15 Oct. '64	31 Dec. '65	3,467,000

TABLE A  
SCHEDULE OF CONTRACTS (Cont'd)

Item	Description	Est. Yardage	Est. Date of			Est. Cost (includes 12% Cont.)
			Advertisement	Award	Completion	
8P	Sta. 2420+00 to Sta. 3160+00 (Chandeleur Sound)	20,642,000	1 June '65	15 July '65	31 Dec. '66	4,624,000
9P	Sta. 3160+00 (Chandeleur Sound) to -25' contour in Gulf of Mexico	14,222,000	1 Feb. '66	15 Mar. '66	30 June '67	3,186,000
10P	-25' contour to -38' contour (Gulf of Mexico)	2,095,000	---*	1 Sept. '66 (initiate)	1 Dec. '66	469,000
STONE RETENTION DIKES						
1RD	North Retention Dike to 6' contour in Chandeleur Sound, 1st Phase	70,000(shell) 50,000(stone)	1 Mar. '60	15 Apr. '60	1 May '61	1,568,000
2RD	North Retention Dike to 6' contour in Chandeleur Sound, 2nd Phase	50,000(stone)	1 Aug. '62	15 Sept. '62	30 June '63	1,372,000
3RD	South Retention Dike to 6' contour, in Chandeleur Sound, 1st Phase	70,000(shell) 50,000(stone)	1 Sept. '63	15 Oct. '63	1 Nov. '64	1,568,000
4RD	South Retention Dike to 6' contour in Chandeleur Sound, 2nd Phase	50,000(stone)	1 Feb. '66	1 Apr. '66	30 June '67	<u>1,372,000</u>
*Government Hopper Dredge					TOTAL	\$38,092,700

COST

30. Summary of Cost. The cost of excavating the channel between Bayou La Loutre (Mile 36.43) and the 38 ft. contour in the Gulf of Mexico (Mile -9.75) and constructing the stone retention dikes, but exclusive of rights-of-way and relocations which are non-Federal obligations, is estimated to be \$41,216,300.

31. Details of Cost Estimates. A comparison of detail cost estimates covering the same limits of work covered by this design memorandum and that contained in the overall project estimate of \$104,000,000 contained in General Design Memorandum No. 2 dated June 1959 is as shown in Table B, Comparison of Cost.

TABLE B

## COMPARISON OF COSTS

Latest Approved Estimate  
General Design Memo. No. 2, June 1959

Design Memo. Estimate  
November 1959 Price Level

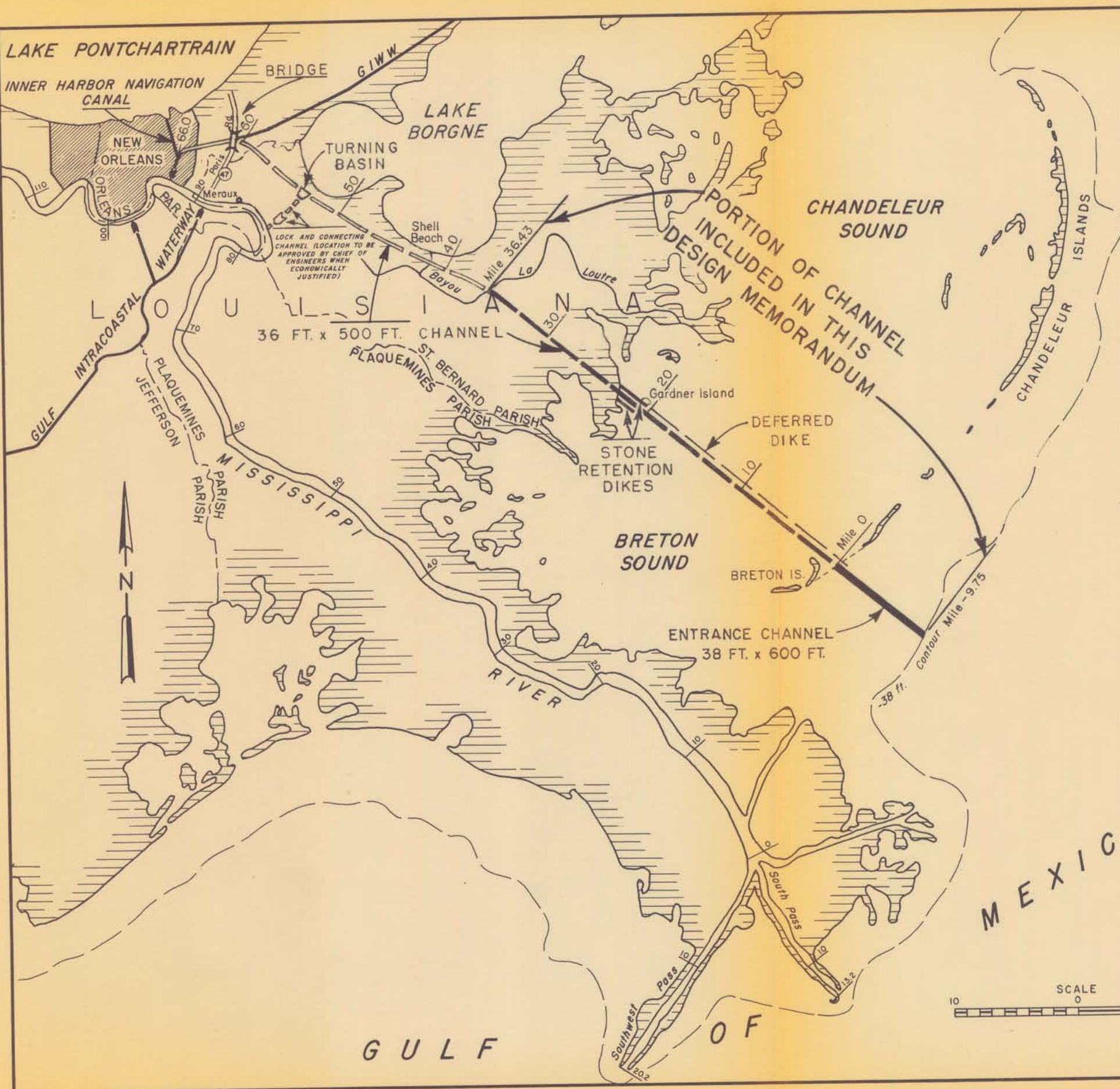
Excavation			
Land cut	62,390,000 cu.yd. @ \$.18/cu.yd.	\$11,230,200	59,867,000 cu.yd. \$10,776,100 @ \$.18/cu.yd.
Water cut	89,615,000 cu.yd. @ \$.20/cu.yd.	17,923,000	89,926,000 cu.yd. 17,985,200 @ \$.20/cu.yd.
Stone Retention Dikes	4.9 mi. each side		3 mi. each side
Shell	348,000 cu. yd. @ \$2.00	696,000	140,000 cu.yd. 350,000 @ \$2.50
Stone	1.75 tons/cu.yd. @ \$12.00 = 330,000 cu. yd. @ \$21.00	6,930,000	1.75 tons/cu.yd. @ \$14.00 = 200,000 cu. yd. 4,900,000 @ \$24.50
		<u>36,779,200</u>	<u>34,011,300</u>
Contingencies (12%)		4,413,500	4,081,400
		<u>41,192,700</u>	<u>38,092,700</u>
Engineering & Design (1.2%)		494,300	457,100
Supervision & Administration (7%)		<u>2,883,500</u>	<u>2,666,500</u>
TOTAL		\$44,570,500	\$41,216,300

An estimated decrease in cost amounting to \$3,354,200 is shown in comparing the cost of accomplishing the work within the limits of this design memorandum to the estimate appearing in the approved General Design Memorandum. The reduction in the cost of excavation (\$474,900 including contingencies, Engineering and Design, and Supervision and Administration) resulted from a reduction in yardage after more detailed surveys and alignment studies. The reduction in dike cost (\$2,879,300 including contingencies, Engineering and Design, and Supervision and Administration) resulted primarily from reduction in the dike length from 9.8 miles (4.9 mile each side) to 6 miles (3 miles each side). The bottom of Chandeleur Sound is very flat near the 6 ft. contour and the profile and maps available at the time the General Design Memorandum was prepared indicated the 6 ft. contour was approximately 4.9 miles from the shore line. The profile obtained from surveys made for this design memorandum indicate the 6 ft. contour is only 3 miles from the shore line. Cost of the deferred dike across Chandeleur Sound as presented in the General Design Memorandum will be increased to compensate for the section of retention dike not being constructed at this time and not previously included as a portion of the deferred dike.

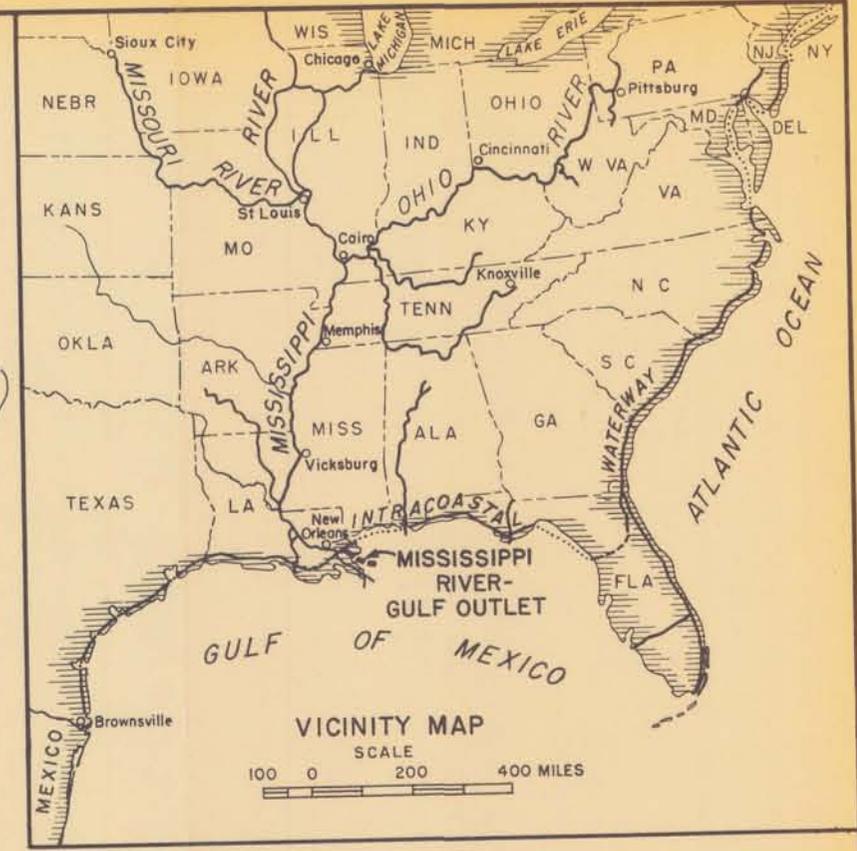
#### RECOMMENDATION

32. Recommendation. Approval of the detail alignment of the channel and other features proposed in this design memorandum is recommended.

LAKE PONTCHARTRAIN  
INNER HARBOR NAVIGATION CANAL



PORTION OF CHANNEL  
INCLUDED IN THIS  
DESIGN MEMORANDUM



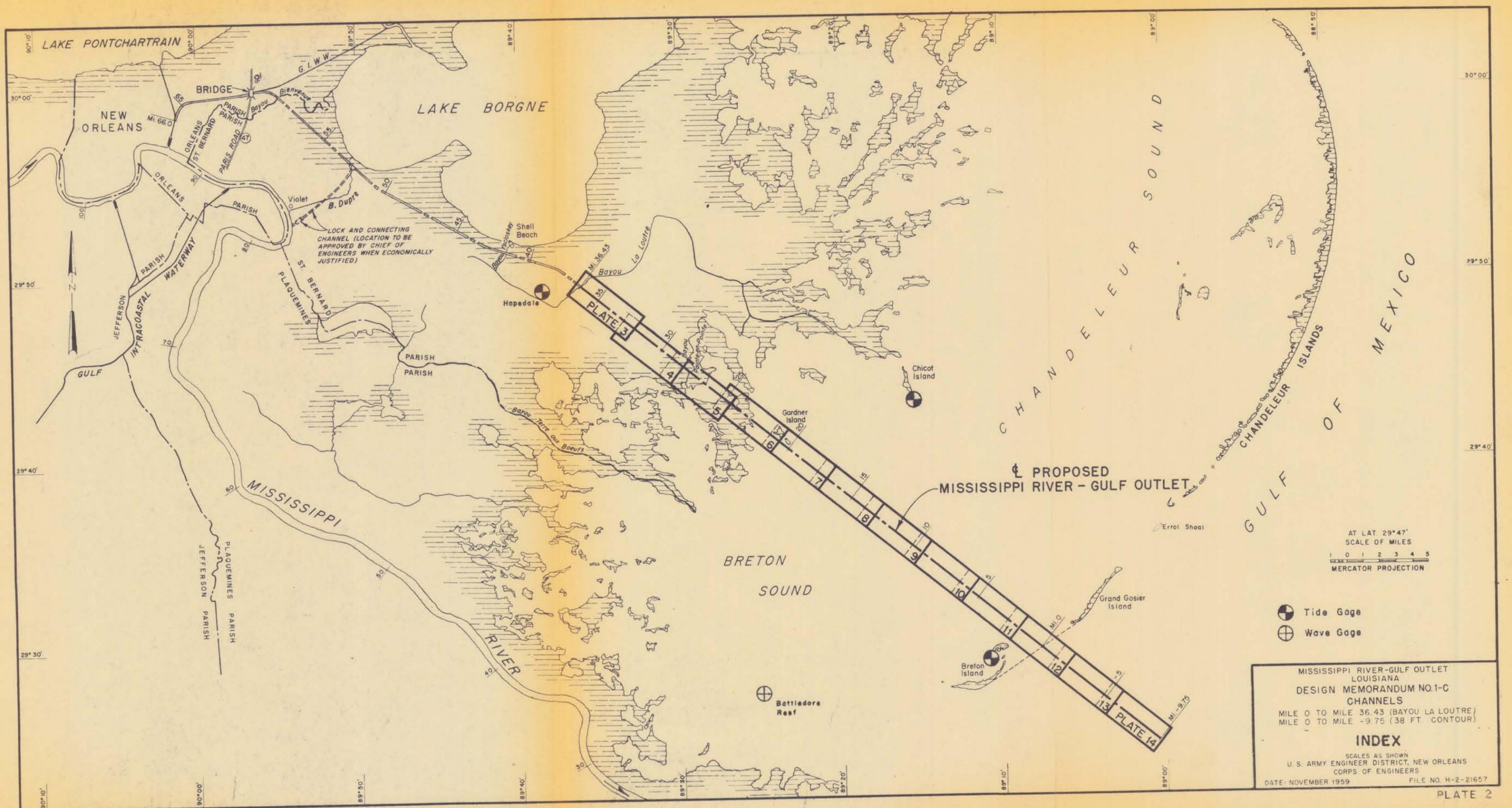
VICINITY MAP  
SCALE  
100 0 200 400 MILES

Note: Deferred dike to be built only when determined to be economically justified from actual channel maintenance experience.

12067

SCALE  
0 10 MILES

MISSISSIPPI RIVER—GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO. I-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**PROJECT LOCATION**  
SCALES AS SHOWN  
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
NOV 1959 FILE NO. H-2-21657



AT LAT. 29°47'  
 SCALE OF MILES  
 1 0 1 2 3 4 5  
 MERCATOR PROJECTION

-  Tide Gage
-  Wave Gage

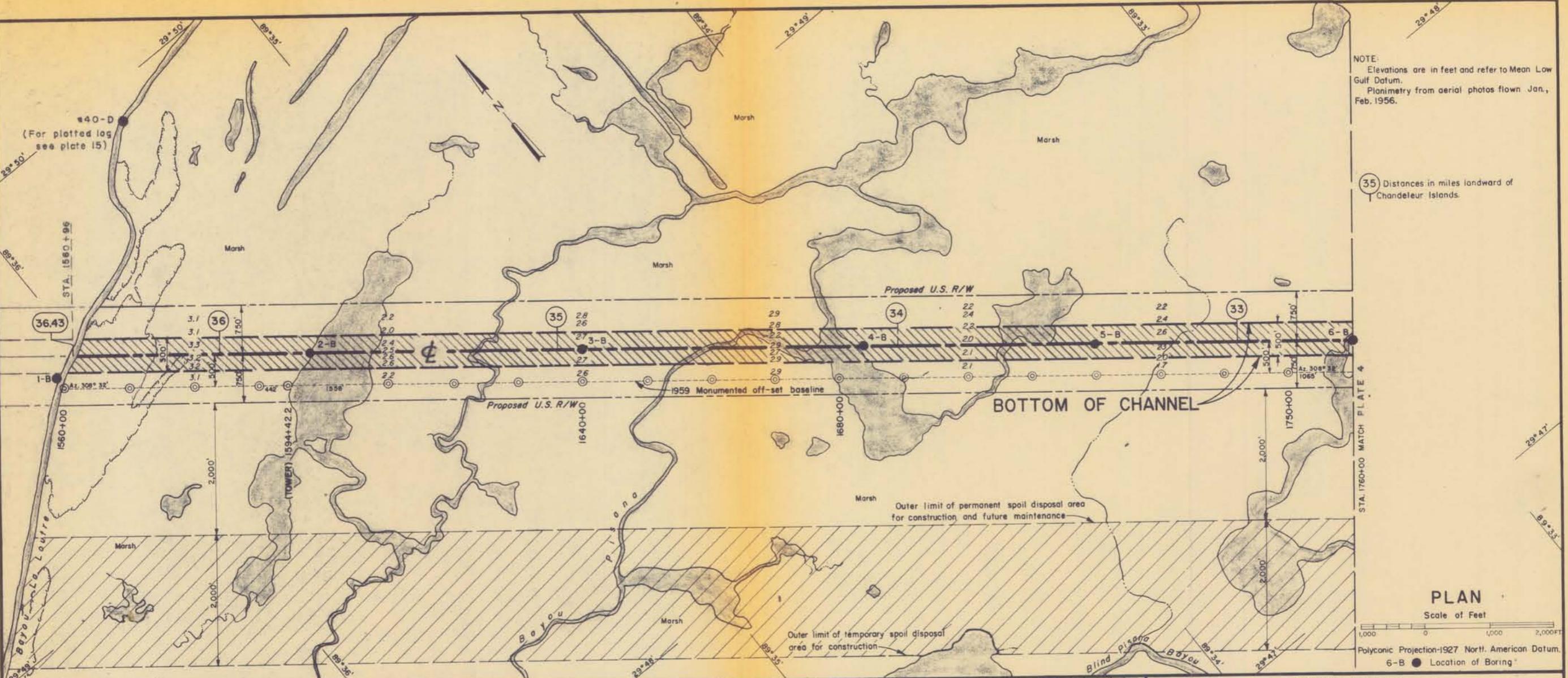
MISSISSIPPI RIVER-GULF OUTLET  
 LOUISIANA  
 DESIGN MEMORANDUM NO.1-C  
 CHANNELS  
 MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
 MILE 0 TO MILE -9.75 (38 FT. CONTOUR)

**INDEX**

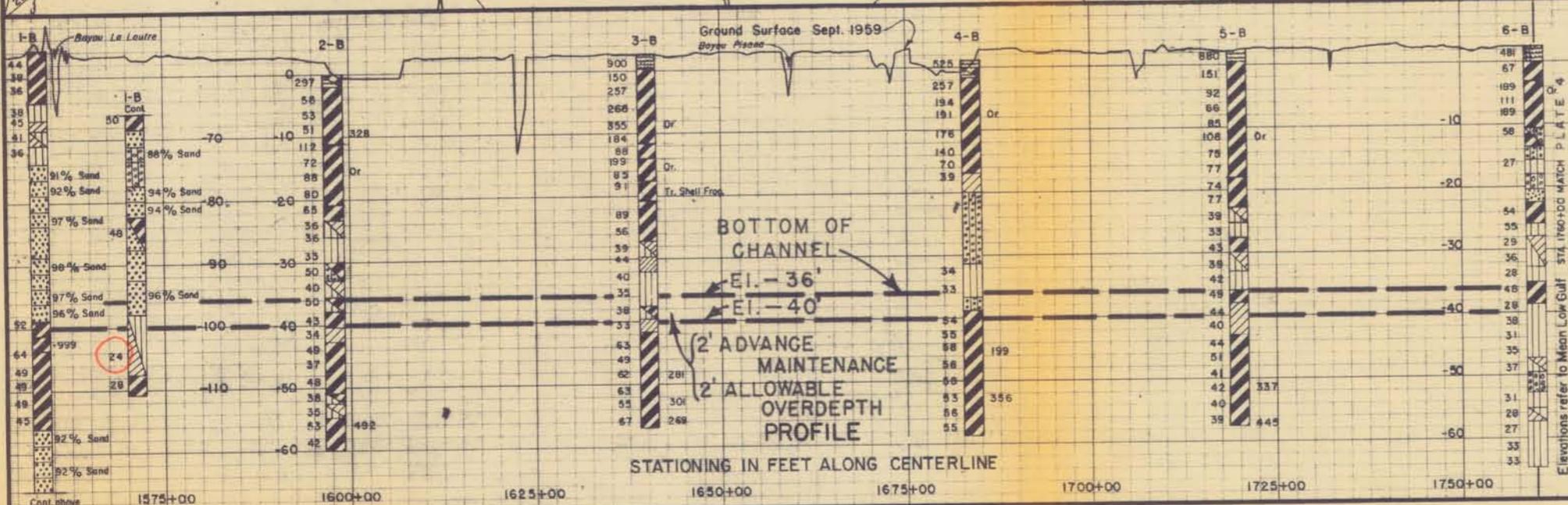
SCALES AS SHOWN  
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
 CORPS OF ENGINEERS  
 DATE: NOVEMBER 1959 FILE NO. H-2-21657

NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.  
Planimetry from aerial photos flown Jan., Feb. 1956.

35 Distances in miles landward of Chandeleur Islands.



**PLAN**  
Scale of Feet  
1,000 0 1,000 2,000 FT  
Polyconic Projection-1927 North American Datum.  
6-B ● Location of Boring



**BORING LEGEND**

	Peat (Pt)		Silt, Sandy Silt (ML)		Shell
	Fat Clay (CH)		Sandy Silt (SM)		Alternate thin layers
	Lean Clay (CL)		Sand (SP)		

Figures to left of boring logs indicate percent of water content based on weight of oven dry soil.  
Figures to right of boring logs are shear strength in pounds per square foot based on results of unconfined compression tests on small core samples.  
"Or" on right side of log denotes "Organic Matter."  
Borings 1-B through 10-B, 12-B, 13-B and 18-B were taken Aug and Oct 1959 and 42-R through 47-R were taken Oct-Nov 1957 with a 1 1/2" I.D. wire core barrel sampler.

**MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS**

MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)

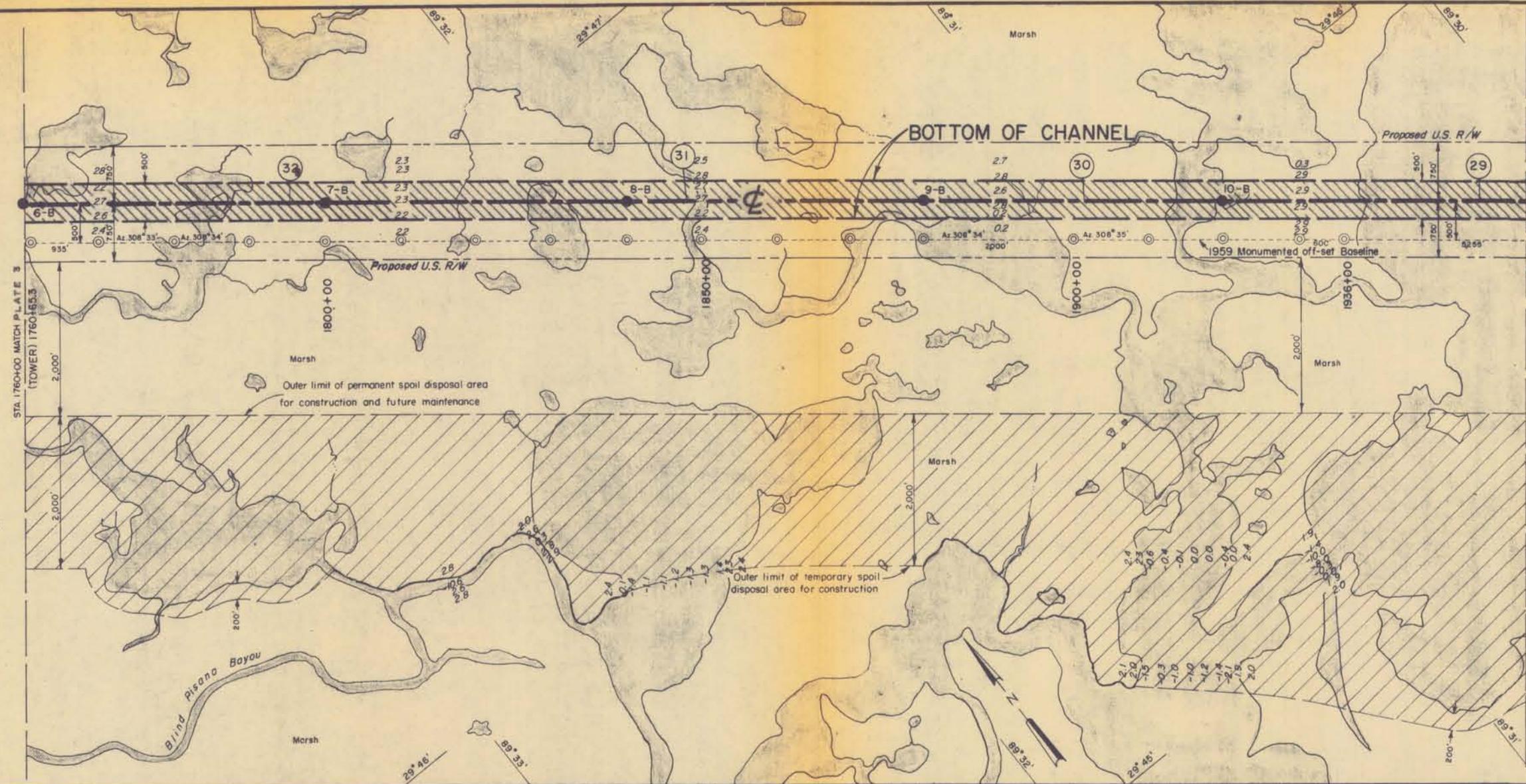
**PLAN, PROFILE AND SOIL BORINGS**

STA 1560+96 TO STA 1760+00  
SCALES AS SHOWN  
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

DATE: NOVEMBER 1959 FILE NO. H-2-21657

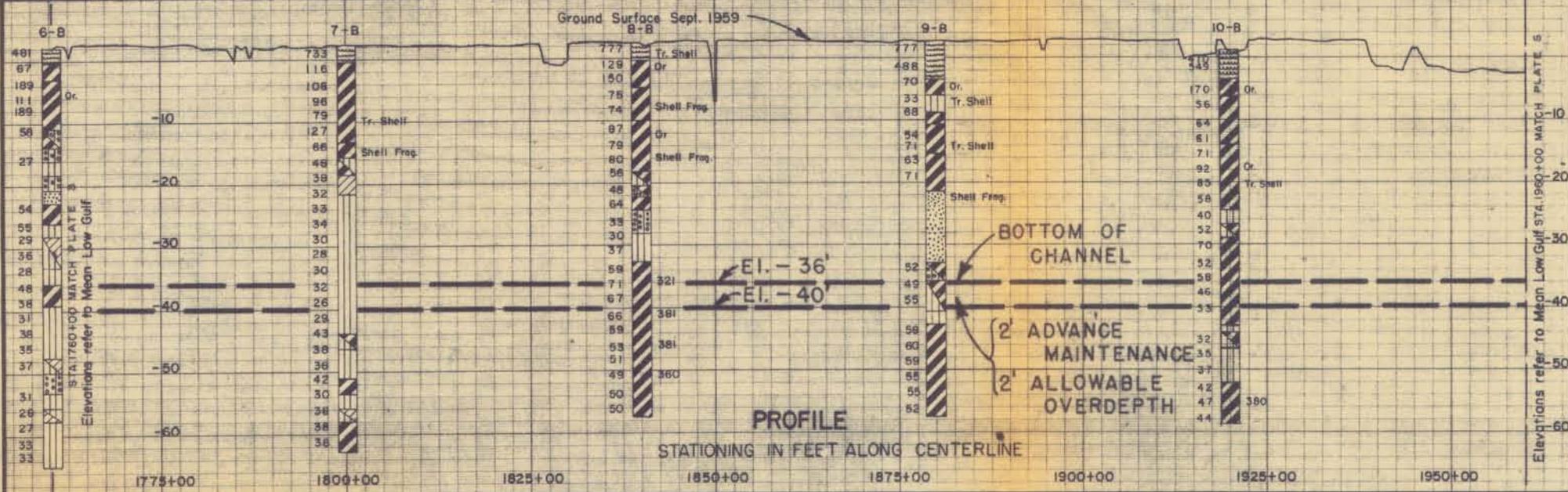
NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.  
Planimetry from aerial photos flown Jan., Feb. 1956.

30 Distances in miles landward of Chandeleur Islands.



**PLAN**

Scale of Feet  
1,000 0 1,000 2,000 Ft.  
Polyconic Projection-1927 North American Datum.  
8-B ● Location of Boring



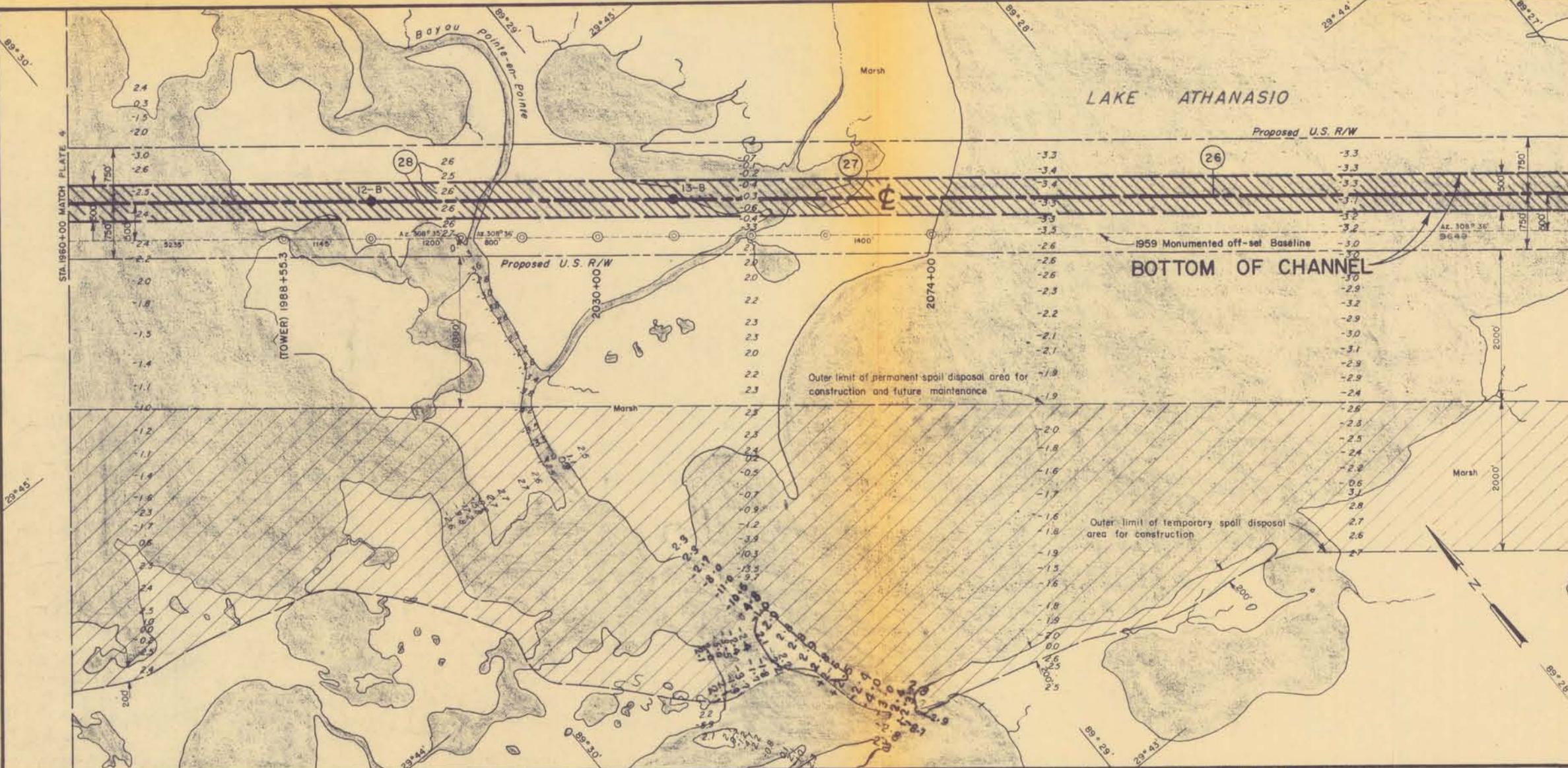
**PROFILE**

NOTE:  
Soil boring legend and notes are shown on Plate 3.

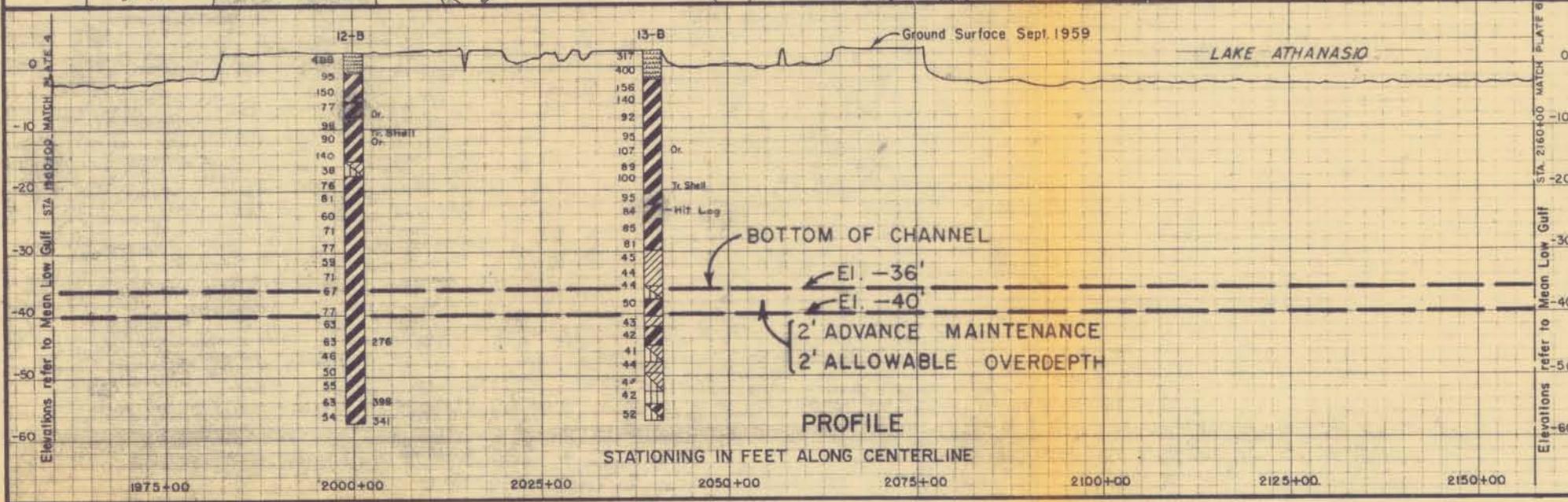
MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38-FT. CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 1760+00 TO STA. 1960+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO. H-2-21657

NOTE  
Elevations are in feet and refer to Mean Low Gulf Datum.  
Planimetry from aerial photos flown Jan.-Feb. 1956.

(27) Distances in miles landward of Chandeleur Islands.



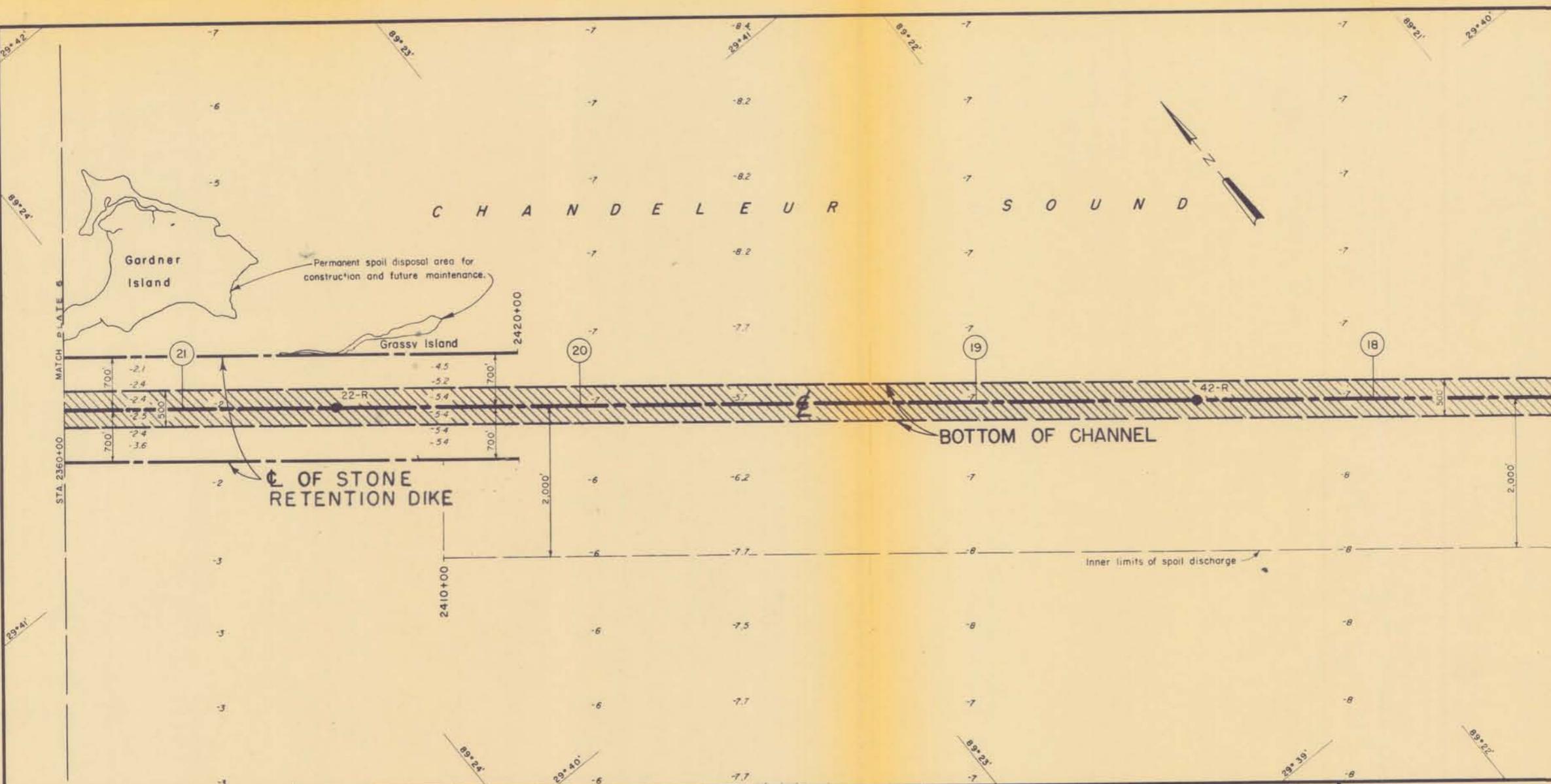
**PLAN**  
Scale of Feet  
1,000 0 1,000 2,000 ft  
Polyconic Projection-1927- North American Datum  
.13-B ● Location of Boring



NOTE:  
Soil boring legend and notes are shown on Plate 3.

MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 1960+00 TO STA. 2160+00  
SCALE AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO. H-2-21657





NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.

Planimetry from aerial photos flown Oct 1959.

20 Distances in miles landward of Chandeleur Islands

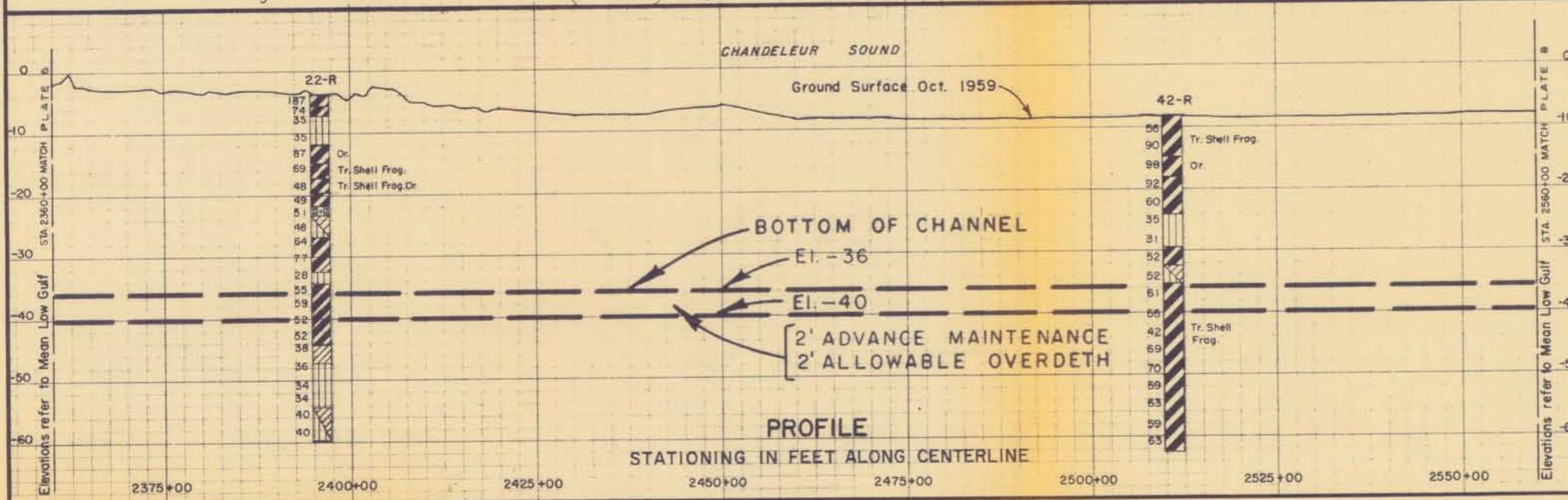
**PLAN**

Scale of Feet

1000 0 1000 2000

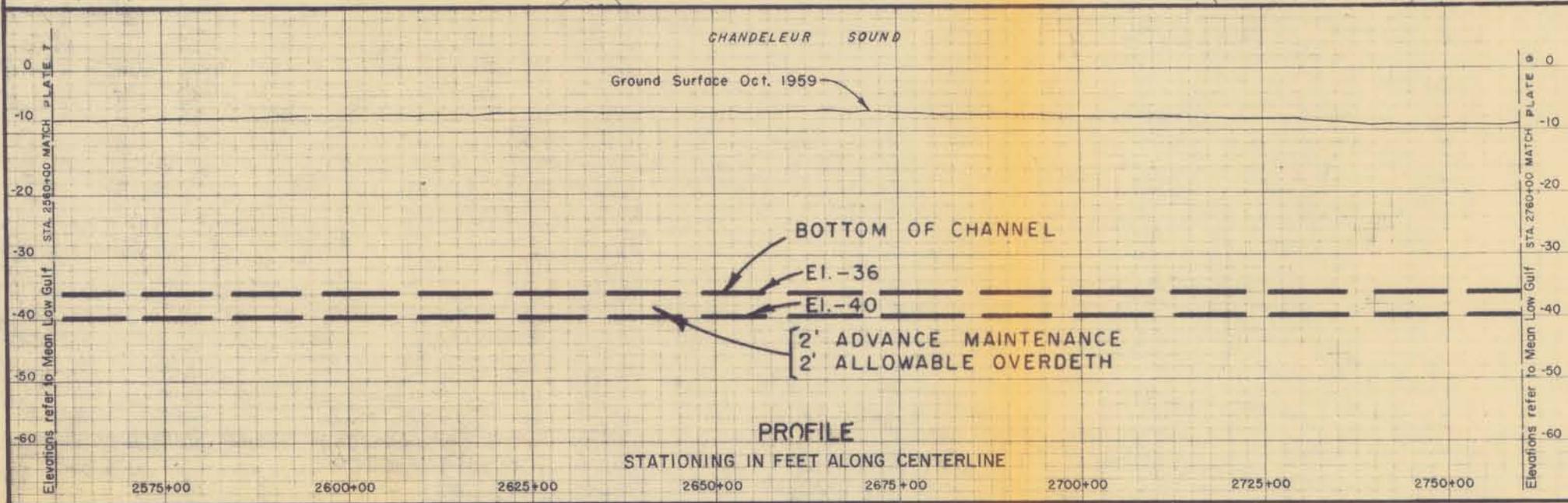
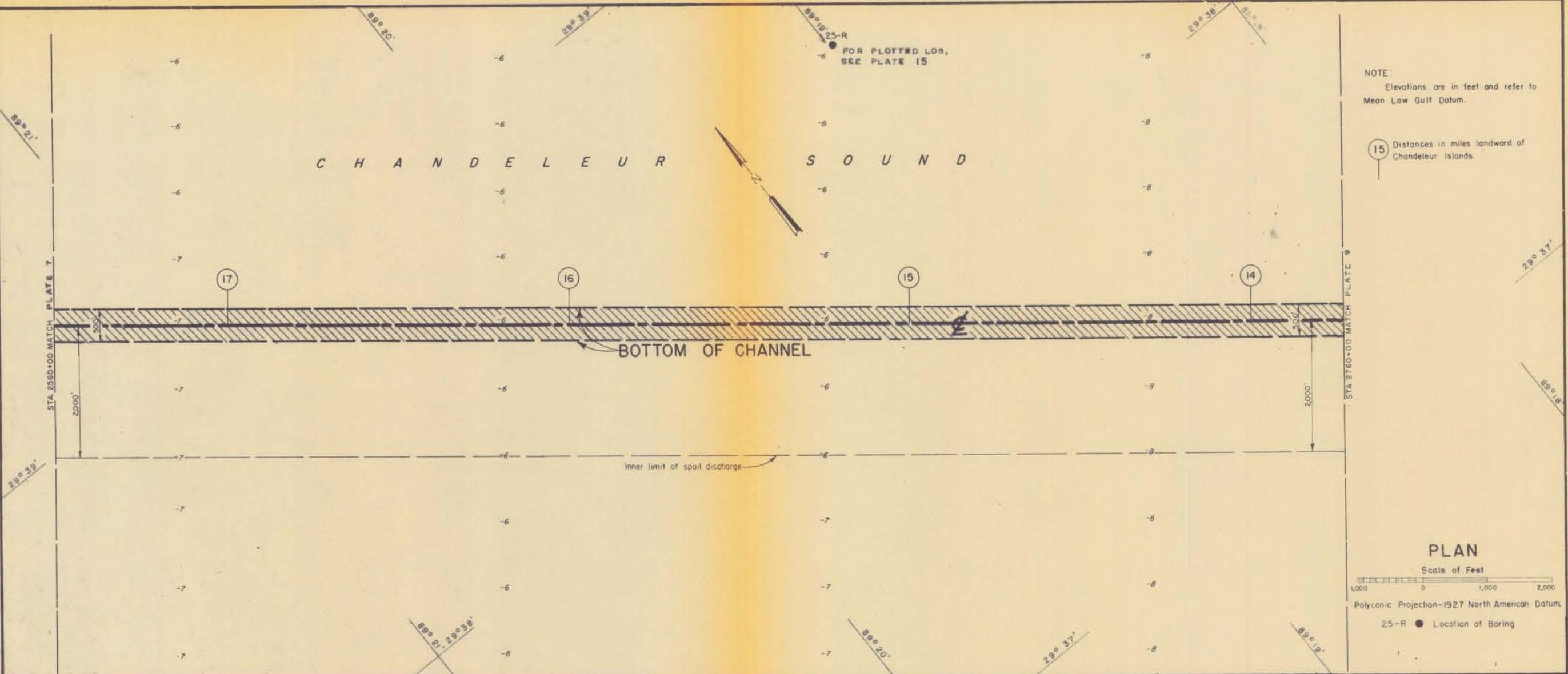
Polyconic Projection-1927 North American Datum.

42-R ● Location of Boring



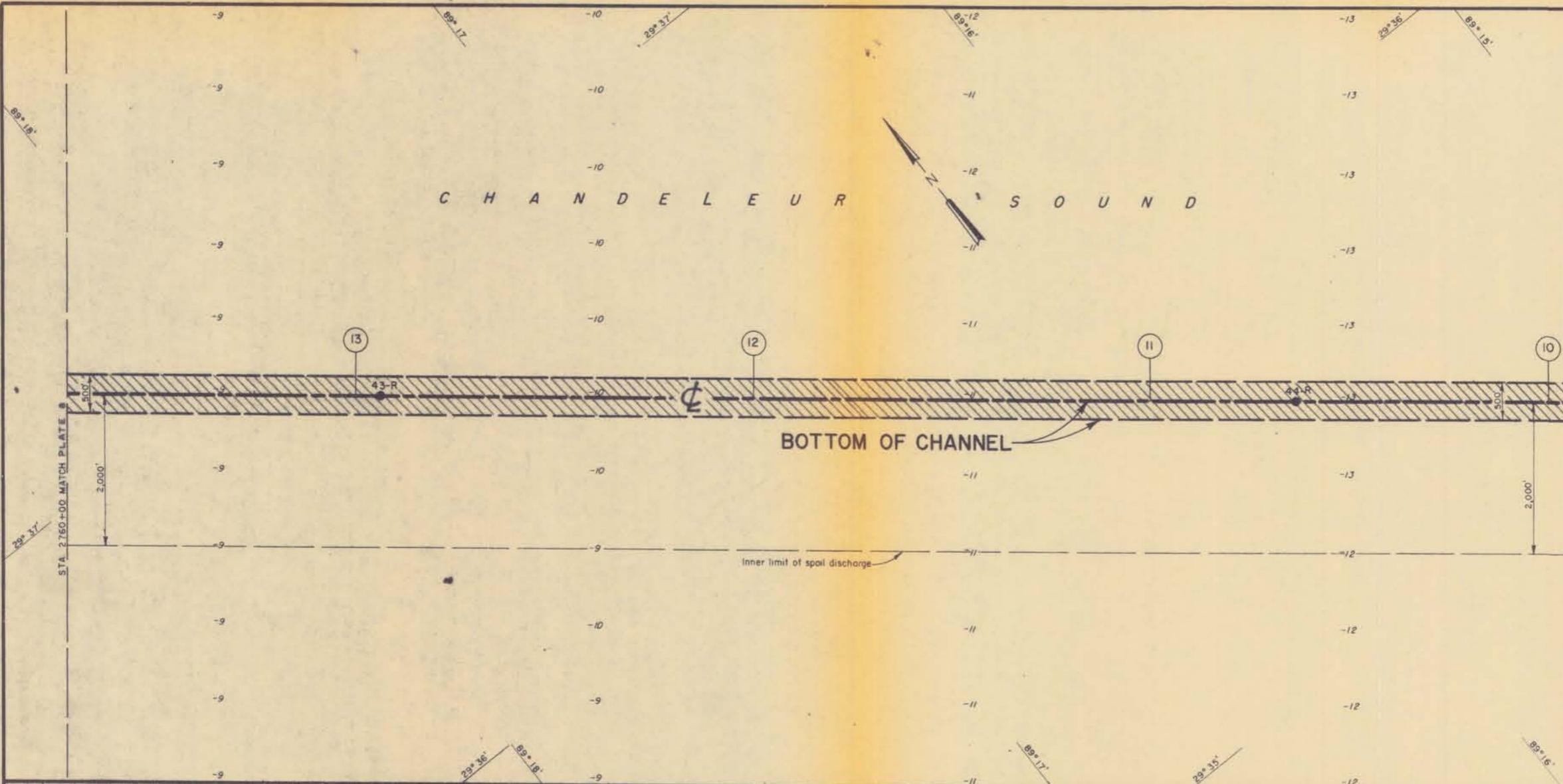
NOTE:  
Soil boring legend and notes are shown on Plate 3.

MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA 2360+00 TO STA 2560+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE NOVEMBER 1959 FILE NO. H-2-21657



MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE 9.75 (38 FT. CONTOUR)

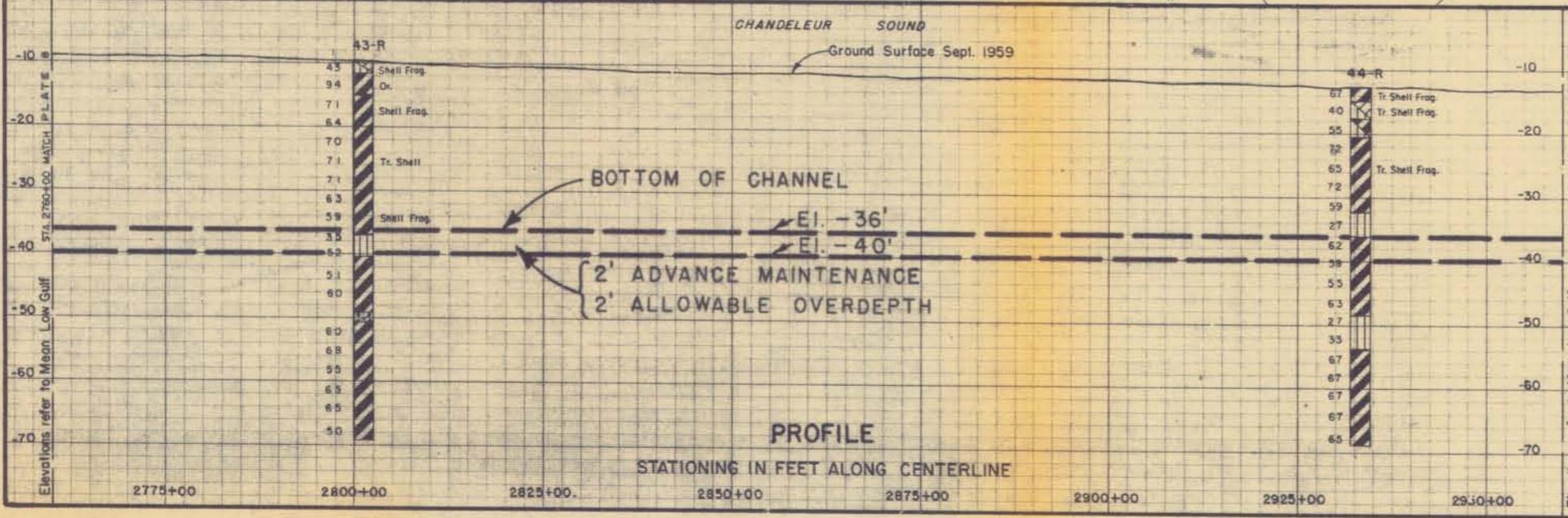
**PLAN, PROFILE AND SOIL BORINGS**  
STA 2560+00 TO STA 2760+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959                      FILE NO. H-2-21657



NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.

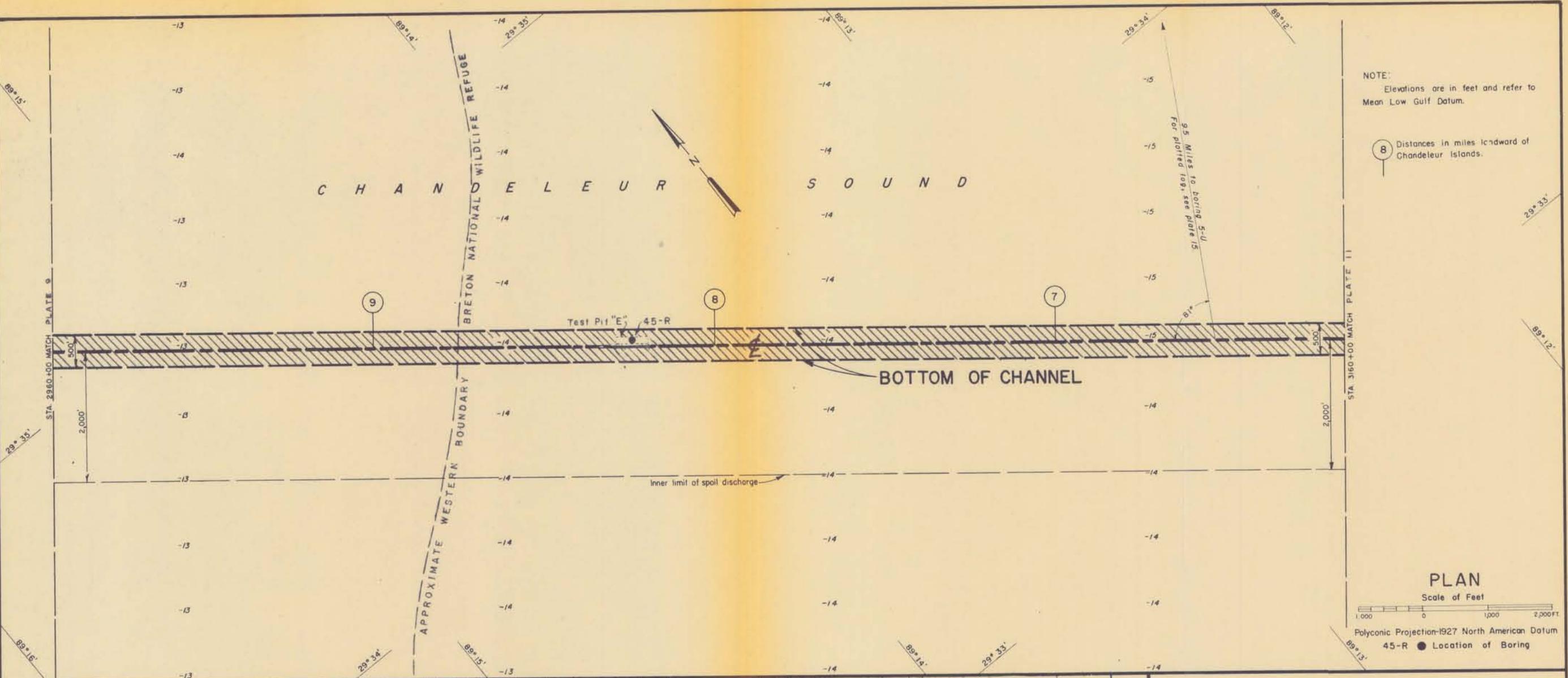
12 Distances in miles landward of Chandeleur Islands.

**PLAN**  
Scale of Feet  
1,000 0 1,000 2,000  
Polyconic Projection-1927 North American Datum  
44-R ● Location of Boring



NOTE:  
Soil boring legend and notes are shown on Plate 3

MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 2760+00 TO STA 2960+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE, NOVEMBER 1959 FILE NO. H-2-21657



NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.

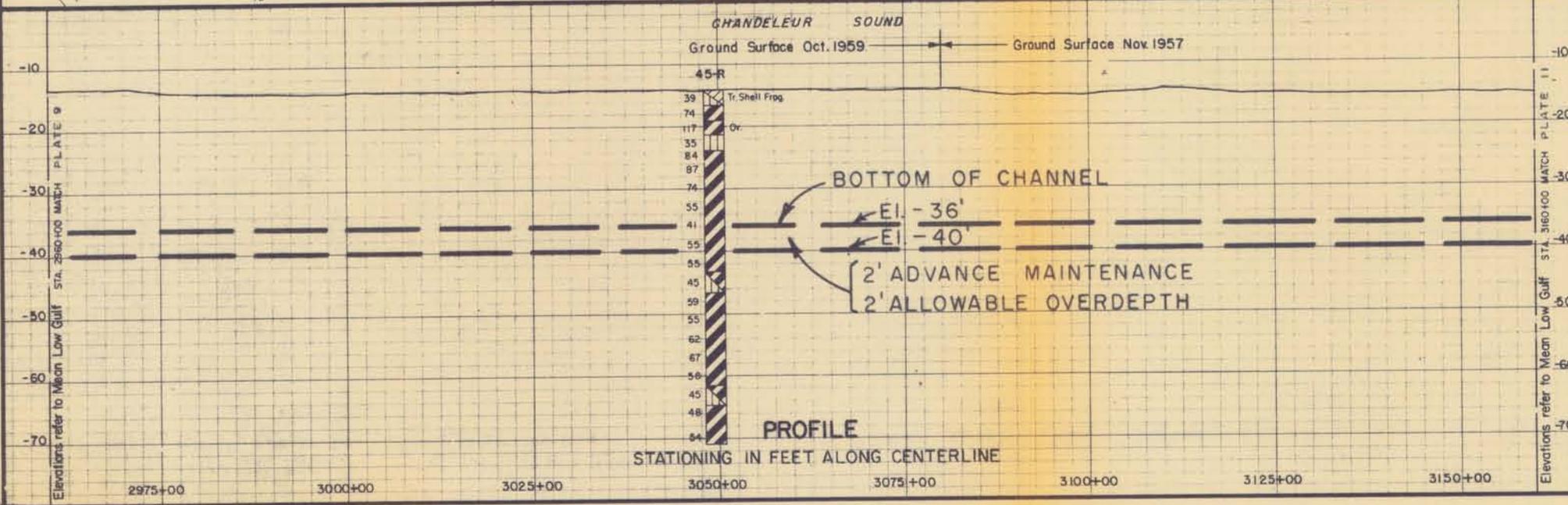
8 Distances in miles landward of Chan-de-leur Islands.

**PLAN**

Scale of Feet

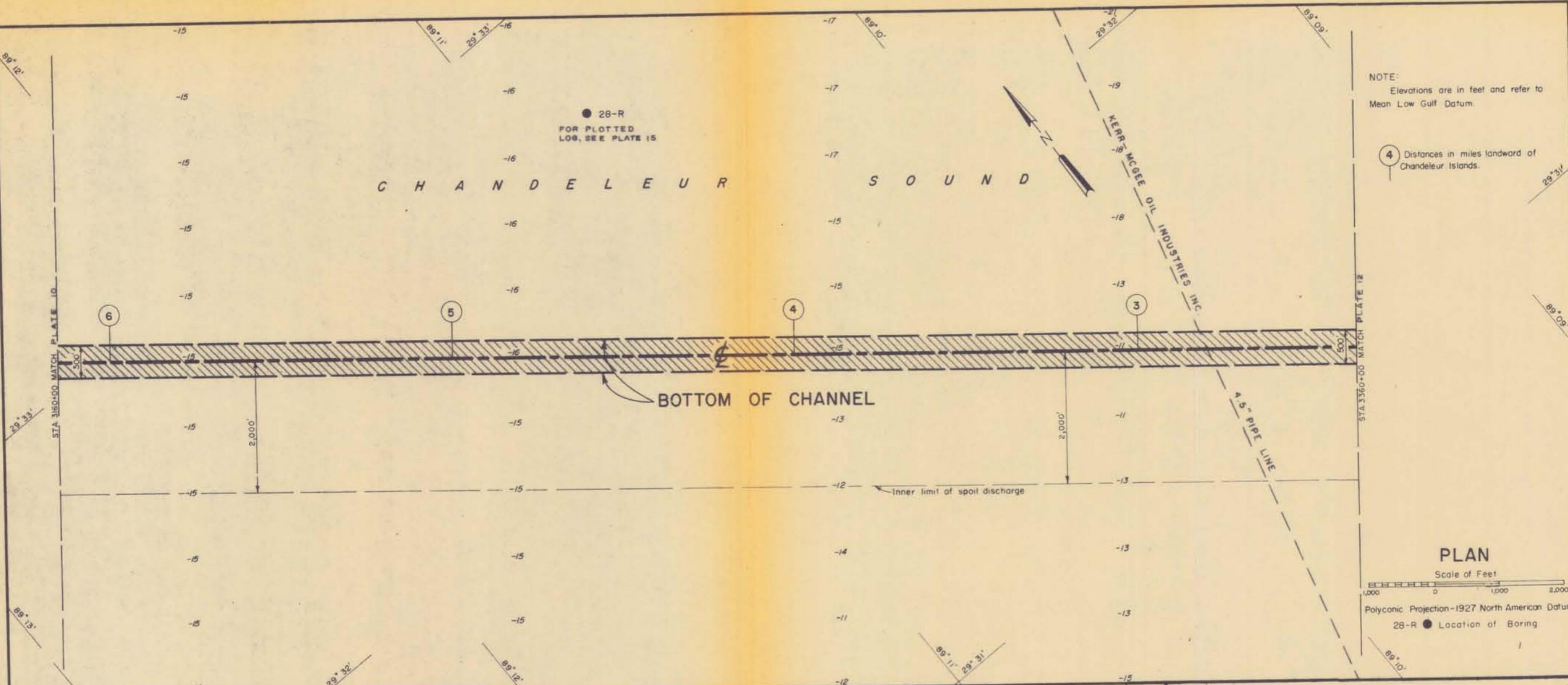


Polyconic Projection-1927 North American Datum  
45-R ● Location of Boring



NOTE:  
Soil boring legend and notes are shown on Plate 3

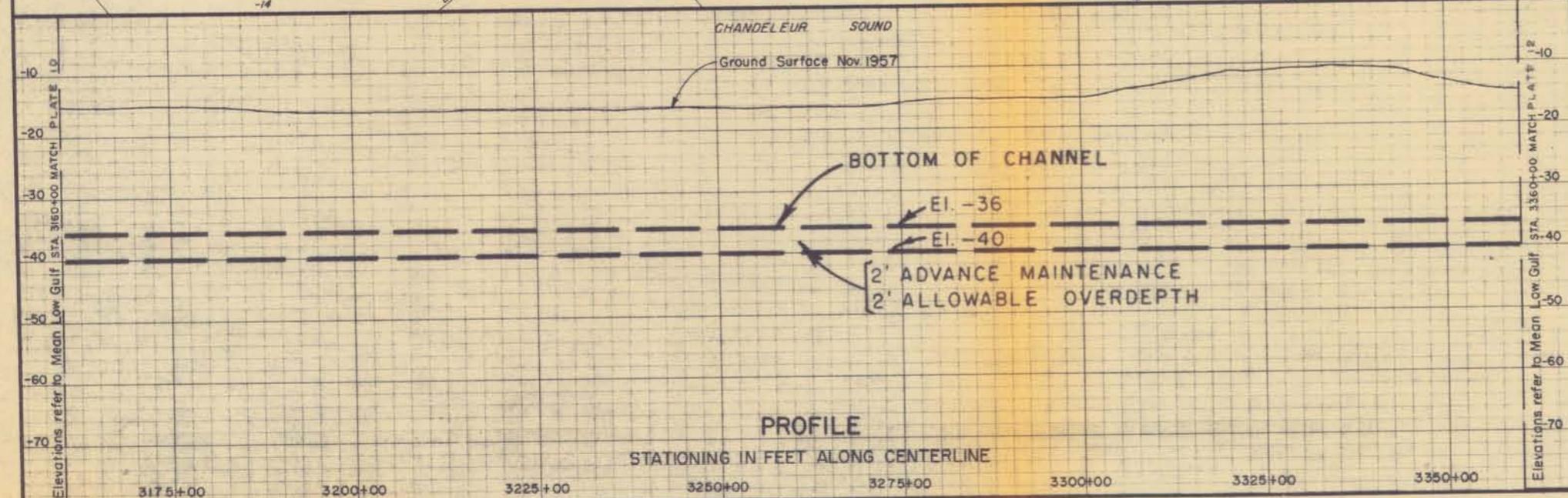
MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 2960+00 TO STA. 3160+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO H-2-21657



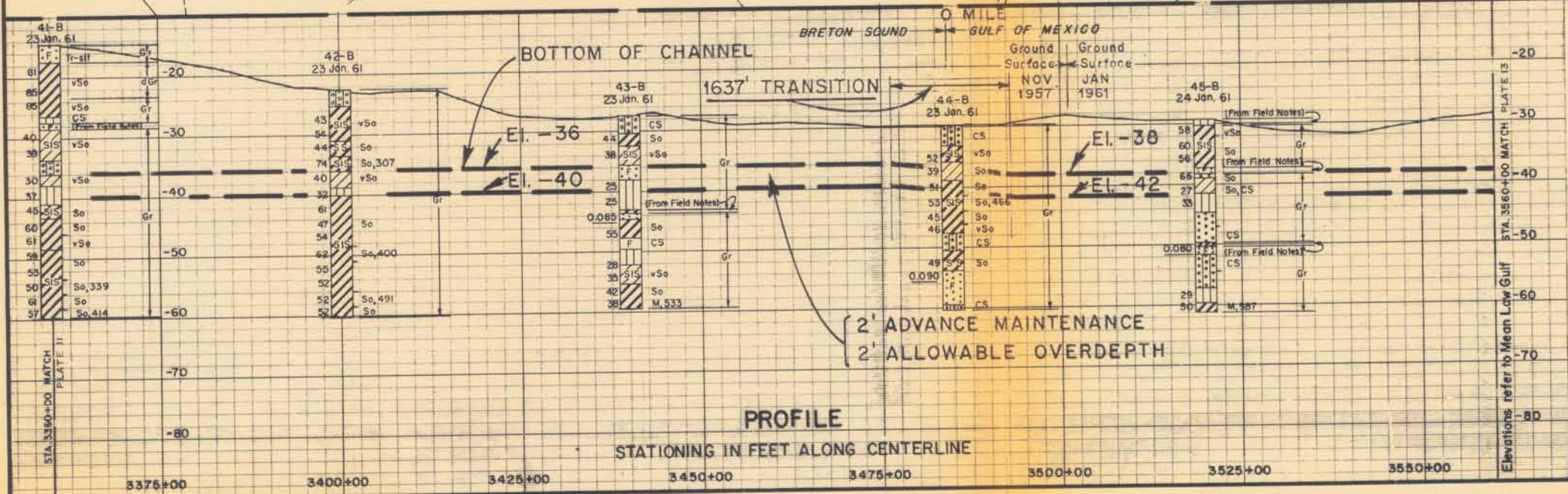
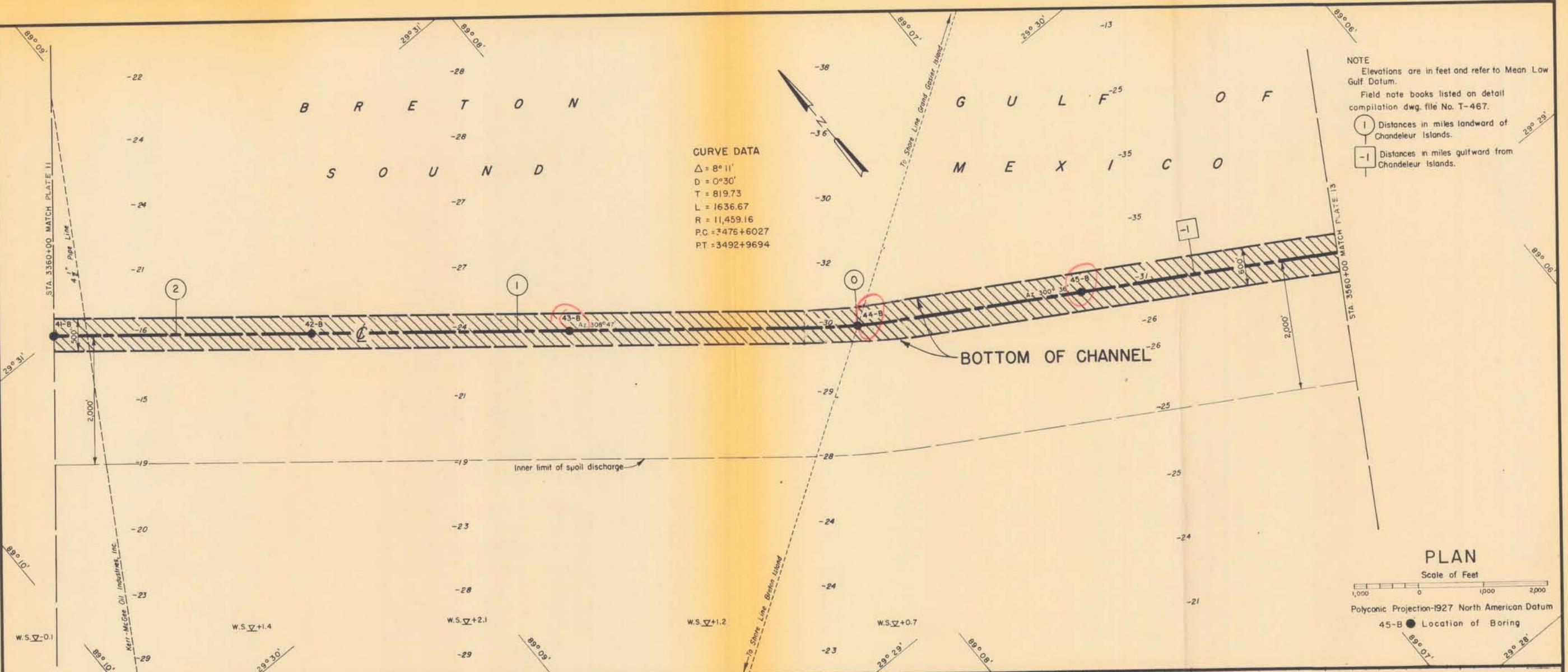
NOTE:  
Elevations are in feet and refer to Mean Low Gulf Datum.

④ Distances in miles landward of Chandeleur Islands.

**PLAN**  
Scale of Feet  
0 1,000 2,000 Ft.  
Polyconic Projection-1927 North American Datum  
28-R ● Location of Boring



MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 3160+00 TO STA. 3360+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO. H-2-21657



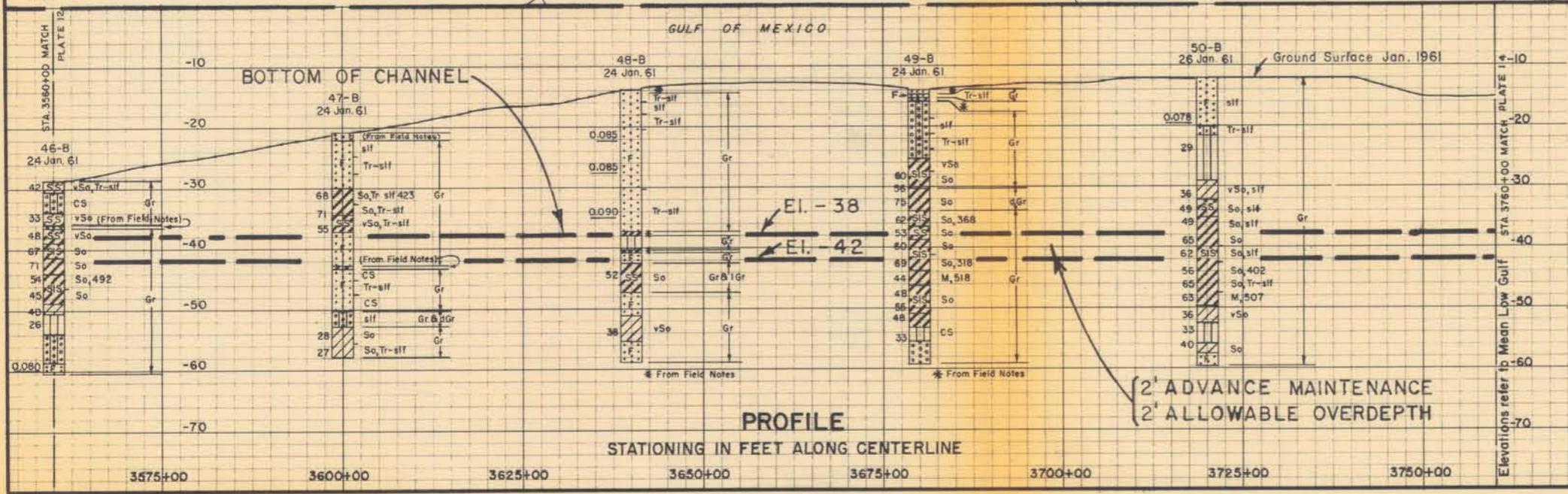
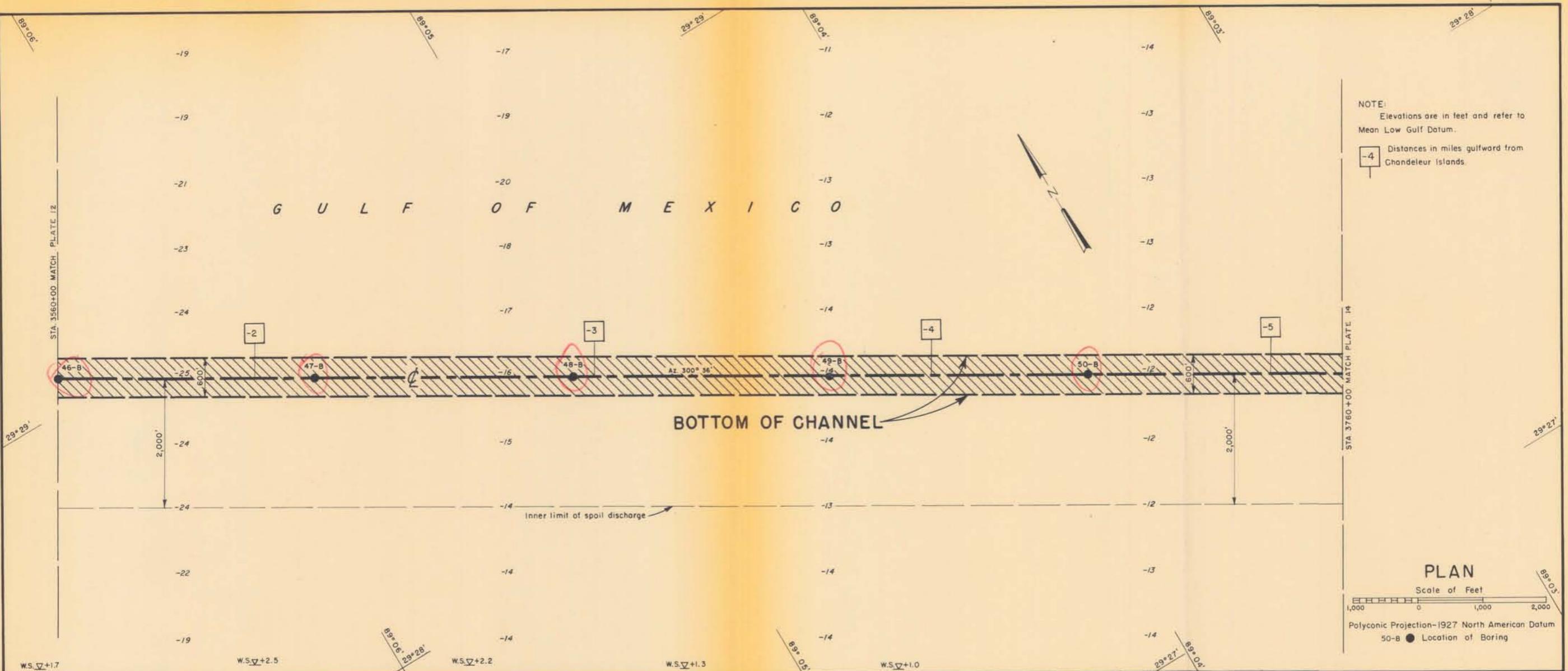
**MISSISSIPPI RIVER-GULF OUTLET  
 LOUISIANA  
 DESIGN MEMORANDUM NO.1-C  
 CHANNELS**

MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
 MILE 0 TO MILE -9.38 (38 FT. CONTOUR)

**PLAN, PROFILE AND SOIL BORINGS**

STA. 3360+00 TO STA. 3560+00  
 SCALES AS SHOWN  
 U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
 CORPS OF ENGINEERS

R. 2-61 DATE: NOVEMBER 1959 FILE NO. H-2-21657



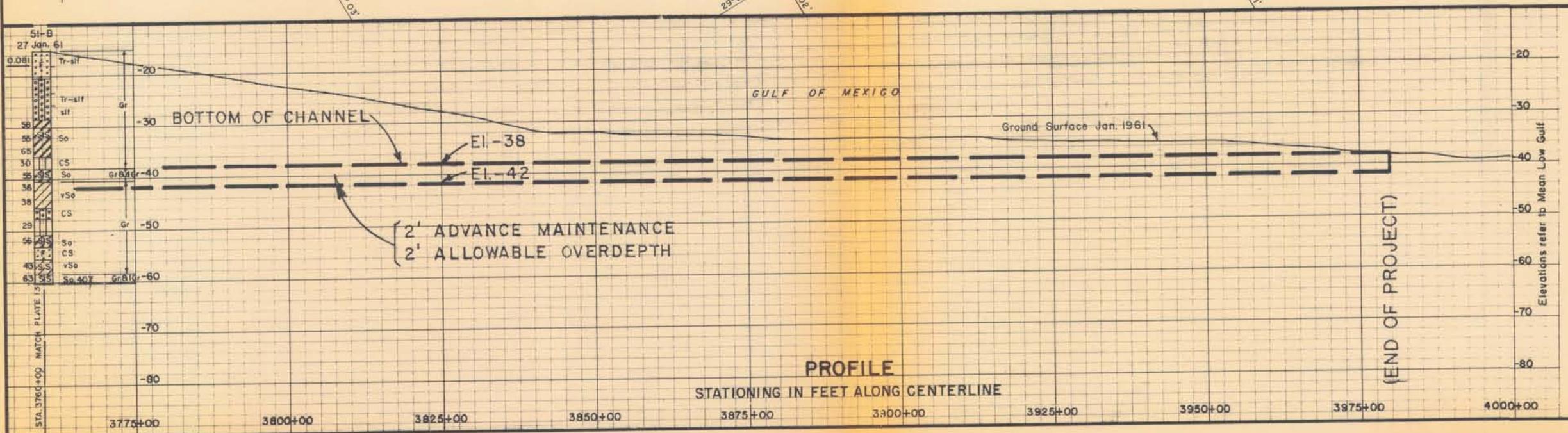
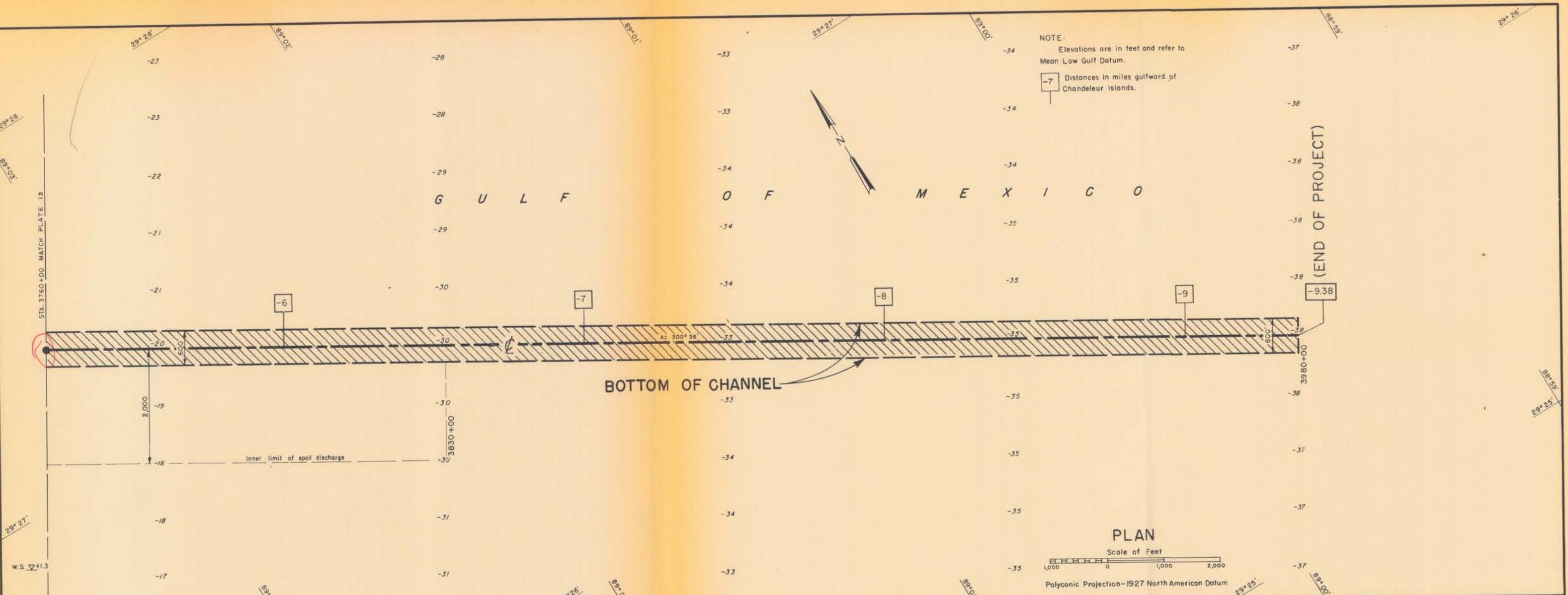
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LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS**

MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.38 (38 FT. CONTOUR)

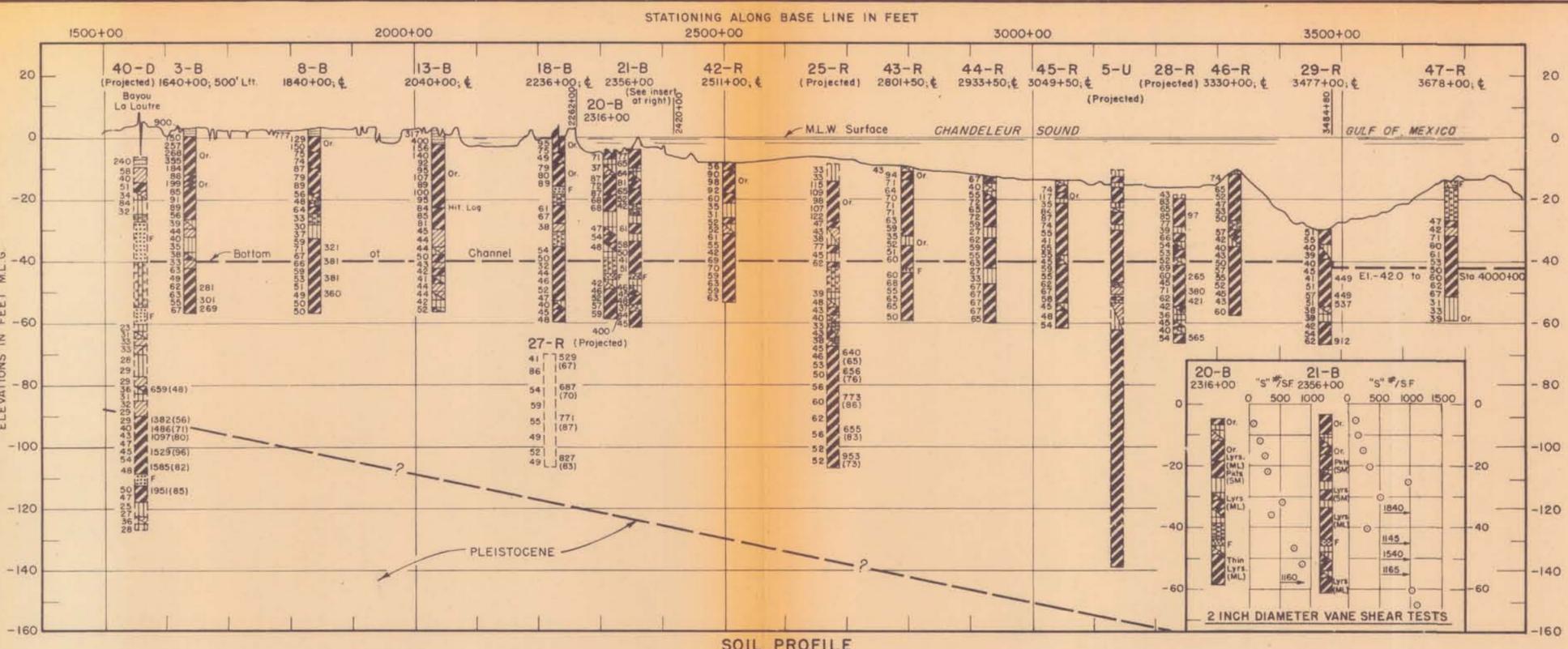
**PLAN, PROFILE AND SOIL BORINGS**

STA. 3560+00 TO STA. 3760+00  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS

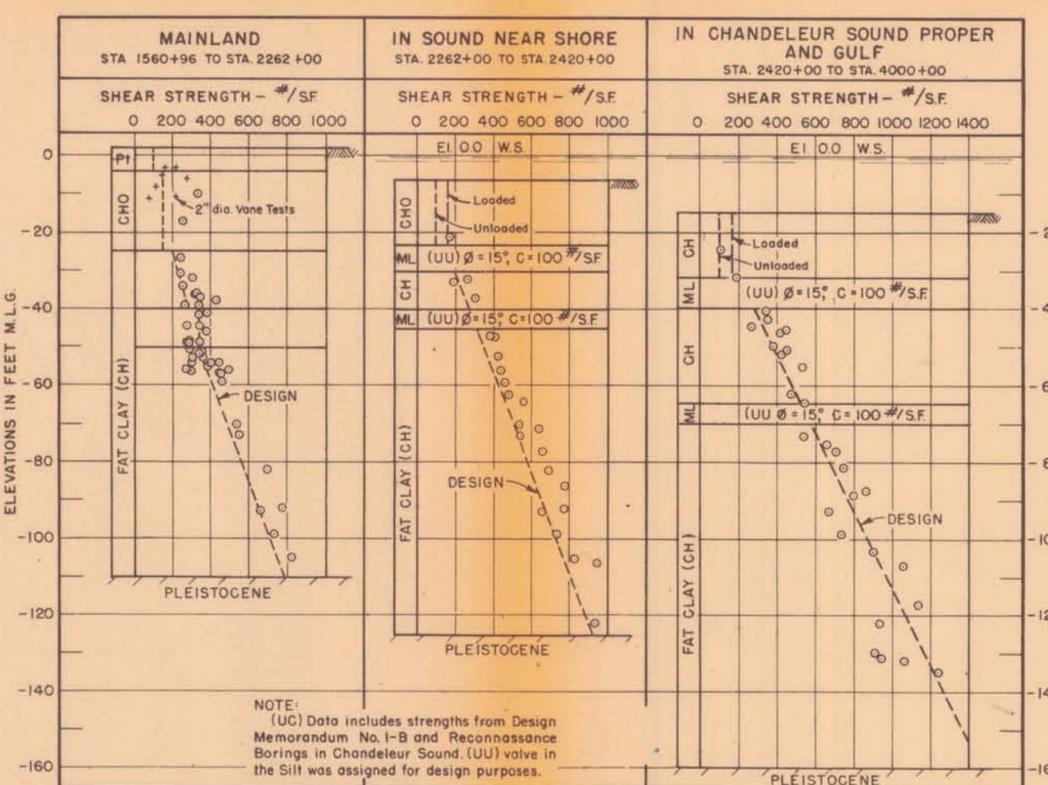
R. 2-61      DATE: NOVEMBER 1959      FILE NO. H-2-21657



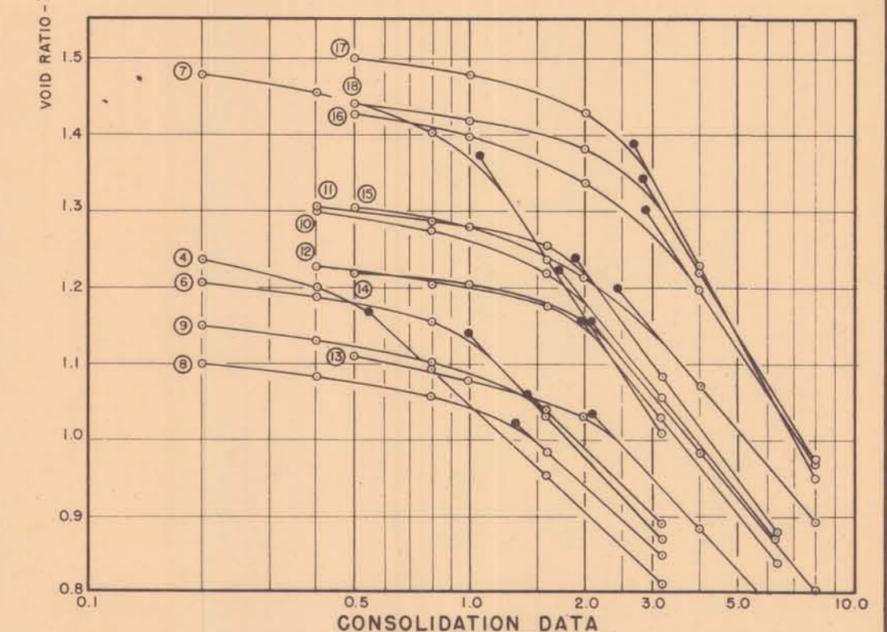
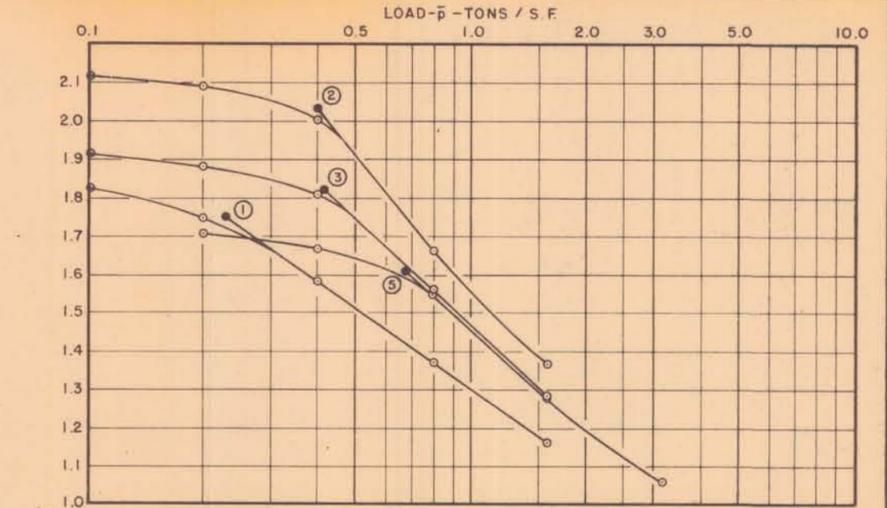
MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.38 (38 FT. CONTOUR)  
**PLAN, PROFILE AND SOIL BORINGS**  
STA. 3760+00 TO STA. 3980+00  
SCALE AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959  
FILE NO. H-2-21657



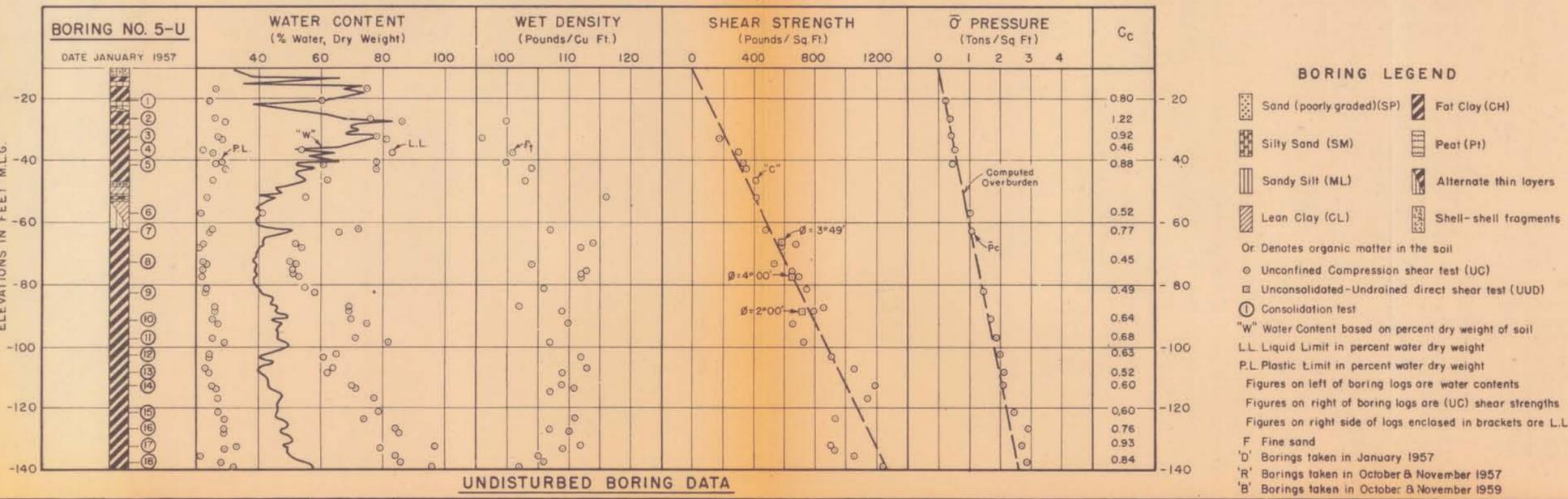
SOIL PROFILE



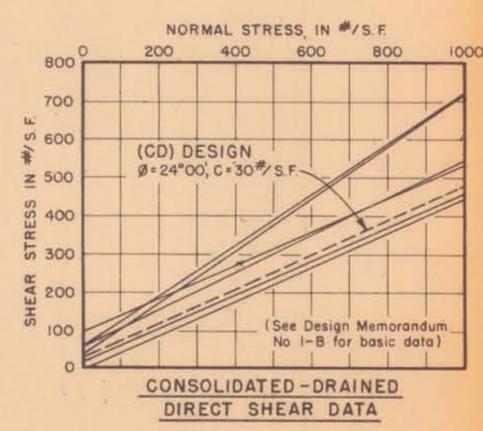
SHEAR STRENGTHS ASSIGNED FOR STABILITY ANALYSIS



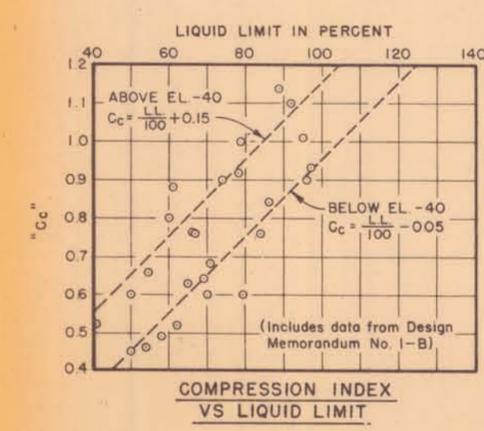
GENERAL NOTES:  
 $\phi$  Angle of internal friction of soil in degrees  
 $C$  Shear strength (Cohesion) in pounds per square foot  
 $C_c$  Compression Index (Slope of virgin branch of 'e-p' curve)  
 $P_c$  Preconsolidation load of soil  
 $e$  Void Ratio (Ratio of volume of voids to solids)  
 $\bar{\sigma}$  Intergranular direct stress  
 $\gamma$  Unit weight in pounds per cubic foot (Unsubmerged)  
 $\gamma_s$  Unit weight in pounds per cubic foot (Submerged)  
 $F.S.$  Factor of safety against assumed shear failure with respect to strength of soil:  $F.S. = \frac{\bar{\sigma} R}{\bar{\sigma} D}$



UNDISTURBED BORING DATA

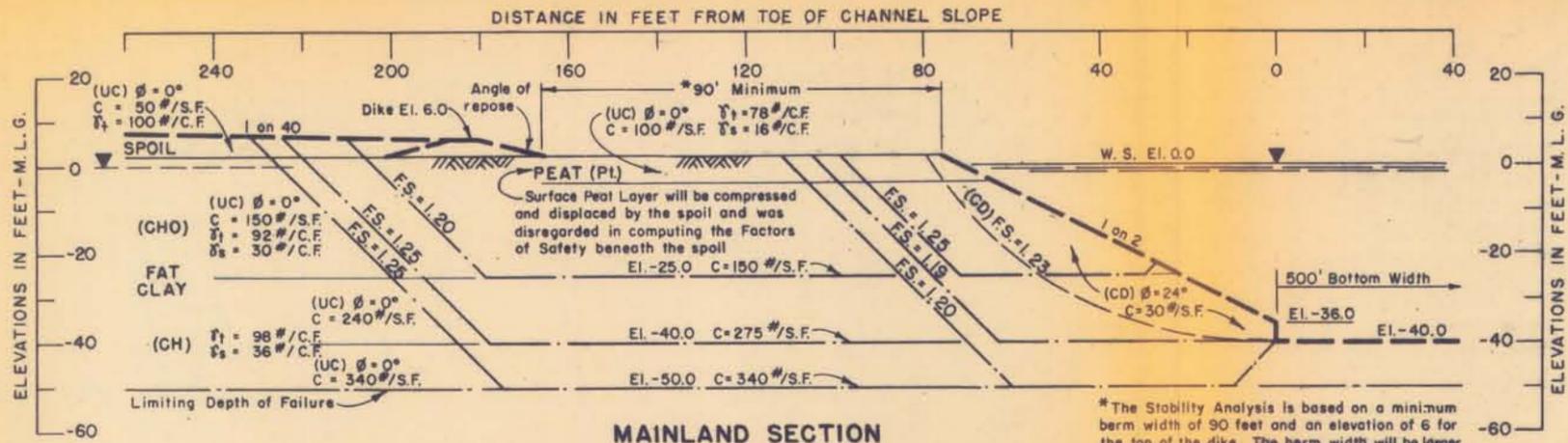


CONSOLIDATED-DRAINED DIRECT SHEAR DATA

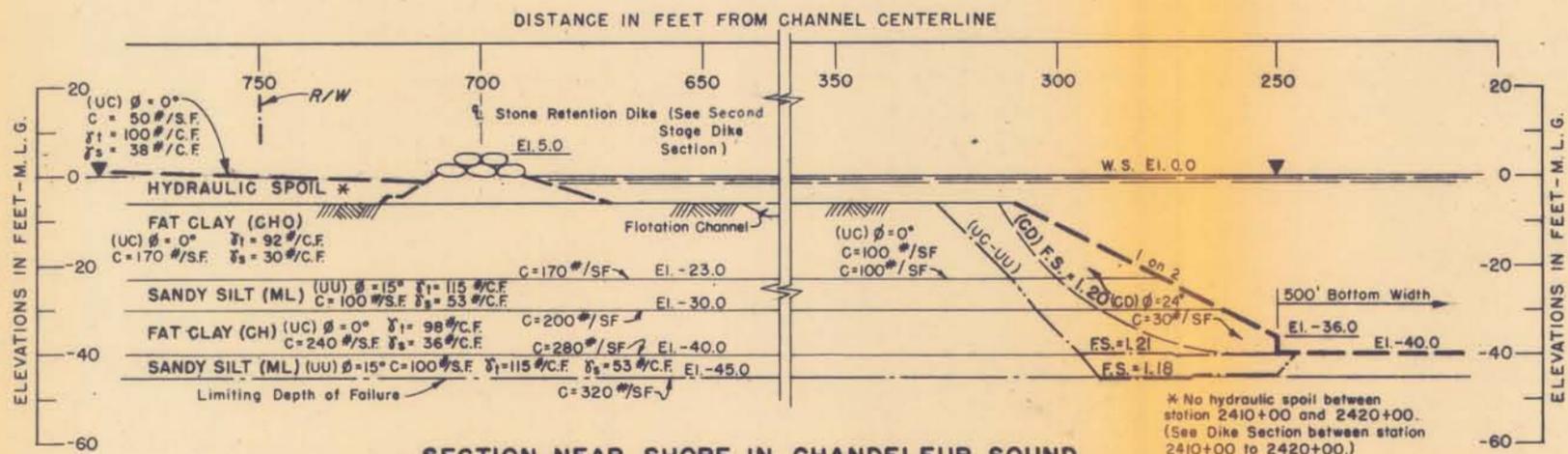


COMPRESSION INDEX VS LIQUID LIMIT

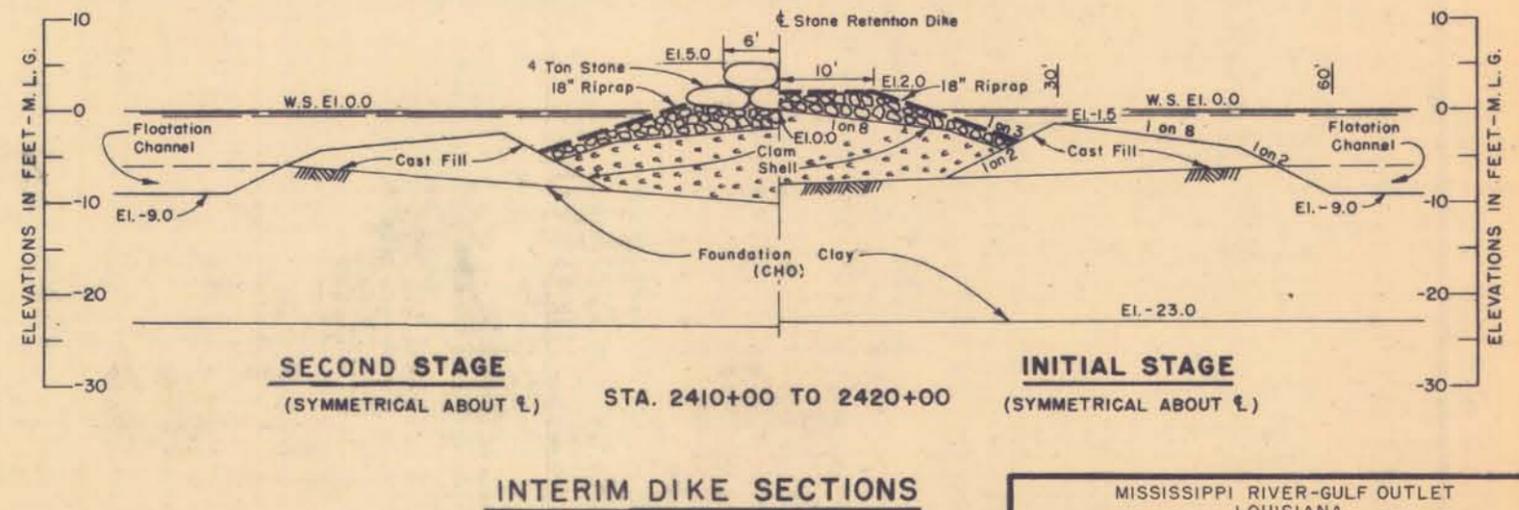
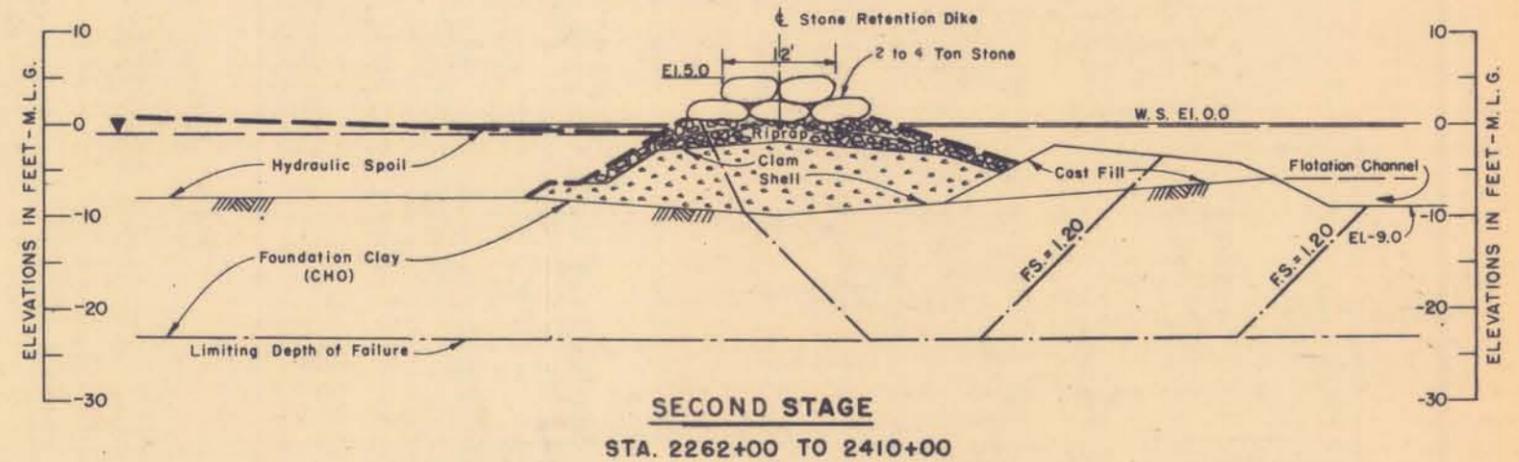
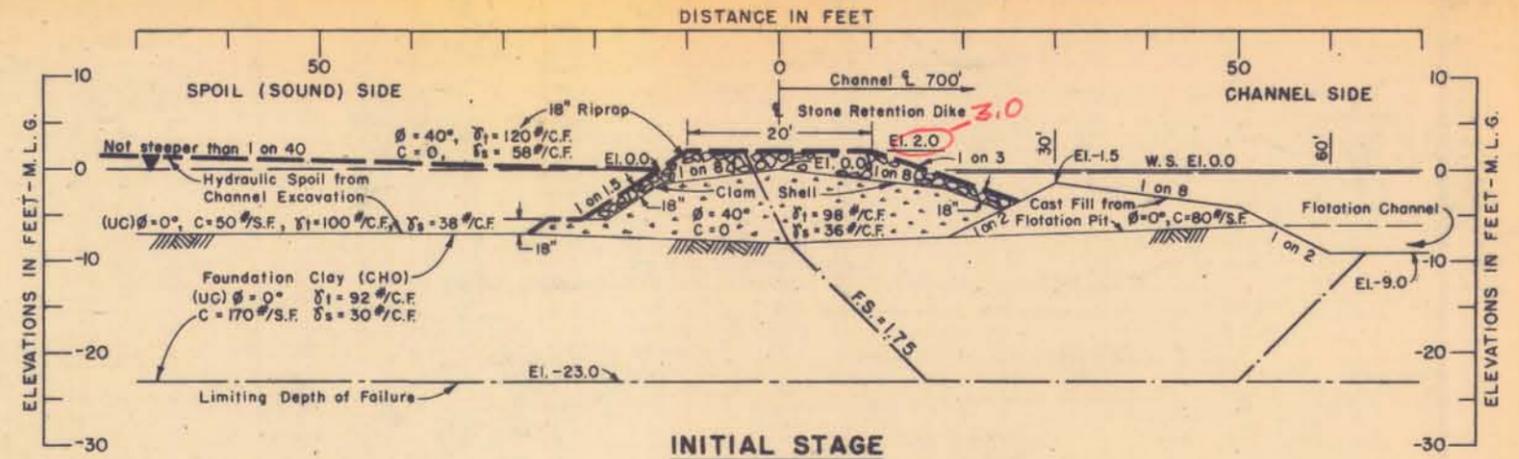
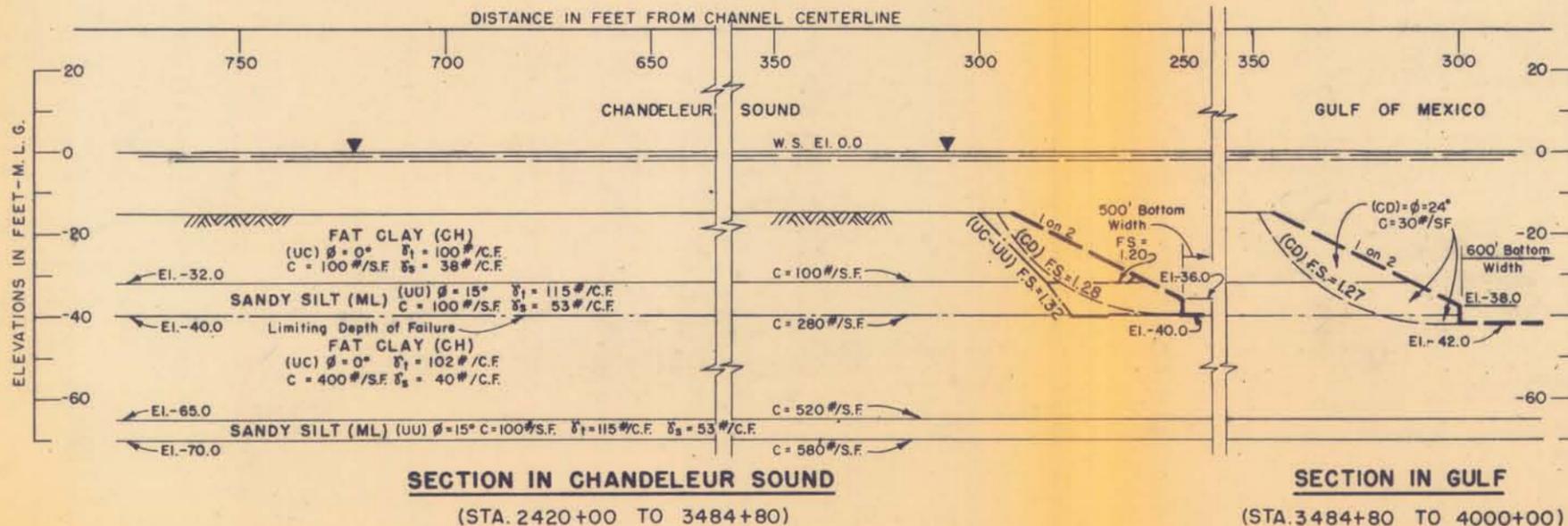
MISSISSIPPI RIVER-GULF OUTLET  
 LOUISIANA  
 DESIGN MEMORANDUM NO.1-C  
 CHANNELS  
 MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
 MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**SOIL PROFILE AND TEST DATA**  
 SCALES AS SHOWN  
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
 CORPS OF ENGINEERS  
 DATE: NOVEMBER 1959 FILE NO. H-2-21657



\*The Stability Analysis is based on a minimum berm width of 90 feet and an elevation of 6 for the top of the dike. The berm width will be larger than 90 feet to provide for erosion protection and the location of the dike will be as shown on Plate No. 17.

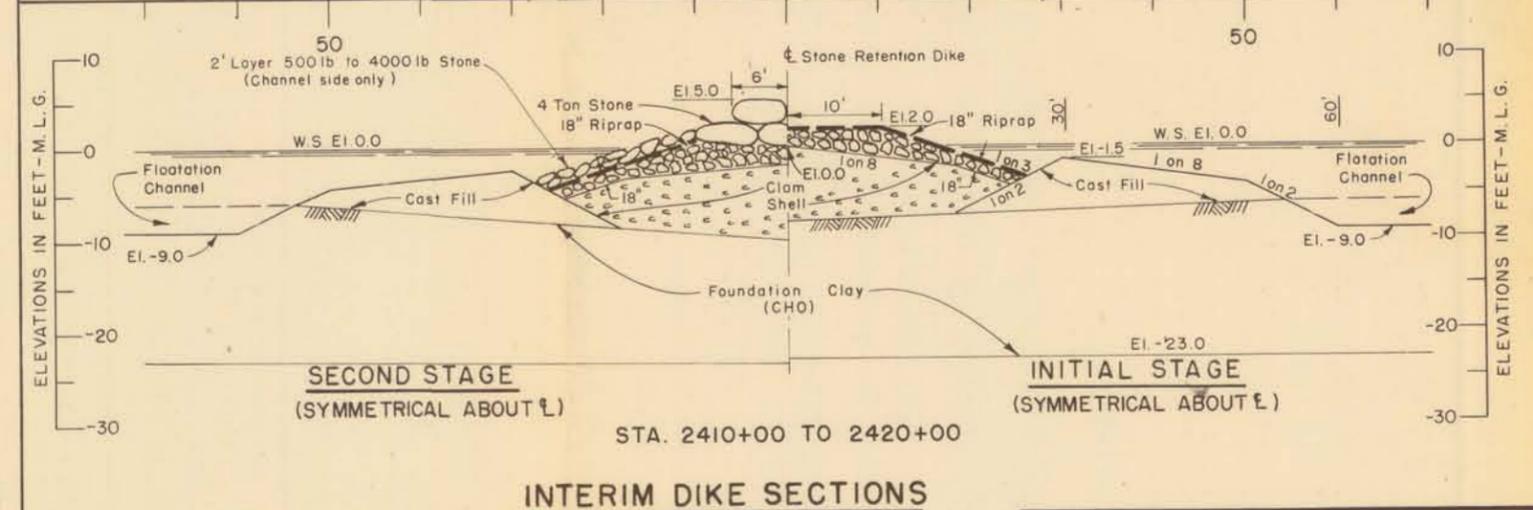
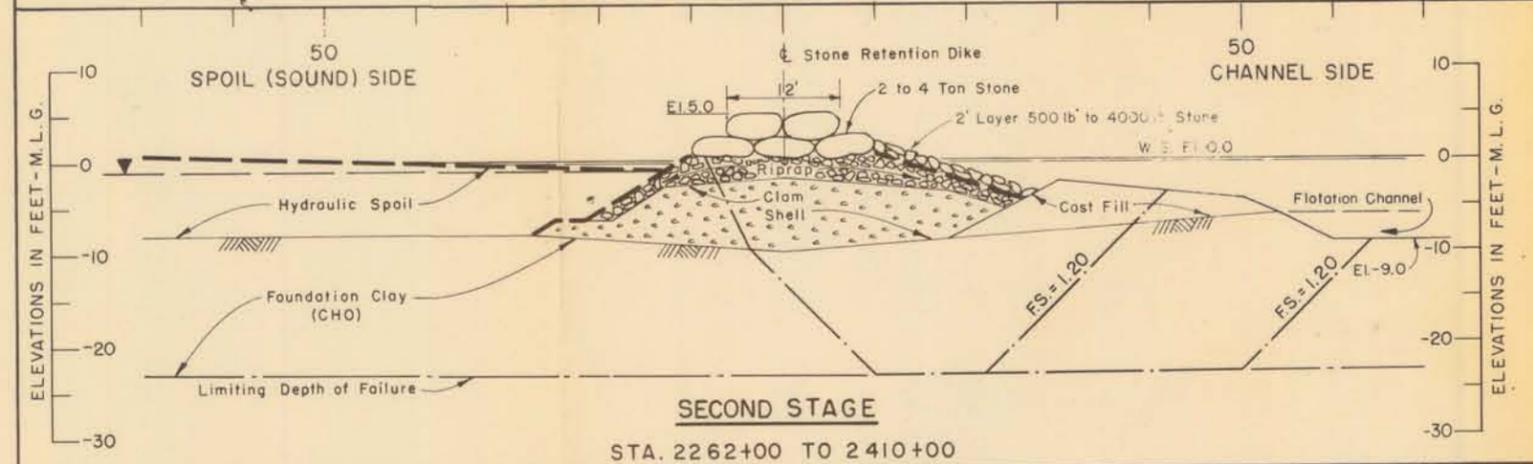
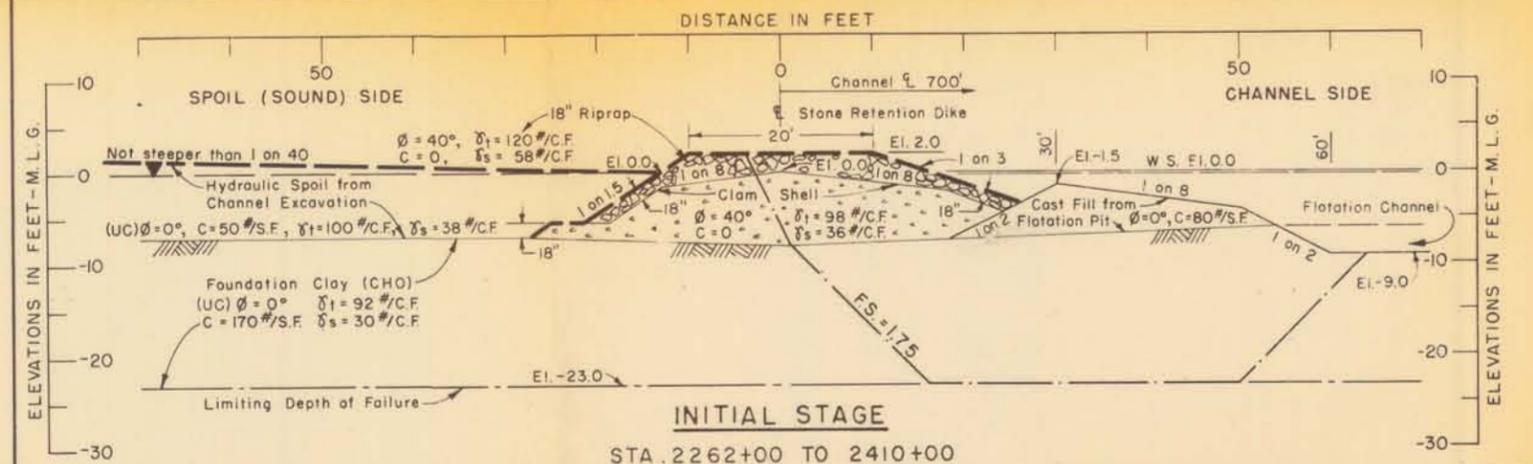
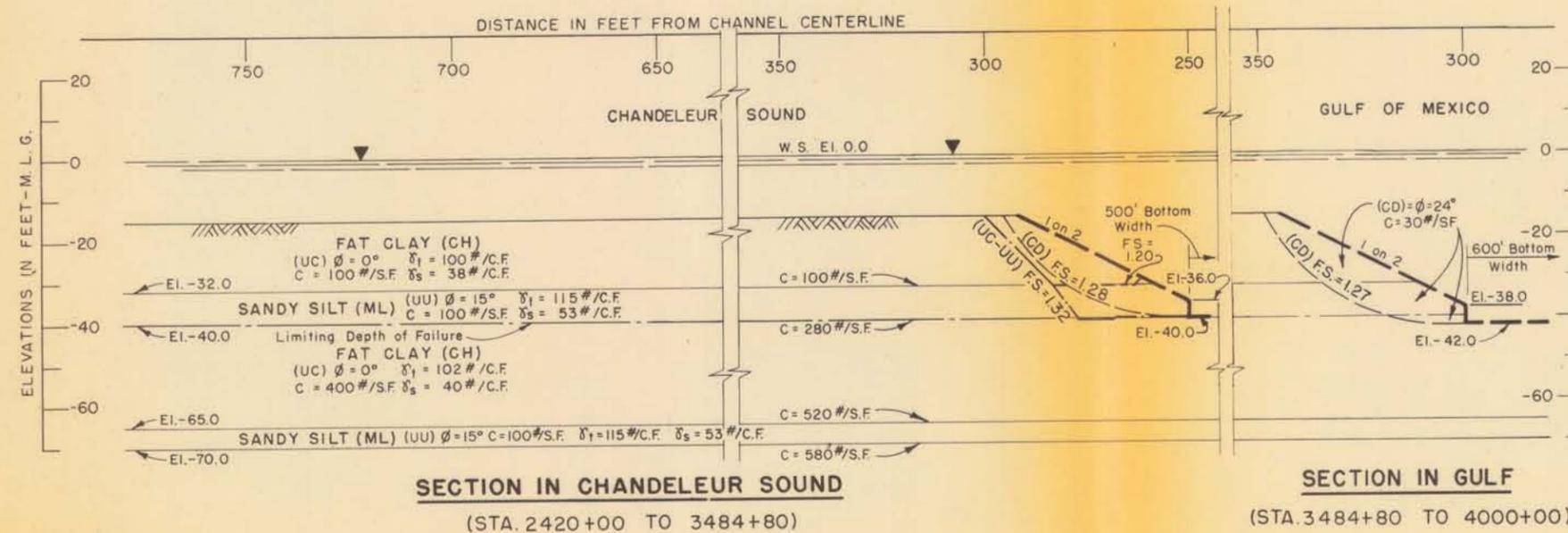
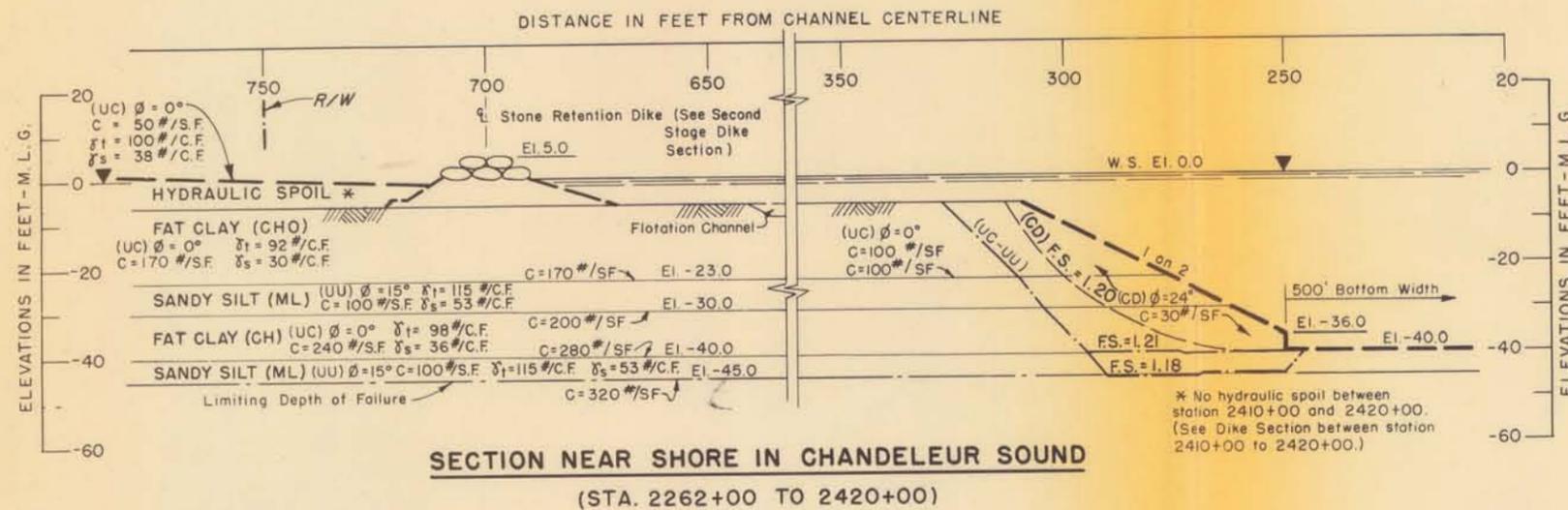
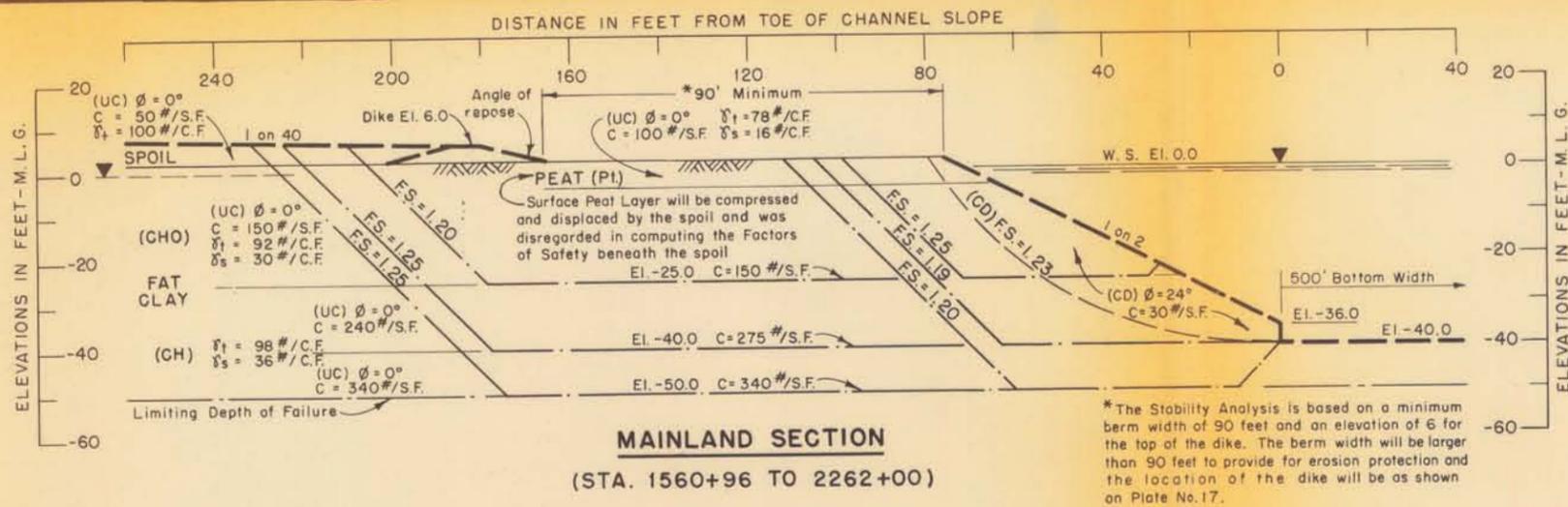


\*No hydraulic spoil between station 2410+00 and 2420+00. (See Dike Section between station 2410+00 to 2420+00.)



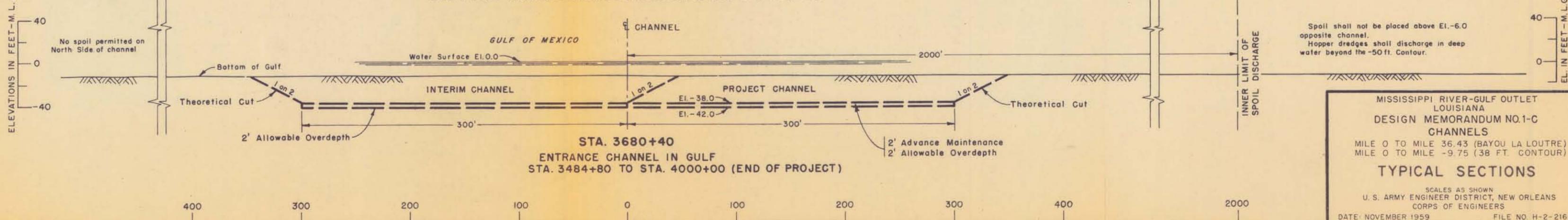
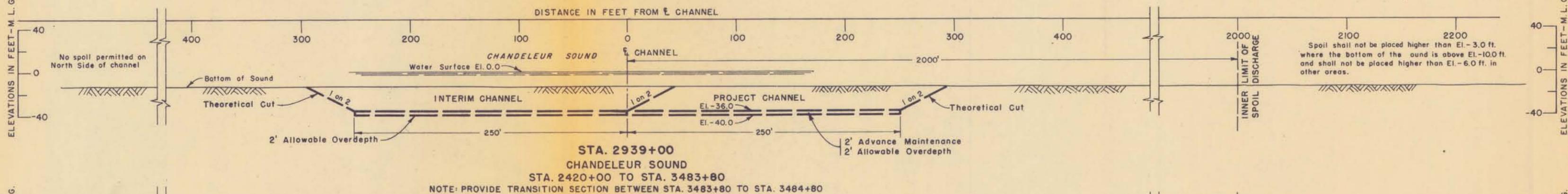
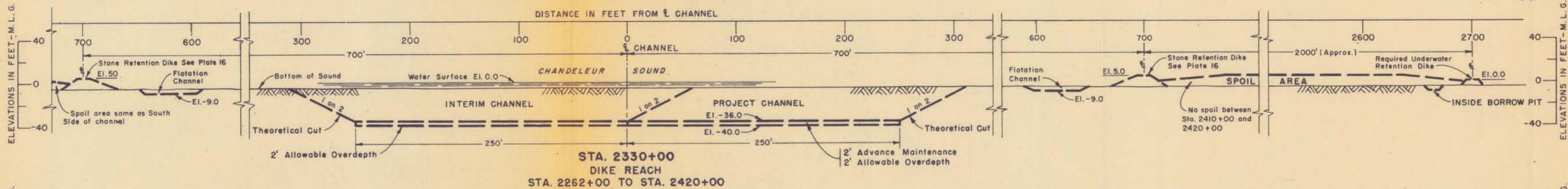
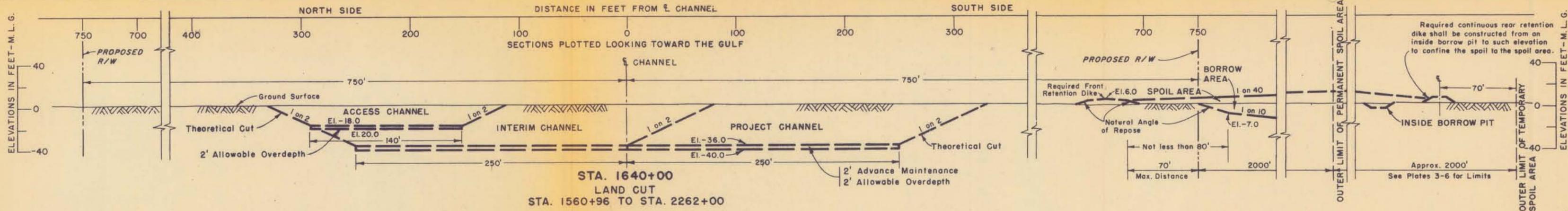
**NOTE:**  
See plate 15 for test data, strength sections, and general notes.  
To compensate for settlement of the dike after second stage construction, 7 to 10 years after completion, additional stone will be added to attain an ultimate section having a 5 ft crown width at elevation +5.0 M.L.G. and approximate side slopes of 1 on 1/2.

MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)  
**STABILITY ANALYSES**  
**CHANNELS AND DIKES**  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO. H-2-21657



NOTE:  
See plate 15 for test data, strength sections, and general notes.  
To compensate for settlement of the dike after second stage construction, 7 to 10 years after completion, additional stone will be added to attain an ultimate section having a 5 ft. crown width at elevation +5.0 M.L.G. and approximate side slopes of 1 on 1/2.

MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.38 (38 FT. CONTOUR)  
**STABILITY ANALYSIS**  
**CHANNELS AND DIKES**  
SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS



MISSISSIPPI RIVER-GULF OUTLET  
LOUISIANA  
DESIGN MEMORANDUM NO.1-C  
CHANNELS  
MILE 0 TO MILE 36.43 (BAYOU LA LOUTRE)  
MILE 0 TO MILE -9.75 (38 FT. CONTOUR)

**TYPICAL SECTIONS**

SCALES AS SHOWN  
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS  
CORPS OF ENGINEERS  
DATE: NOVEMBER 1959 FILE NO. H-2-21657

MISSISSIPPI RIVER-GULF OULET  
LOUISIANA

DESIGN MEMORANDUM No. 1-C

CHANNELS

APPENDIX I

VIEWS OF U. S. FISH AND WILDLIFE SERVICE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service  
2110 Carey St.  
Slidell, La.

October 30, 1959  
LMNGY

District Engineer  
Corps of Engineers, U. S. Army  
New Orleans, Louisiana

Dear Sir:

I am forwarding this preliminary draft of the U. S. Fish and Wildlife Service report on Route B access channel construction, Mississippi River-Gulf Outlet Project, at the request of your staff members, Mr. Baehr, Mr. Gentilich, and Mr. Brune.

This report is scheduled for official release shortly, but because of the deadline of November 14, 1959 for submission of your Route B design memorandum to higher authority, the Regional Supervisor, Branch River Basin Studies, Atlanta, Georgia, requested that you be provided with this advanced copy.

Sincerely yours,

/s/ Charles R. Chapman

Charles R. Chapman  
Biologist in Charge

1 Incl

APPENDIX I

PRELIMINARY DRAFT  
OF PROPOSED REPORT  
SUBJECT TO REVISION  
NOT FOR PUBLIC RELEASE

October 30, 1959

District Engineer  
Corps of Engineers, U.S. Army  
New Orleans, Louisiana

Dear Sir:

Pursuant to the Fish and Wildlife Coordination Act, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq; the U.S. Fish and Wildlife Service has reviewed your proposed plans for "Route B" access channel construction, a feature of the Mississippi River-Gulf Outlet Project. The recommendations contained herein are based on preliminary design data for construction segments between Bayou La Loutre and Breton Sound which were provided our field representatives and are intended to minimize loss of fish and wildlife habitat and reduce anticipated adverse project effects on the oyster industry. This should not be interpreted to imply concurrence by this Service of this channel alignment.

The Louisiana Wildlife and Fisheries Commission cooperated in the preparation of these comments. The recommendations were reviewed with members of your staff to facilitate preparation of your design memorandum for "Route B," which is scheduled to be forwarded to higher authority on or about November 14, 1959, and preparation of subsequent construction contracts.

"Route B" traverses approximately 17 miles of brackish marsh and estuarine habitat from Bayou La Loutre southeasterly to the six foot depth in Breton Sound, and continues some 28 miles across Breton Sound to the 38 foot contour in the Gulf of Mexico.

Two construction segments of about equal length are planned in the marsh area with the division near Bayou Pointe-en-Pointe. Three construction phases will be employed similar to those for segments between Paris Road/Intracoastal Waterway and Bayou La Loutre. Approximately four miles of permanent retention dikes are planned on each side of the channel in Breton Sound from the marsh proper to the six foot depth. Neither permanent dikes across Breton Sound nor Gulf entrance jetties will be constructed unless their future need becomes evident.

The estuarine areas in the two segments from Bayou La Loutre to Breton Sound are of vital importance to the Louisiana oyster industry. Studies to date indicate that serious adverse project effects resulting from canalization and spoiling will destroy habitat in the project area rights-of-way and spoil area. There is no practical way to reduce damage in these construction areas. In addition, the areas adjacent to the construction area and those farther removed but connected by water will be subject to varying degrees of deterioration. Inclusion in the project design of proper spoil placement and retention measures and provisions for maintaining natural water exchange would minimize these adverse effects.

The Service, therefore, recommends that in order to reduce siltation from access channel construction between Bayou La Loutre and Breton Sound, and provide adequate water exchange and drainage, the following project modifications be included in your construction plans.

1. Spoil be contained within designated spoil areas by construction of retention dikes.
2. Draglines be used to build all spoil retention dikes to minimize dispersal of spoil materials.
3. The retention dikes surrounding spoil areas be constructed to encourage maximum spoil retention.
4. The borrow pit from construction of the spoil retention dikes be located inside the spoil area.
5. Excess water from spoil areas be discharged only into Bayou La Loutre, Breton Sound, and/or the dredged channel.
6. Weirs be located as far from point of spoil discharge as practical.
7. Weirs be designed with as high a crest elevation as engineeringly feasible to encourage maximum spoil retention.
8. The front dike across Lake Athanasio be substantial enough to prevent excessive back-flow of silt.
9. Blind Bayou Pisana be outside the spoil area.
10. Spoil in Breton Sound beyond the six foot depth be placed to permit maximum water depth practical over spoil area; at least -3 feet from the 6 to 10 foot depth, and -6 feet at depths more than 10 feet.

Our comments and recommendations are by necessity based on incomplete studies; therefore, are provisional and subject to modification. You may expect our field representatives to continue coordination of study findings, as they become available, with your staff. In the event your present plans are modified, we request notification and opportunity to revise fish and wildlife considerations accordingly.

Sincerely yours,

Regional Director