SUPPLEMENTAL DESIGN MEMORANDUM

FILMORE AVENUE AND MIRABEAU AVENUE BRIDGE

LONDON AVENUE OUTFALL CANAL

ORLEANS LEVEE BOARD PROJECT NO. 24912

A/E PROJECT NO. 9362C

Prepared For

BOARD OF LEVEE COMMISSIONERS

ORLEANS LEVEE DISTRICT

Prepared By

MEYER ENGINEERS, LTD.
Engineer and Architect
4937 Hearst Avenue
P.O. Box 763
Metairie, Louisiana 70004

JULY 3, 1997

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EXECUTIVE SUMMARY

The U.S. Army Corps of Engineers abandoned the Barrier Plan for hurricane protection and adopted the High Level Plan for the vicinity of Lake Pontchartrain in Orleans Parish. The general design of the High Level Plan was presented in the U.S. Army Corps of Engineers' Design Memorandum No. 13, and more detailed designs for the London Avenue Outfall Canal were presented in Design Memorandum No. 19A. The bridges that cross the London Avenue Outfall Canal do not meet this level of flood protection, therefore, revisions must be accomplished. The Orleans Levee District Board of Commissioners has authorized Meyer Engineers, Ltd. to provide professional services to recommend modifications to the Mirabeau Avenue and Filmore Avenue bridges over the London Avenue Outfall Canal in accordance with the U.S. Army Corps of Engineers' High Level Plan. This Design Memorandum Supplement is the first phase of the design and construction process, which presents alternatives to make each bridge conform to the requirements of the U.S. Army Corps of Engineers, Orleans Levee Board, Sewerage and Water Board of New Orleans, New Orleans Department of Streets, and Louisiana Department of Transportation and Development.

Four alternatives were identified for the Orleans Levee District to accomplish the requirements of the High Level Plan. They are:

1. Eliminate the existing bridges and provide I-walls.
2. Replace the existing bridges with new bridges at or near the existing bridge elevation and waterproof or seal the bridges to provide the required level of protection.
3. Replace the existing bridges with new raised bridges clearing the proposed I-walls.
4. Provide floodgates at the existing bridges.

Initial decisions by the Orleans Levee District and the New Orleans Department of Streets eliminated the alternative of removing the existing bridges and providing I-walls. In June of 1994, Meyer Engineers, Ltd. prepared a draft Design Memorandum Supplement. After review and input from the Orleans Levee District and other interested parties, the Design Memorandum Supplement was revised in July of 1995. The recommendations presented in the Design Memorandums in 1994 and 1995 were raising the bridges.

There was much opposition to this recommendation, so the Mayor of New Orleans created a Task Force to recommend a design. The Task Force consisted of representatives of the City Administration, the New

Orleans Department of Streets, U.S. Army Corps of Engineers, Orleans Levee District, the New Orleans Sewerage and Water Board, and local residents. The recommendation from the Task Force was to provide a sealed bridge at Mirabeau Avenue and floodgates at Filmore Avenue. In lieu of a combination of sealed bridges and floodgates throughout the City, it was agreed by the Orleans Levee District and the Task Force to support the all sealed bridge concept. One of the Task Force's provisos is the design waiver of AASHTO's standards. If a waiver cannot be obtained, the matter will return to the Task Force for its consideration.

After further meetings with the Sewerage and Water Board, Orleans Levee District, Department of Streets, United States Army Corps of Engineers and preparation of a Design Waiver Report, the Orleans Levee District directed Meyer Engineers, Ltd. in their letters of February 13, 1996 and August 7, 1996 to design a sealed bridge at a reduced design speed to match the existing roadway approaches. The existing roadway approaches do not provide adequate stopping sight distances for the current posted speed limit.

This Supplemental Design Memorandum addresses the replacement of existing bridges with new sealed bridges at the reduced design speed in accordance with the Task Force and Design Waiver Reports. Also evaluated and presented in this report is replacing the existing bridges with raised bridges above the proposed I-wall and building floodgates at the existing bridges.

The first alternative evaluated was removing the existing bridge and replacing it with a new sealed bridge at the same deck elevation as the existing bridge. A slab span bridge is recommended in order that the canal's hydraulics is not adversely impacted. Prestressed girders and box plate girders were also considered. This alternative was evaluated for both conditions of modifying the approaches for the required design speed and leaving the approaches as they exist with a reduced design speed. The proposed bridge section for the reduced design speed with the approach matching the existing conditions was reviewed and approved by the New Orleans Sewerage and Water Board. If the approaches are not modified, a design waiver from the New Orleans Department of Streets will have to be acquired in order to lower the design speeds, since the required stopping sight distances cannot be achieved in accordance with AASHTO standards. The elevation of the bridge deck will be below the 100-year design water level, therefore, a design waiver from DOTD will be required. The existing road classification (UC-2) sets the design speed as 40 mph (miles per hour). The bridge approaches must be modified to meet current safety design standards for vehicular and pedestrian traffic. Based on this design speed, modifying the bridge approaches will require additional footage of reconstruction of the roadway along each side of the bridge. The approaches for the sealed bridge will also be approximately eight (8') feet wider than the raised bridge approaches. This will impact the oak trees and utility lines along the outside edge of the curb. If the approaches are not modified, a design waiver from the New Orleans Department of Streets will have to be acquired in order to lower the design speeds since the required stopping sight distances cannot be achieved in accordance with AASHTO standards.

The second alternative evaluated was removing the existing bridge and constructing a new raised bridge above the proposed I-wall. This alternative requires modifying the existing roadway approaches on each side of the bridges and has a significant impact on the neighborhood.

The third alternative evaluated was constructing floodgates at the existing bridges.

The selected sealed bridge concept will satisfy the technical design flood requirements. To further accommodate neighborhood groups, specific design waivers should be obtained in accordance with the Design Waiver Report to reduce the impact on the neighborhoods by modifying the design and construction of the required approaches. The impact of each waiver requested should be carefully considered by all interested parties. The preliminary probable cost of the sealed bridge with design waivers to leave the approaches as they exist is $2,765,500 for Mirabeau Avenue and $2,661,700 for Filmore Avenue.

I. INTRODUCTION

A. BACKGROUND

The London Avenue Outfall Canal is located in southeastern Louisiana on the south side of Lake Pontchartrain in Orleans Parish. It is one of three major pumped drainage outfall canals which carries storm water drainage from Orleans Parish to Lake Pontchartrain. The floodwalls of the canal do not meet the design height or sectional stability required by the U.S. Army Corps of Engineers' High Level Plan. The bridges that cross the London Avenue Outfall Canal do not meet the level of flood protection required by the High Level Plan, therefore, modifications must be accomplished. This Supplemental Design Memorandum addresses alternative solutions for achieving the required level of flood protection for the Mirabeau Avenue and Filmore Avenue bridges across the London Avenue Outfall Canal. A general plan showing existing conditions of Mirabeau Avenue and Filmore Avenue bridges on the London Avenue Outfall Canal is shown as Plates I-1A and I-1B.

There are four alternatives available to the Orleans Levee District to accomplish the requirements of the High Level Plan. They are:

1. Eliminate the existing bridges and provide I-walls.
2. Replace the existing bridges with new bridges at or near the existing bridge elevation and waterproof or seal the bridges to provide the required level of protection.
3. Replace the existing bridges with new raised bridges clearing the proposed I-walls.
4. Provide floodgates at the existing bridges.

Based upon initial decisions by the Orleans Levee District and the New Orleans Department of Streets administration, relative to providing uninterrupted access via the existing bridges, removing the existing bridges and providing I-walls or floodgates at the existing bridges were eliminated and Meyer Engineers, Ltd. was not directed to address this alternative in the initial Design Memorandum Supplement completed in June of 1994. After review and input from the Orleans Levee District and other interested parties, the Design Memorandum Supplement was revised in July of 1995. The recommendation from this initial Design Memorandum Supplement was to construct raised bridges at Mirabeau Avenue and Filmore Avenue. There was much opposition to this recommendation, so the Mayor created a Task Force to evaluate the measures needed to floodproof the bridges, seek advice and comments through public hearings, provide a report, recommend a design that would have minimal impact on the quality of life in the affected neighborhoods, and provide maximum flood protection for the City. The recommendation from the Task Force was to provide a sealed bridge at Mirabeau Avenue and floodgates at Filmore Avenue.

In lieu of a combination of sealed bridges and floodgates throughout the City, it was agreed by the Orleans Levee District and the Task Force to support the all sealed bridge concept with reduced design speeds and match the existing approaches. Therefore, Meyer Engineers, Ltd. was directed by the Orleans Levee District to prepare this Supplemental Design Memorandum addressing the different alternatives considered initially as well as the selected sealed bridge option at reduced speed with no modifications to the approaches.

B. JUSTIFICATION FOR PROJECT

The U.S. Army Corps of Engineers has abandoned the Barrier Plan for hurricane protection and adopted the High Level Plan for the vicinity of Lake Pontchartrain. The general design of the High Level Plan was presented in the U.S. Army Corps of Engineers' Design Memorandum No. 13. More detailed designs for the London Avenue Outfall Canal were presented in Design Memorandum No. 19A, which contained assumptions, computations, and cost estimates to protect the area adjacent to the London Avenue Outfall Canal from a Standard Project Hurricane. The bridges that cross the London Avenue Outfall Canal do not meet this level of flood protection, therefore, the Orleans Levee District Board of Commissioners authorized Meyer Engineers, Ltd. to provide professional services to recommend modifications to the Mirabeau Avenue and Filmore Avenue bridges over the London Avenue Outfall Canal in accordance with the U.S. Army Corps of Engineers' High Level Plan.

C. SCOPE OF PROJECT

The scope of this project is to provide an engineering recommendation to accomplish modifications to the Mirabeau Avenue and Filmore Avenue bridges across the London Avenue Outfall Canal required by the U.S. Army Corps of Engineers' High Level Plan for Lake Pontchartrain. This Supplemental Design Memorandum is the first phase of the design and construction process, which presents alternatives to make each bridge conform to the requirements of the High Level Plan and the requirements of the several governmental authorities having jurisdiction. These governmental authorities include the New Orleans District U.S. Army Corps of Engineers, Orleans Levee Board, Sewerage and Water Board of New Orleans, New Orleans Department of Streets, and Louisiana Department of Transportation and Development.

The first alternative considered was removing the existing bridge and replacing it with a new sealed bridge with sealed joints and high parapet walls. The parapet walls would be constructed to elevation 13.9' N.G.V.D. The ultimate elevation of the top of the new floodwalls will be elevation 13.9' N.G.V.D. The floodwalls are constructed to elevation 14.4' N.G.V.D. allowing for 6" of settlement.

The second alternative considered was removing the existing bridge and constructing a new raised bridge above the top of the new floodwall.

The third alternative considered was constructing floodgates at the existing bridges.

D. CREDITABLE ACTIVITIES

This Supplemental Design Memorandum presents alternatives to make the Mirabeau Avenue and Filmore Avenue bridges over the London Avenue Outfall Canal floodsafe in accordance with the U.S. Army Corps of Engineers' High Level Plan. The design criteria used by the U.S. Army Corps of Engineers is employed in all analyses to ensure creditable activities upon the completion of the construction. A creditable activity is one in which the cost incurred by the Orleans Levee District will be credited towards the District's share of any projects being funded jointly by the Orleans Levee District and the U.S. Army Corps of Engineers.

E. OTHER STUDIES

Burk & Associates, Inc. completed a Design Memorandum titled "London Avenue Canal Floodwalls and Levees" in April 1986 for the Orleans Levee District. This Design Memorandum Supplement contained the general design and costs of several alternatives for the bridges, floodgates, levees, floodwalls, and drainage pumping stations on the London Avenue Outfall Canal in accordance with the U.S. Army Corps of Engineers' High Level Plan. The flood protection modifications were divided into phases on a priority basis. Most of the modifications consisted of constructing cantilever steel sheet pile I-wall floodwalls in the existing earthen levees. In addition to this, the bridge crossings and pumping stations were proposed to be modified in accordance with the High Level Plan.

F. DESIGN CRITERIA

1. Hydraulic Study

The general design of the London Avenue Outfall Canal in accordance with the High Level Plan is presented in the U.S. Army Corps of Engineers' Design Memorandum No. 19A. A hydraulic analysis was performed by the U.S. Army Corps of Engineers for the London Avenue Outfall Canal using HEC-2. A starting water surface elevation of 11.5' N.G.V.D. was used at Lake Pontchartrain. This is the still water surface elevation of the Lake for the Standard Project Hurricane. The water surface profile was then calculated for the canal (see Appendix A). The water surface elevation at the Mirabeau Avenue and Filmore Avenue bridges was calculated by the U.S. Army Corps of Engineers to be 11.85' N.G.V.D. for the Standard Project Hurricane. This is the high water surface elevation that was used in the analyses of the Mirabeau Avenue and Filmore Avenue bridges on the London Avenue Outfall Canal.

2. Geotechnical

A geotechnical investigation was done by Eustis Engineering Company for the Orleans Levee District on March 4, 1986. The investigation included boring logs, triaxial compression tests, consolidation tests, and direct shear tests (see Appendix B). This existing geotechnical report was used for the analyses of this Supplemental Design Memorandum. Additional soil borings will be needed in the area of the pile supported retaining walls.

3. Roads and Bridges

The roads and bridges shall be designed according to Louisiana Department of Transportation and Development, American Association of State Highway and Transportation Officials (AASHTO) standards, and New Orleans Department of Streets' requirements. Using Louisiana Department of Transportation and Development's Design Standards for Urban Collector Roads and Streets, Mirabeau Avenue and Filmore Avenue are classified as UC-2 according to the New Orleans Department of Streets (see Appendix C). Based on this classification, the design speed and stopping sight distances were developed. This criteria was used to develop the road profiles.

For the sealed bridge, a design waiver from the New Orleans Department of Streets will have to be acquired in order to lower the design speed so that safe stopping sight distances can be achieved in accordance with AASHTO standards. These safe stopping sight distances must be achieved in the available approach lengths and elevations. The design waiver of AASHTO's standards is one of the Tasks Force's provisos. If a waiver cannot be obtained, the matter will return to the Task Force for its consideration.

The bridge design will be in accordance with DOTD requirements. Standard details for girders, and slab design have been included in Appendix C. Design calculations are included in Appendix F.

G. OTHER COMMENTS

A public meeting was held on July 25, 1994 with area residents, Levee Board Commissioners, New Orleans City Councilmen, and Legislators. At this meeting the majority of the voiced objection by citizens was to both a raised bridge and a sealed bridge at the design speed required by the New Orleans Department of Streets.

At a subsequent Orleans Levee District meeting, the Board voted to place floodgates at the Mirabeau Avenue and Filmore Avenue sites at the London Avenue Outfall Canal and to participate in the City's Task Force to recommend which bridges should remain open during a storm event and which could be closed with floodgates.

After completion of the Task Force Report, the Orleans Levee District, Task Force participants and citizen groups recommended construction of a sealed bridge with design waivers as appropriate to protect the character of the neighborhood. Copies of letters from residents received by the Orleans Levee District and forwarded to Meyer Engineers, Ltd. were included in the Design Memorandum Supplement dated July 21, 1995. A copy of the Task Force Report is included in Appendix D. A separate report entitled "Design Waiver Report" was prepared by Meyer Engineers, Ltd. at the request of the Orleans Levee District to identify the design waivers that would be needed.

II. EXISTING CONDITIONS

A. EXISTING LEVEES AND ADJACENT PROPERTY

The existing levees along the London Avenue Outfall Canal at Mirabeau Avenue and Filmore Avenue consist mainly of earthen levees with steel sheet pile walls. Most of the steel sheet pile walls have two (2') foot wide concrete caps to increase the floodwall height and to protect the steel sheet piles from corrosion. I-walls have been constructed along the canal on each side of Filmore Avenue and Mirabeau Avenue in accordance with the U.S. Army Corps of Engineers' High Level Plan for Lake Pontchartrain. These I-walls, constructed under a U.S. Army Corps of Engineers' project, will connect to the modifications selected for each bridge.

The London Avenue Outfall Canal at Mirabeau Avenue and Filmore Avenue is located within a residential area of Orleans Parish. The property lines adjoining the levee are located at the toe of the levee which abuts the rear yards of the adjacent residential property. Many garages or tool sheds have been built adjacent to this property line.

B. BRIDGES

The existing Mirabeau Avenue bridge located on the London Avenue Outfall Canal is approximately 128 feet long and approximately 70.3 feet wide, and was built in 1964. The existing roadway section has an approximately 31 foot wide grass median and 33 foot travel lanes in either direction. The roadway profiles approaching the bridge do not meet current design standards for the 35 miles per hour (mph) posted speed limit. The existing right-of-way width is 128 feet (see Plate II-2A). Plan profile sheets are provided as Plates II-2B through II-2D. The girder span bridge is cambered and carries two (2) lanes of traffic in each direction. There is a four (4') foot wide raised concrete median in the center and four (4') foot wide sidewalks on both sides. The Mirabeau Avenue bridge substructure consists of five (5) pile bents with piles driven to elevation -26.43' N.G.V.D. The average pile length is approximately 30 feet. The piles at the end bents are Class "B" creosote timber piles. All end bent piles are battered 1:20 in alternate directions. The piles at the interior pile bents are twelve (12") inch steel pipe piles filled with concrete. The bridge superstructure consists of a concrete deck supported by twelve (12) - 21WF55 steel girders (see Plates II-2C and II-4). Louisiana Department of

Transportation and Development rated the overall condition of the bridge to be in poor condition recommending minor rehabilitation work in its October 1993 inspection.

The existing Filmore Avenue bridge located on the London Avenue Outfall Canal is approximately 139 feet long and approximately 38 feet wide, and was built in 1959. The existing roadway section has an approximately 35 foot wide grass median and 34 foot travel lanes in either direction. The roadway profiles approaching the bridge do not meet current design standards for the 35 mph posted speed limit. The existing right-of-way width is 120 feet (see Plate II-3A). Plan profile sheets are provided as Plates II-3B through II-3D. The girder span bridge is cambered and carries one (1) lane of traffic in each direction. There is a one (1') foot wide raised concrete median in the center and four (4') foot wide sidewalks on both sides. The Filmore Avenue bridge substructure consists of six (6) pile bents. The piles at the end bents are twelve (12") inch Class "B" timber piles. Every other end bent pile is battered 1:20. The piles at the interior pile bents are twelve (12") inch steel pipe piles filled with concrete. The average pile length is approximately 26 feet. The bridge superstructure consists of a concrete deck supported by eight (8) - 18WF77 steel girders (see Plates II-3C and II-4). Louisiana Department of Transportation and Development rated the overall condition of the bridge to be in poor condition recommending minor rehabilitation work in its October 1993 inspection.

III. BRIDGE ANALYSIS

A. BRIDGES

Methods to make each bridge conform to the U.S. Army Corps of Engineers' High Level Plan were investigated by comparing advantages, disadvantages, and probable cost for the alternatives considered. The first alternative considered was removing the existing bridge and replacing it with a new bridge with sealed joints and high parapet walls. The sealed bridge was analyzed at the design speed required for the current roadway classification and the design speed required to match the existing roadway approach slopes. The existing roadway approach slopes do not meet the current design criteria for stopping sight distances, so design waivers would be required, and the posted speeds must be lowered. After public outcry, recommendation from the Mayor's Task Force, and preparation of a Design Waiver Report, the Orleans Levee District directed Meyer Engineers, Ltd. to design the sealed bridges in accordance with the Task Force and Design Waiver reports.

The second alternative considered was removing the existing bridge and constructing a new bridge above the high water surface elevation of the High Level Plan. For alternative two, constructing the bridge at two different elevations were considered. The two elevations were 1) clearing the high water level of the Standard Project Hurricane which requires penetration of the I-wall and results in a partial low level sealed bridge and; 2) completely clearing the top of the proposed I-wall. The difference in impacts to adjacent structures and traffic patterns for these two elevations were minimal, therefore, the study proceeded based on constructing the bridge to clear the top of the I-wall.

The third alternative considered was providing floodgates at the existing bridges.

For each alternative, I-walls would be constructed along the London Avenue Outfall Canal levees from the bridge and connected to the existing I-walls at each end of the bridge.

After beginning this study, the Orleans Levee District requested that a 30 miles per hour (mph) design speed be reviewed. Both approach roads are currently posted at 35 mph. The 40 mph design speed is required for the UC-2 roadway classification. For the 30 mph design speed, a design waiver from the New Orleans Department of Streets and specific direction of the Orleans Levee District is required. For safety reasons, Meyer Engineers, Ltd. recommends a design speed of 40 mph. For selection of either the 30 or 40 mph design speed, the existing road profile does not meet current design criteria. AASHTO recommends a posted speed of 25 mph for a design speed of 30 mph. The design criteria and assumptions used to establish the length of vertical curves are included in Appendix E.

Temporary detour bridges to maintain traffic flow patterns during construction were not included in any of the alternatives. The work is planned to be coordinated with other bridge projects to allow traffic to use other bridge crossings to maintain traffic flow, emergency use and to help minimize any inconveniences.

The I-wall to be constructed under this contract will be constructed to approximately 50 feet from the centerline of the existing bridges and connected to the existing High Level Plan I-wall. Existing utility lines cross the canal within close proximity of the bridges. These utilities will be modified to meet the High Level Flood Protection Plan. Each alternative includes the cost of completing the I-wall, modifying the existing drainage system to accommodate any increase in runoff due to construction activity and providing 5' wide access doors through the floodwall to allow for maintenance of the levees and bridges.

The floodwall finish shall match the sections of the floodwall already constructed, and the high parapet walls of the sealed bridge shall be smooth concrete finished walls. The "Guidelines for Aesthetic and Landscape Treatment of the London Avenue Canal" by Terra Designs, Inc. was reviewed, however, artwork is not recommended. The use of recreational platforms and pedestrian footbridges to view the canal are not recommended.

Staging areas will be the same areas used for the floodwall project which has been completed. The staging areas are by Pumping Station No. 4 and the triangular piece of property located south of Mirabeau Avenue on Pratt Drive.

Additional topographic information is needed to tie the floodwalls recently completed and staging areas into the original survey.

The following analysis is specific to each bridge.

1. Mirabeau Avenue Bridge

   a. Replacing and Sealing (40 mph)

      This alternative evaluates removal of the existing bridge and construction of a new replacement bridge at the same deck elevation as the existing bridge deck for the required 40 mph design speed (see Plate III-1A). The deck elevation will be below the high water level of the Standard Project Hurricane, therefore, the new bridge will be designed to resist uplift forces including anchor bolts for the slab and concrete cap, and waterstops and compression seals at the joints. The elevation of the bridge deck will be below the 100-year design water level, therefore, a design waiver from DOTD would have to be acquired for violation of the two (2') foot of freeboard requirement below the bridge. New Orleans Sewerage and Water Board approval will also have to be obtained. In order to resist the uplift forces, the existing piles will have to be removed and replaced with longer piles. The bridge approaches will be modified to meet current design standards. The top of the parapet wall will be at elevation 13.9' N.G.V.D.

The existing approach roadway width is approximately 33 feet wide and the existing grass median is approximately 31 feet wide. The proposed four (4') foot wide median on the bridge will be transitioned to match the 31 foot wide median. The roadway approach on each side of the bridge shall accommodate two (2) travel lanes for the bridge and one (1) travel lane for service roads for Pratt Drive and Warrington Drive (see Plates III-1B and III-1C). This roadway section width will be approximately two (2') feet wider than the existing distance from edge of travel lane to edge of travel lane. Therefore, the new curb will be approximately two (2') closer to the sidewalk. The oak trees behind the curb will have to be trimmed. Property acquisition is not anticipated at this time. Adjacent to the approaches, service roads will accommodate one travel lane. There will not be sufficient room to accommodate parked vehicles on the service roads.

The existing number of bents in the canal cannot be exceeded in order that the canal's hydraulics will not be adversely impacted. Therefore, the new bridge section at the canal will be a 50 foot Type II girder span approximately 180 feet long and 71 feet wide. The width of the new bridge shall include four (4) 12 foot wide travel lanes, a four (4') foot wide raised concrete median, six (6') foot wide sidewalks, and barrier rails (see Plates III-1D and III-1E).

Spanning the I-wall, the bridge section shall have two (2) 20 foot slab spans (see Plate III-1F). The slab spans are used at the I-walls to reduce the elevation of the bridge. In order to tie into existing grade, retaining walls and fill material will be necessary to eliminate the need for property acquisition. The adjacent property is too close to slope the fill material to tie into existing grade and have adequate clearance to provide the service road. Based on a 40 mph design speed, the approach will extend approximately 430 feet from the slab spans on both sides of the bridge to tie into existing grade. Since longer approaches with retaining walls and service roads will be necessary, traffic shall be rerouted as shown on Plate III-5A after installation of the bridges. The preliminary probable cost for the sealed bridge alternative is $6,480,500 as shown in Section IV.

The primary advantages of sealing the bridge are that the bridge will remain open during times of high water and the impact to the neighborhoods is less than raising the bridge.

The disadvantages of sealing the bridge are that the approaches will require some modification and the high parapet walls will block the view of the canal. A design waiver would be required to eliminate the modification of the approaches.

b. Replacing and Sealing (30 mph)

This alternative evaluates removal of the existing Mirabeau Avenue bridge and construction of a new replacement bridge at the same deck elevation for a 30 mph design speed (see Plate III-1G). The 30mph design speed would closely match the existing approach slopes, however, a design waiver would be required in order to design for any speed less than the required 40 mph design speed. The bridge, piles, and parapet walls will be designed to resist uplift and lateral loads from the high water as discussed in the previous section.

The bridge approaches will not be modified to meet current design standards. The existing roadway cross sections including lanes, sidewalks, and curbs will only be transitioned to match (see Plate III-1H). The existing roadway cross sections do not meet current design standards and will require a design waiver from the New Orleans Department of Streets.

The canal hydraulics cannot be adversely impacted per the New Orleans Sewerage and Water Board. The existing bridge consists of five (5) pile bents; three (3) pile bents within the canal cross section and one (1) pile bent at the floodwall at each end.

The proposed bridge will consist of seven (7) pile bents; three (3) pile bents within the canal cross section and two (2) pile bents at the floodwall at each end (see Plate III-1I). The pile bents within the canal cross section were spaced on 30 foot centers to match the existing spacing and the two (2) pile bents at the floodwall were spaced on 20 foot centers to span the wall. The proposed bridge section was reviewed and approved by the New Orleans Sewerage and Water Board. The 30 foot spans require a slab thickness of 20" for slab span bridge construction.

Other bridge types were considered such as prestressed girder and box plate girder. These types of bridges were not recommended because matching the existing bridge deck elevation would lower the bottom of the bridge below the existing bottom elevation, thereby adversely impacting the canal hydraulics and creating conflicts in clearing the I-wall.

The weight of the 20" slab span will help offset the buoyant force which may be applied to the bridge at times of high water. With the proposed slab span section, the bottom elevation of the bridge would be raised approximately 8" above the existing bridge bottom. The bottom of the bridge will still not have 2' of freeboard to the design water surface elevation, therefore, a design waiver will have to be acquired from LA DOTD. Cast-in-place construction is recommended over precast prestressed slab spans because Mirabeau Avenue bridge is in a vertical curve where precast prestressed slab spans will not be able to be used in the curved section.

The transition from the existing roadway cross section to the bridge cross section will occur in approximately 150'. Asphaltic concrete overlay will be required to make this transition. The preliminary cost for the 30 mph sealed bridge alternative is $2,765,500 as shown in Section IV.

The primary advantage of sealing the bridge and lowering the design speed is the impacts to the neighborhood will be minimal. This is the alternative selected by the Orleans Levee District after many meetings, public input and coordination with representatives of the City of New Orleans, the Sewerage and Water Board, and the U.S. Army Corps of Engineers. The approaches will remain as they are and retaining walls along the road approaches will not be needed.

The disadvantage of sealing the bridge is that the high parapet walls will block the view of the canal.

c. Replacing and Raising

This alternative evaluates removal of the existing Mirabeau Avenue bridge and construction of a new replacement bridge to clear the top of the I-wall (see Plate III-2A). The existing roadway widths are approximately 33 feet wide and the existing grass median is approximately 31 feet wide. The proposed four (4') foot wide median on the bridge will be transitioned to match the 31 foot wide median. The roadway width in each direction shall accommodate two (2) travel lanes for the bridge and one (1) lane for service roads for Pratt Drive and Warrington Drive (see Plates III-2B and III-2C). The oak trees will have to be trimmed, although they may not be impacted. Property acquisition is not anticipated at this time. Adjacent to the retaining walls, the service roads will accommodate one travel lane. There will not be sufficient room to accommodate parked vehicles on the service roads.

Since the bridge will be raised, vehicular and pedestrian access under the bridge at Pratt Drive and Warrington Drive was considered. It is not recommended because of safety and inadequate vertical clearance problems.

The existing number of bents in the canal cannot be exceeded in order that the canal's hydraulics will not be adversely impacted. Therefore, the new bridge section at the canal will be a 50 foot Type II girder span approximately 180 feet long and 72 feet wide. The width of the new bridge shall include four (4) 12 foot wide travel lanes, a four (4') foot wide raised concrete median, four (4') foot wide outside shoulders, barrier rail, four (4') foot wide sidewalks, and hand rails (see Plates III-2D and III-2E).

Spanning the I-wall, the bridge section shall have two (2) 20 foot slab spans (see Plate III-2F). The slab spans are used at the I-walls to reduce the elevation of the bridge. In order to tie into existing grade, retaining walls and fill material will be necessary to eliminate the need for property acquisition. The adjacent property is too close to slope the fill material to tie into existing grade and have adequate clearance to provide the service road. For a 40 mph design speed, the approaches will extend approximately 560 feet from the slab spans on both sides of the bridge to tie into existing grade. Traffic will be rerouted as shown on Plate III-5B after construction of the bridges. The preliminary probable cost for this alternative is $8,012,400 as shown in Section IV.

The advantage of raising the bridges above the top of the I-wall will be eliminating the need for any sealing of the bridge. This will minimize the possibility of closing this route due to failure of the sealed joints. Raising the bridge will also reduce the chance of deterioration, damage or failure of the bridge due to high water, floating debris, or other damage. The hydraulic conditions of the London Avenue Outfall Canal will be greatly improved by raising the bridges above the top of the I-wall versus providing a 3-sided tunnel bridge. The cross sectional area of the canal will be increased, improving the hydraulic conditions. The raised bridge approaches are approximately eight (8') feet narrower than the sealed bridge approaches, therefore, the utility lines and oak trees along the outside edge of the curb will not be as affected, although the oak trees will have to be trimmed. The view from the bridge to the canal will not be obstructed, providing an aesthetically pleasing perspective. High retaining walls for the approaches can be softened by providing landscaping and brick walls.

The disadvantages of raising the bridge are the retaining walls and service roads required to eliminate the need for property acquisition. This will mean that certain existing median openings will be closed and that residents detour to side streets. The service roads will accommodate one travel lane, therefore, there will not be sufficient room for a parked vehicle. The palm trees in the median will have to be relocated. The oak trees behind the curb should have only limited root damage and will only need to be trimmed.

d. Floodgates

The floodgate alternative evaluates construction of movable floodgates at each end of the Mirabeau Avenue bridge to close the gap in the floodwall caused by the bridge. The gates would be closed during storm conditions by the Orleans Levee Board personnel. The top of the gates would be constructed to the same elevation as the I-wall. During storm conditions, water would flow over the existing low level bridge.

The floodgates would be the sliding or rolling type which would be hidden behind the floodwalls in the open position. Since the Mirabeau Avenue bridge width is 70'-3", double gates with a removable center post would have to be constructed. The floodgate would be constructed of structural steel and the gate monoliths would consist of reinforced concrete columns on a concrete slab supported by prestressed piles. The preliminary probable cost for the floodgate alternative is $1,508,804 as shown in Section IV.

There are several advantages for the floodgate alternative. The major advantage is the minimal impact it would have on the neighborhood. During most of the construction, half of the bridge may remain open to traffic and after construction the gates would be behind the floodwall most of the time. The approaches would remain the same which would also lessen the impacts to the neighborhood. The canal hydraulics would not be adversely impacted since the bridge would remain the same.

The primary disadvantage is that the bridge would be closed to traffic during times of high water. The gates would have to be maintained and operated by Orleans Levee Board personnel in times of emergency.

2. Filmore Avenue Bridge

a. Replacing and Sealing (40 mph)

This alternative evaluates removal of the existing bridge and construction of a new replacement bridge at the same deck elevation as the existing bridge (see Plate III-3A). The deck elevation will be below the high water level of the Standard Project Hurricane, therefore, the new bridge will have to be designed to resist uplift forces and include design of anchor bolts for the slab and concrete cap, and waterstops and compression seals at the joints. The elevation of the bridge deck will be below the design water level, therefore, a design waiver would have to be acquired from DOTD for violation of two (2') feet of freeboard requirement below the bridge. In order to resist the uplift forces, the existing piles will have to be removed and replaced with longer piles. The bridge approaches will be modified to meet current design standards.

The existing roadway width is approximately 34 feet wide and the existing grass median is approximately 34 feet wide. The proposed four (4') foot wide median on the bridge will be transitioned to match the 34 foot wide median. The roadway width in each direction shall accommodate one (1) travel lane for the bridge, one (1) travel lane for service roads for Pratt Drive and Warrington Drive, and one (1) lane for parking. The oak trees will have to be trimmed. Property acquisition is not anticipated at this time. (see Plates III-3B and III-3C).

The existing number of bents in the canal cannot be exceeded in order that the canal's hydraulics will not be adversely impacted. Therefore, the new bridge section at the canal will be a 55 foot Type II girder span approximately 190 feet long and 47 feet wide. The width of the new bridge shall include two (2) 12 foot wide travel lanes, a four (4') foot wide raised concrete median, six (6') foot wide sidewalks, and barrier rails (see Plates III-3D and III-3E).

Spanning the I-walls, the bridge section shall have two (2) 20 foot slab spans (see Plate III-3F). The slab spans are used at the I-walls to reduce the elevation of the bridge. In order to tie into existing grade, retaining walls and fill material will be necessary to eliminate the need for property acquisition since the adjacent property is too close to slope the fill material to tie into existing grade and have adequate clearance to provide the service road. For the 40 mph design speed, the approaches will extend approximately 400 feet from the slab spans on both sides of the bridge to tie into existing grade. Since longer approaches and service roads will be necessary, traffic shall be rerouted as shown on Plate III-5C after installation of the bridges. The preliminary probable cost for the sealed bridge alternative is $6,198,000 as shown in Section IV.

The primary advantages of sealing the bridge are that the bridge will remain open during times of high water and the impact to the neighborhoods is less than raising the bridge.

The disadvantages of sealing the bridge are that the approaches will require some modification and the high parapet walls will block the view of the canal. A design waiver would be required to eliminate the modification of the approaches.

b. Replacing and Sealing (35 mph)

This alternative evaluates removal of the existing Filmore Avenue bridge and construction of a new replacement bridge at the same deck elevation for a 35 mph design speed (see Plate III-3G). The 35mph design speed would closely match the existing approach slopes, however, a design waiver would be required to design for any speed less than the required 40 mph design speed. The bridge, piles, and parapet walls will be designed to resist uplift and lateral loads from the high water as discussed in the previous section.

The bridge approaches will not be modified to meet current design standards. The existing roadway cross sections including lanes, sidewalks, curbs, and medians will only be transitioned to match (see Plate III-3H). The existing roadway cross sections do not meet current design standards and require a design waiver from the New Orleans Department of Streets.

The canal hydraulics cannot be adversely impacted per the New Orleans Sewerage and Water Board. The existing bridge consists of 6 pile bents; 4 pile bents within the canal cross section and 1 pile bent at the floodwall at each end.

The proposed bridge will consist of the same number of pile bents and the same 30' spacing as the existing bridge. The 30 foot spans require a slab thickness of 20" for slab span bridge construction.

Other bridge types were considered such as prestressed girder and box plate girder. These types of bridges were not recommended because matching the existing bridge deck elevation would lower the bottom of the bridge, thereby adversely impacting the canal hydraulics and creating conflicts in clearing the I-wall.

The weight of the 20" slab span will help offset the buoyant force which may be applied to the bridge at times of high water. With the proposed slab span section, the bottom elevation of the bridge would be raised approximately 6" above the existing bridge bottom. The bottom of the bridge will still not have 2' of freeboard to the design water surface elevation, therefore, a design waiver will have to be acquired from LA DOTD. Cast-in-place construction is recommended over precast prestressed slab spans because Filmore Avenue bridge is in a vertical curve where precast prestressed slab spans will not be able to be used in the curved section.

The transition from the existing roadway cross section to the bridge cross section will occur in approximately 150'. Asphaltic concrete overlay will be required to make this transition. The preliminary cost for the 35 mph sealed bridge alternative is $2,661,700 as shown in Section IV.

The primary advantage of sealing the bridge and lowering the design speed is the impacts to the neighborhood will be minimal. This is the alternative selected by the Orleans Levee District after many meetings, public input and coordination with representatives of the City of New Orleans, the Sewerage and Water Board, and the U.S. Army Corps of Engineers. The approaches will remain as they are and retaining walls along the road approaches will not be needed.

The disadvantage of sealing the bridge is that the high parapet walls will block the view of the canal.

c. Replacing and Raising

This alternative evaluates removal of the existing Filmore Avenue bridge and construction of a new replacement bridge to clear the top of the I-wall (see Plate III-4A). The existing roadway widths are approximately 34 feet wide and the existing grass median is approximately 34 feet wide. The proposed four (4') foot wide median on the bridge will be transitioned to match the 34 foot wide median. The roadway width in each direction shall accommodate one (1) travel lane for the bridge, one (1) travel lane for service roads for Pratt Drive and Warrington Drive, and one (1) lane for parking (see Plates III-4B) and III-4C). Although the oak trees behind the curb may not be impacted, the trees will have to be trimmed. Property acquisition is not anticipated at this time.

Since the bridge will be raised, vehicular and pedestrian access under the bridge at Pratt Drive and Warrington Drive was considered. It is not recommended because of safety and inadequate clearance problems.

The existing number of bents in the canal cannot be exceeded in order that the canal's hydraulics will not be adversely impacted. Therefore, the new bridge section at the canal will be a 55 foot Type II girder span approximately 190 feet long and 48 feet wide. The width of the new bridge shall include two (2) 12 foot wide travel lanes, a four (4') foot wide raised concrete median, four (4') foot wide outside shoulders, barrier rail, four (4') foot wide sidewalks, and hand rails (see Plates III-4D and III-4E).

Spanning the I-wall, the bridge section shall have two (2) 20 foot slab spans (see Plate III-4F). The slab spans are used at the I-walls to reduce the elevation of the bridge. In order to tie into existing grade, retaining walls and fill material will be necessary to eliminate the need for property acquisition since the adjacent property is too close to slope the fill material to tie into existing grade and have adequate clearance to provide the service road. The approaches will extend approximately 590 feet from the slab spans on both sides of the bridge to tie into existing grade. Since longer approaches and service roads will be necessary, traffic will be rerouted as shown on Plate III-5D after installation of the bridges. The preliminary probable cost for the raised bridge alternative is $8,380,400 as shown in Section IV.

The advantages of raising the bridges above the top of the I-wall will be eliminating the need for any sealing of the bridge. This will minimize the possibility of closing this route due to failure of the sealed joints. Raising the bridge will also reduce the chance of deterioration, damage or failure of the bridge due to high water, floating debris, or other damage. The hydraulic conditions of the London Avenue Outfall Canal will be greatly improved by raising the bridges above the top of the I-wall versus providing a 3-sided tunnel bridge. The cross sectional area of the canal will be increased, improving the hydraulic conditions. The raised bridge approaches are approximately eight (8') feet narrower than the sealed bridge approaches, therefore, the utility lines and oak trees along the outside edge of the curb will not be as affected, although the oak trees will have to be trimmed. The view from the bridge to the canal will not be obstructed, providing an aesthetically pleasing perspective. High retaining walls for the approaches can be softened by providing landscaping and brick walls.

The disadvantages of raising the bridge are the retaining walls and service roads required to eliminate the need for property acquisition. This will mean that certain existing median openings will be closed and that residents detour to side streets. The service roads will accommodate one travel lane, therefore, there will not be sufficient room for a parked vehicle. The palm trees in the median will have to be relocated. The oak trees behind the curb should have only limited root damage and will only need to be trimmed.

d. Floodgates

The floodgate alternative evaluates construction of movable floodgates at each end of the Filmore Avenue bridge to close the gap in the floodwall caused by the bridge. The gates would be closed during storm conditions by the Orleans Levee Board personnel. The top of the gates would be constructed to the same elevation as the I-wall. During storm conditions, water would flow over the existing low level bridge.

The floodgates would be the sliding or rolling type which would be hidden behind the floodwalls in the open position. Since the Filmore Avenue bridge width is 38', a single gate approximately 42' long would be constructed. The floodgate would be constructed of structural steel and the gate monoliths would consist of reinforced concrete columns on a concrete slab supported by prestressed piles. The preliminary probable cost for the floodgate alternative is $1,520,892 as shown in Section IV.

There are several advantages for the floodgate alternative. The major advantage is the minimal impact it would have on the neighborhood. During most of the construction, half of the bridge may remain open to traffic and after construction the gates would be behind the floodwall most of the time. The approaches would remain the same which would also lessen the impacts to the neighborhood. The canal hydraulics would not be adversely impacted since the bridge would remain the same.

The primary disadvantage is that the bridge would be closed to traffic during times of high water. The gates would have to be maintained and operated by Orleans Levee Board personnel in times of emergency.

B. RIGHT-OF-WAY CONSIDERATIONS AND OTHER CONSTRUCTION REQUIREMENTS

1. Right-of-Way Considerations

The existing right-of-way width for Mirabeau Avenue is 128 feet, and the existing right-of-way width for Filmore Avenue is 120 feet. These existing rights-of-way are of a sufficient width to accommodate the retaining walls and service roads necessary for the proposed bridge modifications.

Property acquisition is not anticipated at this time. Temporary construction access servitudes may be necessary during the construction phase of this project. This will be determined in the design phase of the project.

2. Traffic Plan

Both sealing and raising the bridges at a 40 mph design speed at Mirabeau Avenue and Filmore Avenue involve the use of retaining walls and service roads to eliminate the need for property acquisition. Several median openings will have to be closed permanently as shown on Plates III-5A through III-5D. Median closures will require the residents to use on side streets. The residents on Warrington and Pratt Drive at Filmore Avenue are already required to use adjoining streets. No additional traffic will be generated. Existing local traffic will be rerouted to more convenient routes after construction.

3. Utility Relocations

The proposed I-walls will be constructed to approximately 50 feet from the centerline of the existing bridges. Several existing utility lines cross the canal within close proximity of the bridges. According to the High Level Plan, where new steel sheet piling is to be driven at these utility crossings, a temporary bypass line will be built to maintain the services. After installation of the temporary bypass, the new steel sheet piling is driven at the proper location and a steel sleeve is installed to allow the permanent utility line to pass through the floodwall. Once the permanent utility pipe is passed through the floodwall, a watertight seal is placed around the pipe and then the temporary bypass line can be disassembled.

Meyer Engineers, Ltd. does not recommend passing the utility lines through the floodwall because of maintenance problems and the possibility of flooding by leaking or failing. It is recommended that the utilities be adjusted to pass over the top of the I-wall. If piles are required, the existing number of piles cannot be exceeded in order that the canal's hydraulics is not adversely impacted. This will also permit the utility to be impacted one time during the installation of the sheet piling which will create less inconvenience to the public. However, the U.S. Army Corps of Engineers' normal procedure as outlined in their Design Memorandum No. 19A is that where new sheet piling is to be driven, a temporary bypass line shall be built to maintain necessary services. After installation of the bypass, the new sheet piling is driven at the proper location and a steel sleeve is installed to allow the permanent utility line to pass through the floodwall. Then, a watertight seal is placed around the pipe and the bypass line can be disassembled. At less critical utility crossings, the bypass line can be deleted if the existing utility line can be disconnected long enough to allow construction of the new sheet pile and reconnection of the utility pipeline.

The Mirabeau Avenue crossing has a twelve (12") inch waterline on the north side of the bridge and six (6") inch and ten (10") inch gas lines on the south side of the bridge. The Filmore Avenue crossing has a 50 inch waterline and a four (4") inch gas line on the south side of the bridge. Each of these uilities are outlined in the United States Army Corps of Engineers' Design Memorandum Supplement No. 19A as requiring relocation and a temporary bypass. Therefore, these utilities shall be passed through the floodwall after installation of the bypass in accordance with the Design Memorandum.

In addition to the water mains and gas transmission trunklines, the Sewerage and Water Board's primary electric power transmission cable will require relocation. This power cable provides electric service to Drainage Pumping Station Nos. 3 and 4, and must be on line at all times to allow the drainage pump stations to operate. Therefore, before construction commences, a relocated power cable must be installed.

4. Handicap Requirements

The existing bridges have sidewalks with steps to tie into the lower sidewalk grade at the street level. In order to make the bridges accessible for those who are disable in accordance with the American with Disabilities Act of 1990, ramps are required. This would require extensive modifications to the approaches. This work is outside of the scope of the work of this bridge replacement project as established by the Task Force and the U.S. Army Corps of Engineers. The sidewalk approaches to the bridge will require a design waiver by the New Orleans Department of Streets. Minimum modification to the existing sidewalks will be accomplished to match the proposed bridge.

Extensive modifications to the approaches would require ramps at the proper grade slopes with retaining walls. The maximum ramp slope is 1:12 with landings required so that the maximum vertical rise between a landing or resting place is no greater than 30". The maximum vertical rise from the bridge to the street level is approximately 10' for both bridges. Several runs with retaining walls and landings would be required to tie into the lower sidewalk grade at the street level. The landings are required to be a minimum of 5' in length and 5' in width where they occur at a change in direction. Handrails are required since the rise of the ramp is greater than 6" and the length of the ramp is greater than 6'.

The handrails should be continuous along the inside edge of the ramp. Each handrail should extend at least 12" past the sloping segment at the top and bottom of the ramp. The clear space between the inside edge of the rail and the wall should be 1-1/2". The top of the rail should be located between 34" and 38" above the level of ramp and the ends of the rail should be rounded or returned smoothly.

The ramp should have a cross slope of less than 1:50 and should also be designed to minimize ponding and address ice concerns in wintery weather.

5. Detour Route

Mirabeau Avenue and Filmore Avenue bridges are planned to be included in one construction contract. Therefore, the bridges may be under construction at the same time. If they are under construction at the same time, one bridge may not be used as a detour route for the other bridge.

Hence, a detour route independent of each of the bridges was chosen. The major collector streets in the area were chosen for the detour routes in an effort to keep additional traffic out of the residential neighborhoods. The streets for the detour route are Paris Avenue, Robert E. Lee Blvd., and St. Anthony St. (see Exhibit III-6)

IV. PRELIMINARY STATEMENT OF PROBABLE COST

A. Mirabeau Avenue Bridge

1. Preliminary Statement of Probable Cost
Sealed Bridge and Design Speed 40 mph
Mirabeau Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$225,000	$225,000
Embankment (Net Section)	10,000	CY	@	$6	$60,000
Portland Cement Conc. Pav. (10" thick)	8,000	SY	@	$45	$360,000
Asphaltic Cement Conc. Pav. (5" thick)	4,300	SY	@	$15	$64,500
Conc. Approach Slabs (40' long)	625	SY	@	$110	$68,750
Prestressed Conc. Piles (Est. length 70')	8,000	LF	@	$50	$400,000
Retaining Wall & Footing (including piles)	2,250	CY	@	$730	$1,642,500
Barrier Rail	1,800	LF	@	$60	$108,000
Concrete Curb	5,000	LF	@	$7	$35,000
Temporary Signs & Barricades	1	LS	@	$40,000	$40,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	1,000	LB	@	$3	$3,000
Mobilization	1	LS	@	$400,000	$400,000
Utility Relocation	1	LS	@	$300,000	$300,000
Mirabeau Ave. Sealed Brdg. (180'L x 70'8"W)	1	LS	@	$780,000	$780,000
Reinforced Concrete I-Wall	50	CY	@	$450	$22,500
Steel Sheet Piling	5,400	SF	@	$13	$70,200
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	3,800	CY	@	$40	$152,000
Granular Material (Vehicular Measure)	12,800	CY	@	$8	$102,400
24" Drain Pipe	2,200	LF	@	$95	$209,000
Catch Basins	34	EA	@	$1,500	$51,000
Aggregate Material (Net Section)	1,150	CY	@	$40	$46,000
Concrete Sidewalk (4" thick)	1,000	SY	@	$25	$25,000
Concrete Drives (6" thick)	500	SY	@	$35	$17,500
Testing, Loading, & Reloading Piles	1	LS	@	$20,000	$20,000
Parapet Wall	190	LF	@	$150	$28,500
Street Lights	1	LS	@	$15,000	$15,000
Electrial Feeders	1	LS	@	$40,000	$40,000
					$5,311,850
Contingency				10%	$531,200
Engineering, Geotechnical, Administration, Testing				12%	$637,400
TOTAL					$6,480,500

2. Preliminary Statement of Probable Cost
Sealed Bridge and Design Speed 30 mph
Mirabeau Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$150,000	$150,000
Embankment (Net Section)	2,000	CY	@	$6	$12,000
Asphaltic Cement Conc. Pav. (5" thick)	5,500	SY	@	$15	$82,500
Conc. Approach Slabs (40' long)	625	SY	@	$110	$68,750
Prestressed Conc. Piles (Est. length 70')	8,000	LF	@	$50	$400,000
Retaining Wall & Footing (including piles)	60	CY	@	$730	$43,800
Concrete Curb	1,000	LF	@	$7	$7,000
Temporary Signs & Barricades	1	LS	@	$10,000	$10,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	500	LB	@	$3	$1,500
Mobilization	1	LS	@	$100,000	$100,000
Utility Relocation	1	LS	@	$300,000	$300,000
Mirabeau Ave. Sealed Brdg. (140'L x 70'8"W)	1	LS	@	$780,000	$780,000
Reinforced Concrete I–Wall	50	CY	@	$450	$22,500
Steel Sheet Piling	5,400	SF	@	$13	$70,200
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	500	CY	@	$40	$20,000
Granular Material (Vehicular Measure)	2,000	CY	@	$8	$16,000
24" Drain Pipe	400	LF	@	$95	$38,000
Catch Basins	10	EA	@	$1,500	$15,000
Aggregate Material (Net Section)	400	CY	@	$40	$16,000
Concrete Sidewalk (4" thick)	160	SY	@	$25	$4,000
Testing, Loading, & Reloading Piles	1	LS	@	$5,000	$5,000
Parapet Wall	190	LF	@	$150	$28,500
Street Lights	1	LS	@	$10,000	$10,000
Electrial Feeders	1	LS	@	$40,000	$40,000
					$2,266,750
Contingency				10%	$226,700
Engineering, Geotechnical, Administration, Testing				12%	$272,000
TOTAL					$2,765,500

3. Preliminary Statement of Probable Cost
Raised Bridge and Design Speed 40 mph
Mirabeau Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$250,000	$250,000
Embankment (Net Section)	21,000	CY	@	$6	$126,000
Portland Cement Conc. Pave. (10" thick)	10,000	SY	@	$45	$450,000
Asphaltic Cement Conc. Pave. (5" thick)	5,000	SY	@	$15	$75,000
Conc. Approach Slabs (40' long)	550	SY	@	$110	$60,500
Prestressed Concrete Piles (Est. length 75')	9,000	LF	@	$50	$450,000
Retaining Wall & Footing (including piles)	3,400	CY	@	$730	$2,482,000
Barrier Rail	2,200	LF	@	$60	$132,000
Concrete Curb	5,100	LF	@	$7	$35,700
Temporary Signs & Barricades	1	LS	@	$40,000	$40,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	1,500	LB	@	$3	$4,500
Mobilization	1	LS	@	$400,000	$400,000
Utility Relocation	1	LS	@	$370,000	$370,000
Mirabeau Ave. Raised Brdg (180'L x 71'8"W)	1	LS	@	$720,000	$720,000
Reinforced Concrete I—wall	130	CY	@	$450	$58,500
Steel Sheet Piling	5,400	SF	@	$13	$70,200
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	4,000	CY	@	$40	$160,000
Sidewalk (4" thick) & Ramps	86	SY	@	$50	$4,300
Granular Material (Vehicular Measure)	19,600	CY	@	$8	$156,800
24" Drain Pipe	2,600	LF	@	$95	$247,000
Catch Basins	42	EA	@	$1,500	$63,000
Aggregate Material (Net Section)	1,500	CY	@	$40	$60,000
Concrete Sidewalk (4" thick)	1,000	SY	@	$25	$25,000
Concrete Drives (6" thick)	600	SY	@	$35	$21,000
Testing, Loading, & Reloading Piles	1	LS	@	$20,000	$20,000
Street Lights	1	LS	@	$20,000	$20,000
Electrical Feeders	1	LS	@	$40,000	$40,000

					$6,567,500
Contingency				10%	$656,800
Engineering, Geotechnical, Administration, Testing				12%	$788,100

TOTAL					$8,012,400

4. Preliminary Statement of Probable Cost
Floodgates
Mirabeau Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Excavation	600	CY	@	$12	$7,200
Conc. Prestressed Piles (Est. Length 50')	7,000	LF	@	$50	$350,000
Steel Sheet Piling	7,000	LF	@	$13	$91,000
Conc. Sill/Ftg (Class A Concrete)	300	CY	@	$225	$67,500
Tracks	320	LF	@	$25	$8,000
Conc. Walls (Class AA Concrete)	150	CY	@	$600	$90,000
Center Post	1	LS	@	$75,000	$75,000
A36 Steel	34,000	LB	@	$3	$102,000
Seals – Neoprene	1	LS	@	$10,000	$10,000
Rollers, Locks, Inserts	1	LS	@	$25,000	$25,000
Utility Relocation	1	LS	@	$300,000	$300,000
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Mobilization	1	LS	@	$25,000	$25,000
Temporary Signs & Barricades	1	LS	@	$20,000	$20,000
Testing, Loading, & Reloading Piles	1	LS	@	$15,000	$15,000
Street Lights	1	LS	@	$5,000	$5,000
Electrical Feeder	1	LS	@	$40,000	$40,000
					$1,236,700
Contingency				10%	$123,700
Engineering, Geotechnical, Administration, Testing				12%	$148,404
TOTAL					$1,508,804

B. Filmore Avenue Bridge

1. Preliminary Statement of Probable Cost
   Sealed Bridge and Design Speed 40 mph
   Filmore Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$250,000	$250,000
Embankment (Net Section)	5,000	CY	@	$6	$30,000
Portland Cement Conc. Pave. (10" thick)	5,400	SY	@	$45	$243,000
Asphaltic Cement Conc. Pave. (5" thick)	4,500	SY	@	$15	$67,500
Conc. Approach Slabs (40'long)	400	SY	@	$110	$44,000
Prestressed Conc. Piles (Est. length 70')	6,000	LF	@	$50	$300,000
Retaining Wall & Footing (including piles)	2,300	CY	@	$730	$1,679,000
Barrier Rail	1,580	LF	@	$60	$94,800
Concrete Curb	3,000	LF	@	$7	$21,000
Temporary Signs & Barricades	1	LS	@	$40,000	$40,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	1,200	LB	@	$3	$3,600
Mobilization	1	LS	@	$400,000	$400,000
Utility Relocation	1	LS	@	$600,000	$600,000
Filmore Ave. Sealed Bridge (190'L x 46'8"W)	1	LS	@	$543,000	$543,000
Reinforced Concrete I–Wall	100	CY	@	$450	$45,000
Steel Sheet Piling	6,500	SF	@	$13	$84,500
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	2,500	CY	@	$40	$100,000
Granular Material (Vehicular Measure)	11,000	CY	@	$8	$88,000
24" Drain Pipe	2,100	LF	@	$95	$199,500
Catch Basins	32	EA	@	$1,500	$48,000
Aggregate Material (Net Section)	1,100	CY	@	$40	$44,000
Concrete Sidewalk (4" thick)	550	SY	@	$25	$13,750
Concrete Drives (6" thick)	350	SY	@	$35	$12,250
Testing, Loading, & Reloading Piles	1	LS	@	$20,000	$20,000
Parapet Wall	190	LF	@	$150	$28,500
Street Lights	1	LS	@	$15,000	$15,000
Electrical Feeder	1	LS	@	$40,000	$40,000
					$5,080,400
Contingency				10%	$508,000
Engineering, Geotechnical, Administration, Testing				12%	$609,600
TOTAL					$6,198,000

2. Preliminary Statement of Probable Cost
Sealed Bridge and Design Speed 35 mph
Filmore Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$100,000	$100,000
Embankment (Net Section)	1,000	CY	@	$6	$6,000
Asphaltic Cement Conc. Pave. (5" thick)	2,500	SY	@	$15	$37,500
Conc. Approach Slabs (40' long)	400	SY	@	$110	$44,000
Prestressed Conc. Piles (Est. length 70')	6,000	LF	@	$50	$300,000
Retaining Wall & Footing (including piles)	100	CY	@	$730	$73,000
Concrete Curb	1,000	LF	@	$7	$7,000
Temporary Signs & Barricades	1	LS	@	$20,000	$20,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	500	LB	@	$3	$1,500
Mobilization	1	LS	@	$100,000	$100,000
Utility Relocation	1	LS	@	$600,000	$600,000
Filmore Ave. Sealed Bridge (150'L x 46'8"W)	1	LS	@	$543,000	$543,000
Reinforced Concrete I-wall	100	CY	@	$450	$45,000
Steel Sheet Piling	6,500	SF	@	$13	$84,500
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	500	CY	@	$40	$20,000
Granular Material (Vehicular Measure)	1,000	CY	@	$8	$8,000
24" Drain Pipe	400	LF	@	$95	$38,000
Catch Basins	10	EA	@	$1,500	$15,000
Aggregate Material (Net Section)	400	CY	@	$40	$16,000
Concrete Sidewalk (4" thick)	550	SY	@	$25	$13,750
Testing, Loading, & Reloading Piles	1	LS	@	$5,000	$5,000
Parapet Wall	190	CY	@	$150	$28,500
Street Lights	1	LS	@	$10,000	$10,000
Electrical Feeders	1	LS	@	$40,000	$40,000
					$2,181,750
Contingency				10%	$218,180
Engineering, Geotechnical, Administration, Testing				12%	$261,810
TOTAL					$2,661,700

3. Preliminary Statement of Probable Cost
Raised Bridge and Design Speed 40 mph
Filmore Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Removal of Structures & Obstructions	1	LS	@	$300,000	$300,000
Embankment (Net Section)	10,000	CY	@	$6	$60,000
Portland Cement Conc. Pave. (10" thick)	7,000	SY	@	$45	$315,000
Asphaltic Cement Conc. Pave. (5" thick)	6,500	SY	@	$15	$97,500
Conc. Approach Slabs (40' long)	320	SY	@	$110	$35,200
Prestressed Conc. Piles (Est. length 75')	6,500	LF	@	$50	$325,000
Retaining Wall & Footing (including piles)	4,000	CY	@	$730	$2,920,000
Barrier Rail	2,360	LF	@	$60	$141,600
Concrete Curb	4,000	LF	@	$7	$28,000
Temporary Signs & Barricades	1	LS	@	$40,000	$40,000
Landscaping	1	LS	@	$20,000	$20,000
Fertilizer	1,700	LB	@	$3	$5,100
Mobilization	1	LS	@	$400,000	$400,000
Utility Relocation	1	LS	@	$725,000	$725,000
Filmore Ave. Raised Bridge (190'L x 47'8"W)	1	LS	@	$510,000	$510,000
Reinforced Concrete I–wall	160	CY	@	$450	$72,000
Steel Sheet Piling	6,500	SF	@	$13	$84,500
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Base Course (Net Section)	3,000	CY	@	$40	$120,000
Sidewalk (4" thick) & Ramps	450	SY	@	$50	$22,500
Granular Material (Vehicular Measure)	23,000	CY	@	$8	$184,000
24" Drain Pipe	2,400	LF	@	$95	$228,000
Catch Basins	36	EA	@	$1,500	$54,000
Aggregate Material (Net Section)	1,700	CY	@	$40	$68,000
Concrete Sidewalk (4" thick)	550	SY	@	$25	$13,750
Concrete Drives (6" thick)	400	SY	@	$35	$14,000
Testing, Loading, & Reloading Piles	1	LS	@	$20,000	$20,000
Street Lights	1	LS	@	$20,000	$20,000
Electrical Feeders	1	LS	@	$40,000	$40,000
					$6,869,150
Contingency				10%	$686,900
Engineering, Geotechnical, Administration, Testing				12%	$824,300
TOTAL					$8,380,400

4. Preliminary Statement of Probable Cost
Floodgates
Flimore Avenue Bridge at London Avenue Outfall Canal

ITEM	QUANTITY			UNIT PRICE	AMOUNT
Excavation	300	CY	@	$12	$3,600
Prestressed Conc. Piles (Est. Length 50')	5,000	LF	@	$50	$250,000
Steel Sheet Piling	4,000	SF	@	$13	$52,000
Conc. Sill/Ftg (Class A Concrete)	150	CY	@	$225	$33,750
Tracks	170	LF	@	$25	$4,250
Conc. Walls & Posts w/Reinf.	100	CY	@	$375	$37,500
Steel Sheet Piling (I–Wall)	2,500	SF	@	$13	$32,500
A36 Steel	34,000	LB	@	$3	$102,000
Seals – Neoprene	1	LS	@	$10,000	$10,000
Rollers, Locks, Inserts	1	LS	@	$10,000	$10,000
Utility Relocation	1	LS	@	$600,000	$600,000
Floodwall Access Doors	2	EA	@	$3,000	$6,000
Temporary Signs & Barricades	1	LS	@	$20,000	$20,000
Testing, Loading, & Reloading Piles	1	LS	@	$15,000	$15,000
Mobilization	1	LS	@	$25,000	$25,000
Street Lights	1	LS	@	$5,000	$5,000
Electrical Feeder	1	LS	@	$40,000	$40,000
					$1,246,600
Contingency				10%	$124,700
Engineering, Geotechnical, Administration, Testing				12%	$149,592
TOTAL					$1,520,892

V. DESIGN & CONSTRUCTION SCHEDULE

The design and construction schedule presented on the next page outlines the dates and time frame beginning with the preliminary Design Memorandum Supplement through the completion of construction.

The Design Memorandum Supplement is estimated to take about 5 months to draft, address comments, and finalize. The plans and specifications are estimated to take about 14 months to prepare 35, 65, 95, and 100% submittals including reviews and changes to incorporate comments. The advertisement and bidding period will take approximately 2 months. Construction of the bridges will take approximately 8-1/2 months.

9362BBAR

MEYER ENGINEERS, LTD.

LONDON AVENUE CANAL BRIDGES
FILMORE AND MIRABEAU AVE.

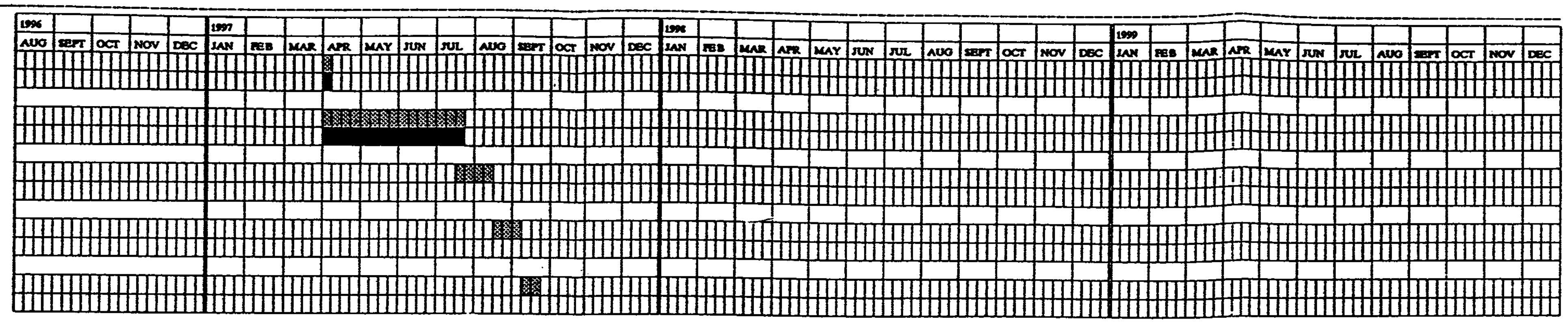
A/E PROJECT NO. 9362B
OLB PROJECT NO. 24912
July 9, 1997

PERIOD FROM: 04/03/97
TO: 09/19/97

LEGEND:
SCHEDULED:
ACTUAL:

SUPPLEMENTAL DESIGN MEMORANDUM:

Notice to Proceed	*Scheduled Comp.:*	*04/03/97*
	Actual Comp.:	*04/03/97*
Preliminary Supplemental DM	*Scheduled Comp.:*	*07/25/97*
	Actual Comp.:	*07/25/97*
Review & Comment – Suppl. DM	*Scheduled Comp.:*	*08/15/97*
	Actual Comp.:	*00/00/00*
Incorporate Comments	*Scheduled Comp.:*	*09/05/97*
	Actual Comp.:	*00/00/00*
Final Supplemental DM	*Scheduled Comp.:*	*09/19/97*
	Actual Comp.:	*00/00/00*



9362BBAR

MEYER ENGINEERS, LTD.

LONDON AVENUE CANAL BRIDGES
FILMORE AND MIRABEAU AVE.

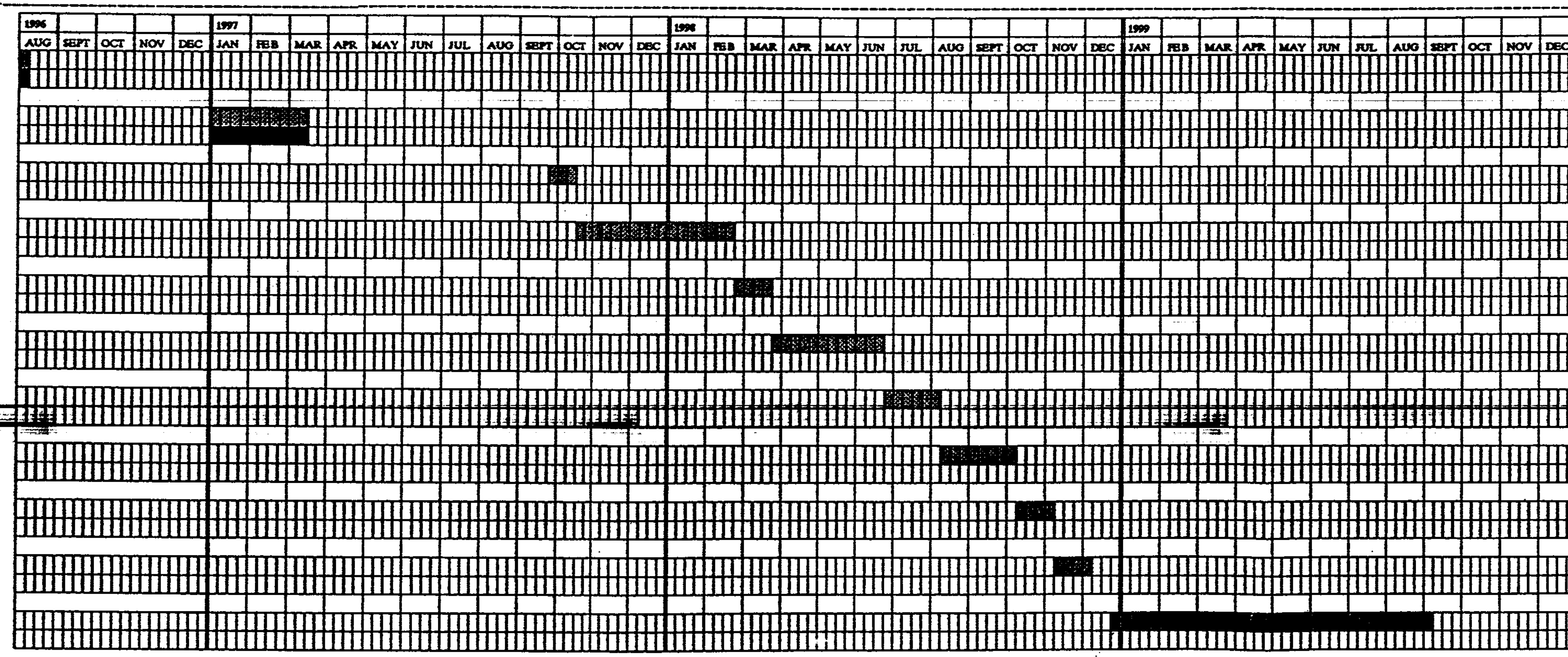
A/E PROJECT NO. 9362B
OLB PROJECT NO. 24912
July 9, 1997

PERIOD FROM: 08/07/96
TO: 09/01/99

LEGEND:
SCHEDULED:
ACTUAL:

CONSTRUCTION DOCUMENTS:

Notice to Proceed	*Scheduled Comp.:*	*08/07/96*
	Actual Comp.:	*08/07/96*
Plans & Specs (35%)	*Scheduled Comp.:*	*03/11/97*
	Actual Comp.:	*03/11/97*
Review & Comment (35%)	*Scheduled Comp.:*	*10/17/97*
	Actual Comp.:	*00/00/00*
Plans & Specs (65%)	*Scheduled Comp.:*	*02/20/98*
	Actual Comp.:	*00/00/00*
Review & Comment (65%)	*Scheduled Comp.:*	*03/20/98*
	Actual Comp.:	*00/00/00*
Plans & Specs (95%)	*Scheduled Comp.:*	*06/19/98*
	Actual Comp.:	*00/00/00*
Review & Comment (95%)	*Scheduled Comp.:*	*08/07/98*
	Actual Comp.:	*00/00/00*
Plans & Specs (100%)	*Scheduled Comp.:*	*10/09/98*
	Actual Comp.:	*00/00/00*
Advertise & Recieve Bids	*Scheduled Comp.:*	*11/06/98*
	Actual Comp.:	*00/00/00*
Review Bids & Award Contract	*Scheduled Comp.:*	*12/04/98*
	Actual Comp.:	*00/00/00*
Construction	*Scheduled Comp.:*	*09/01/99*
	Actual Comp.:	*00/00/00*



VI. SELECTED BRIDGE IMPROVEMENT

Based on engineering evaluations of the alternatives and compliance with established design standards, it was initially recommended in July 1995 to construct a raised bridge to clear the top of the I-wall. There was much opposition to this recommendation, so the Mayor created a Task Force to recommend a design. The recommendation from the Task Force was to provide a sealed bridge at Mirabeau Avenue and floodgates at Filmore Avenue. In lieu of a combination of sealed bridges and floodgates throughout the City, it was agreed by the Orleans Levee District and the Task Force to support the all sealed bridge concept at both bridges.

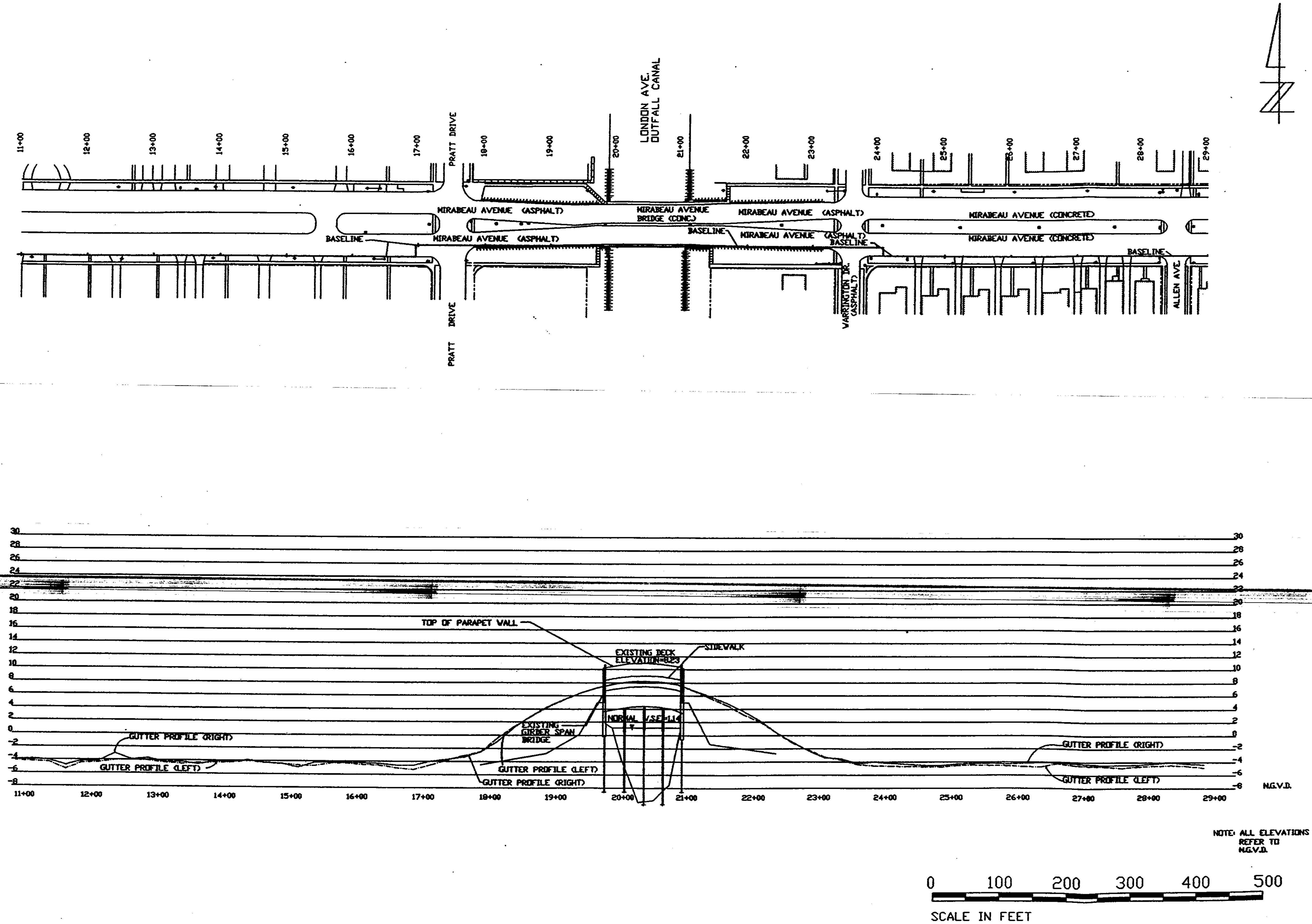
The selected sealed bridge concept will satisfy the technical design flood requirements. The sealed bridge alternatives with design waivers for the approaches to match existing conditions were recommended for minimal impact to the adjacent neighborhoods. Design waivers of AASHTO's standards would have to be acquired from the New Orleans Department of Streets. One of the Task Force's provisos is the design waiver of AASHTO standards. If a waiver cannot be obtained, the matter will return to the Task Force for its consideration.

The canal hydraulics cannot be adversely impacted per the New Orleans Sewerage and Water Board. The existing Mirabeau Avenue bridge consists of five (5) piles bents; three (3) pile bents within the canal cross section and one (1) pile bent at the floodwall at each end. The proposed Mirabeau Avenue bridge will consist of seven (7) pile bents; three (3) pile bents within the canal cross section and two (2) pile bents at the floodwall at each end. The pile bents within the canal cross section were spaced on 30' centers matching the existing spacing and two (2) pile bents at the floodwall were spaced on 20' centers to span the I-wall. The proposed bridge section was reviewed and approved by the New Orleans Sewerage and Water Board. The proposed Filmore Avenue bridge consists of the same number of pile bents and spacing as the existing bridge.

The required slab thickness is 20" for slab span construction of both bridges. The weight of the 20" slab span will help offset the buoyant force which may be applied to the bridge at times of high water. Cast-in-place construction is recommended over precast prestressed slab spans because both bridges are in a vertical curve where precast prestressed slab spans will not be able to be used in the curved section.

The bottoms of the bridges will be raised approximately 6" to 8" higher above the existing bridge bottom elevation because of the proposed slab spans. However, the bottom of the bridges will still not have 2' foot of freeboard to the design water surface elevation. A design waiver will have to be obtained from LA DOTD.

The preliminary probable cost of the sealed bridge and no major modifications to the approaches is $2,765,500 for Mirabeau Avenue and $2,661,700 for Filmore Avenue.



NOTE: ALL ELEVATIONS REFER TO N.G.V.D.

project no. 9362
drawn GY
checked AMT
date 7-3-97
revised

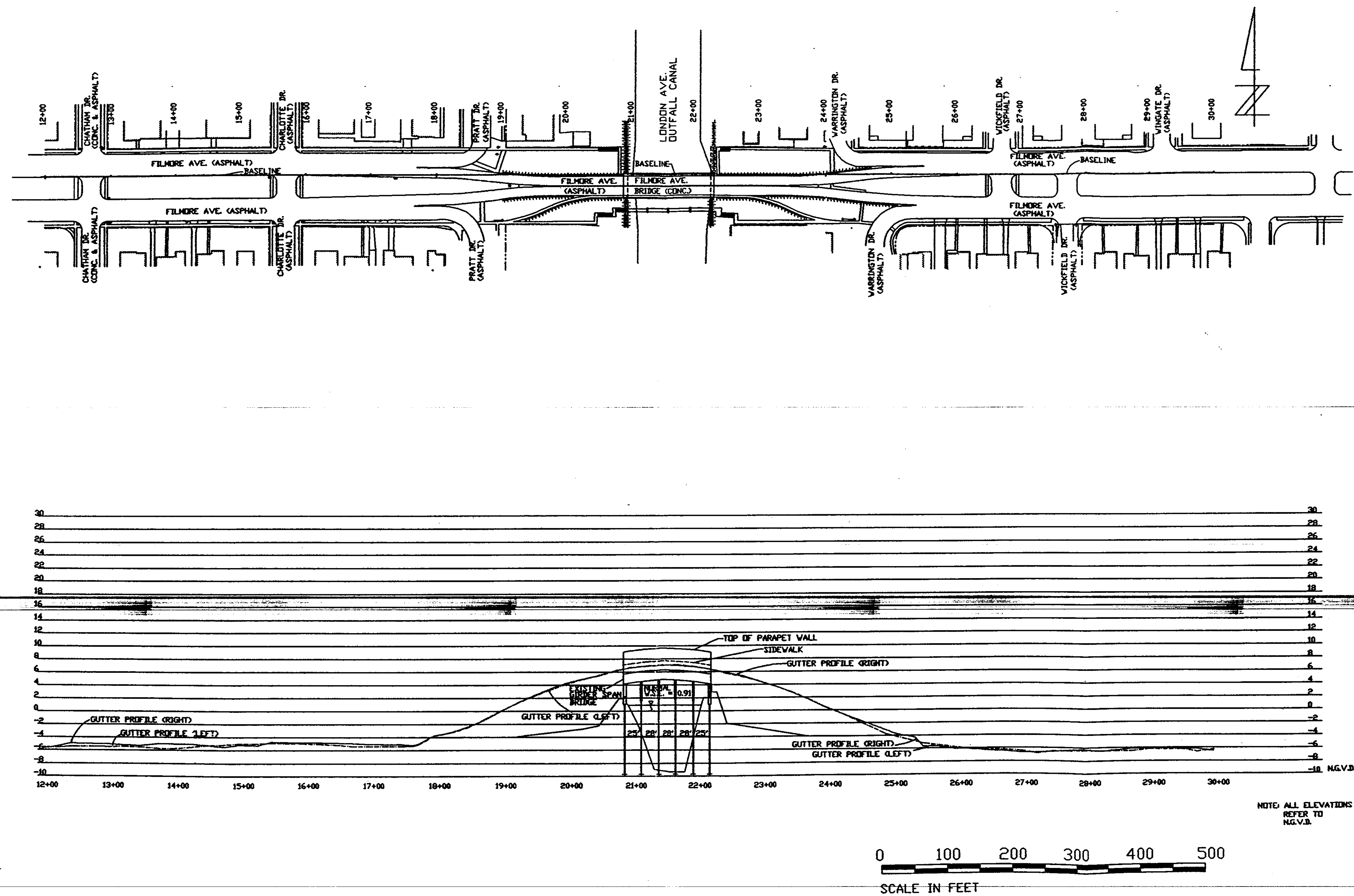
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE - EXISTING GENERAL PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
I-1A

9362-11A.DWG



project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

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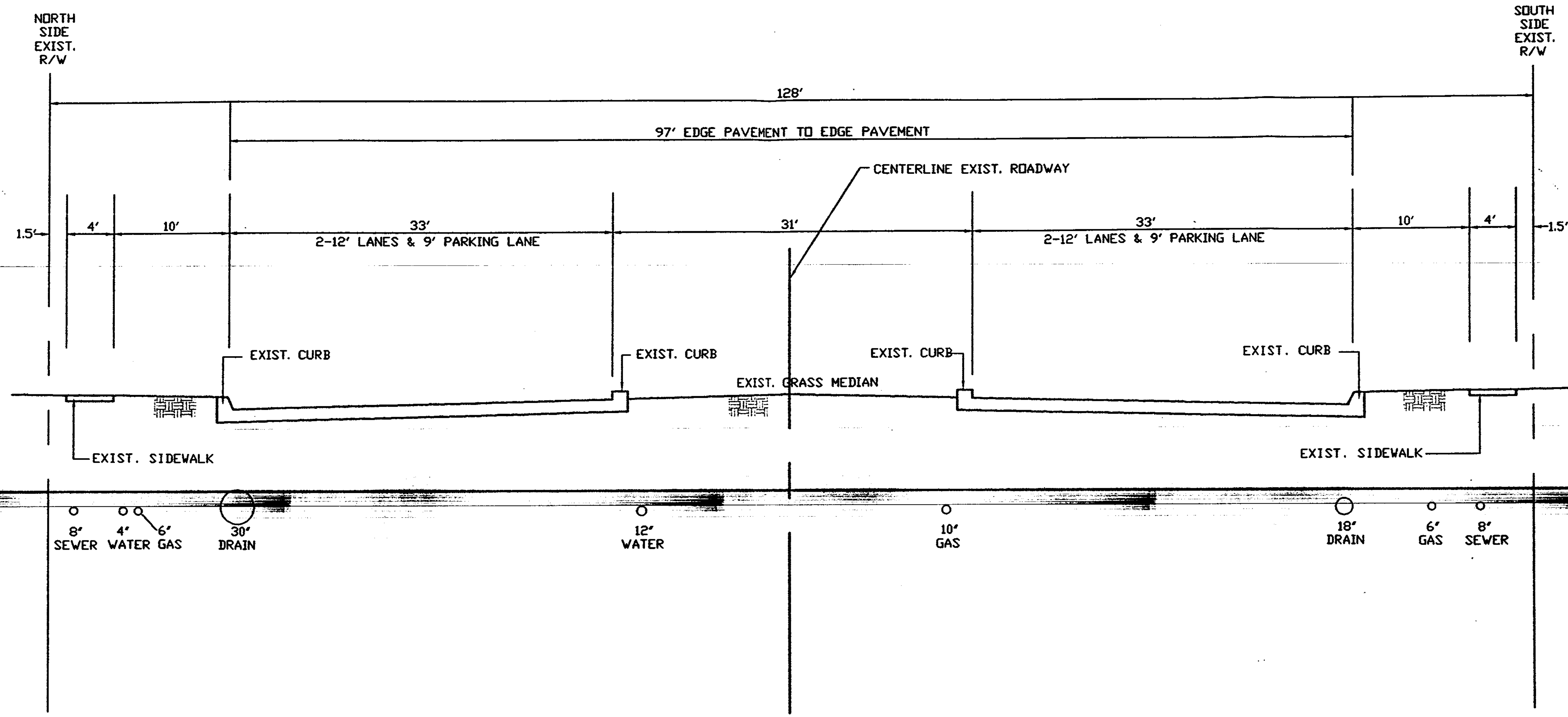
FILMORE AVENUE - EXISTING GENERAL PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
I-1B

9362-11B.DWG



MIRABEAU AVENUE
EXISTING ROADWAY SECTION

N.T.S.

PLOT AT 1=10
9362-22A.DWG

project no. 9362
drawn GY
checked AMT
date 07-03-97
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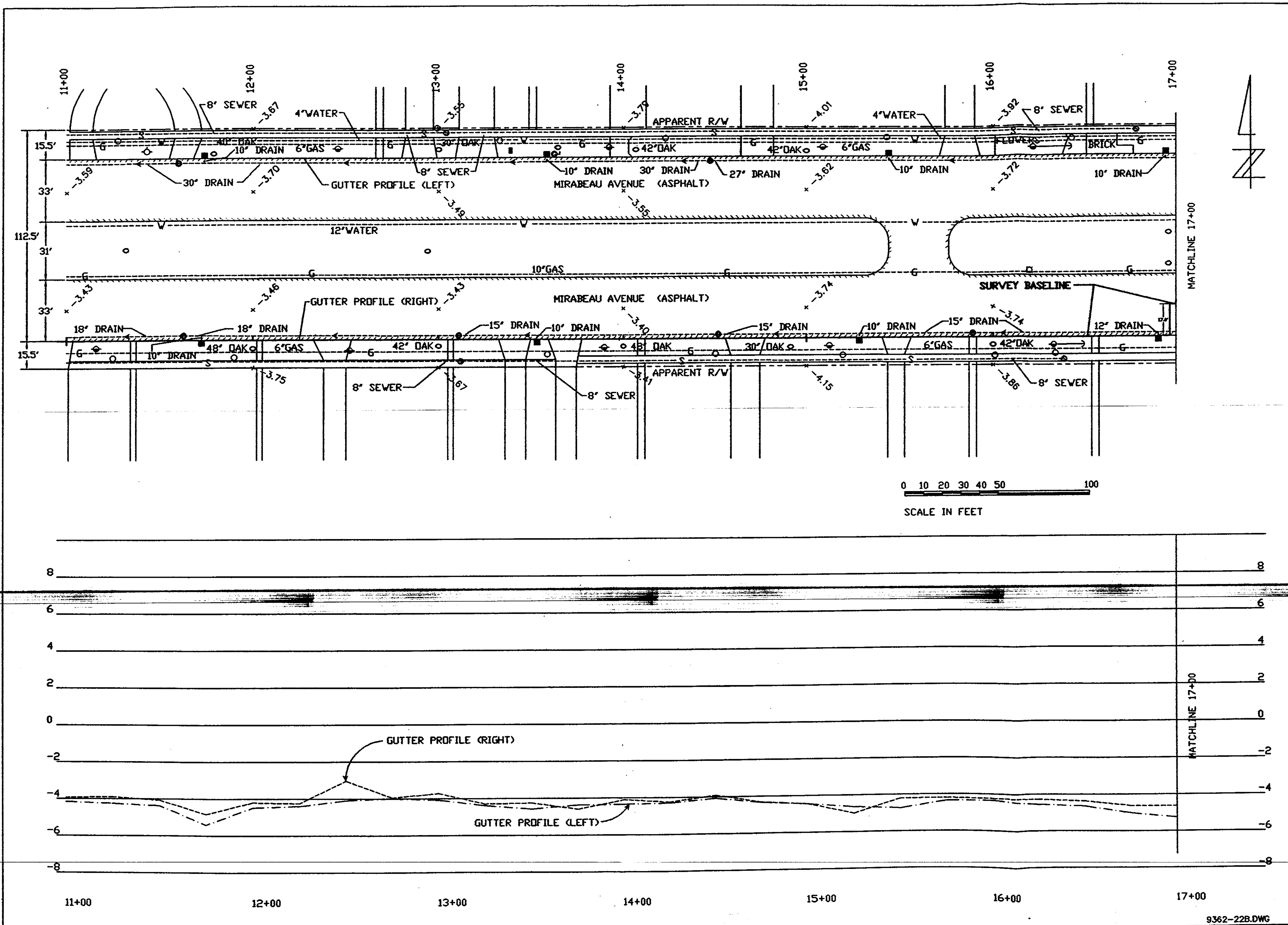
MIRABEAU AVENUE EXISTING ROADWAY SECTION

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-2A



project no. 9362
drawn GY
checked AHT
date 07-03-97
revised

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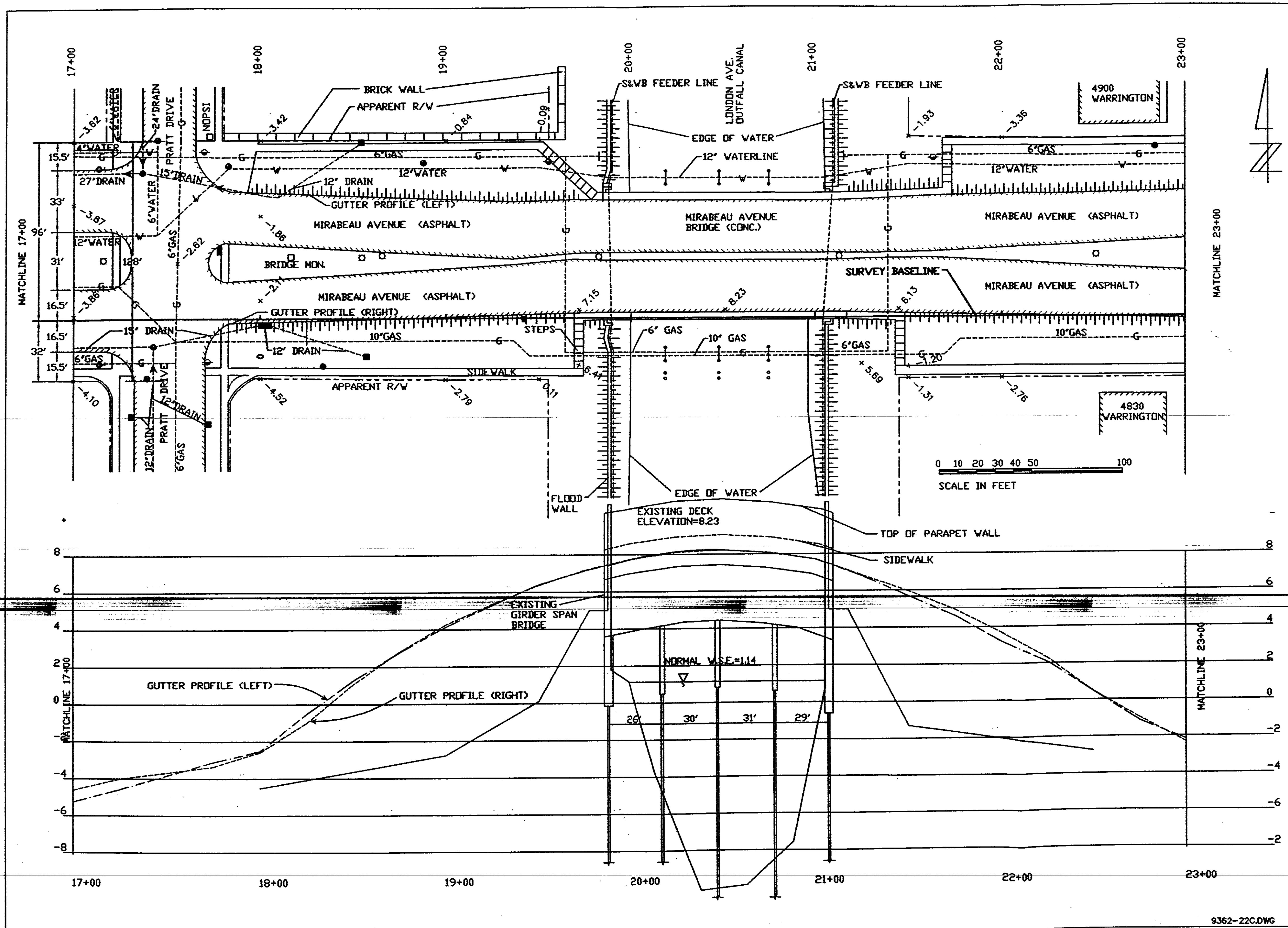
MIRABEAU AVENUE BRIDGE - EXISTING PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-2B



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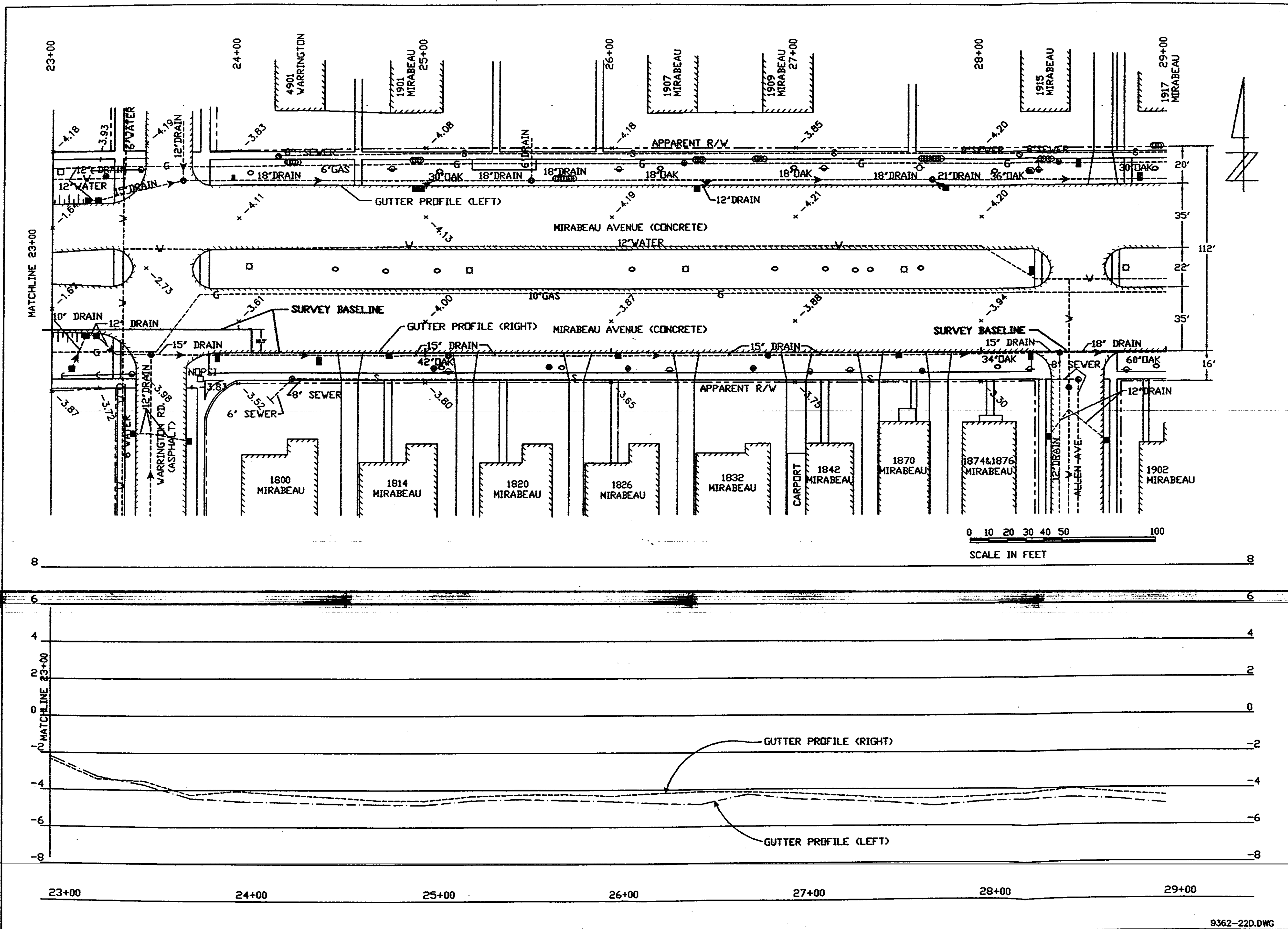
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MIRABEAU AVENUE BRIDGE - EXISTING PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-2C



project no. 9362
drawn DY
checked AMT
date 07-03-97
revised

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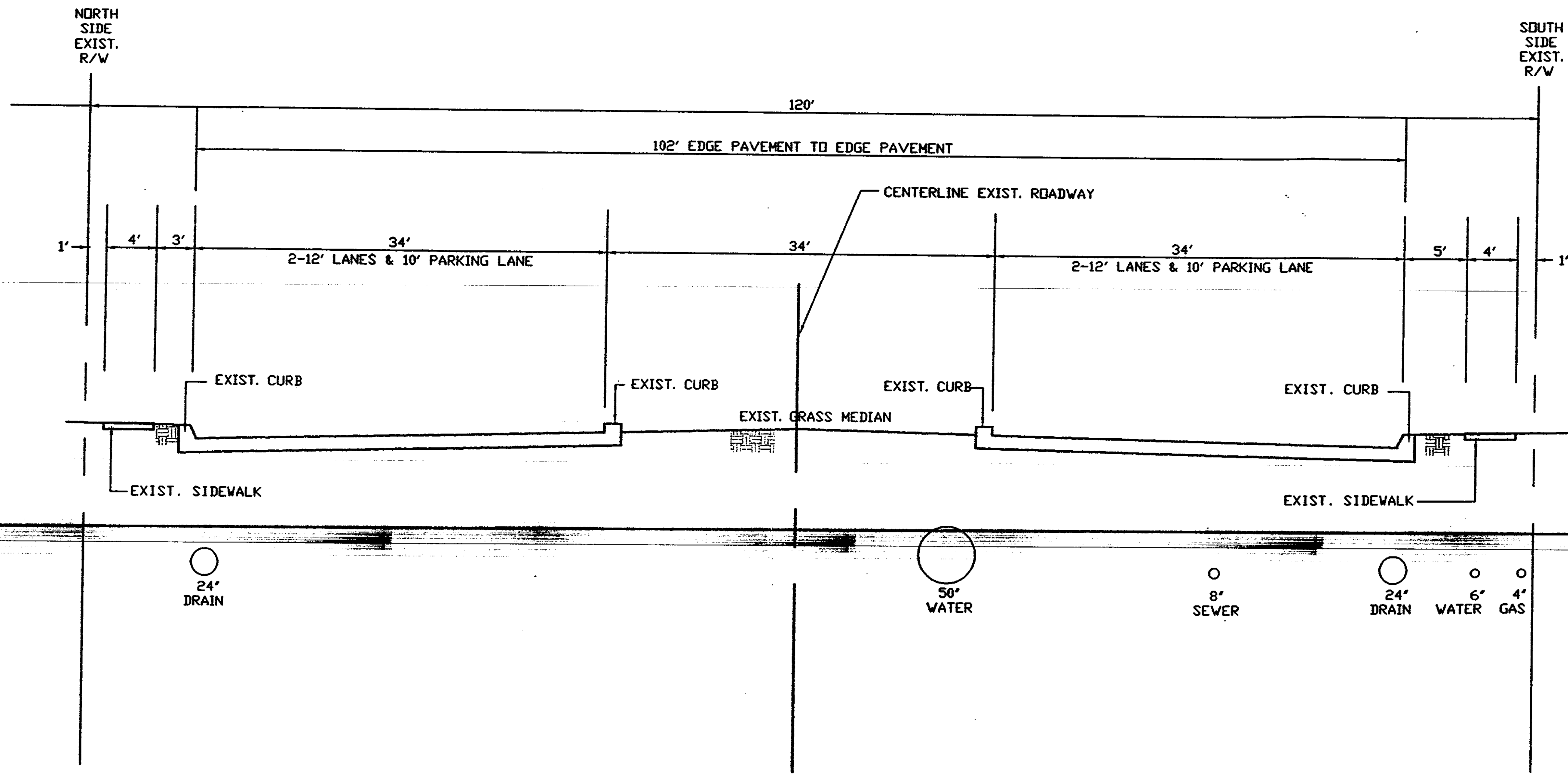
MIRABEAU AVENUE BRIDGE - EXISTING PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-2D



FILMORE AVENUE
EXISTING ROADWAY SECTION

N.T.S.

PLOT AT 1=10
9362-23A.DWG

project no. 9362
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checked AMT
date 07-03-97
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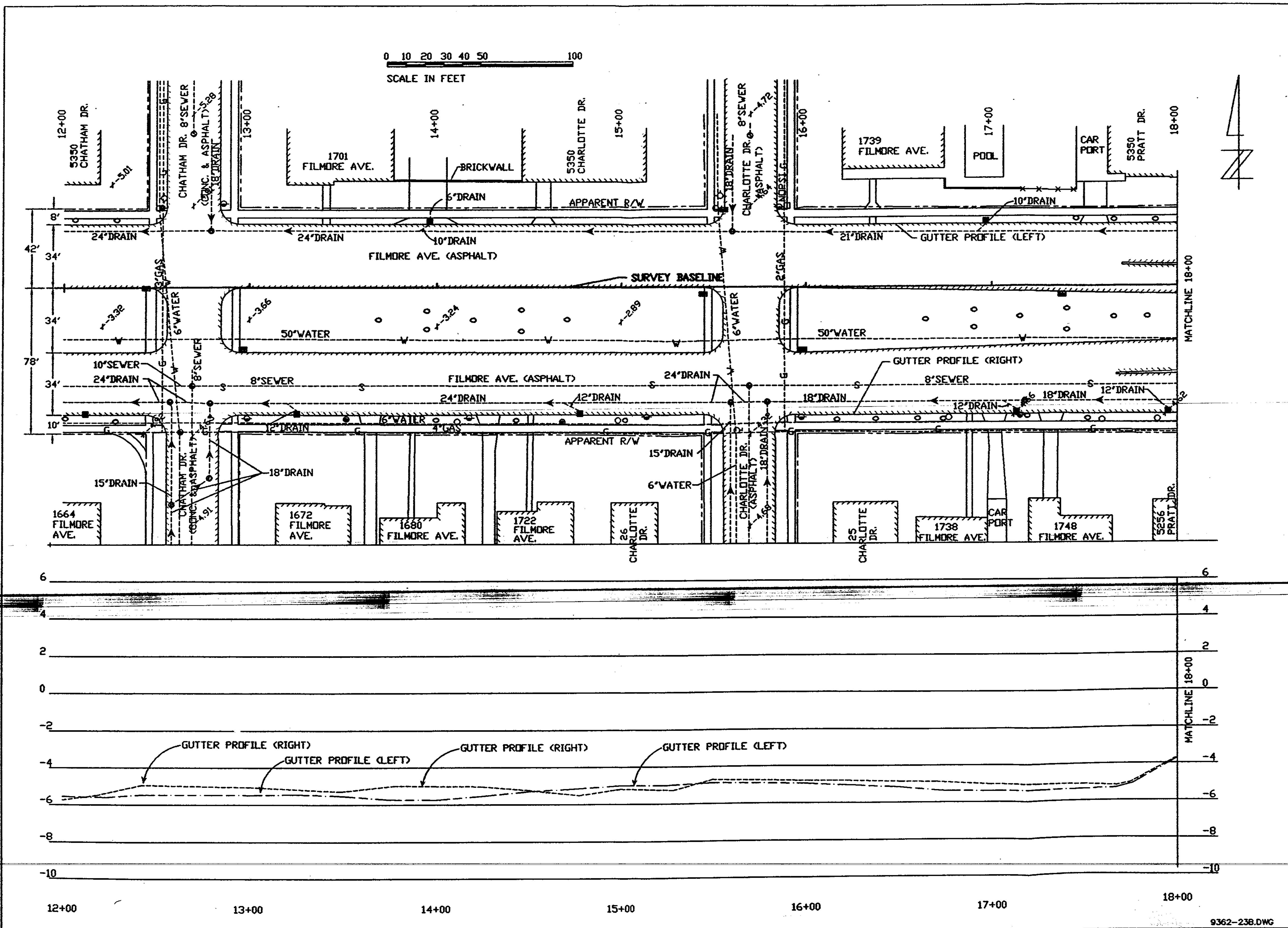
FILMORE AVENUE EXISTING ROADWAY SECTION

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-3A



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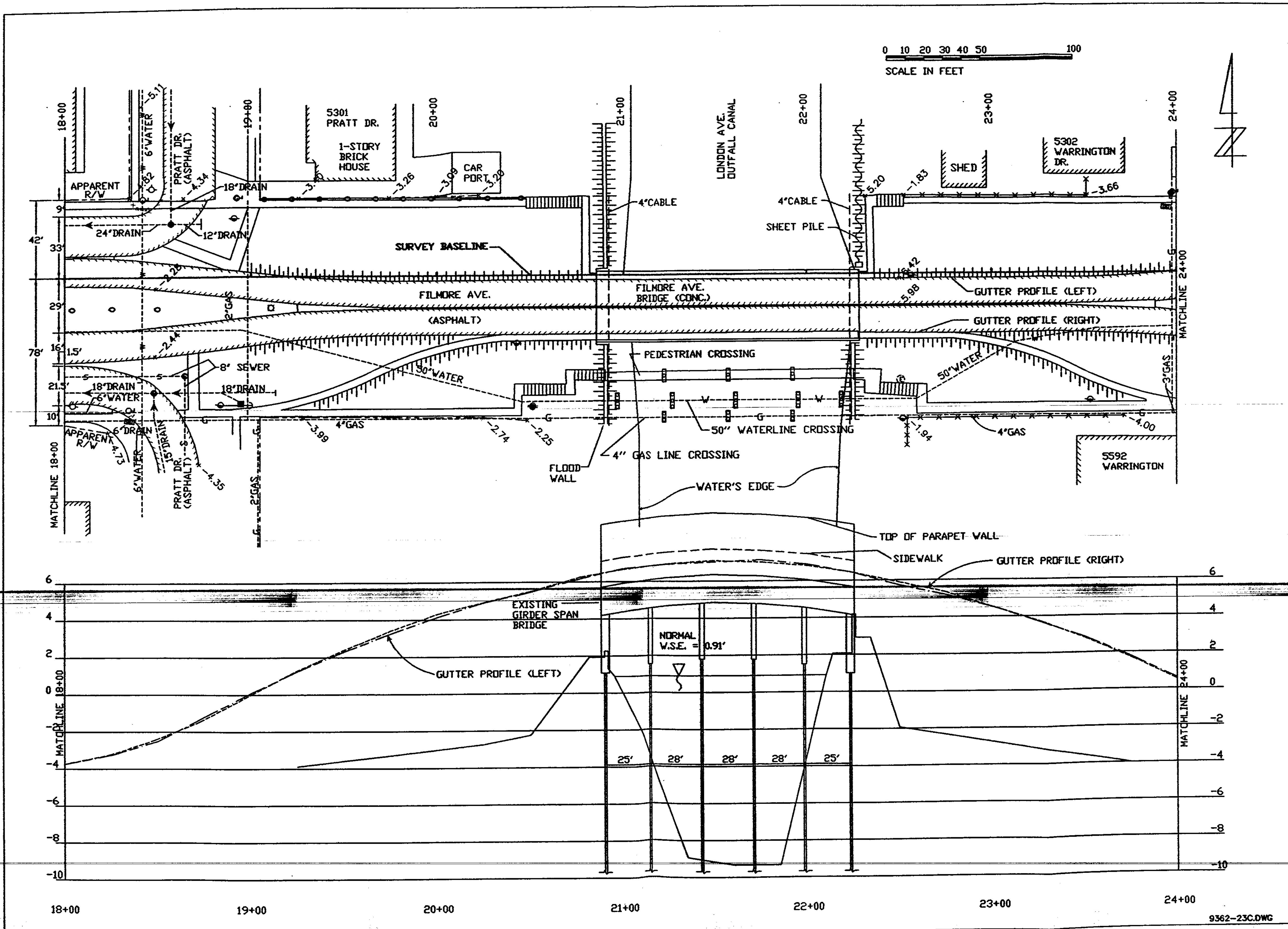
FILMORE AVENUE BRIDGE - EXISTING PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-3B



project no. 9362
drawn GT
checked AMT
date 07-03-97
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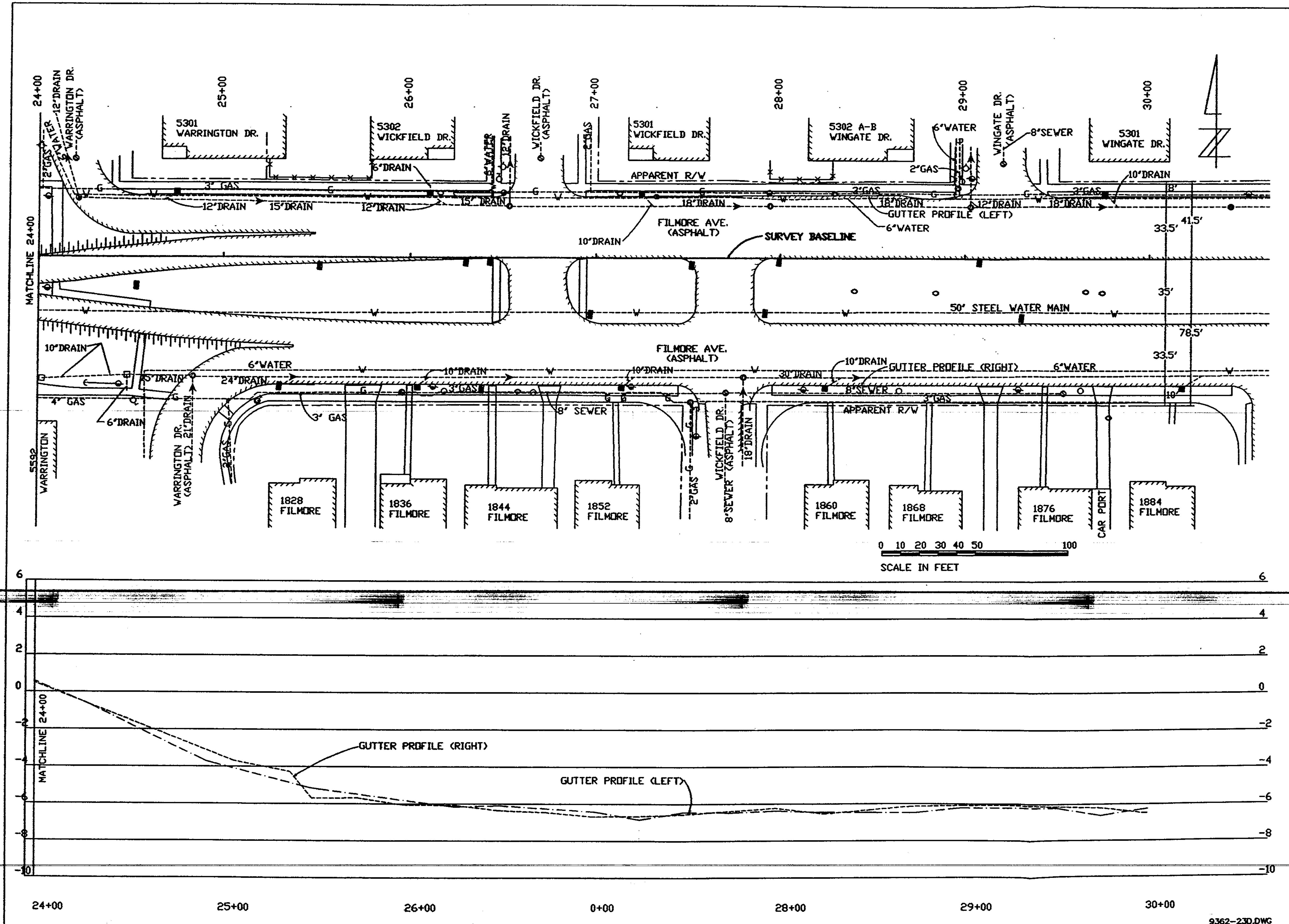
FILMORE AVENUE BRIDGE - EXISTING PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-3C



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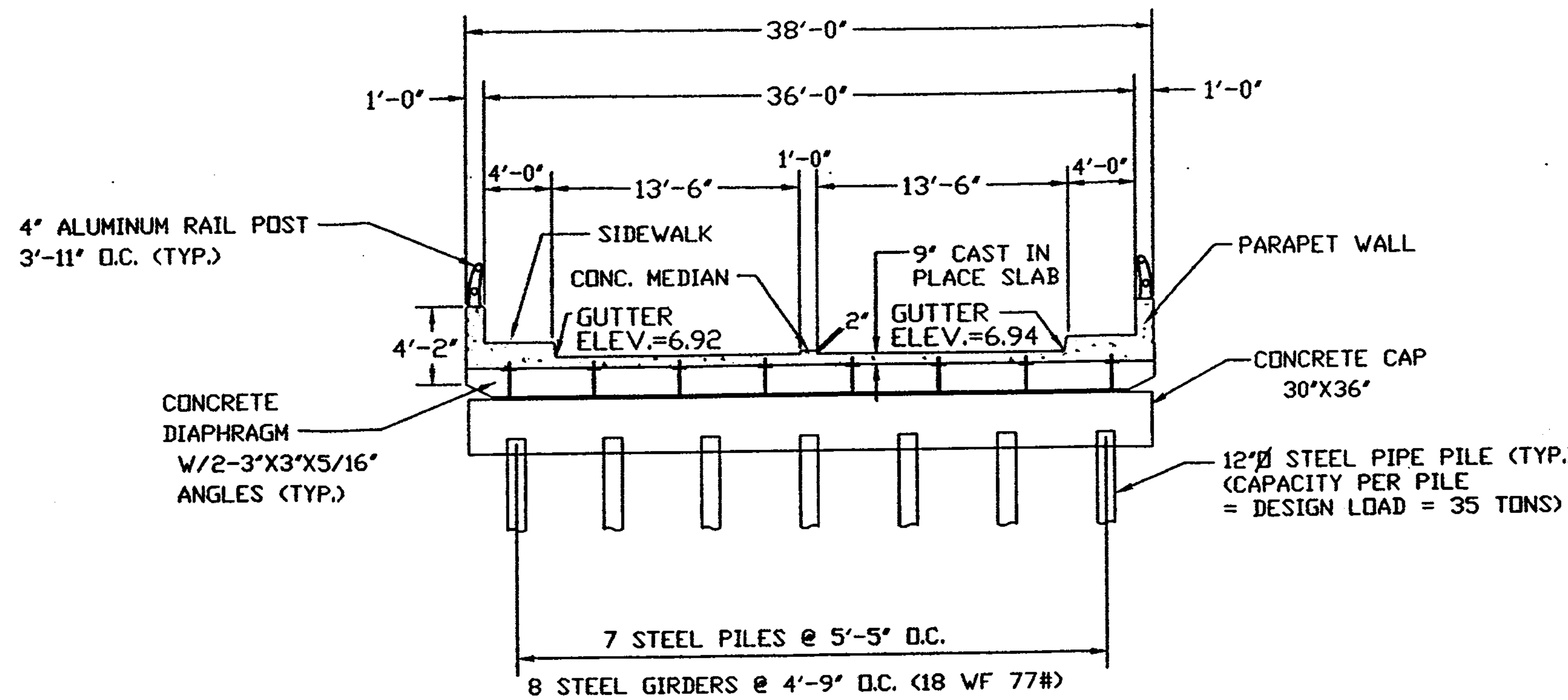
FILMORE AVENUE BRIDGE - EXISTING PLAN AND PROFILE

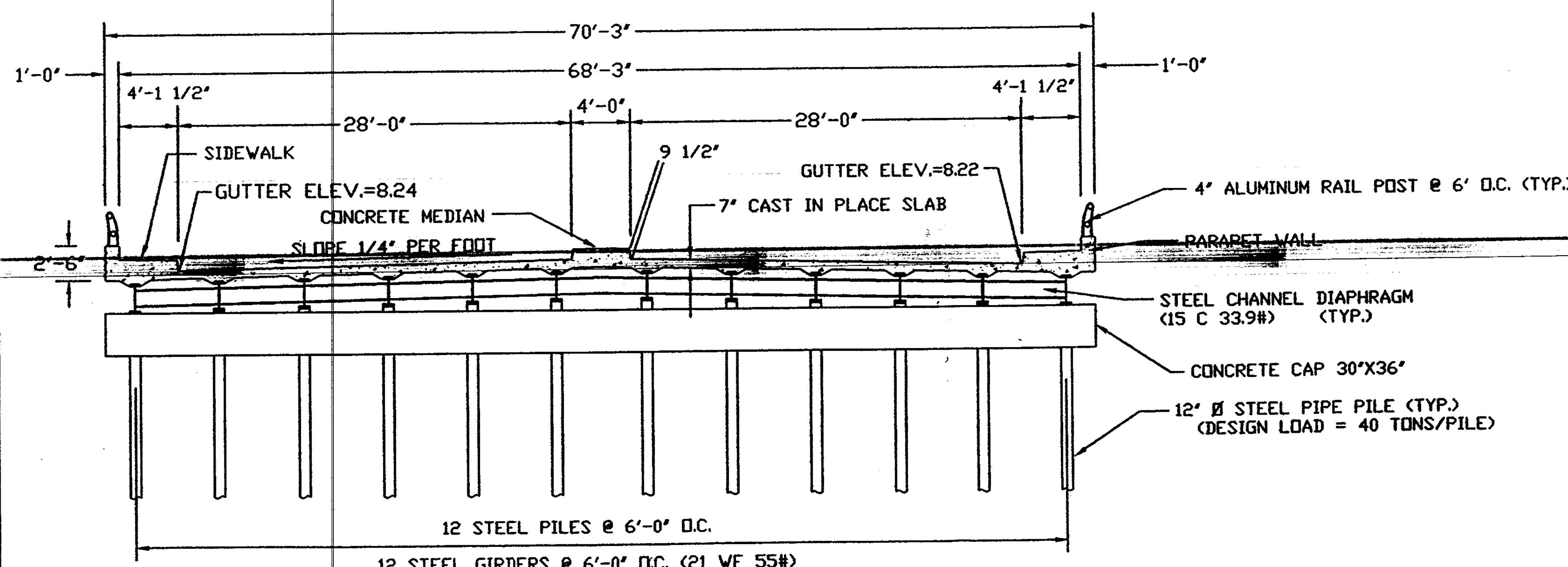
BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-3D



EXISTING BRIDGE SECTION

FILMORE AVE. BRIDGE



EXISTING BRIDGE SECTION

MIRABEAU AVE. BRIDGE

0 15 30

SCALE IN FEET

9362-24.DWG

project no. 9362
drawn DY
checked AMT
date 07-03-97
revised

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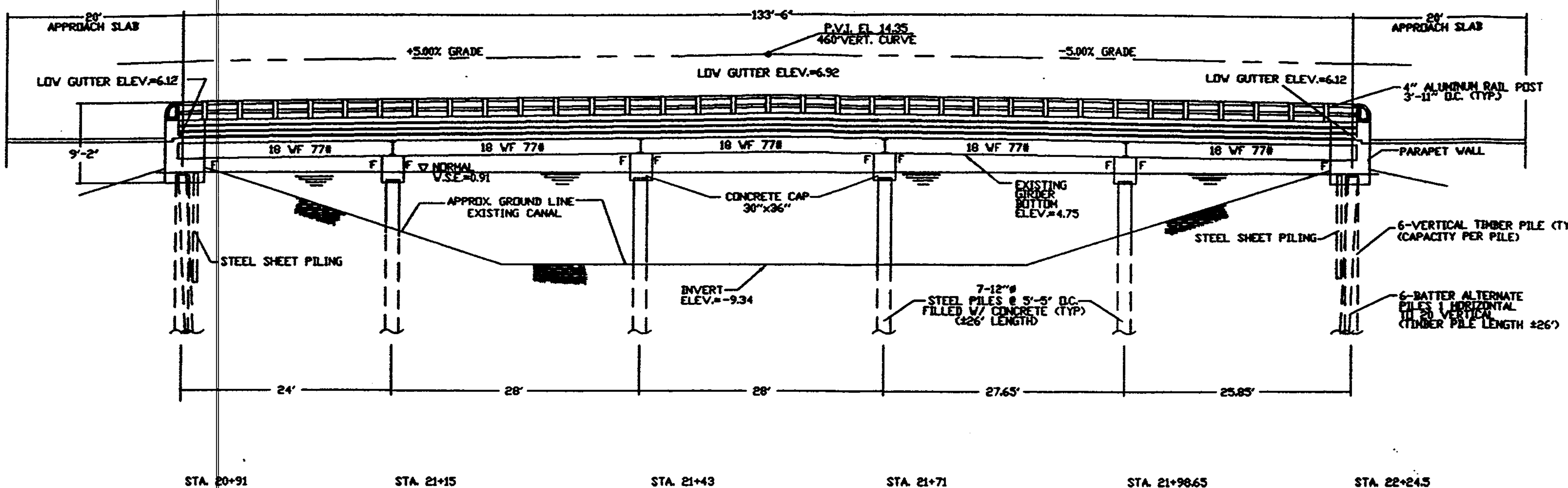
MIRABEAU AVE. & FILMORE AVE. - EXISTING BRIDGE SECTIONS

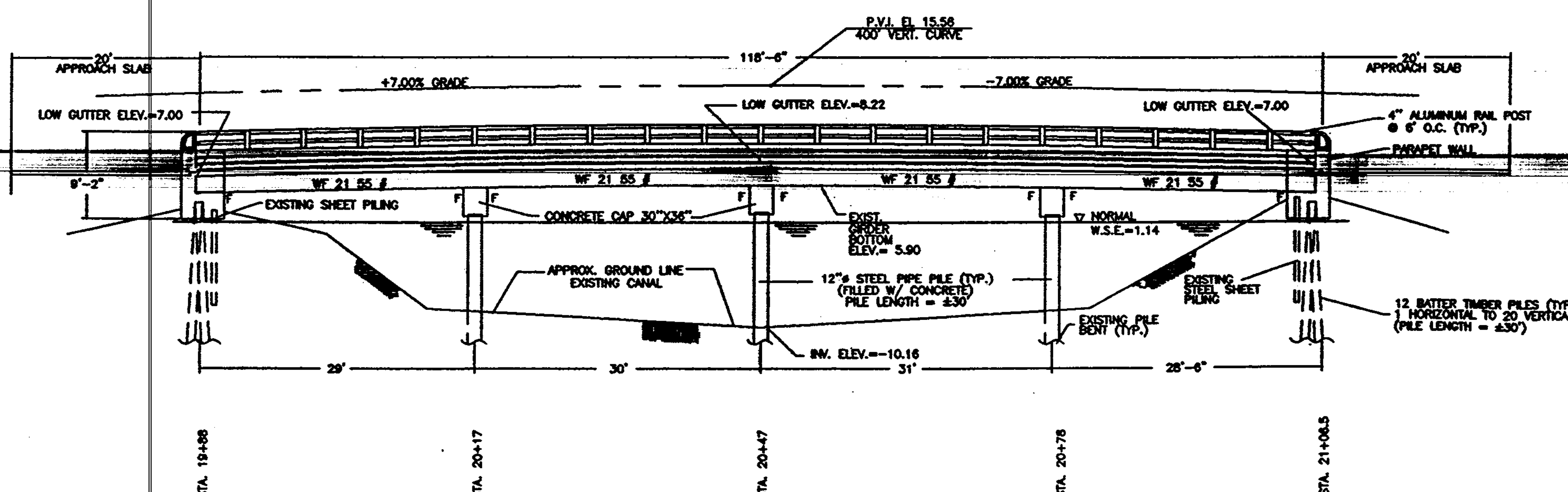
BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-4



EXISTING BRIDGE ELEVATION

FILMORE AVE. BRIDGE



EXISTING BRIDGE ELEVATION

MIRABEAU AVE. BRIDGE

9362-25.DWG

project no. 9362
drawn MMD
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date 7-3-97
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MEYER ENGINEERS, LTD.
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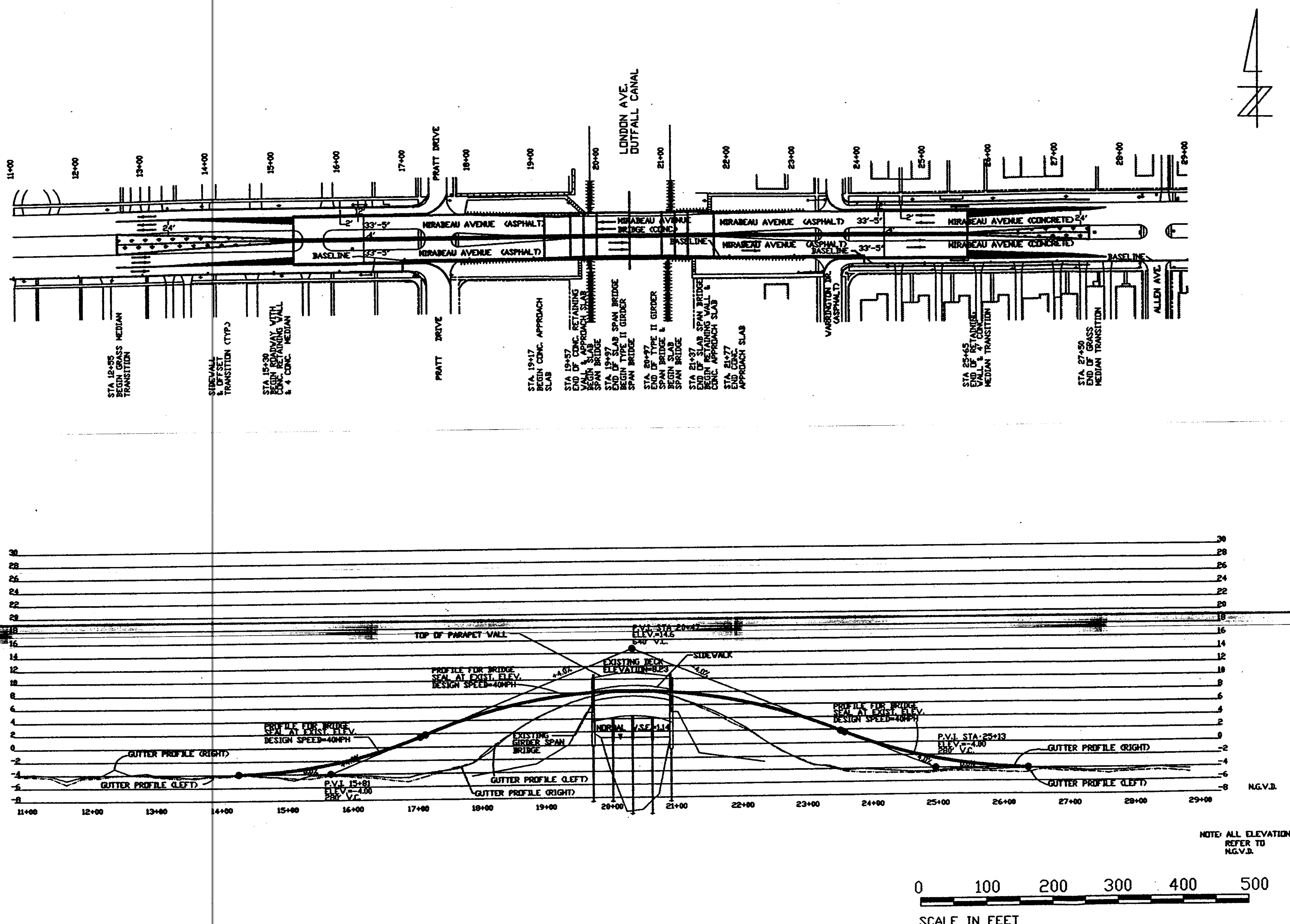
MIRABEAU AVE. & FILMORE AVE. - EXISTING BRIDGE ELEVATIONS

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-5



9362-11A.DWG

project no. 9362
drawn OY
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date 7-3-97
revised

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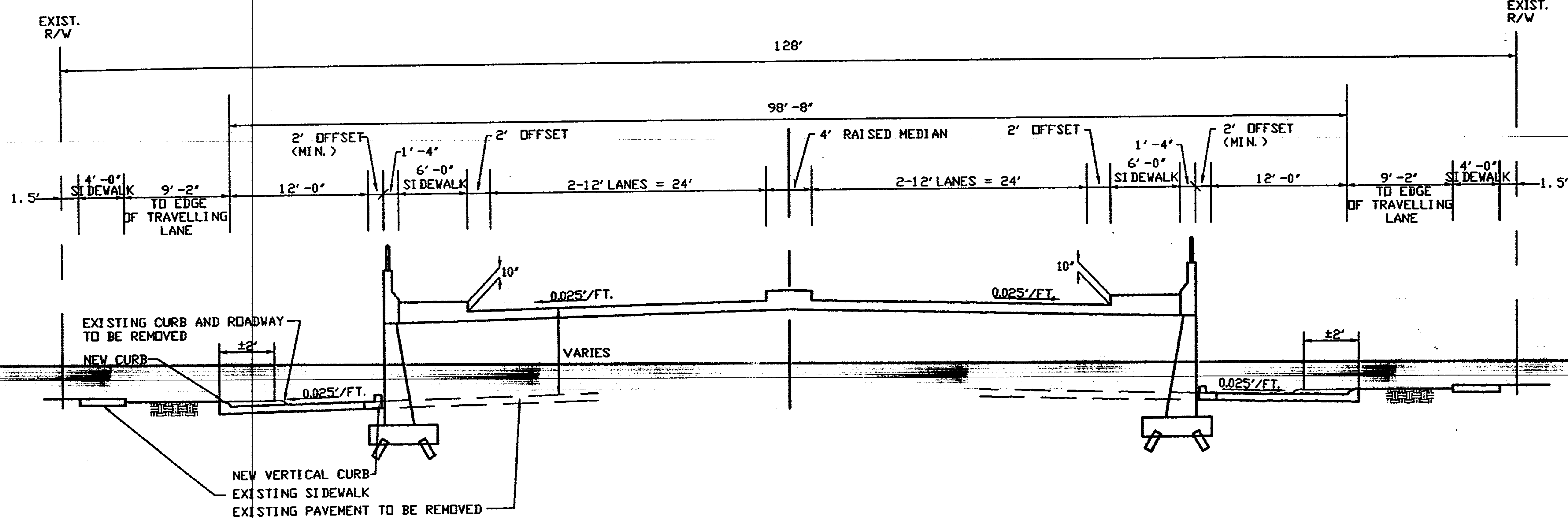
MIRABEAU AVE. SEALED BRIDGE - PLAN AND PROFILE (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1A



MIRABEAU AVENUE SEALED BRIDGE (40 MPH)

NEW ROADWAY SECTION AT RETAINING WALL

N.T.S.

PLOT AT 1=10
9362-31B.DWG

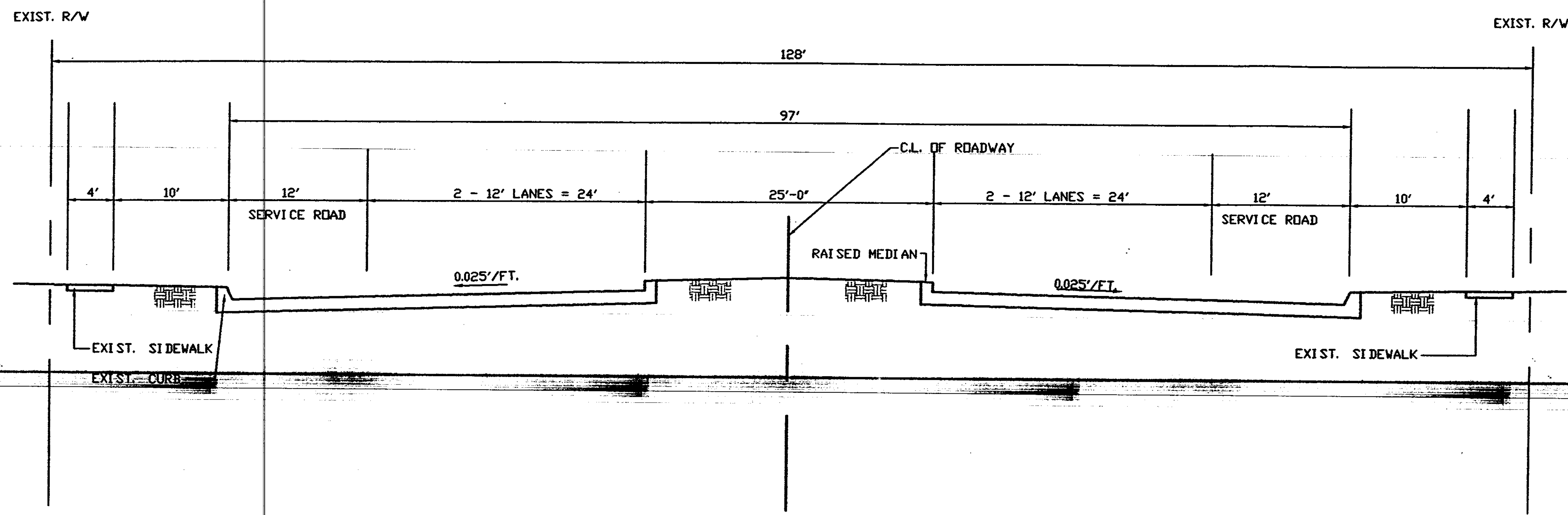
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - ROADWAY SECTION (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1B



MIRABEAU AVENUE SEALED BRIDGE (40 MPH)

NEW ROADWAY SECTION AT TRANSITION

N.T.S.

PLOT AT 1=10
9362-31C.DWG

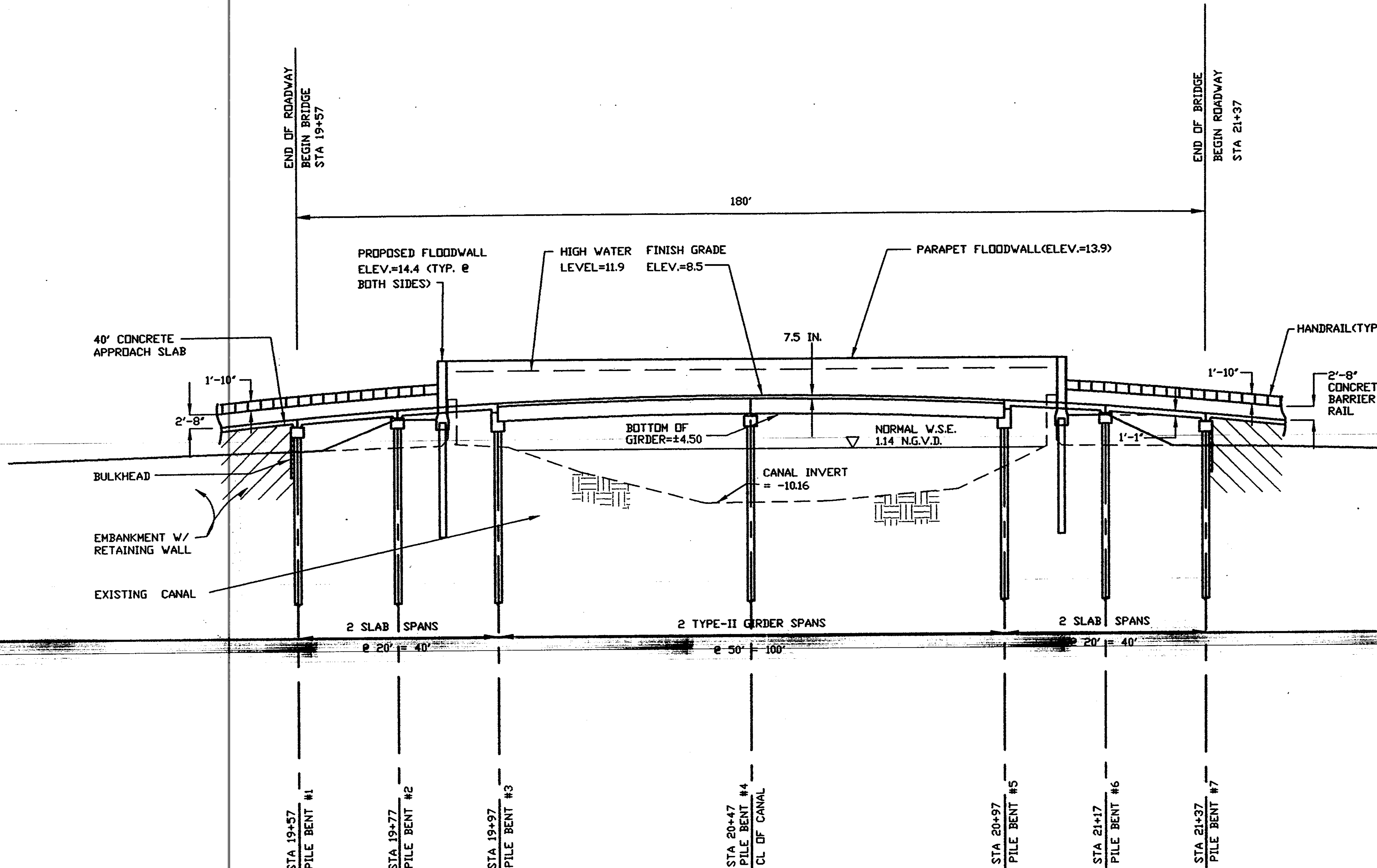
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - ROADWAY SECTION (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1C



MIRABEAU AVENUE SEALED BRIDGE (40 MPH)
NEW BRIDGE SECTION AT CANAL
N.T.S.

ALL ELEVATIONS REFER TO N.G.V.D.

PLOT AT 1=20
9362-31D.DWG

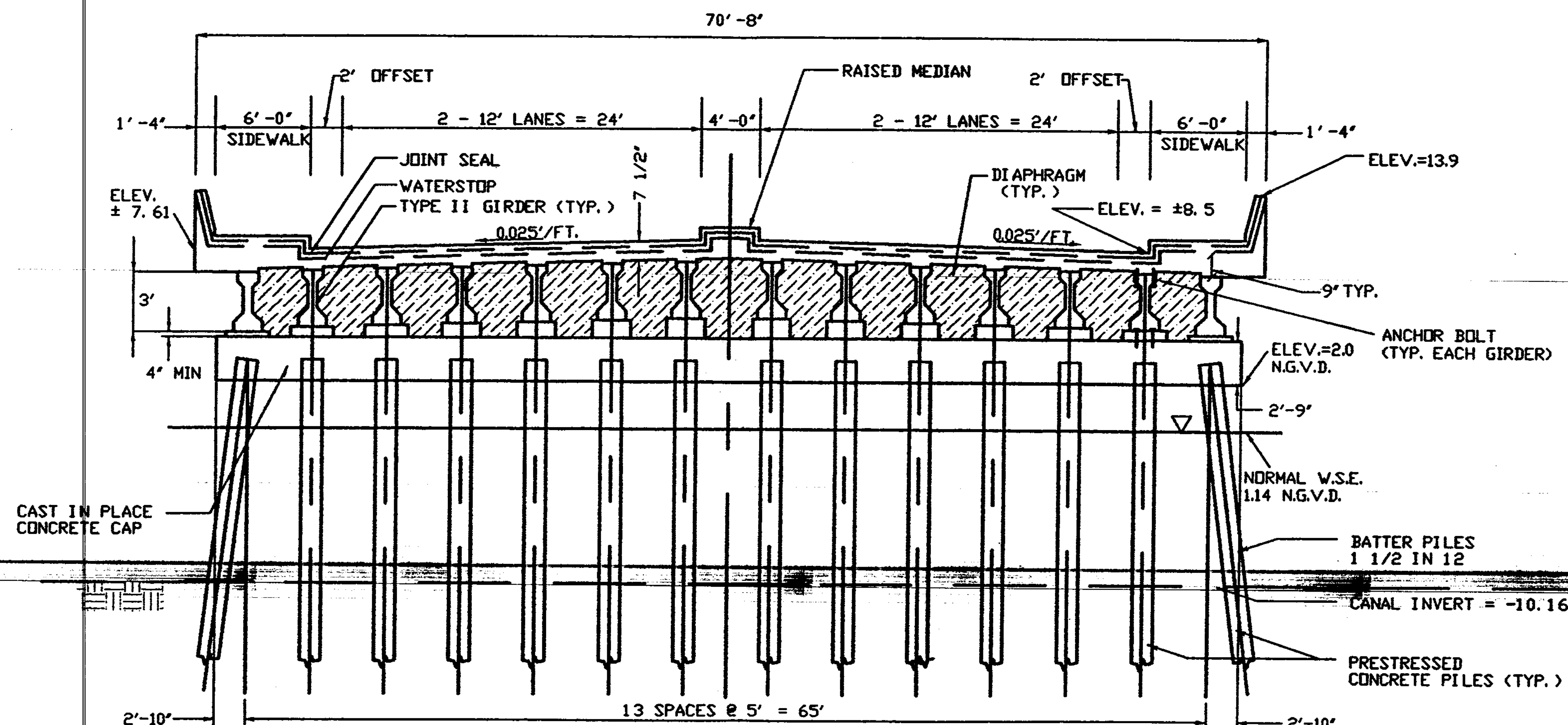
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE SECTION AT CANAL (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1D



ALL ELEVATIONS REFER TO N. G. V. D.

MIRABEAU AVENUE SEALED BRIDGE (40 MPH)

NEW BRIDGE SECTION AT TYPE II GIRDER SPAN

N.T.S.

PLOT AT 1=10
9362-31E.DWG

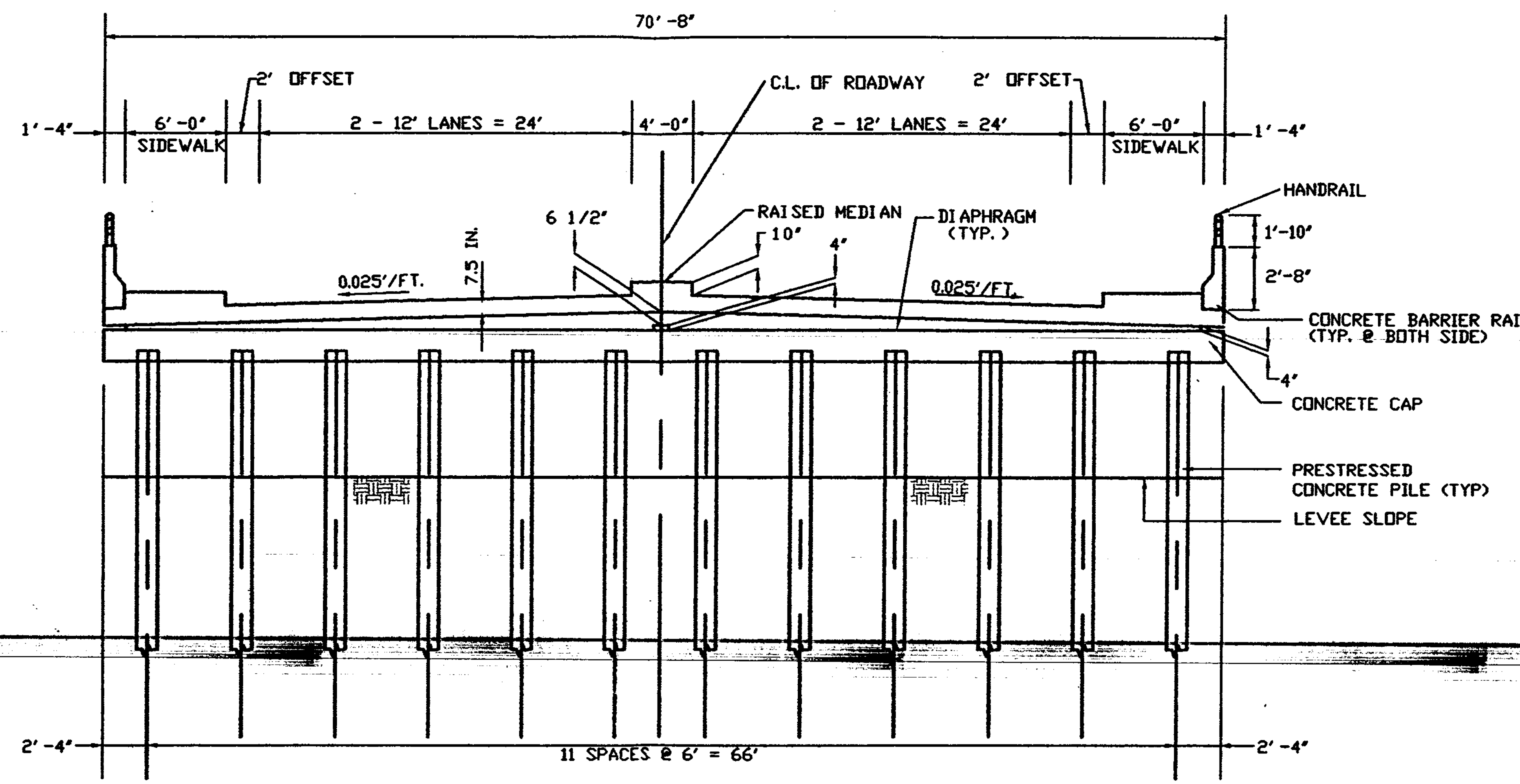
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVE. SEALED BRIDGE - SECTION AT GIRDER SPAN (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
II-1E



MIRABEAU AVENUE SEALED BRIDGE (40 MPH)

NEW BRIDGE SECTION AT SLAB SPAN

N. T. S.

PLOT AT 1=10
9362-31F.DWG

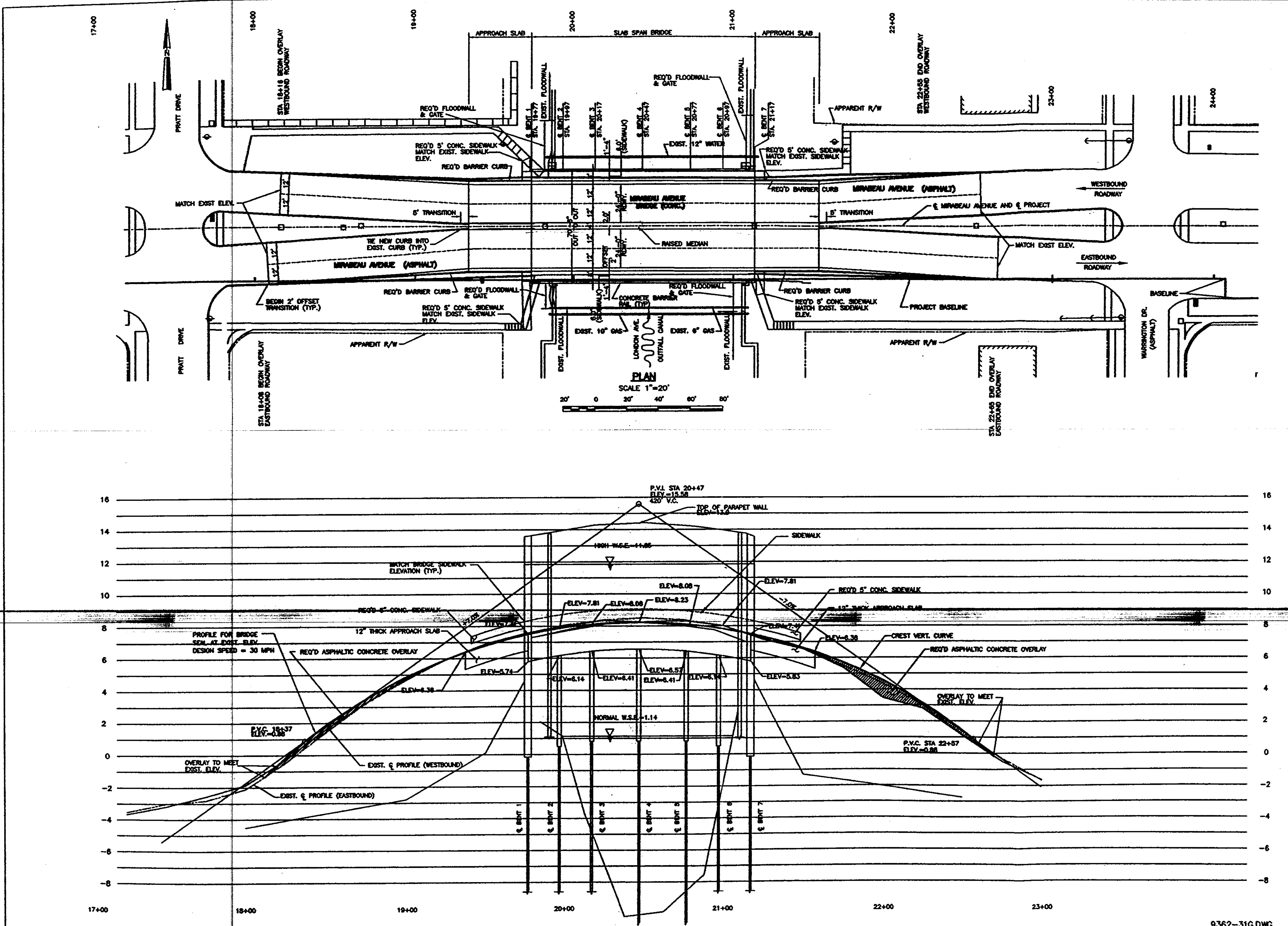
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVE. SEALED BRIDGE SECTION AT SLAB SPAN (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-F



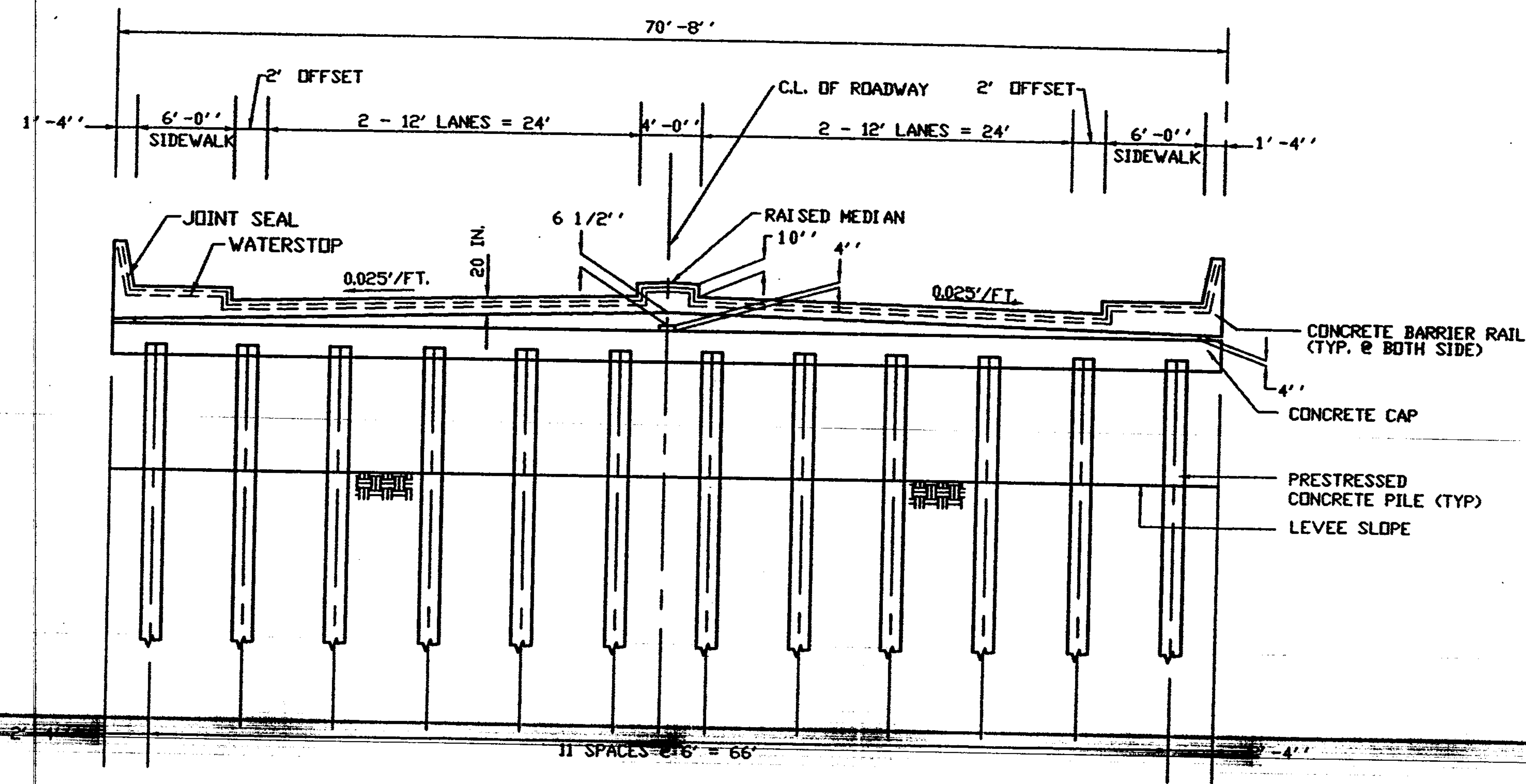
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - PLAN AND PROFILE (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1G



MIRABEAU AVENUE SEALED BRIDGE (30 MPH)
NEW ROADWAY CROSS SECTION - SLAB SPAN

SCALE 1'' = 10'

project no. 9362
drawn MMQ
checked AMT
date 7-3-97
revised

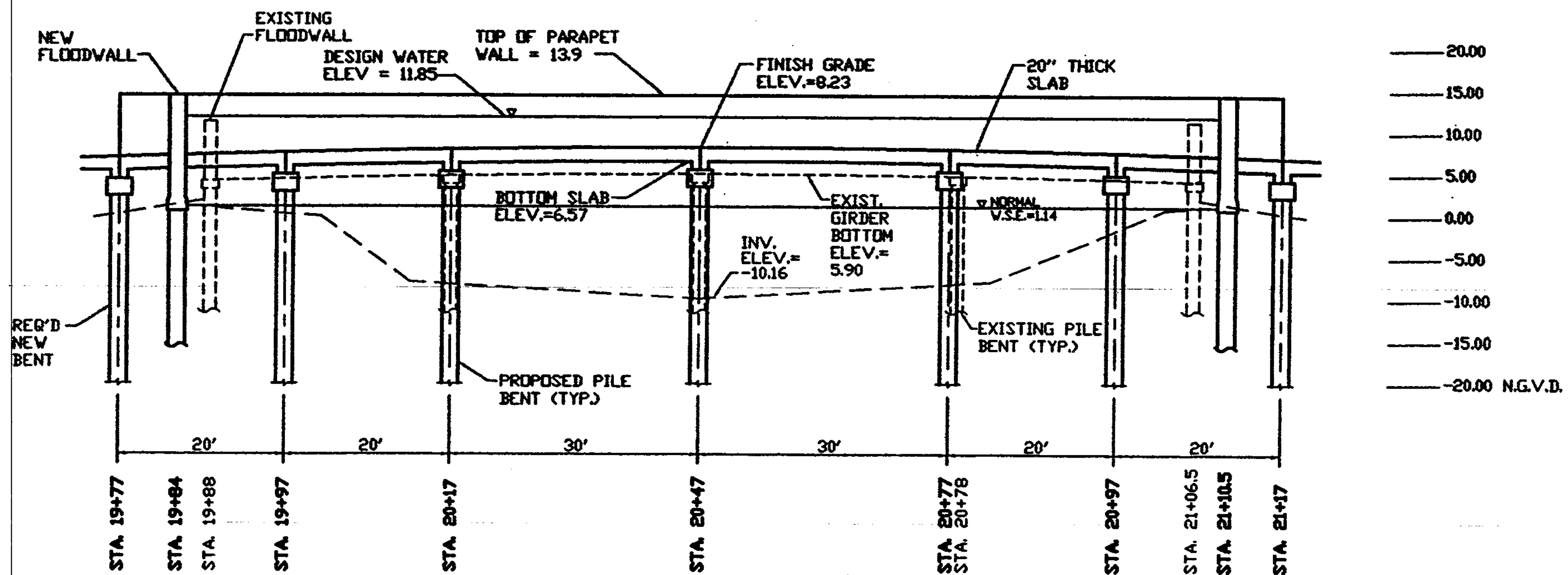
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - ROADWAY SECTION (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-1H

9362-31H.DWG



MIRABEAU AVENUE SEALED BRIDGE (30 MPH)
NEW BRIDGE SECTION AT CANAL - SLAB SPAN

SCALE 1"=20'

9362-311.DWG

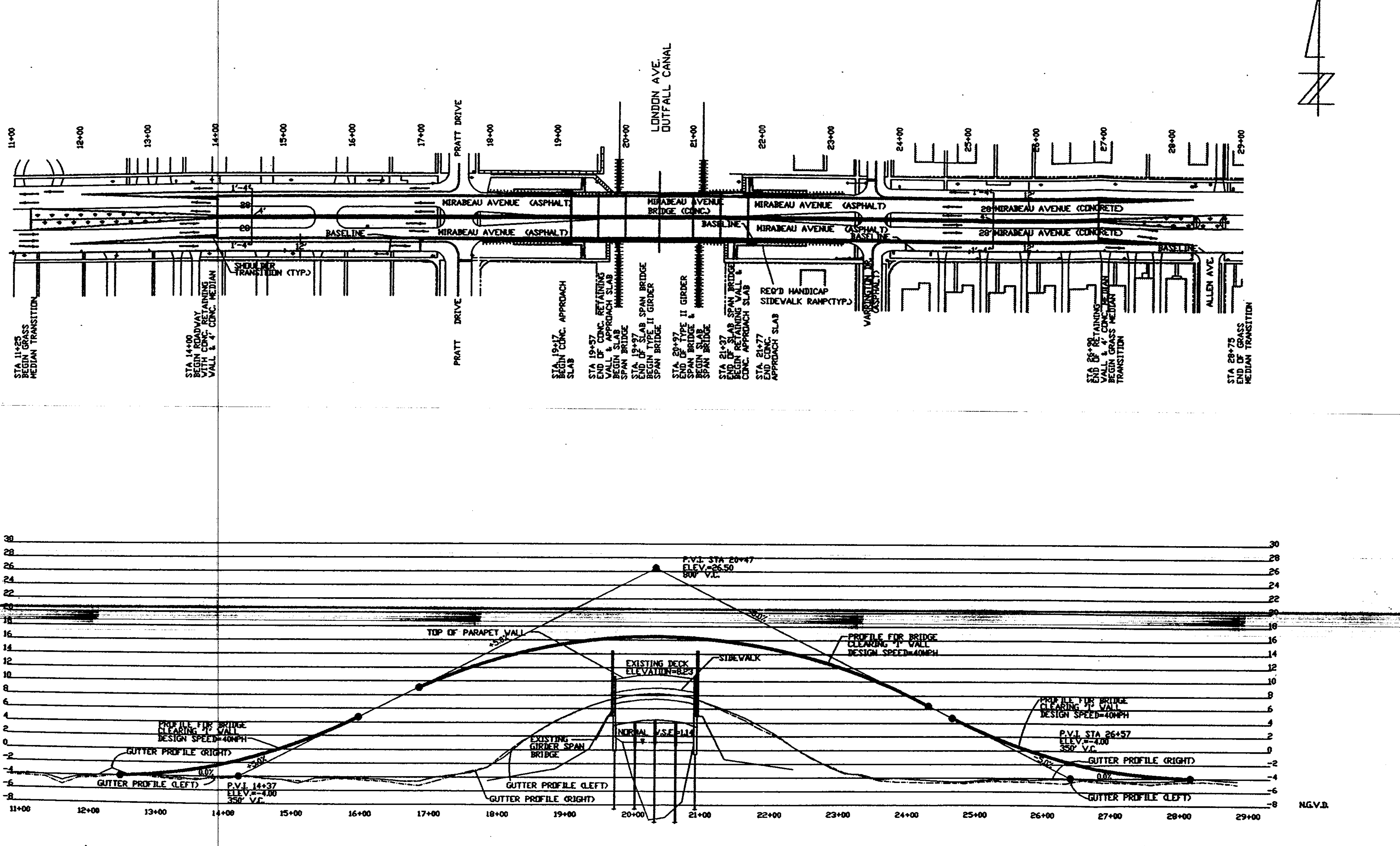
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE AT CANAL (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

project no. 9362
drawn MAO
checked AMT
date 7-3-97
revised

plate no.
II-1



NOTE: ALL ELEVATIONS REFER TO N.G.V.D.

0 100 200 300 400 500

SCALE IN FEET

9362-11A.DWG

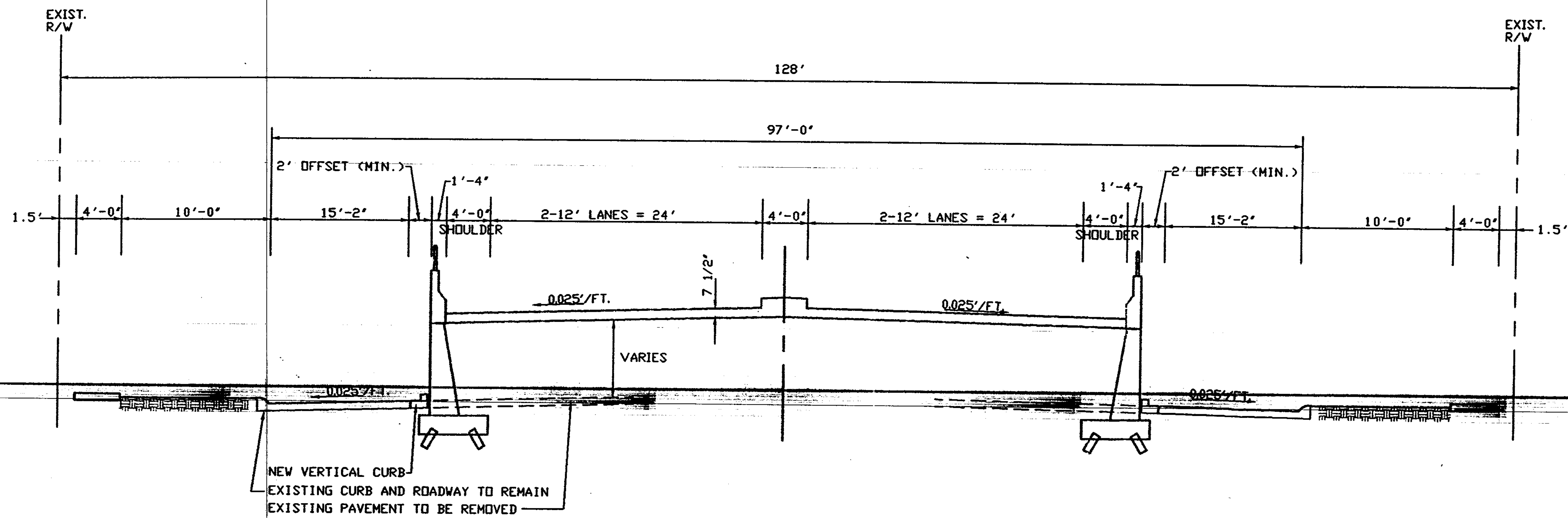
project no. 9362
drawn GY
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE RAISED BRIDGE - PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2A



MIRABEAU AVENUE RAISED BRIDGE

NEW ROADWAY SECTION AT RETAINING WALL

N.T.S.

PLOT AT 1=10
9362-32B.DWG

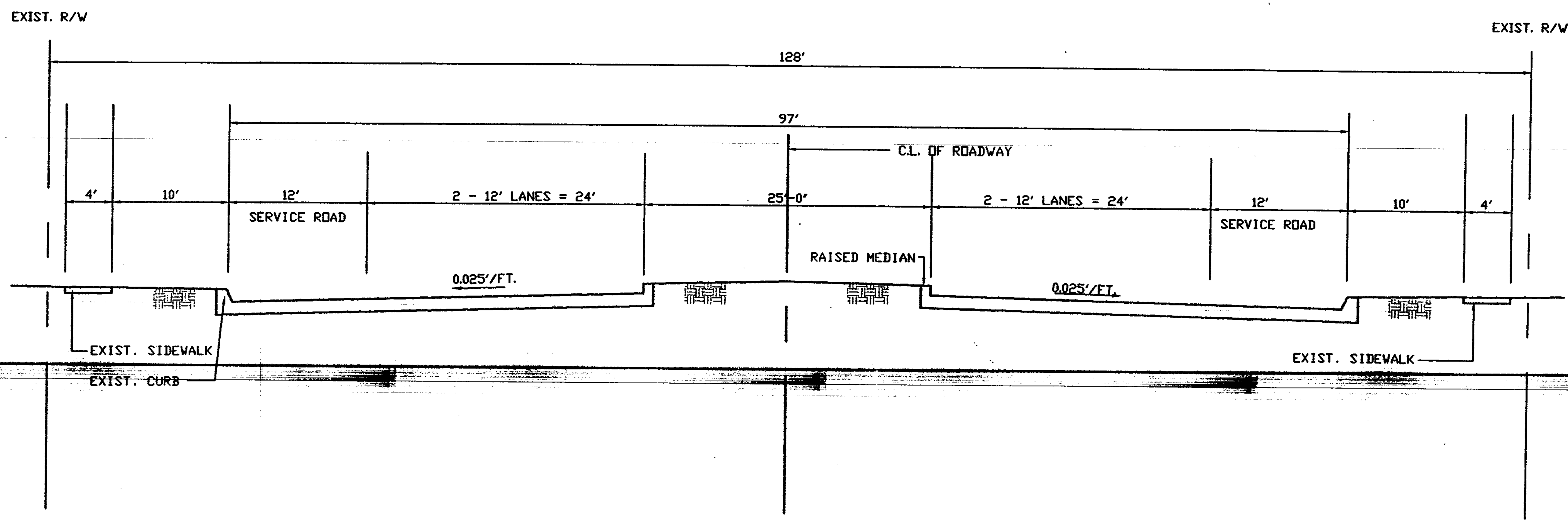
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVE. RAISED BRIDGE - SECTION AT RETAINING WALL

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2B



MIRABEAU AVENUE RAISED BRIDGE

NEW ROADWAY SECTION AT TRANSITION

N.T.S.

PLOT AT 1=10
9362-32C.DWG

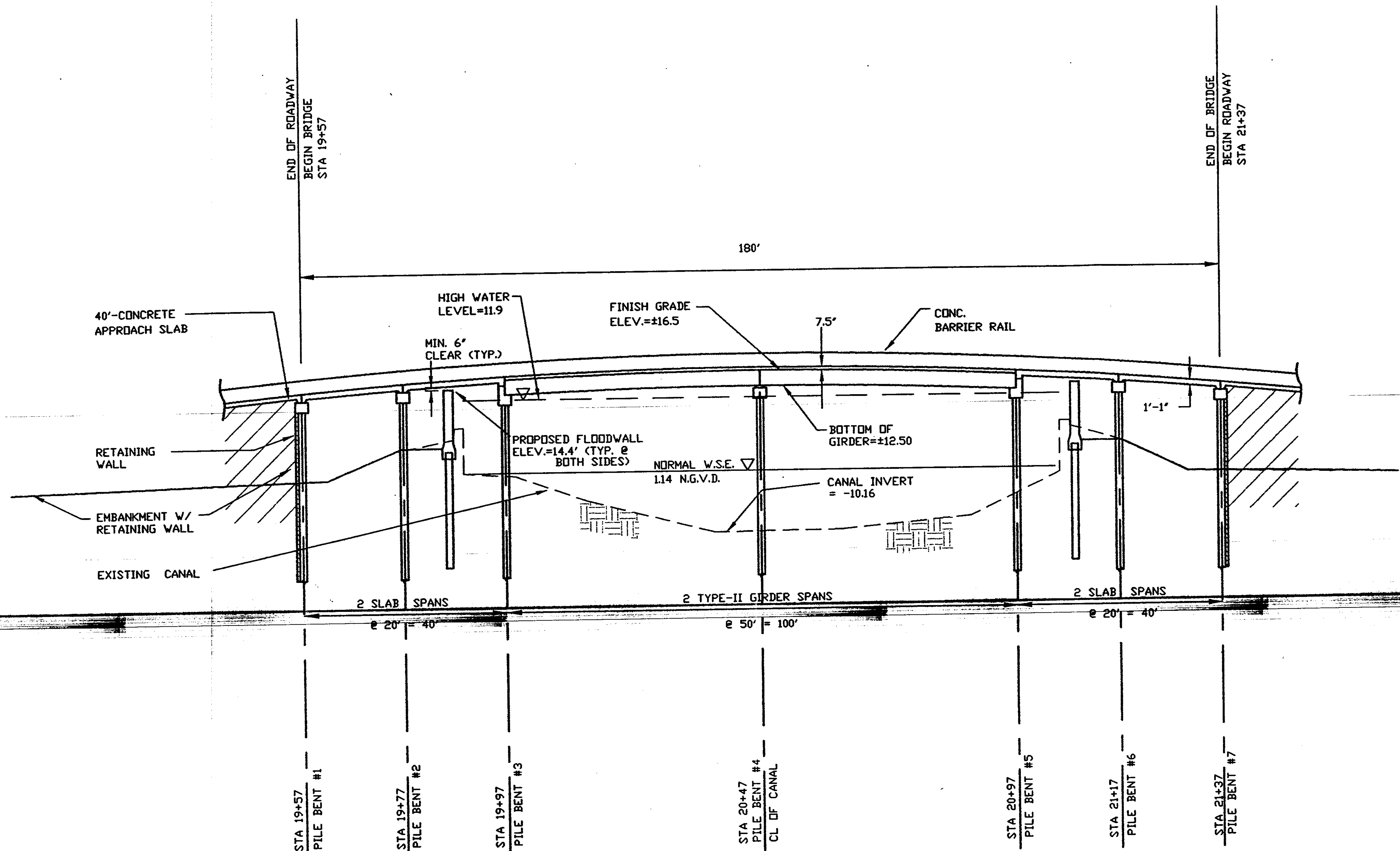
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVE. RAISED BRIDGE - SECTION AT TRANSITION

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2C



MIRABEAU AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT CANAL

N.T.S.

ALL ELEVATIONS REFER TO N.G.V.D.

PLOT AT 1=20
9362-32D.DWG

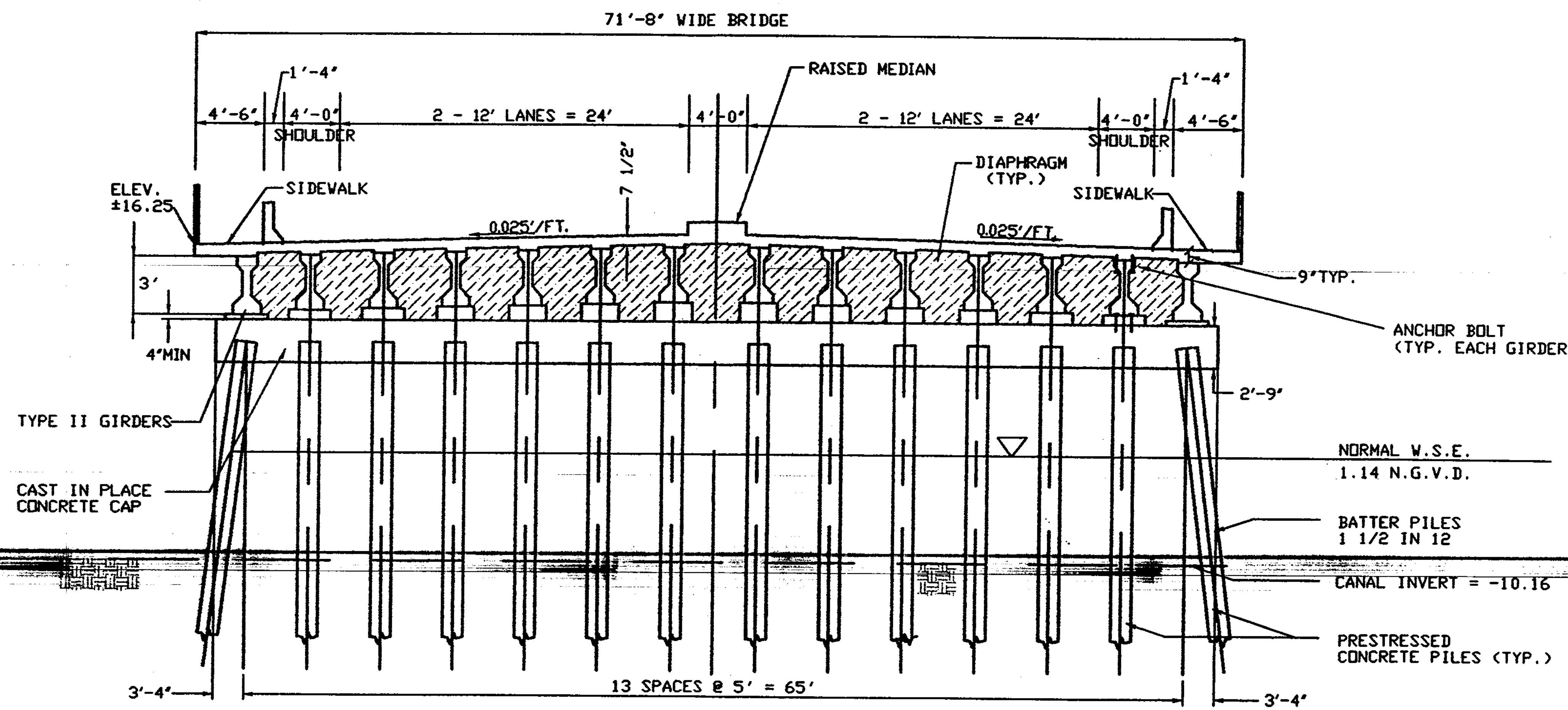
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE RAISED BRIDGE - SECTION AT CANAL

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2D



ALL ELEVATIONS REFER TO N.G.V.D.

MIRABEAU AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT TYPE II GIRDER SPAN

N.T.S.

PLOT AT 1=10
9362-32E.DWG

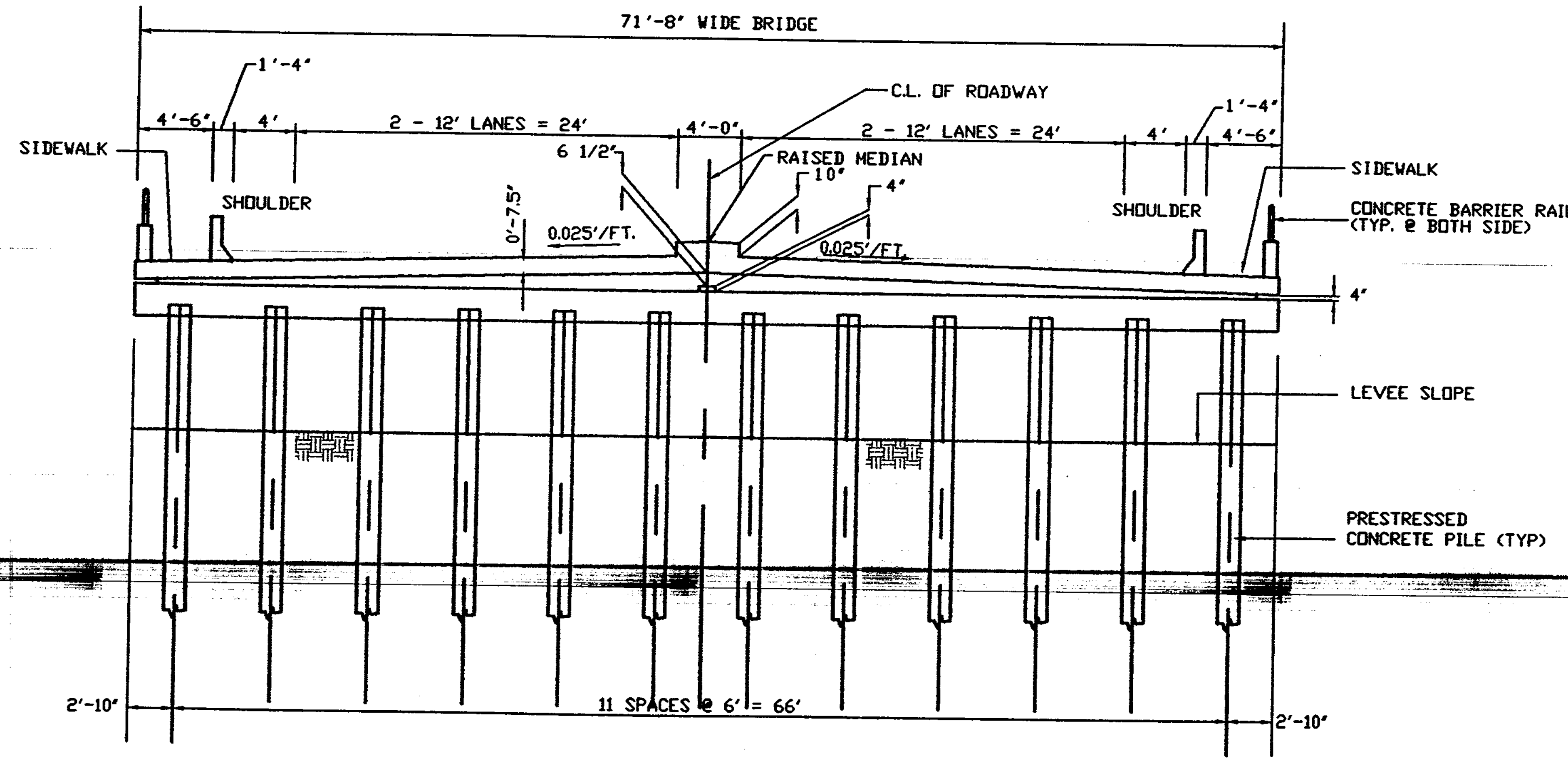
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVE. RAISED BRIDGE - SECTION AT GIRDER SPAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2E



ALL ELEVATIONS REFER TO N.G.V.D.

MIRABEAU AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT SLAB SPAN

N.T.S.

PLOT AT 1=10
9362-32F.DWG

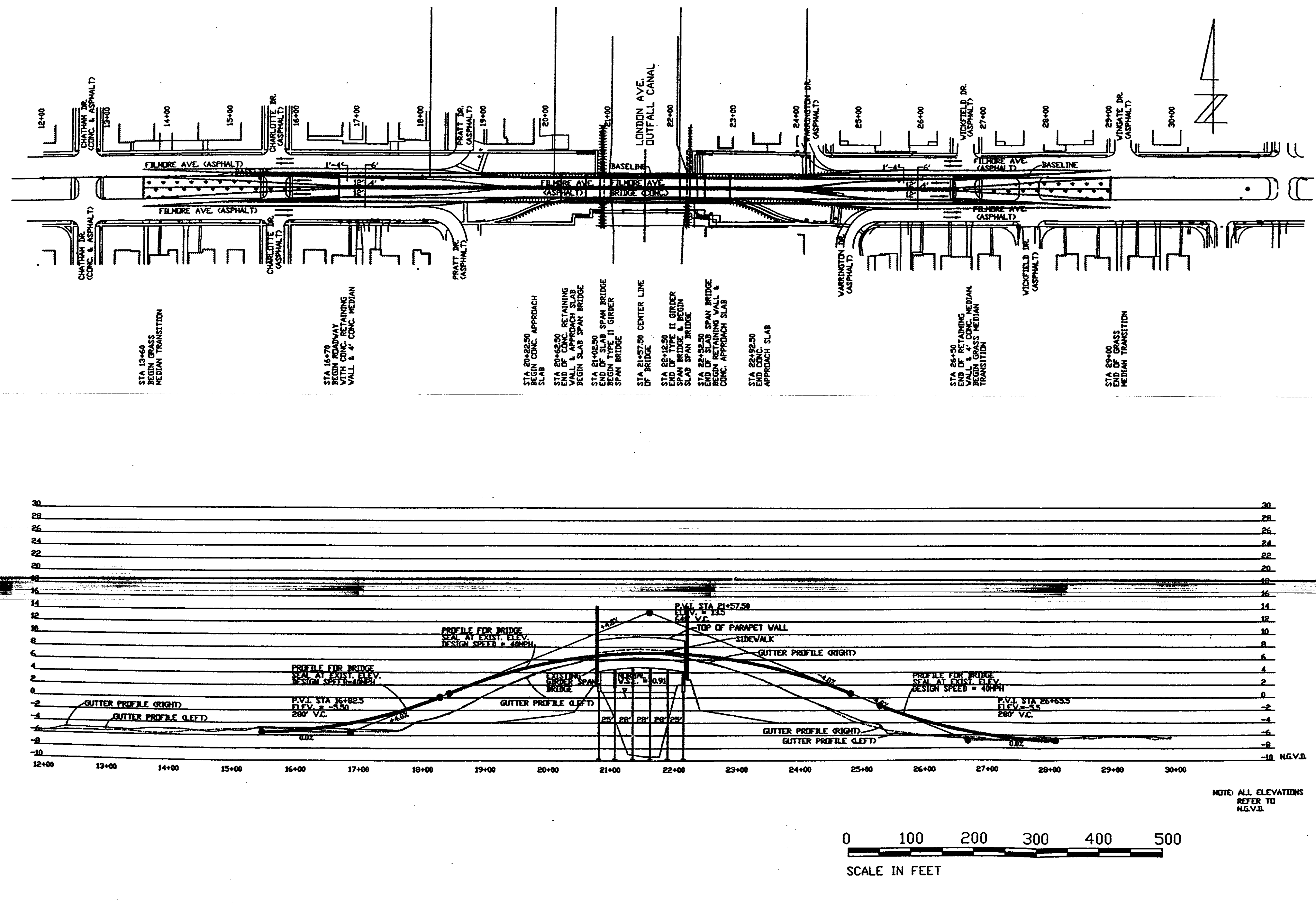
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE RAISED BRIDGE - SECTION AT SLAB SPAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-2F



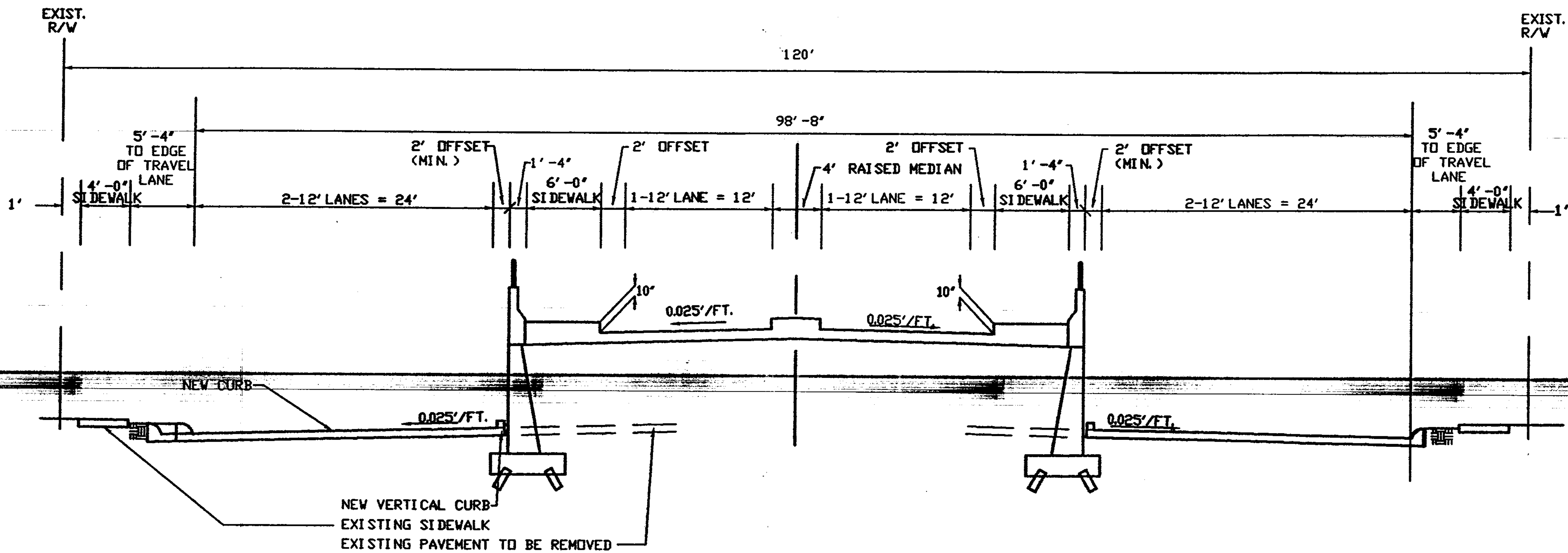
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE - PLAN AND PROFILE (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3A



FILMORE AVENUE SEALED BRIDGE (40 MPH)

NEW ROADWAY SECTION AT RETAINING WALL

N.T.S.

PLOT AT 1=10
9362-33B.DWG

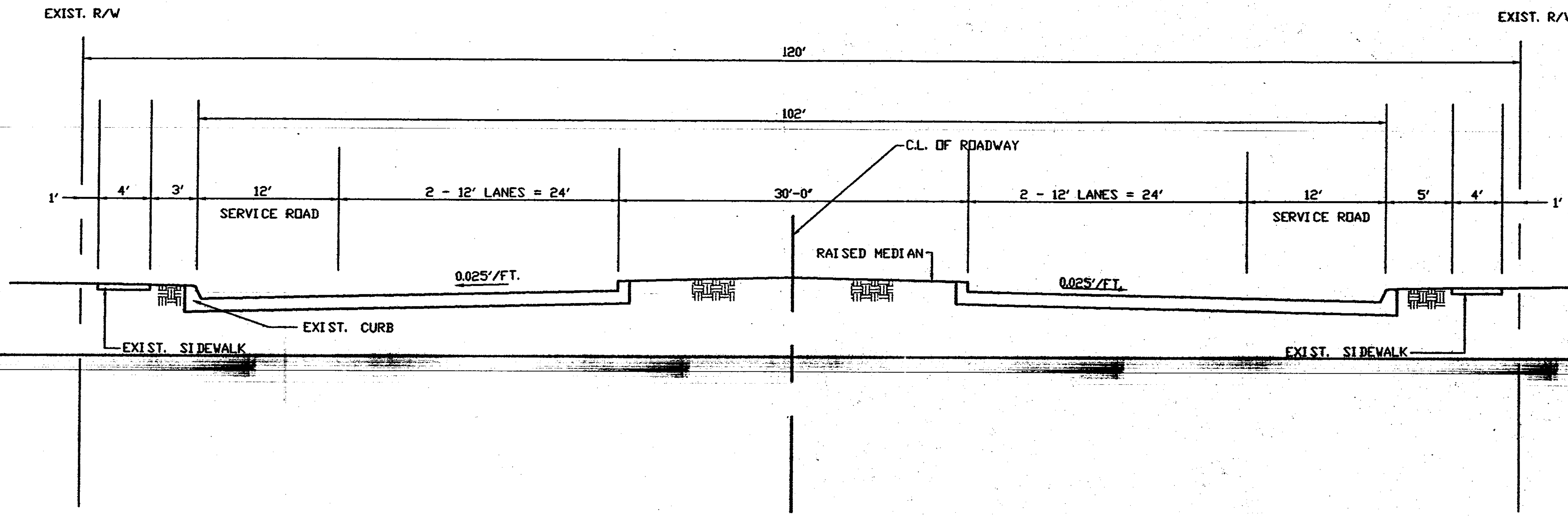
project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE - ROADWAY SECTION (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3B



FILMORE AVENUE SEALED BRIDGE (40 MPH)

NEW ROADWAY SECTION AT TRANSITION

N.T.S.

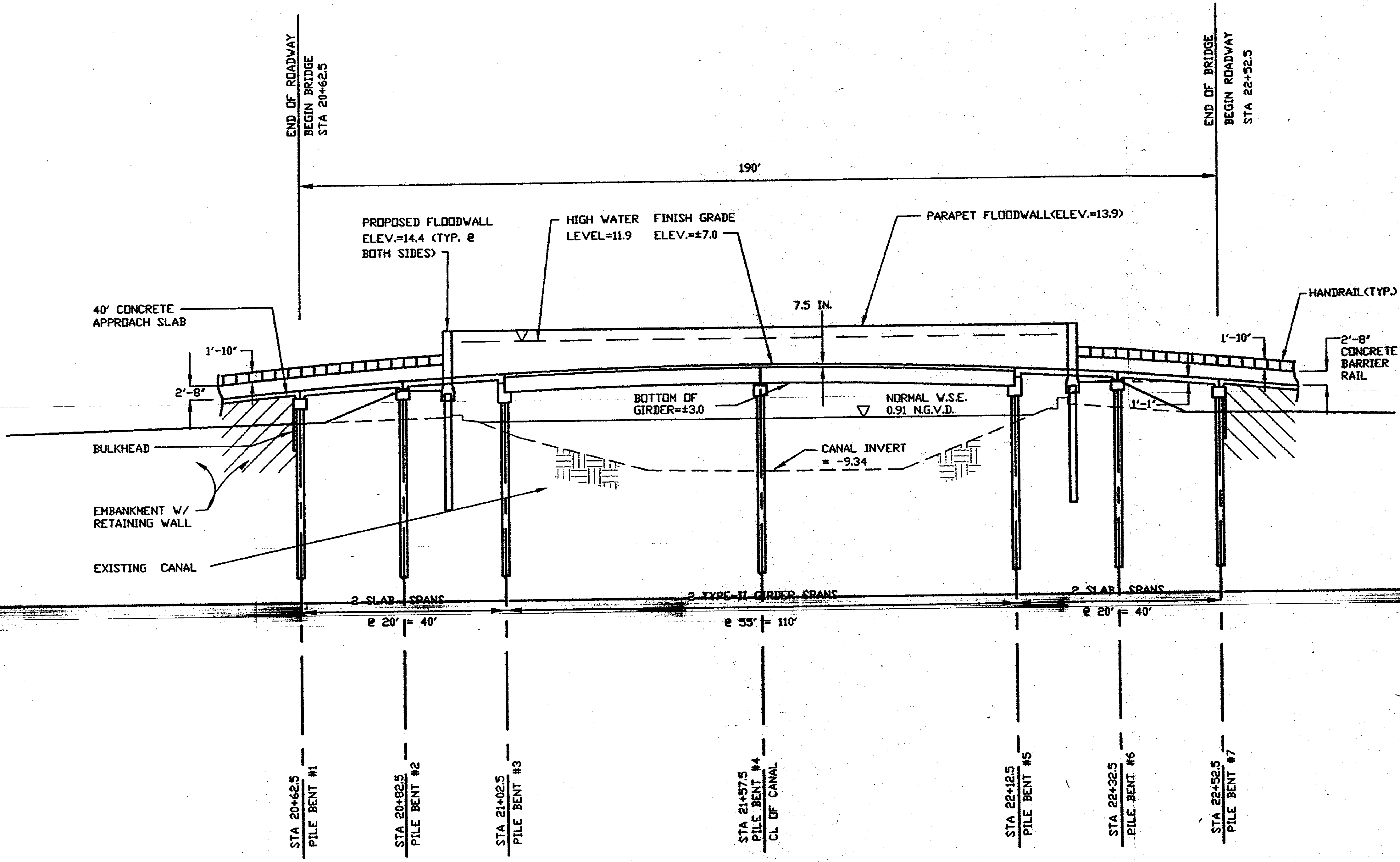
PLOT AT 1=10
9362-33C.DWG

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE - ROADWAY SECTION (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
-3C



FILMORE AVENUE SEALED BRIDGE (40 MPH)

NEW BRIDGE SECTION AT CANAL

N.T.S.

ALL ELEVATIONS REFER TO N.G.V.D.

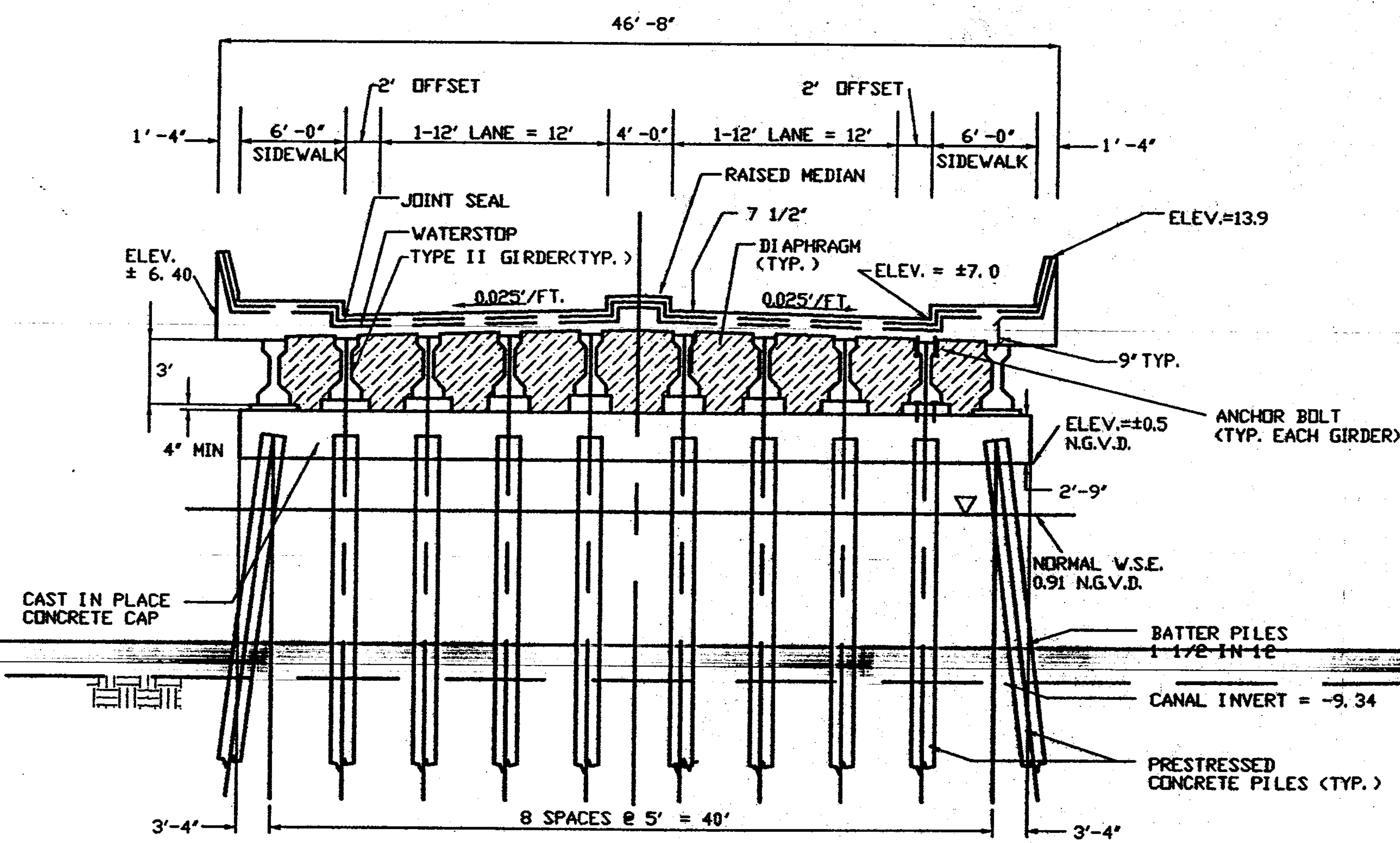
PLOT AT 1=20
9362-330.DWG

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE SECTION AT CANAL (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3D



ALL ELEVATIONS REFER TO N. G. V. D.

FILMORE AVENUE SEALED BRIDGE (40 MPH)

NEW BRIDGE SECTION AT TYPE II GIRDER SPAN

N.T.S.

project no. 9362
drawn MMD
checked AMT
date 7-3-97
revised

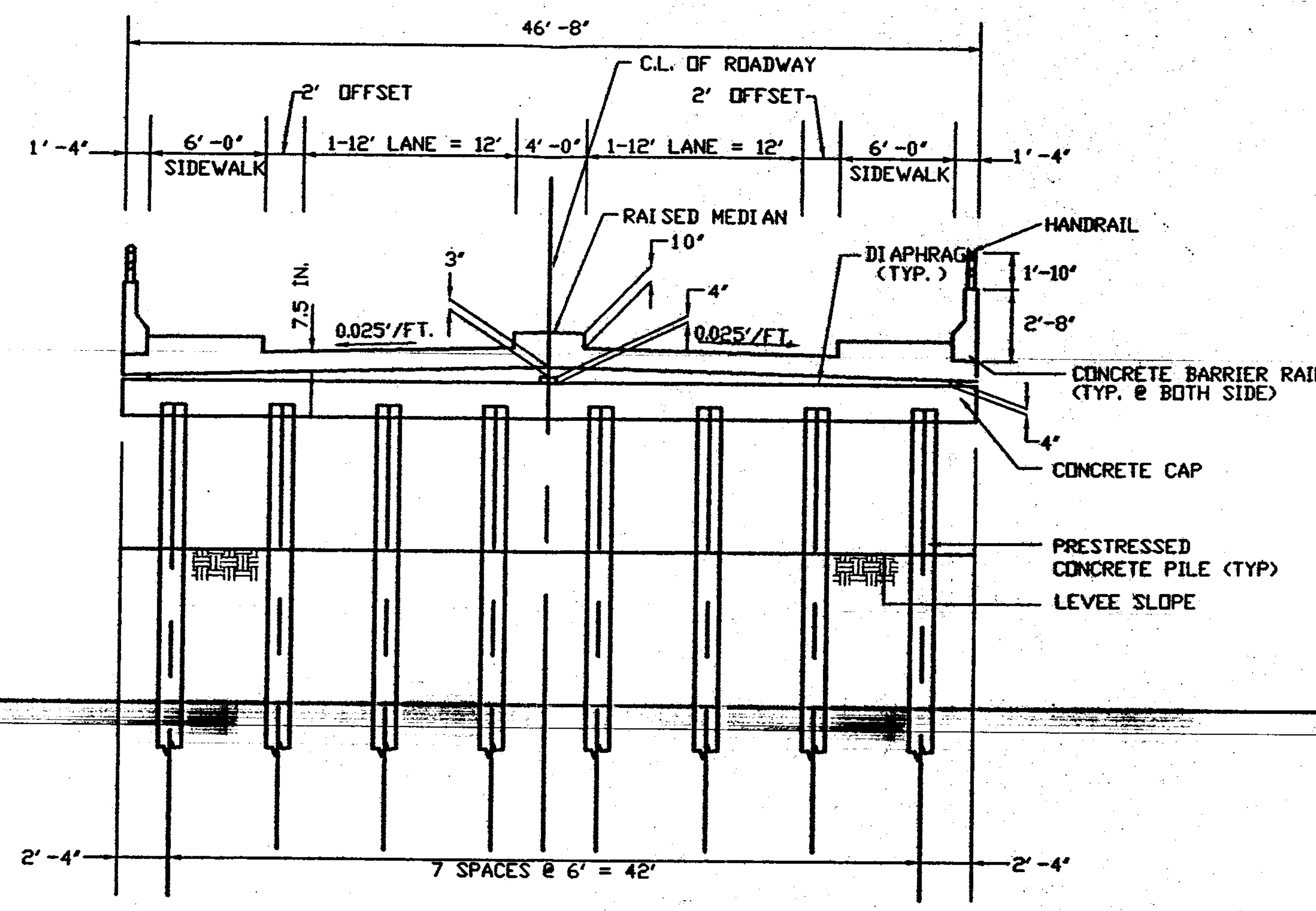
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVE. SEALED BRIDGE - SECTION AT GIRDER SPAN (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3E

PLOT AT 1=10
9362-33E.DWG



FILMORE AVENUE SEALED BRIDGE (40 MPH)

NEW BRIDGE SECTION AT SLAB SPAN

N. T. S.

PLOT AT 1=10
9362-33F.DWG

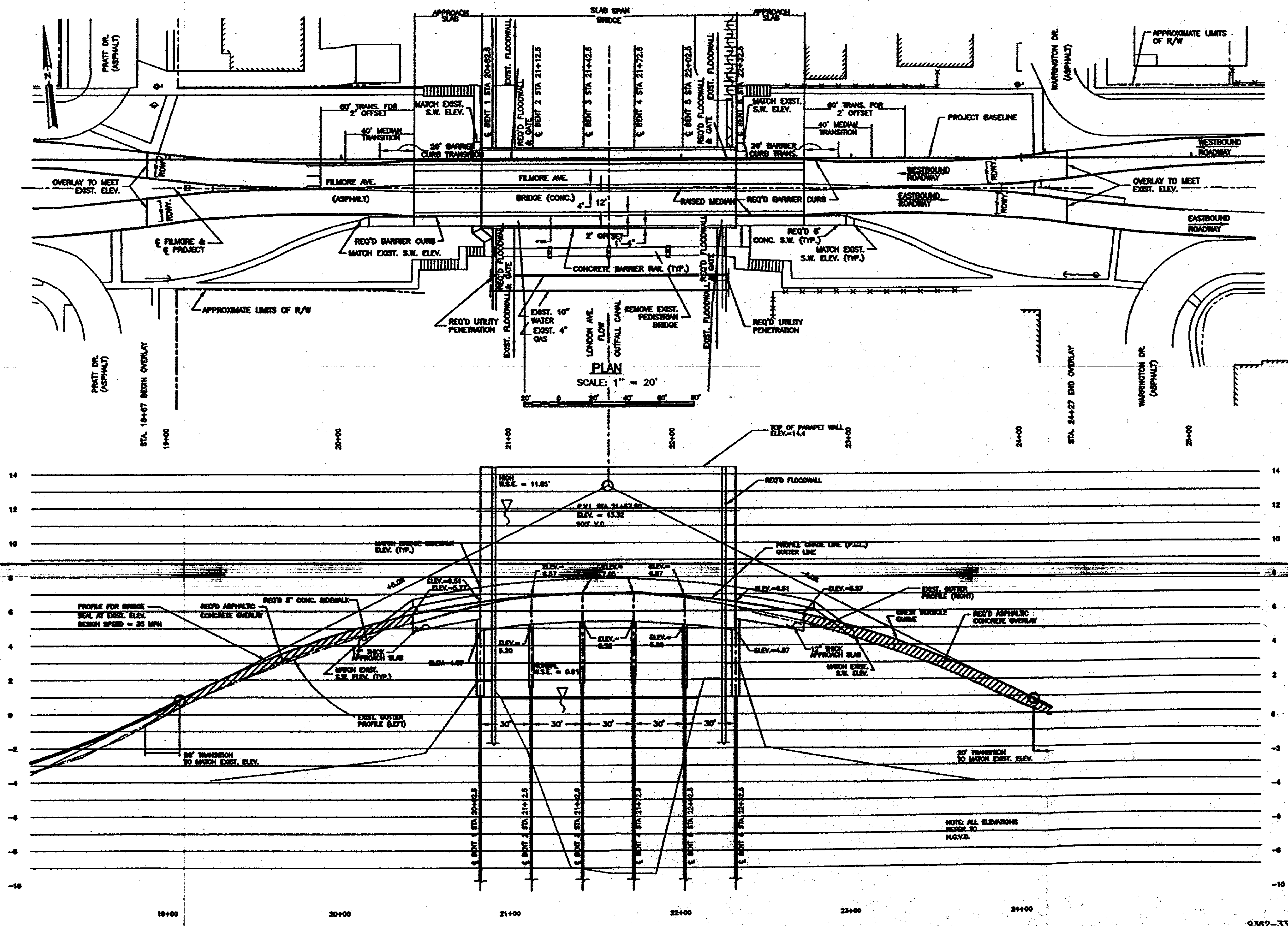
project no. 9362
drawn MMO
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVE. SEALED BRIDGE SECTION AT SLAB SPAN (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3F



9362-33G.DWG

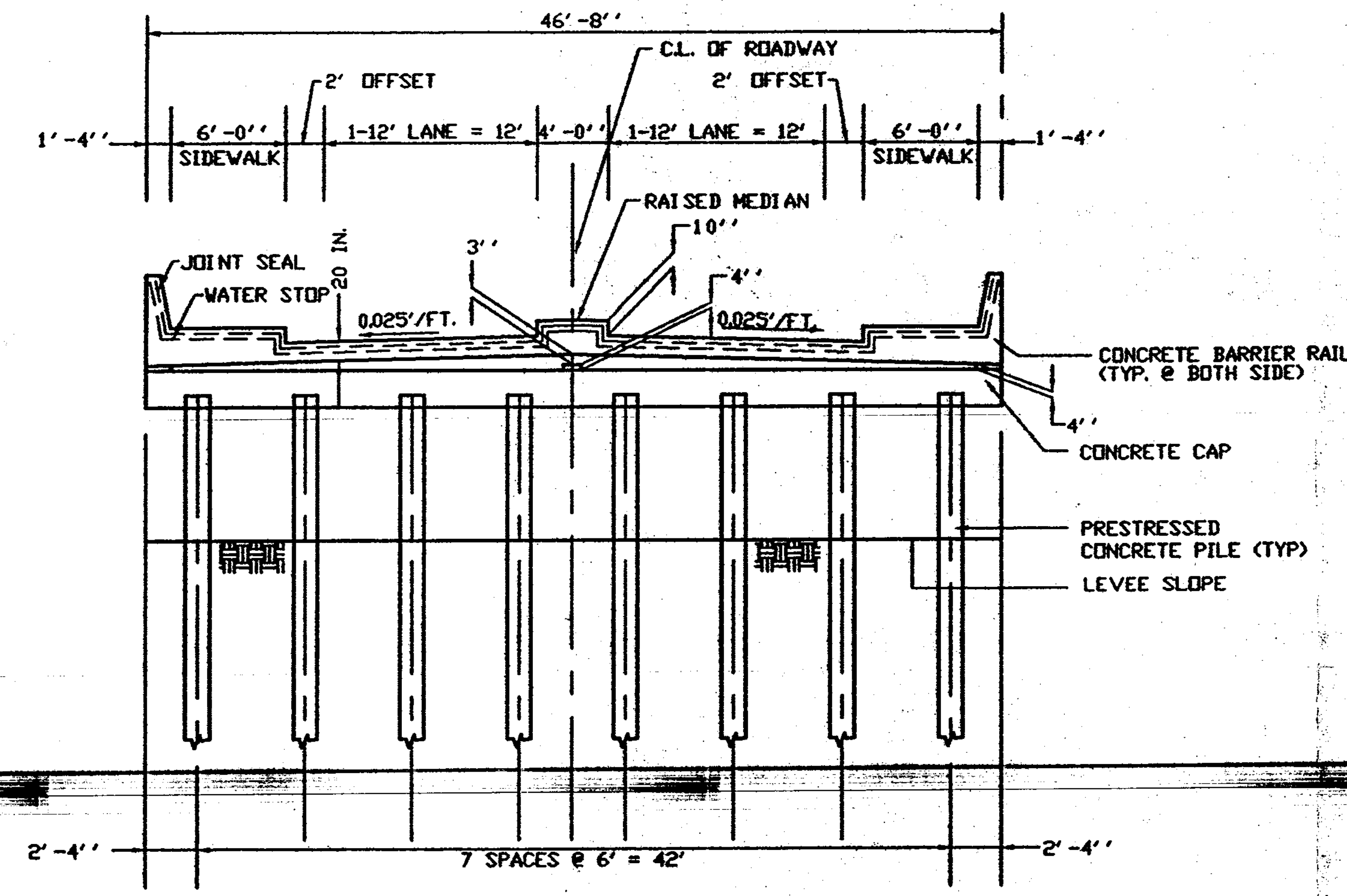
project no. 9362
drawn MMO
checked ANT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE - PLAN AND PROFILE (35 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3G



FILMORE AVENUE SEALED BRIDGE (35 MPH)
NEW ROADWAY CROSS SECTION - SLAB SPAN

SCALE 1''=10'

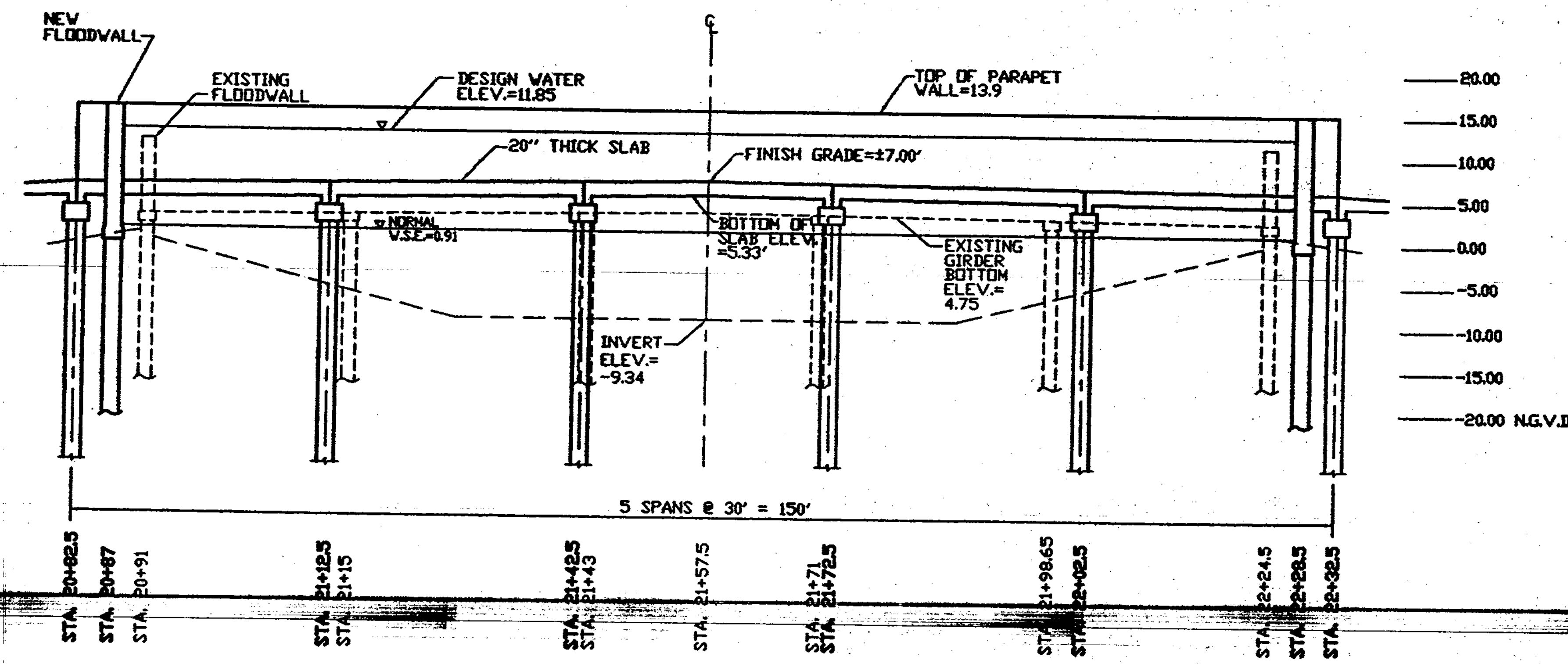
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - ROADWAY SECTION (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-3H

9362-33H.DWG



FILMORE AVENUE SEALED BRIDGE (35 MPH)
CANAL CROSS SECTION - SLAB SPAN

SCALE 1'=20'

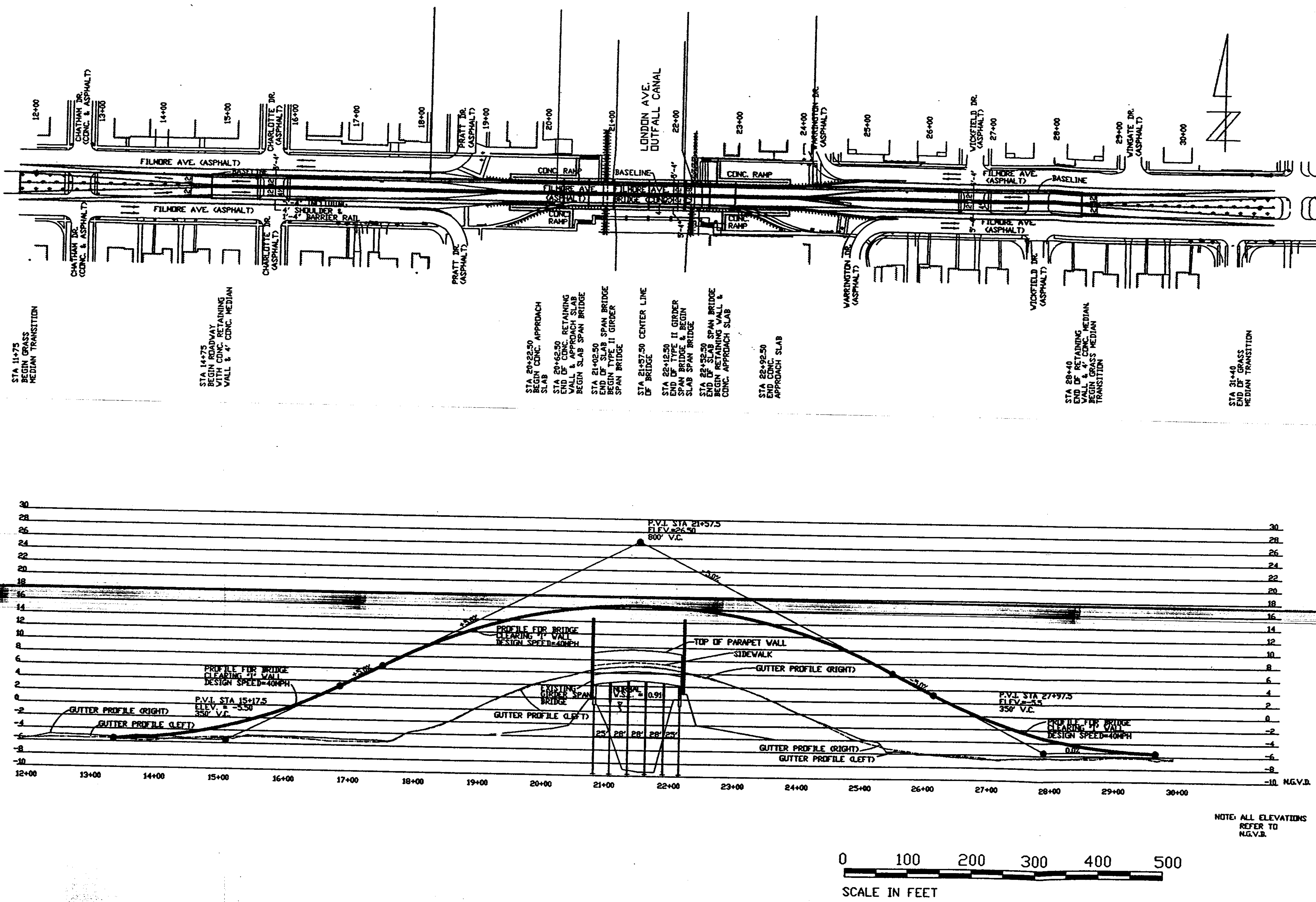
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE AT CANAL (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no. III-31

9362-33I.DWG



project no. 9362
drawn MMD
checked AKT
date 7-3-97
revised

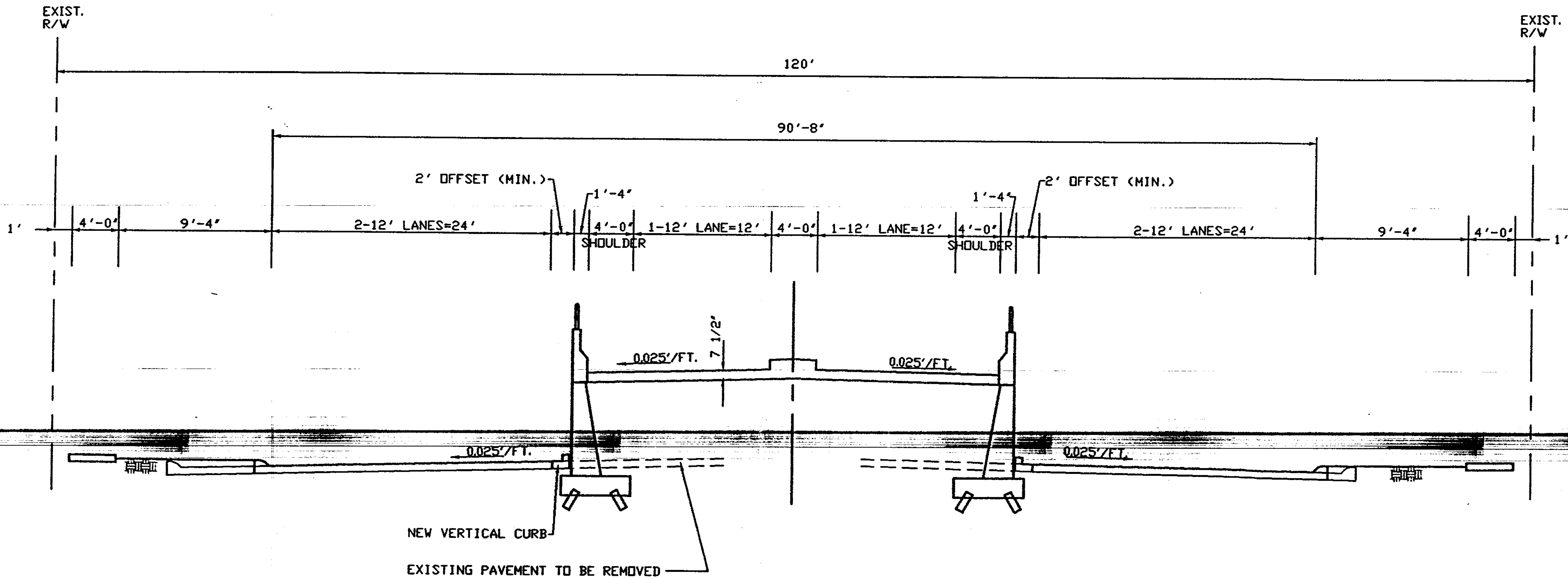
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE RAISED BRIDGE - PLAN AND PROFILE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4A

9362-11B.DWG



FILMORE AVENUE RAISED BRIDGE

NEW ROADWAY SECTION AT RETAINING WALL

N.T.S.

PLOT AT 1=10
9362-34B.DWG

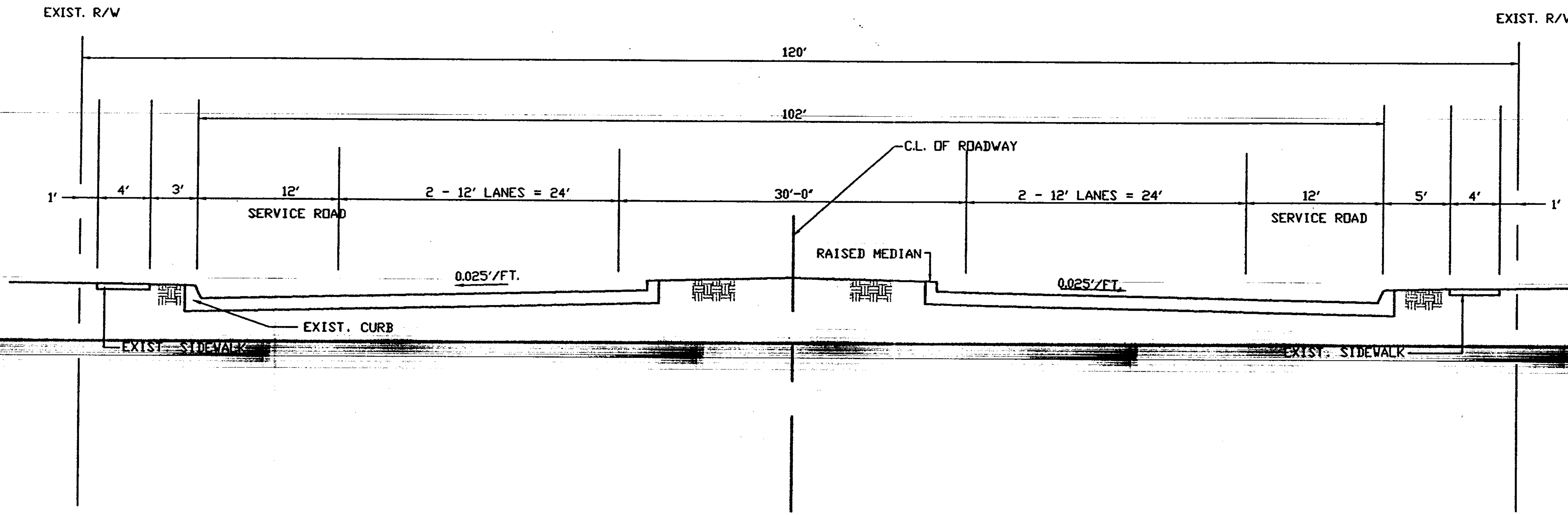
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVE. RAISED BRIDGE - SECTION AT RETAINING WALL

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4B



FILMORE AVENUE RAISED BRIDGE

NEW ROADWAY SECTION AT TRANSITION

N.T.S.

PLOT AT 1=10
9362-34C.DWG

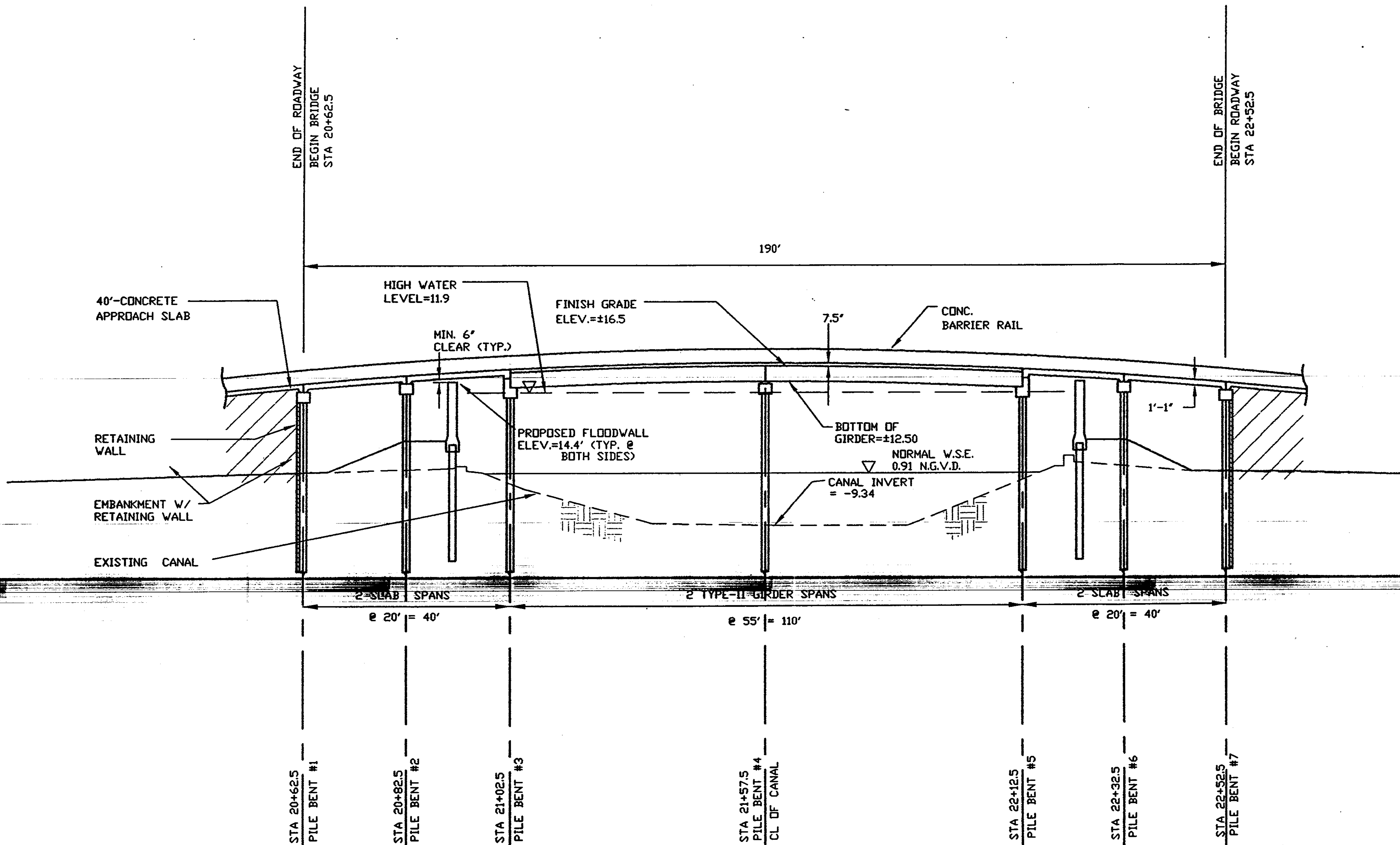
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE RAISED BRIDGE - ROADWAY SECTION

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4C



FILMORE AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT CANAL

N.T.S.

ALL ELEVATIONS REFER TO N.G.V.D.

PLOT AT 1=20
9362-34D.DWG

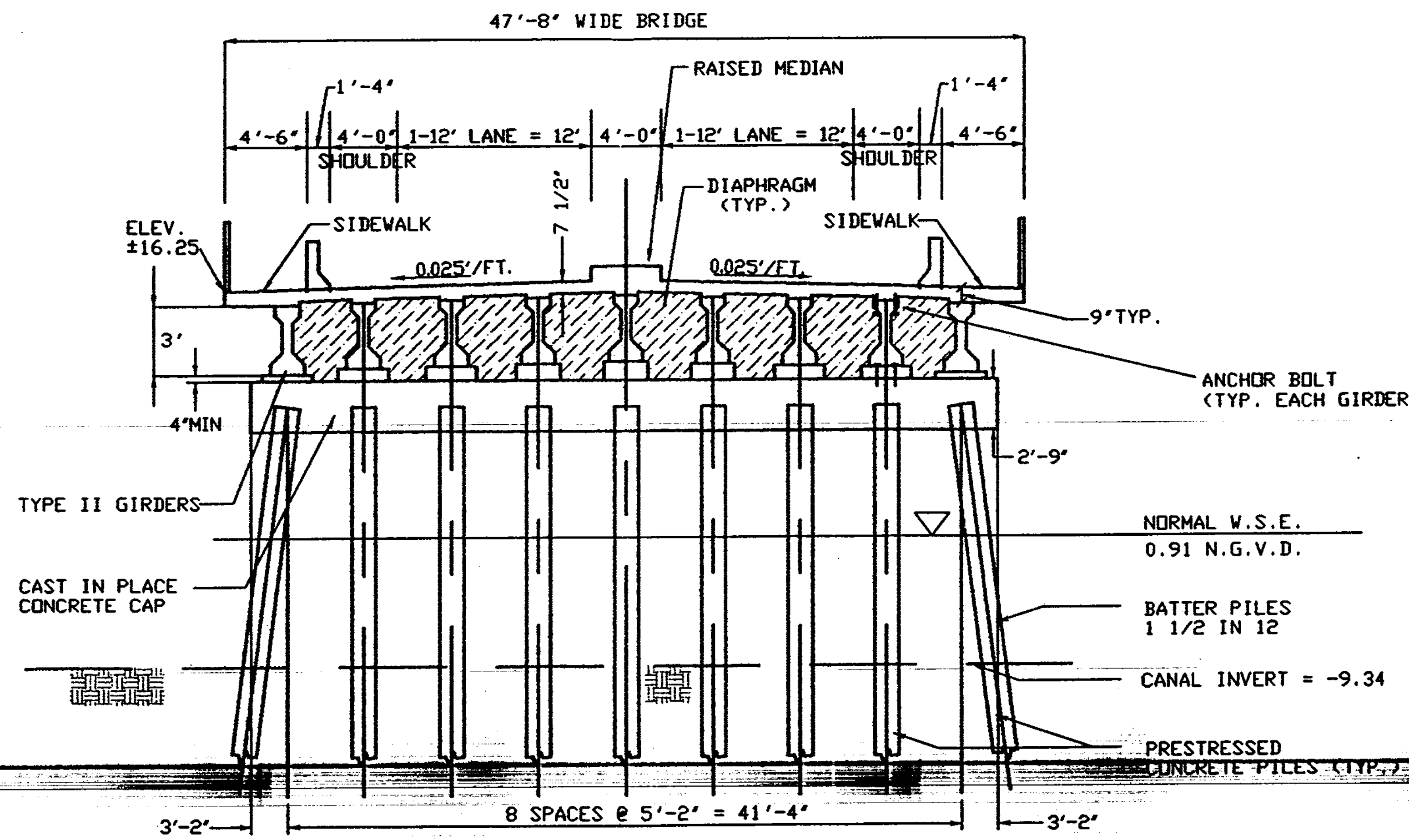
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE RAISED BRIDGE - SECTION AT CANAL

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4D



ALL ELEVATIONS REFER TO N.G.V.D.

FILMORE AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT TYPE II GIRDER SPAN

N.T.S.

PLOT AT 1=10
9362-34E.DWG

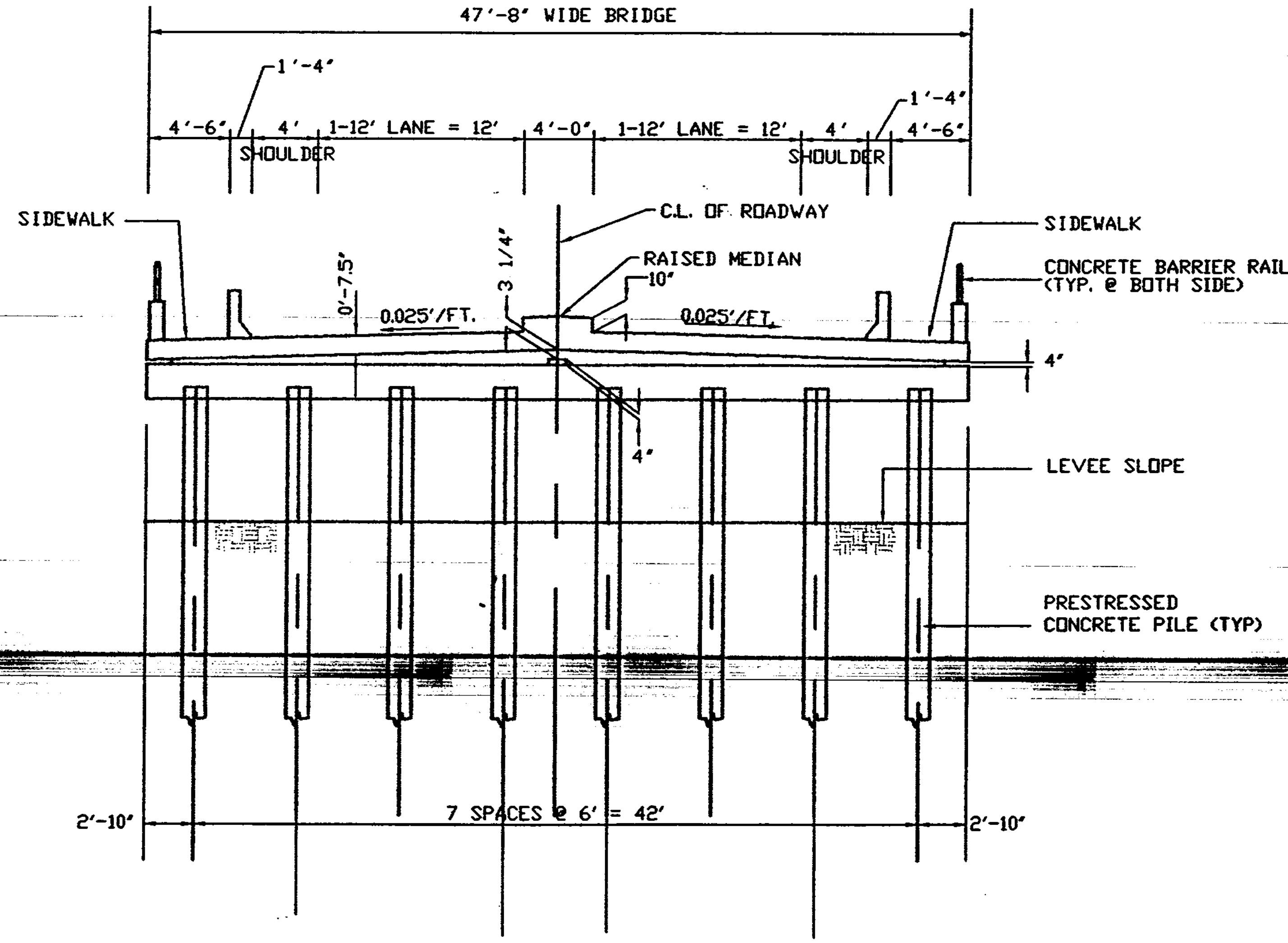
project no. 9362
drawn OY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVE. RAISED BRIDGE - SECTION AT GIRDER SPAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4E



ALL ELEVATIONS REFER TO N.G.V.D.

FILMORE AVENUE RAISED BRIDGE

NEW BRIDGE SECTION AT SLAB SPAN

N.T.S.

PLOT AT 1=10
9362-34F.DWG

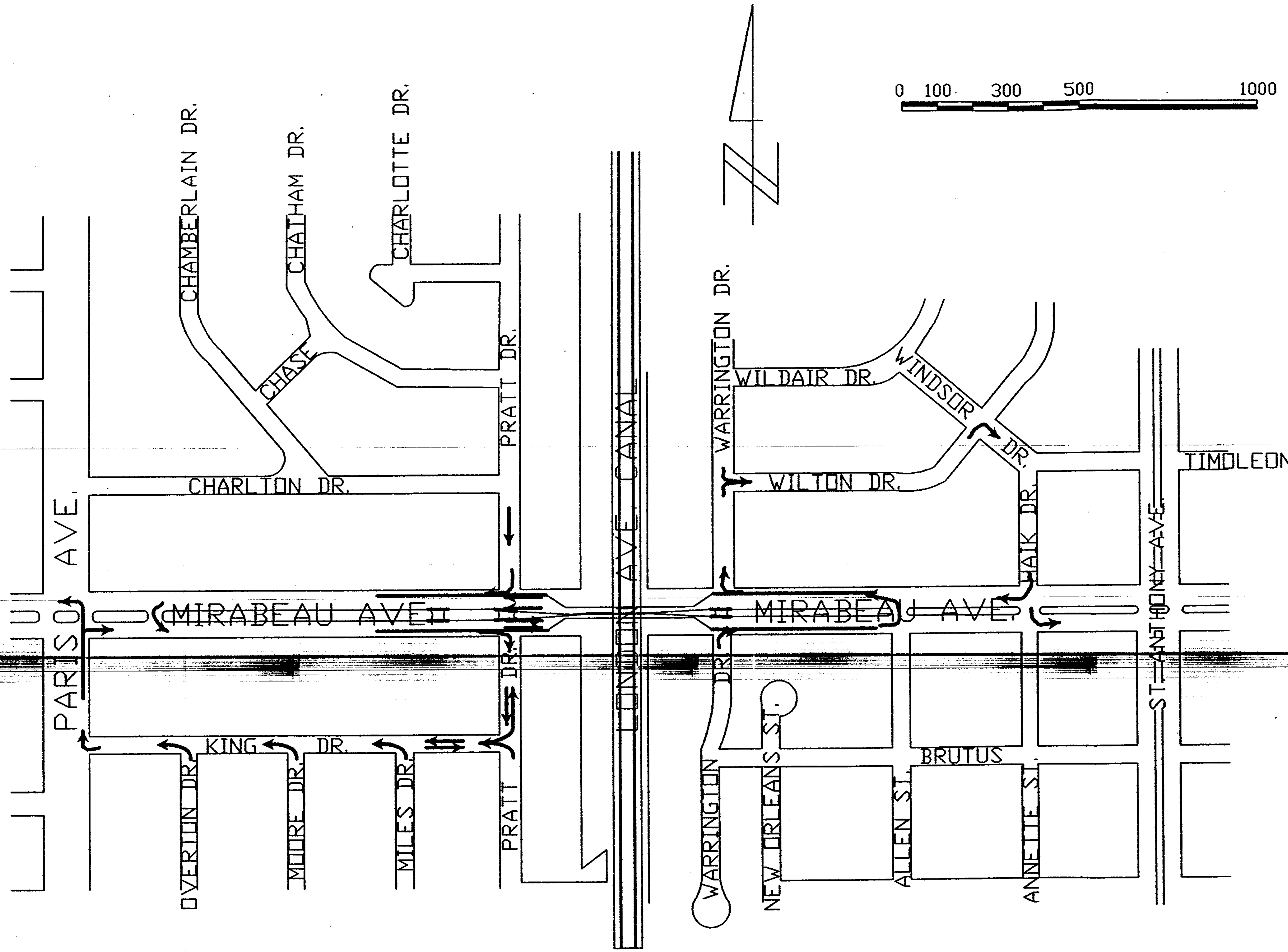
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE RAISED BRIDGE - SECTION AT SLAB SPAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-4F



project no. 9362
drawn GY
checked AMT
date 06-22-94
revised

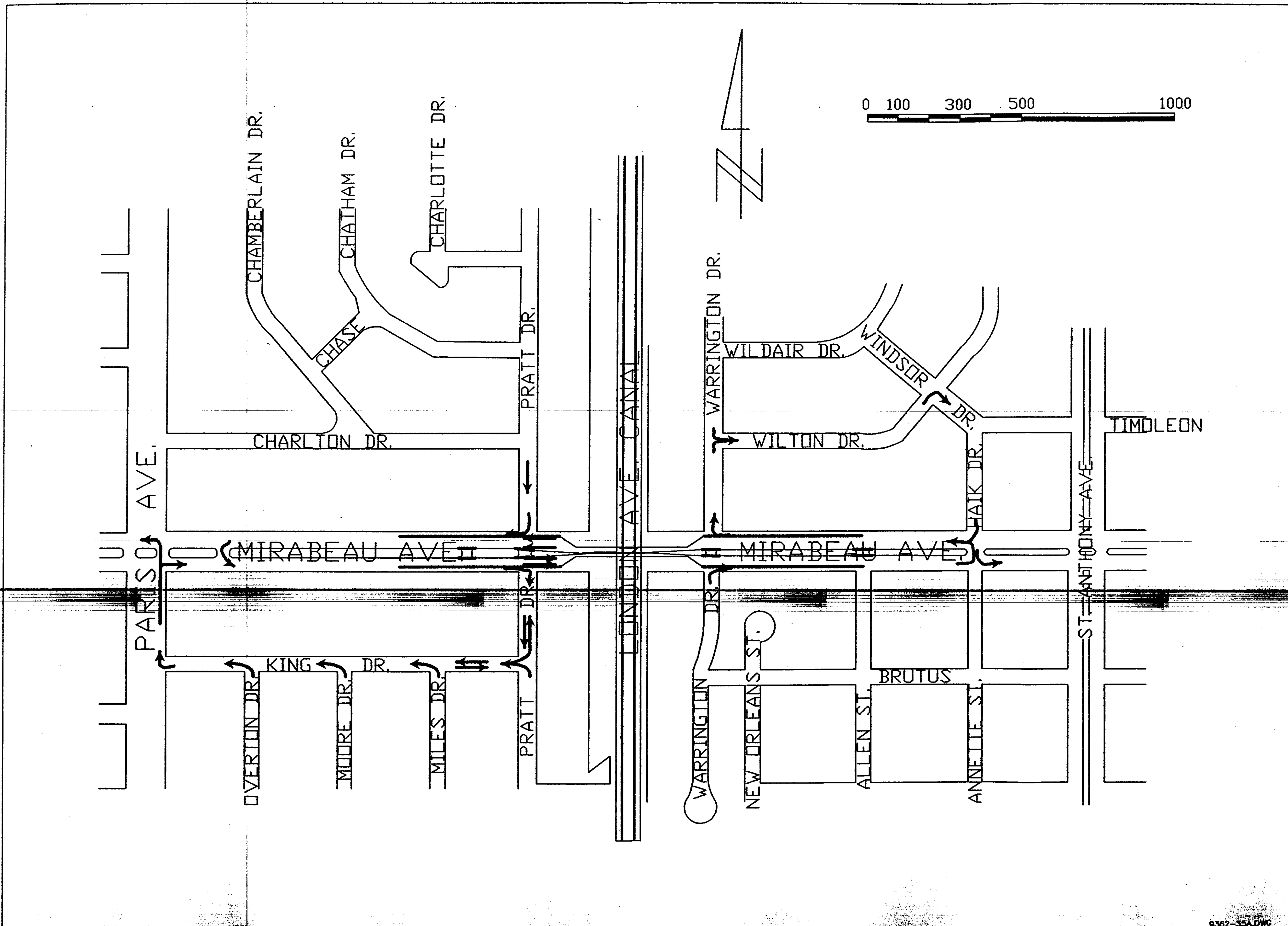
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE SEALED BRIDGE - TRAFFIC PLAN (40 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-5A

9362-35A.DWG



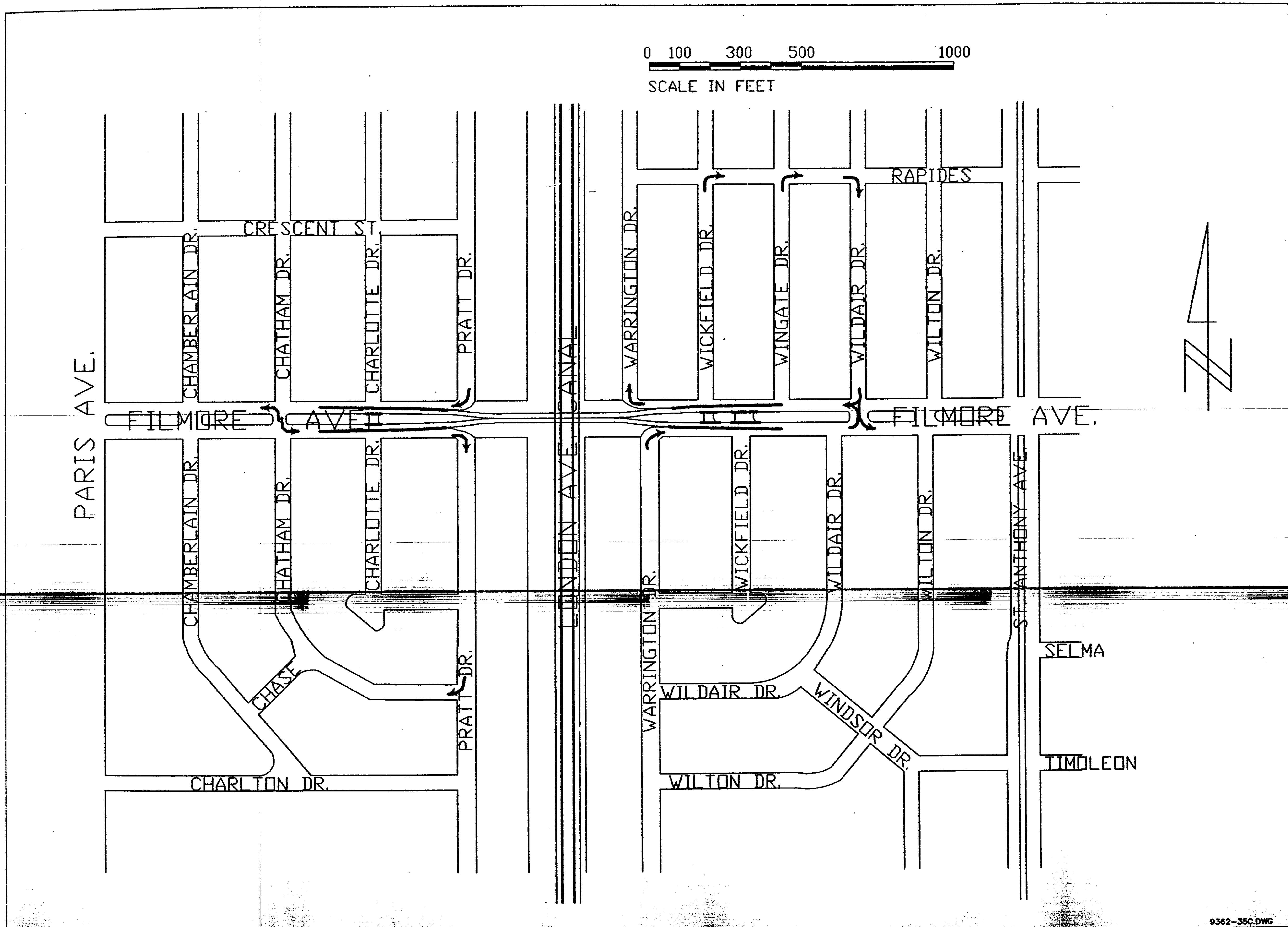
project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AVENUE RAISED BRIDGE - TRAFFIC PLAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-5B



project no. 9362
drawn OY
checked AMT
date 06-22-94
revised

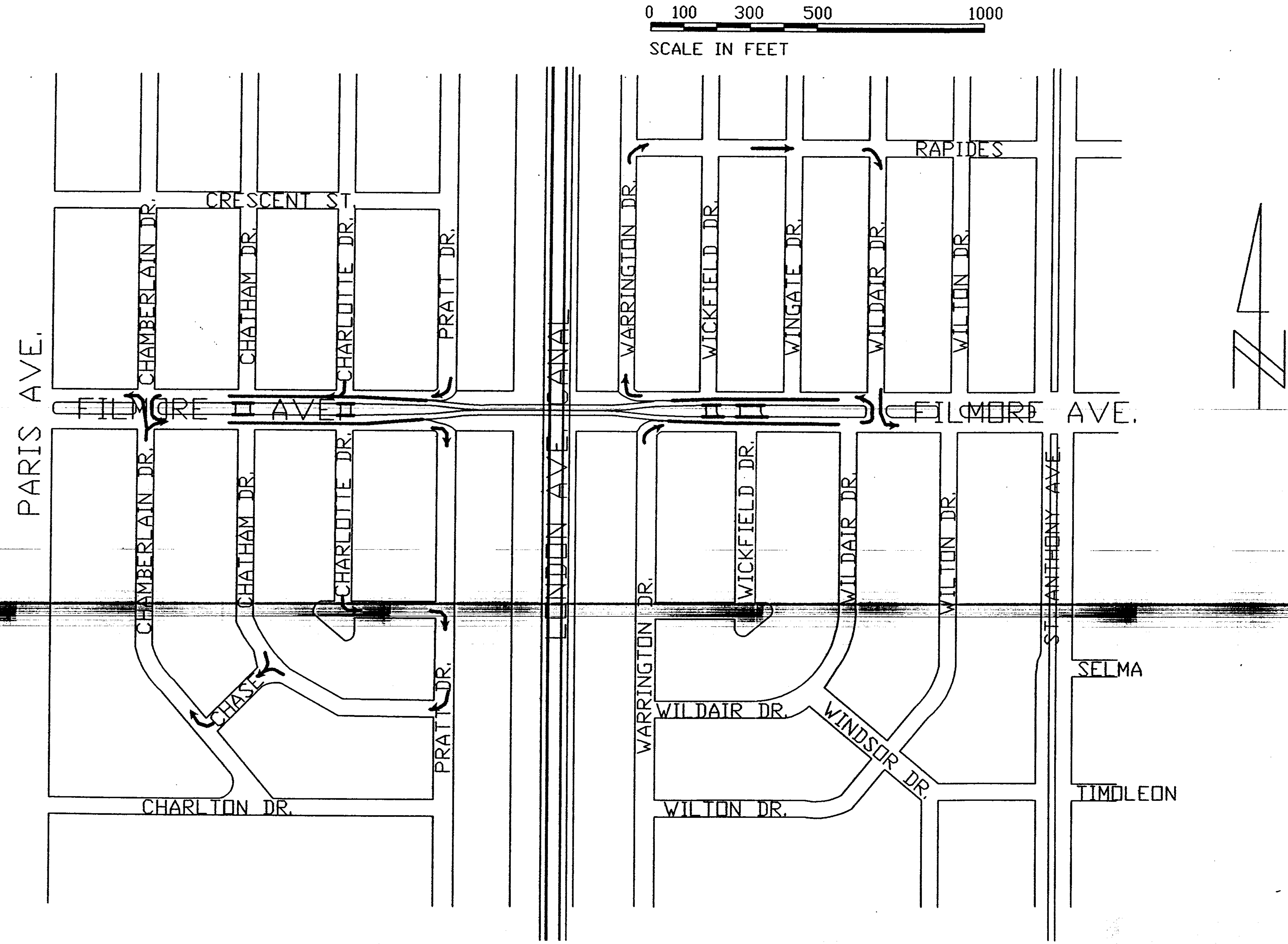
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE SEALED BRIDGE - TRAFFIC PLAN (30 MPH)

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-5C

9362-35C.DWG



project no. 9362
drawn GY
checked AMT
date 07-03-97
revised

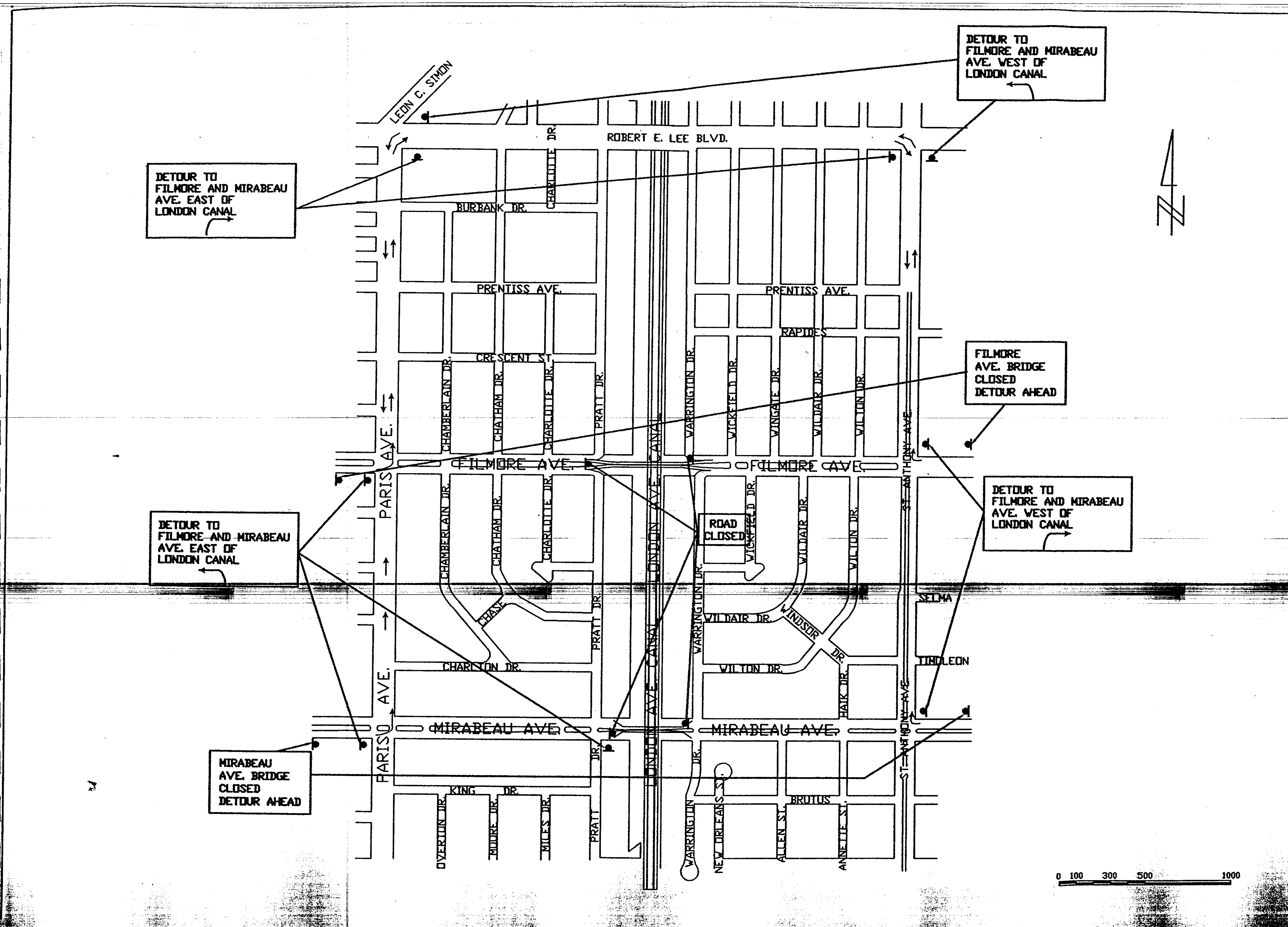
MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

FILMORE AVENUE RAISED BRIDGE - TRAFFIC PLAN

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-5D

9362-35C.DWG



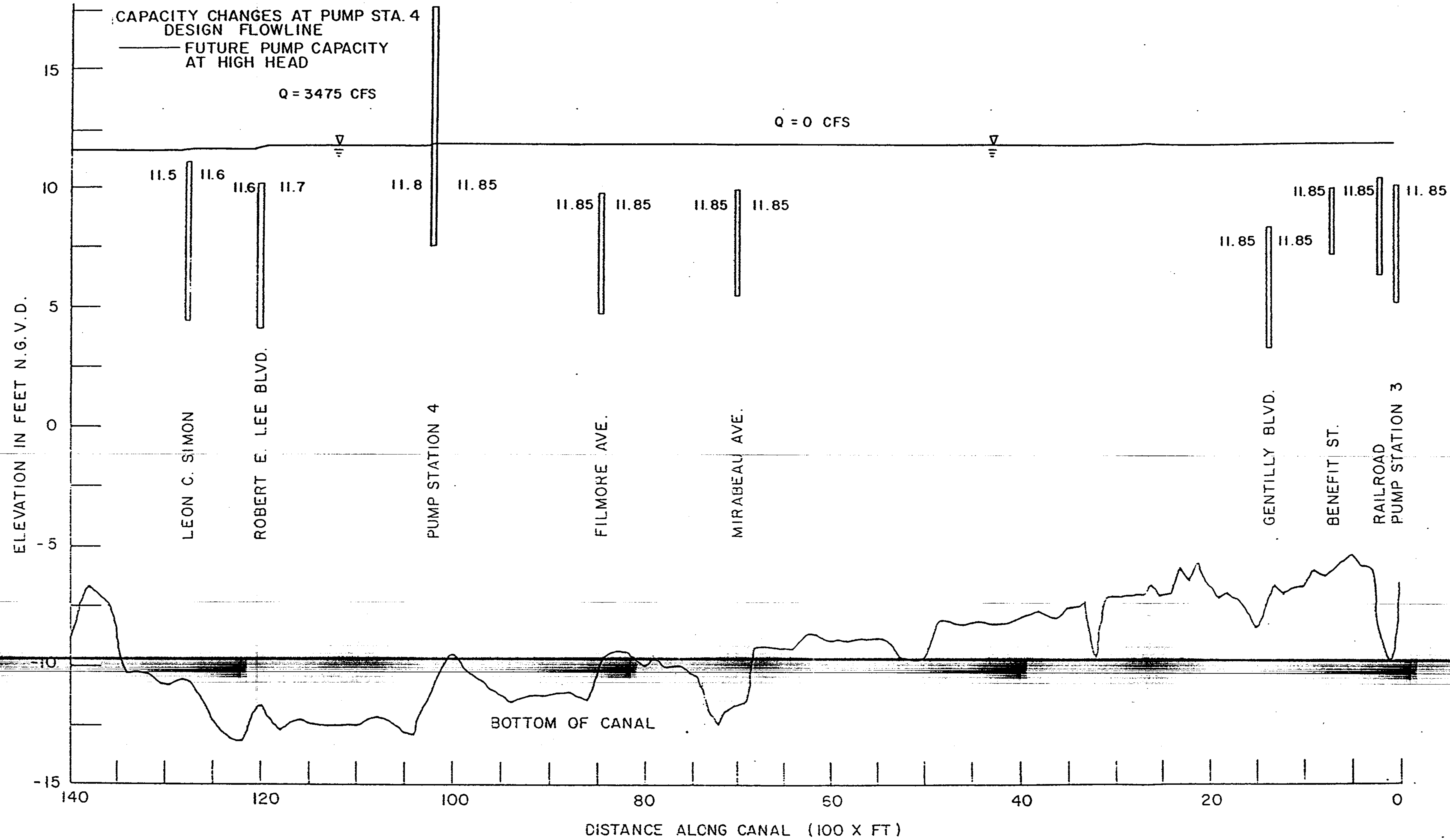
project no. 9382
drawn MMD
checked AMT
date 7-3-97
revised

MEYER ENGINEERS, LTD.
ENGINEER & ARCHITECT

MIRABEAU AND FILMORE AVENUE BRIDGES - DETOUR ROUTE

BOARD OF COMMISSIONERS
ORLEANS LEVEE DISTRICT

plate no.
III-6



LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19A GENERAL DESIGN
LONDON AVENUE OUTFALL CANAL

DESIGN FLOWLINE
EXISTING CHANNEL
ALL BRIDGES FLOOD PROOFED
WITHOUT BUTTERFLY VALVES

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

DATE: SEPT. 1998 FILE NO. H-2-30288

PLATE 36-A

APPENDIX B

GEOTECHNICAL INVESTIGATION

GEOTECHNICAL INVESTIGATION
ORLEANS LEVEE DISTRICT
LONDON AVENUE OUTFALL CANAL
OLB PROJECT NO. 2049-0269
NEW ORLEANS, LOUISIANA

VOLUME II

FOR
THE BOARD OF LEVEE COMMISSIONERS OF THE ORLEANS LEVEE DISTRICT
NEW ORLEANS, LOUISIANA

BURK & ASSOCIATES, INC.
ENGINEERS, PLANNERS & ENVIRONMENTAL SCIENTISTS
NEW ORLEANS, LOUISIANA

By
Eustis Engineering Company
Metairie, Louisiana

4 March 1986

TABLE 3
LONDON AVENUE BORING DATA

BORING NO.	DRILLING AGENCY	LEVEE	PROJECT BASELINE STATION	OFFSET
1-LUW	COE	WEST	0+50	TOE
2-LUE	COE	EAST	1+88	C/L
6-LUG	*	WEST	27+77	C/L
3-LUW	COE	WEST	50+00	36'LS
4-LUE	COE	EAST	49+75	TOE
5-LUG	*	EAST	87+70	C/L
5-LUW	COE	WEST	112+16	C/L
2-LG	COE	C/L CANAL	139+68	---
4-LUG	COE	C/L CANAL	141+68	---
1-LG	COE	C/L CANAL	143+68	---
3-LUG	COE	WEST	144+20	50 'LS
2-LUG	COE	WEST	144+20	C/L
1-LUG	COE	EAST	151+00	C/L
6-LUE	COE	EAST	154+68	TOE
1-ULP	COE	WEST	156+58	TOE
1-LP	COE	WEST	157+90	150 'LS
2-LP	COE	EAST	159+41	50 'LS
B-1	AE	WEST	0+85	TOE
B-2	AE	WEST	7+60	C/L
B-3	AE	WEST	11+60	C/L
B-4	AE	WEST	14+70	C/L
B-5	AE	WEST	19+60	C/L
B-6	AE	WEST	24+60	C/L
B-7	AE	WEST	29+60	C/L
B-8	AE	WEST	34+60	C/L
B-9	AE	WEST	39+60	C/L
B-10	AE	WEST	44+60	C/L
B-11	AE	WEST	50+35	C/L
B-12	AE	WEST	55+00	C/L
B-13	AE	WEST	60+00	C/L
B-14	AE	WEST	65+00	C/L
B-15	AE	WEST	69+85	C/L
B-16	AE	WEST	74+75	C/L
B-17	AE	WEST	79+75	C/L
B-18	AE	WEST	84+75	C/L
B-19	AE	WEST	86+35	C/L
B-20	AE	WEST	89+75	C/L
B-21	AE	WEST	94+75	C/L
B-22	AE	WEST	99+75	C/L
B-23	AE	WEST	101+20	C/L
B-24	AE	WEST	104+75	C/L
B-25	AE	WEST	109+75	C/L
B-26	AE	WEST	114+75	C/L
B-27	AE	WEST	121+35	TOE

TABLE 3 (cont'd)
LONDON AVENUE BORING DATA

BORING NO.	DRILLING AGENCY	LEVEE	STATION	OFFSET
B-28	AE	WEST	124+75	TOE
B-29	AE	WEST	127+50	TOE
B-30	AE	WEST	134+00	TOE
B-31	AE	WEST	139+00	TOE
B-32	AE	WEST	143+00	TOE
B-33	AE	WEST	149+00	TOE
B-34	AE	WEST	154+00	TOE
B-35	AE	WEST	159+00	TOE
B-36	AE	EAST	1+95	C/L
B-37	AE	EAST	7+10	C/L
B-38	AE	EAST	11+60	C/L
B-39	AE	EAST	13+70	C/L
B-40	AE	EAST	21+40	C/L
B-41	AE	EAST	24+60	C/L
B-42	AE	EAST	29+60	C/L
B-43	AE	EAST	34+60	C/L
B-44	AE	EAST	39+60	C/L
B-45	AE	EAST	44+60	C/L
B-46	AE	EAST	50+65	C/L
B-47	AE	EAST	55+00	C/L
B-48	AE	EAST	60+00	C/L
B-49	AE	EAST	65+00	C/L
B-50	AE	EAST	69+85	C/L
B-51	AE	EAST	74+75	C/L
B-52	AE	EAST	79+75	C/L
B-53	AE	EAST	84+75	C/L
B-54	AE	EAST	89+75	C/L
B-55	AE	EAST	94+75	C/L
B-56	AE	EAST	99+75	C/L
B-57	AE	EAST	102+95	C/L
B-58	AE	EAST	104+75	C/L
B-59	AE	EAST	109+75	C/L
B-60	AE	EAST	114+75	C/L
B-61	AE	EAST	119+75	C/L
B-62	AE	EAST	124+75	TOE
B-63	AE	EAST	128+60	C/L
B-64	AE	EAST	134+00	TOE
B-65	AE	EAST	139+00	TOE
B-66	AE	EAST	143+00	TOE
B-67	AE	EAST	149+00	TOE
B-68	AE	EAST	154+00	TOE
B-69	AE	EAST	159+00	TOE

* BORINGS 5-LUG AND 6-LUG WERE DRILLED BY AE CONTRACTOR AND CLASSIFIED BY CORPS OF ENGINEER PERSONNEL

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

LOCATION OF BORINGS (Sheet 1 of 3)

Boring Number	Station Number	Location
B-1	0+85	Levee Crown
B-2	7+60	Levee Crown
B-3	11+60	Levee Crown
B-4	14+70	Levee Crown
B-5	19+60	Levee Crown
B-6	24+60	Levee Crown
B-7	29+60	Levee Crown
B-8	34+60	Levee Crown
B-9	39+60	Levee Crown
B-10	44+60	Levee Crown
B-11	50+35	Levee Crown
B-12	55+00	Levee Crown
B-13	60+00	Levee Crown
B-14	65+00	Levee Crown
B-15	69+85	Levee Crown
B-16	74+75	Levee Crown
B-17	79+75	Levee Crown
B-18	84+75	Levee Crown
B-19	86+35	Levee Crown
B-20	89+75	Levee Crown
B-21	94+75	Levee Crown
B-22	99+75	Levee Crown
B-23	101+20	Levee Crown
B-24	104+75	Levee Crown
B-25	109+75	Levee Crown
B-26	114+75	Levee Crown
B-27	121+35	Levee Toe
B-28	124+75	Levee Toe
B-29	127+50	Levee Toe
B-30	134+00	Levee Toe
B-31	139+00	Levee Toe
B-32	143+00	Levee Toe
B-33	149+00	Levee Toe

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

LOCATION OF BORINGS (Cont'd)

Boring Number	Station Number	Location
B-34	154+00	Levee Toe
B-35	159+00	Levee Toe
B-36	1+95	Levee Crown
B-37	7+10	Levee Crown
B-38	11+60	Levee Crown
B-39	13+70	Levee Crown
B-40	21+40	Levee Crown
B-41	24+60	Levee Crown
B-42	29+60	Levee Crown
B-43	34+60	Levee Crown
B-44	39+60	Levee Crown
B-45	44+60	Levee Crown
B-46	50+65	Levee Crown
B-47	55+00	Levee Crown
B-48	60+00	Levee Crown
B-49	65+00	Levee Crown
B-50	69+85	Levee Crown
B-51	74+75	Levee Crown
B-52	79+75	Levee Crown
B-53	84+75	Levee Crown
B-54	89+75	Levee Crown
B-55	94+75	Levee Crown
B-56	99+75	Levee Crown
B-57	102+95	Levee Crown
B-58	104+75	Levee Crown
B-59	109+75	Levee Crown
B-60	114+75	Levee Crown
B-61	119+75	Levee Crown
B-62	124+75	Levee Crown
B-63	128+60	Levee Crown
B-64	134+00	Levee Toe
B-65	139+00	Levee Toe
B-66	143+00	Levee Toe
B-67	149+00	Levee Toe
B-68	154+00	Levee Toe

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

LOCATION OF BORINGS (Cont'd) (Sheet 3 of 3)

Boring Number	Station Number	Location
B-69	159+00	Levee Toe
B-70	Not Taken	Canal Centerline
B-71	Not Taken	Canal Centerline
B-72	Not Taken	Canal Centerline
B-73	19+60	Canal Centerline
B-74	24+60	Canal Centerline
B-75	29+60	Canal Centerline
B-76	34+60	Canal Centerline
B-77	39+60	Canal Centerline
B-78	44+60	Canal Centerline
B-79	50+35	Canal Centerline
B-80	55+00	Canal Centerline
B-81	60+00	Canal Centerline
B-82	65+00	Canal Centerline
B-83	69+85	Canal Centerline
B-84	74+75	Canal Centerline
B-85	79+75	Canal Centerline
B-86	86+35	Canal Centerline
B-87	89+75	Canal Centerline
B-88	94+75	Canal Centerline
B-89	99+75	Canal Centerline
B-90	104+75	Canal Centerline
B-91	109+75	Canal Centerline
B-92	114+75	Canal Centerline
B-93	121+35	Canal Centerline
B-94	124+75	Canal Centerline
B-95	128+60	Canal Centerline
B-96	134+00 (East)	Canal Centerline
B-97	139+00 (East)	Canal Centerline
B-98	145+00 (East)	Canal Centerline
B-99	147+00 (East)	Canal Centerline
B-100	153+00 (East)	Canal Centerline
B-101	159+00 (East)	Canal Centerline

NOTE: Locations of canal borings is approximate.

LOG OF BORING

EUSTIS ENGINEERING COMPANY

SOIL AND FOUNDATION CONSULTANTS

METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements

Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

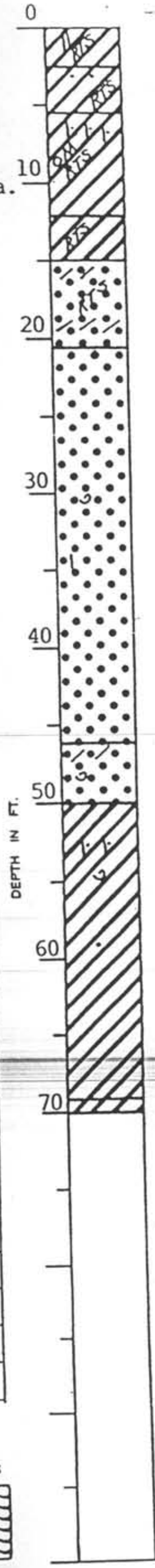
For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.

Burk & Associates, Inc., New Orleans, Louisiana

Boring No. West 15 Soil Technician A. Croal, Jr. Date 17 October 1985

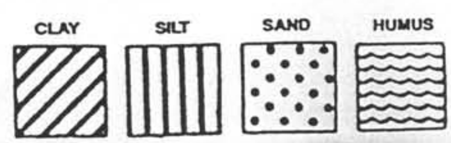
Ground Elev. 4.8 Datum NGVD Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification 69+85	*Standard Penetration Test	
1	1.7	2.5	0.0	2.5	Medium stiff tan & gray clay w/silt		
					pockets & grass roots		
2	4.7	5.5	2.5	5.5	Medium stiff tan & gray clay w/sand		
					pockets & roots		
3	7.7	8.5	5.5		Soft dark gray clay w/silty sand		
					layers, organic matter & roots		
4	10.7	11.5		12.0	Soft dark gray clay w/organic matter		
					& roots		
5	13.7	14.5	12.0	15.0	Soft gray clay w/roots		
6	15.5	17.0	15.0		Medium dense gray fine sand w/clay	3	20
					pockets & roots		
7	18.0	19.5		20.5	Medium dense gray fine sand w/clay	10	14
					layers		
8	20.5	22.0	20.5		Very dense gray fine sand	50=6" (Seat)	
9	23.5	25.0			Ditto	25	50=8"
10	28.5	30.0			Ditto	20	50=6"
11	33.5	35.0			Very dense gray fine sand w/few shell	18	50=8"
					fragments & trace of silt		
12	38.5	40.0			Very dense gray fine sand	23	50=6"
13	43.5	45.0		46.0	Very dense gray fine sand, w/few shell	2	50=10"
					fragments		
14	48.5	50.0	46.0	50.0	Medium dense gray fine sand w/clay	3	12
					pockets & shell fragments		
15	53.2	54.0	50.0		Medium stiff gray clay w/silty sand		
					pockets & few shell fragments		
					(Continued)		



*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

WHILE THIS LOG OF BORING IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT ITS RESPECTIVE LOCATION ON THE DATE SHOWN, IT IS NOT WARRANTED THAT IT IS REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



Remarks:

Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY
SOIL AND FOUNDATION CONSULTANTS
METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.
Burk & Associates, Inc., New Orleans, Louisiana

Boring No. 15 (Cont'd) Soil Technician A. Croal, Jr. Date 17 October 1985

Ground Elev. ______ Datum ______ Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification	*Standard Penetration Test	
16	58.2	59.0			Medium stiff gray clay w/few silty sand		
					pockets & few shell fragments		
17	63.2	64.0		66.0	Medium stiff gray clay w/shell		
					fragments		
18	68.2	69.0	66.0	69.0	Stiff gray clay w/shell fragments &		
					trace of sand		
19	69.5	70.0	69.0	70.0	Stiff green clay		

DEPTH IN FT.

*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

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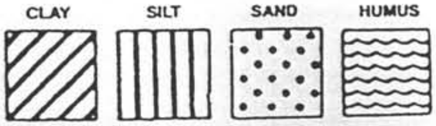


Predominant type shown heavy. Modifying type shown light.

Remarks: ______

LOG OF BORING

EUSTIS ENGINEERING COMPANY

SOIL AND FOUNDATION CONSULTANTS

METAIRIE, LA.

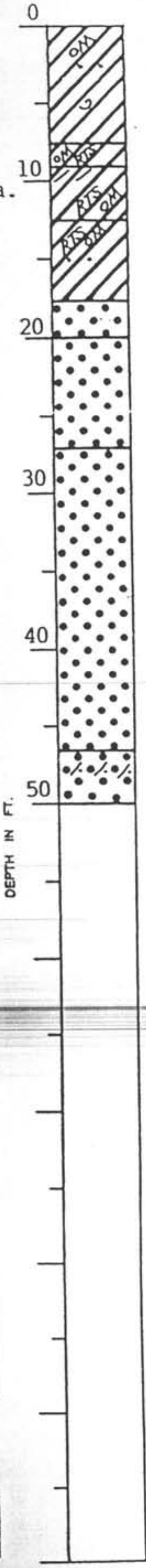
Name of Project: London Avenue Canal, Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.
Burk & Associates, Inc., New Orleans, Louisiana

Boring No. 18 Soil Technician George Hardee Date 25 October 1985

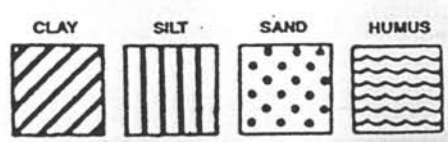
Ground Elev. 4.7 Datum NGVD Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification 84+75	*Standard Penetration Test	
1	1.5	2.5	0.0		Very stiff gray clay w/organic matter		
					& sand pockets		
2	5.0	5.5		7.5	Stiff gray clay w/organic matter, sand		
					pockets & shells		
3	8.0	8.5	7.5	9.0	Medium stiff brown & gray clay w/roots		
					& organic matter		
4	10.5	11.5	9.0	12.5	Soft brown & gray clay w/clay pockets,		
					roots & wood		
5	13.5	14.5	12.5		Soft gray clay w/roots & organic matter		
6	16.5	17.5		17.5	Soft gray clay w/sand pockets		
7	17.5	19.0	17.5	20.0	Dense gray fine sand	11	42
8	20.5	22.0	20.0		Medium dense gray fine sand	3	18
9	23.5	25.0		27.0	Ditto	5	25
10	28.5	30.0	27.0		Dense gray fine sand	12	50
11	33.5	35.0			Ditto	16	50
12	38.5	40.0			Ditto	11	30
13	43.5	45.0		46.5	Ditto	5	32
14	48.5	50.0	46.5	50.0	Loose gray fine sand w/clayey sand	3	9
					layers		



*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

WHILE THIS LOG OF BORING IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT ITS RESPECTIVE LOCATION ON THE DATE SHOWN, IT IS NOT WARRANTED THAT IT IS REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



Remarks:

Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY Sheet 1 of 2

SOIL AND FOUNDATION CONSULTANTS

METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements

Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.

Burk & Associates, Inc., New Orleans, Louisiana

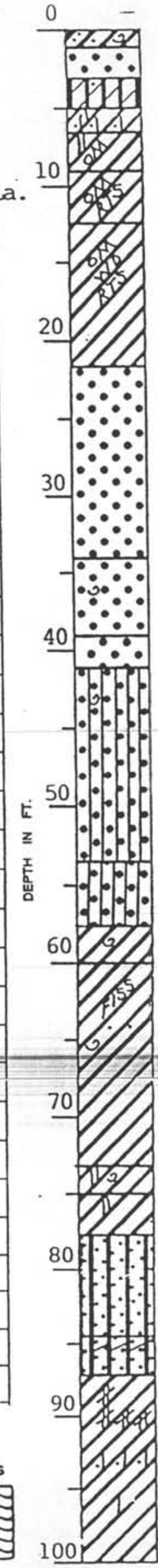
Boring No. 50 Soil Technician A. Croal, Jr. Date 13 November 1985

Ground Elev. ____ Datum ____ Gr. Water Depth See Text

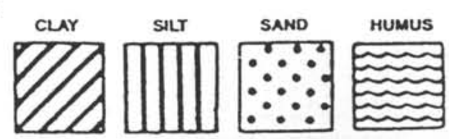
Sample No.	SAMPLE Depth — Feet From	SAMPLE Depth — Feet To	DEPTH STRATUM Feet From	DEPTH STRATUM Feet To	VISUAL CLASSIFICATION	*STANDARD PENETRATION TEST	
1	0.0	0.5	0.0	1.0	Very stiff gray & brown clay w/fine		
					sand lenses, pockets & shell		
					fragments		
2	1.7	2.5	1.0	3.0	Loose tan fine sand		
3	2.5	4.0	3.0	5.0	Medium compact brown & gray clayey silt	3	14
					w/fine sand lenses		
4	5.0	6.5	5.0	6.5	Medium stiff to stiff gray clay w/sandy	2	8
					silt lenses & layers		
5	8.2	9.0	6.5	9.0	Soft dark gray clay w/silt pockets &		
					trace of organic matter		
6	10.7	11.5	9.0	12.5	Soft dark gray clay w/organic matter		
					& roots		
7	13.7	14.5	12.5		Very soft gray clay w/organic matter		
					& wood		
8	18.2	19.0		21.8	Soft gray clay w/organic matter & roots		
9	21.7	22.5	21.8		Loose to medium dense gray fine sand		
10	22.5	24.0			Medium dense gray fine sand	4	26
11	25.0	26.5			Ditto	4	23
12	27.5	29.0			Ditto	3	19
13	30.0	31.5		34.0	Ditto	8	25
14	33.5	35.0	34.0	39.0	Dense gray fine sand w/shell fragments	9	32
15	38.5	40.0	39.0	41.0	Very dense gray fine sand	12	50=11"
16	43.5	45.0	41.0		Medium dense gray silty sand w/few	6	26
					shell fragments		
17	48.5	50.0		53.5	Medium dense gray silty sand	5	27
18	53.5	55.0	53.5	57.5	Loose gray silty sand	3	10

*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

WHILE THIS LOG OF BORING IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT ITS RESPECTIVE LOCATION ON THE DATE SHOWN, IT IS NOT WARRANTED THAT IT IS REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



Remarks: ____



Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY
SOIL AND FOUNDATION CONSULTANTS
METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.
Burk & Associates, Inc., New Orleans, Louisiana

Boring No. 50 (Cont'd) Soil Technician A. Croal, Jr. Date 13 November 1985

Ground Elev. ______ Datum ______ Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification	*Standard Penetration Test	
19	58.5	60.0	57.5	60.0	Soft gray clay w/shell fragments	2	4
20	63.2	64.0	60.0	66.0	Medium stiff gray fissured clay w/sand		
					pockets & few shell fragments &		
					vertical fissures.		
21	68.2	69.0	66.0	73.0	Stiff gray clay w/few shell fragments		
22	73.2	74.0	73.0	75.0	Stiff greenish-gray clay w/silt		
					pockets & shells		
23	76.7	77.5	75.0	77.5	Very stiff greenish-gray & tan clay		
					w/few silt pockets		
24	77.5	79.0	77.5		Compact gray sandy silt	9	44
25	80.0	81.5			Ditto	8	35
26	82.5	84.0		84.5	Medium compact gray sandy silt	6	21
27	85.0	86.5	84.5	87.0	Very loose gray sandy silt w/clay	2	2
					layers		
28	88.5	90.0	87.0		Medium stiff gray clay w/clayey silt	2	6
					lenses & layers		
29	91.7	92.5			Medium stiff gray clay w/sandy silt		
				94	layers		
30	96.7	97.5	94	100.0	Stiff gray clay w/silt lenses		

DEPTH IN FT.

*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

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CLAY SILT SAND HUMUS

Remarks: ______

Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY

SOIL AND FOUNDATION CONSULTANTS

METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements

Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

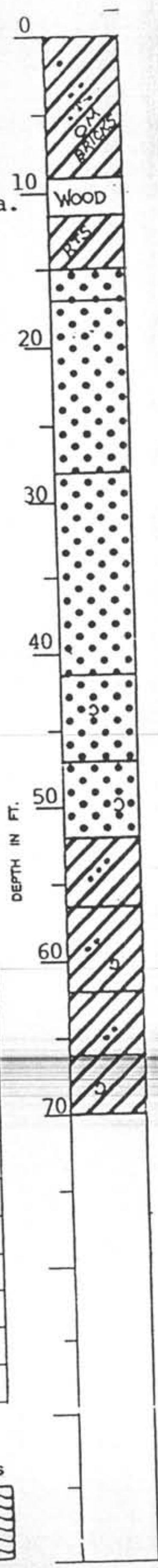
For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.

Burk & Associates, Inc., New Orleans, Louisiana

Boring No. 53 Soil Technician A. J. Mayeux Date 4 December 1985

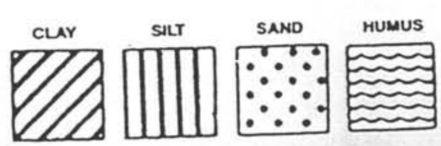
Ground Elev. ______ Datum ______ Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification	*Standard Penetration Test	
1	2.0	2.5	0.0		Medium stiff gray & tan clay w/sand lenses & pockets & trace of organic matter		
2	5.5	6.0			Medium stiff gray & tan clay w/sand pockets		
3	8.0	8.5		9.0	Medium stiff gray & tan clay w/vertical sand layers, organic matter & bricks		
	11.0	11.5	9.0	11.5	Wood w/organic matter & clay		
4	14.0	14.5	11.5	15.0	Soft gray & tan clay w/decayed roots		
5	15.0	16.5	15.0	17.0	Loose gray sand	1	5
6	17.5	19.0	17.0		Medium dense gray sand	2	13
7	20.0	21.5			Ditto	4	19
8	23.5	25.0		28.0	Ditto	2	15
9	28.5	30.0	28.0		Dense gray sand	5	35
10	33.5	35.0			Ditto	10	48
11	38.5	40.0		41.5	Ditto	7	32
12	43.5	45.0	41.5	47.0	Medium dense gray sand w/shell fragments	5	19
13	48.5	50.0	47.0	52.0	Loose gray sand w/shell fragments	2	8
14	53.5	55.0	52.0	56.5	Medium stiff gray clay w/sand layers	1	4
15	59.0	59.5	56.5	62.0	Stiff gray & tan clay w/sand pockets & shell fragments		
16	64.0	64.5	62.0	66.0	Stiff gray clay w/sand pockets		
17	69.0	69.5	66.0	70.0	Medium stiff gray clay w/shell fragments		



*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

WHILE THIS LOG OF BORING IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT ITS RESPECTIVE LOCATION ON THE DATE SHOWN, IT IS NOT WARRANTED THAT IT IS REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



Remarks: ______

Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY

SOIL AND FOUNDATION CONSULTANTS

METAIRIE, LA.

Name of Project: London Avenue Canal, Levee and Floodwall Improvements

Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

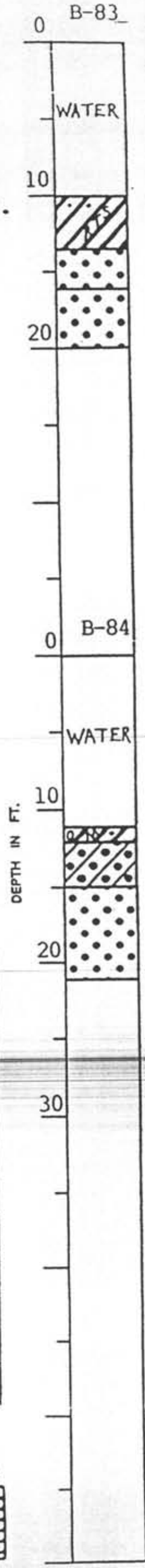
For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.

Burk & Associates, Inc., New Orleans, Louisiana

Boring No.______ Soil Technician R. Mayeaux Date 10 December 1985

Ground Elev.______ Datum ______ Gr. Water Depth See Text

Sample No.	Sample Depth — Feet From	Sample Depth — Feet To	Depth Stratum Feet From	Depth Stratum Feet To	Visual Classification	*Standard Penetration Test	
					BORING 83		
			0.0	10.0	Water		
1	11.0	12.0	10.0	13.5	Very soft gray clay w/sand pockets & roots		
2	14.5	15.0	13.5	16.0	Loose gray sand		
3	17.0	17.5	16.0		Medium dense gray sand		
4	19.5	20.0		20.0	Ditto		
					BORING 84		
			0.0	11.0	Water		
1	11.0	12.0	11.0	12.0	Extremely soft dark gray clay w/organic matter & sand		
2	14.5	15.0	12.0	15.0	Loose dark gray clayey sand		
3	17.5	18.0	15.0		Very loose gray sand		
4	20.5	21.0		21.0	Ditto		



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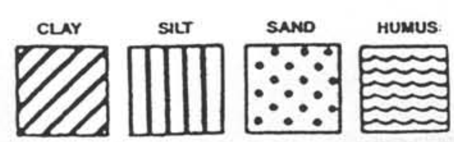
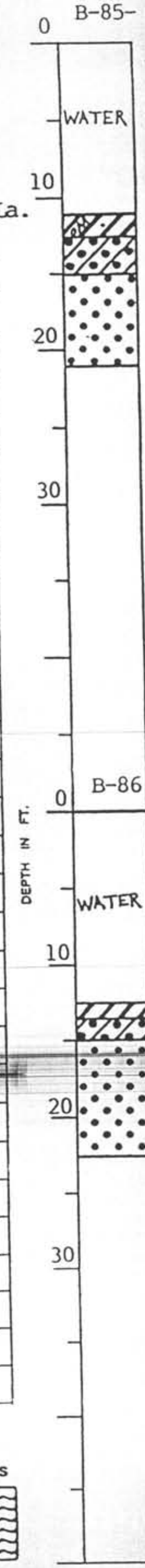


Remarks: ______

Predominant type shown heavy. Modifying type shown light.

LOG OF BORING

EUSTIS ENGINEERING COMPANY
SOIL AND FOUNDATION CONSULTANTS
METAIRIE, LA.



Name of Project: London Avenue Canal, Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269, New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District, New Orleans, La.
Burk & Associates, Inc., New Orleans, Louisiana

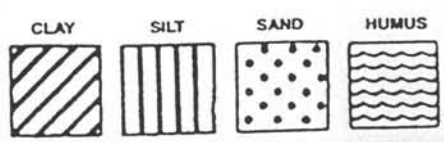
Boring No. ________ Soil Technician R. Mayeaux Date 10 December 1985

Ground Elev. ________ Datum ________ Gr. Water Depth See Text

Sample No.	SAMPLE Depth — Feet From	SAMPLE Depth — Feet To	DEPTH STRATUM Feet From	DEPTH STRATUM Feet To	VISUAL CLASSIFICATION	*STANDARD PENETRATION TEST	
					BORING 85		
			0.0	11.0	Water		
1	11.0	12.0	11.0	12.5	Extremely soft gray clay w/much organic		
					matter & sand		
2	13.5	14.0	12.5	15.0	Loose gray clayey sand		
3	17.5	18.0	15.0		Loose gray sand		
4	20.5	21.0		21.0	Ditto		
					BORING 86		
			0.0	12.5	Water		
1	12.5	13.5	12.5	13.5	Very soft gray clay		
2	14.5	15.0	13.5	15.0	Loose gray clayey sand		
3	17.0	17.5	15.0		Medium dense gray sand		
4	19.5	20.0			Ditto		
5	22.0	22.5		22.5	Ditto		

*Number in first column indicates number of blows of 140-lb. hammer dropped 30 in. required to seat 2-in. O. D. splitspoon sampler 6 in. Number in second column indicates number of blows of 140-lb. hammer dropped 30 in. required to drive 2-in. O. D. splitspoon sampler 1 ft. after seating 6 in.

WHILE THIS LOG OF BORING IS CONSIDERED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT ITS RESPECTIVE LOCATION ON THE DATE SHOWN, IT IS NOT WARRANTED THAT IT IS REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



Remarks: ________

Predominant type shown heavy. Modifying type shown light.

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 15

Sample No.	Depth In Feet	Classification	Water Content Percent	Density PCF Dry	Density PCF Wet	Unconfined Compressive Strength PSF
1	1.7	Medium stiff gray & tan clay w/silt pockets & roots	43.7	73.9	106.2	1715
2	4.7	Medium stiff gray & tan clay w/sand pockets & roots	54.0	65.2	100.5	1935
3	7.7	Soft dark gray clay w/silty sand layers & roots	53.5	60.1	92.3	590*
4	10.7	Soft dark gray clay w/organic matter & roots	92.9	45.7	88.1	690
5	13.7	Soft gray clay w/roots	70.8	57.2	97.6	630
16	58.2	Medium stiff gray clay w/silty sand pockets & shell fragments	46.1	73.7	107.7	1755
18	68.2	Stiff gray clay w/trace of sand	47.8	73.3	108.3	2570

*Unconsolidated Undrained Triaxial Compression Test - One Specimen; Confined at the approximate overburden pressure.

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 18

Sample No.	Depth In Feet	Classification	Water Content Percent	Density PCF Dry	Density PCF Wet	Unconfined Compressive Strength PSF	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI
2	5.0	Stiff gray clay w/sand pockets & shells	26.6	90.2	114.1	3240			
3	8.0	Medium stiff brown & gray clay w/organic matter & roots	74.1	42.9	74.8	1710*			
4	10.5	Soft brown & gray clay w/organic matter & many roots	76.4	----	-----	----			
5	13.5	Soft gray clay w/roots	58.4	64.1	101.5	755			
6	16.5	Soft gray clay w/sand pockets & organic matter	47.0	72.6	106.8	900	72	23	49

*Unconsolidated Undrained Triaxial Compression Test - One Specimen; Confined at the approximate overburden pressure.

EUSTIS ENGINEERING COMPANY
SOIL AND FOUNDATION CONSULTANTS
METAIRIE, LOUISIANA

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 50

Sample No.	Depth in Feet	Classification	Water Content Percent	Density PCF Dry	Density PCF Wet	Unconfined Compressive Strength PSF	Atterberg Limits LL	PL	PI
5	8.2	Soft dark gray clay w/silt pockets & organic matter	51.6	64.1	97.2	805			
6	10.7	Soft dark gray clay w/much organic matter & roots	104.2	41.7	85.2	700	161	45	116
7	13.7	Very soft gray clay w/organic matter & wood	80.7	----	-----	----			
8	18.2	Soft gray clay w/trace of organic matter	84.3	50.6	93.2	580			
20	63.2	Medium stiff gray fissured clay w/sand pockets & partings	44.6	72.7	105.2	1545			
21	68.2	Stiff gray clay w/shell fragments	44.5	75.3	108.8	2430	80	25	55
22	73.2	Stiff greenish-gray clay w/silt pockets & shell fragments	31.6	87.7	115.5	2300			
23	76.7	Stiff greenish-gray & tan clay w/silt pockets	28.8	89.3	115.1	2500	71	22	49
29	91.7	Medium stiff gray clay w/sandy silt layers	46.0	75.8	110.6	1625	74	23	51
30	96.7	Stiff gray clay w/silt lenses	37.9	83.6	115.3	2800			

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 53

Sample No.	Depth in Feet	Classification	Water Content Percent	Density PCF Dry	Density PCF Wet	Unconfined Compressive Strength PSF
1	2.0	Medium stiff gray & tan clay w/sand lenses, pockets & trace of organic matter	35.3	82.3	111.4	1545*
2	5.5	Medium stiff gray & tan clay w/sand pockets	42.2	74.0	105.3	1510
3	8.0	Medium stiff gray & tan clay w/vertical sand layers, organic matter & brick	44.4	----	-----	----
4	14.0	Soft gray & tan clay w/decayed roots	87.0	----	-----	----
15	59.0	Stiff gray & tan clay w/sand pockets & shell fragments	45.2	75.3	109.3	2055
16	64.0	Stiff gray clay w/sand pockets	54.3	68.2	105.2	2155
17	69.0	Medium stiff gray clay w/shell fragments	54.6	67.8	104.8	1705

*Unconsolidated Undrained Triaxial Compression Test - One Specimen; Confined at the approximate overburden pressure.

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana.

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 79

Sample No.	Depth In Feet	Classification	Water Content Percent
1	10.5	Loose dark gray sand w/organic matter	43.6
3	17.0	Medium dense gray sand	24.3

BORING 80

Sample No.	Depth In Feet	Classification	Water Content Percent
1	11.5	Loose gray sand w/trace of organic matter	25.4
3	17.5	Loose to medium dense dark gray sand	26.3

BORING 81

Sample No.	Depth In Feet	Classification	Water Content Percent
1	11.0	Very soft gray organic clay w/silty sand layers	79.9
2	14.0	Medium dense gray sand	22.9

BORING 82

Sample No.	Depth In Feet	Classification	Water Content Percent
1	10.0	Loose gray clayey sand w/organic matter	49.6
2	13.0	Loose gray clayey sand	36.2
3	15.0	Loose gray sand	27.2

BORING 83

Sample No.	Depth In Feet	Classification	Water Content Percent
1	11.0	Very soft gray clay w/sand pockets & roots	75.9
2	14.5	Loose gray sand	29.9
4	19.5	Medium dense gray sand	24.0

Geotechnical Investigation
London Avenue Canal
Levee and Floodwall Improvements
Orleans Levee Board Project No. 2049-0269
New Orleans, Louisiana

For: The Board of Levee Commissioners of the Orleans Levee District
New Orleans, Louisiana

Burk & Associates, Inc., Engineers, Planners & Environmental Scientists
New Orleans, Louisiana

SUMMARY OF LABORATORY TEST RESULTS

BORING 84

Sample No.	Depth In Feet	Classification	Water Content Percent
1	11.0	Extremely soft dark gray clay w/organic matter & sand	108.1
2	14.5	Loose dark gray clayey sand	31.0
3	17.5	Very loose gray sand	33.1

BORING 85

Sample No.	Depth In Feet	Classification	Water Content Percent
1	11.0	Extremely soft gray clay w/much organic matter & sand	76.5
2	13.5	Loose gray clayey sand w/roots	41.1
4	20.5	Loose gray sand	27.8

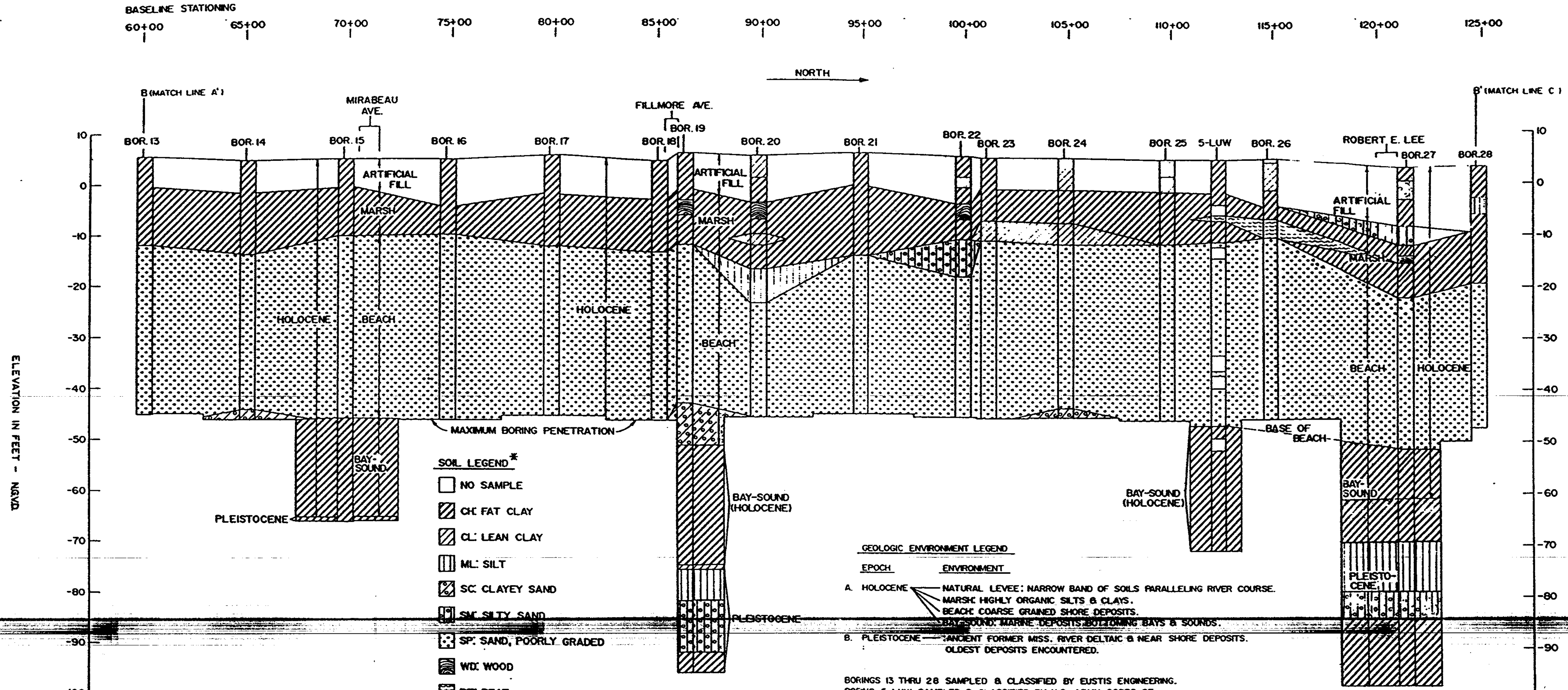
BORING 86

Sample No.	Depth In Feet	Classification	Water Content Percent
1	12.5	Very soft gray clay w/some sand	95.1
2	14.5	Loose gray clayey sand	34.2
3	17.0	Medium dense gray sand	23.5

BORING 87

Sample No.	Depth In Feet	Classification	Water Content Percent
1	12.0	Very soft gray clay w/clayey silt layers, organic matter & roots	43.4
2	14.0	Soft gray clay w/clayey sand pockets & roots	66.1
3	17.0	Loose gray sand	28.3

LONDON AVENUE OUTFALL CANAL - WEST LEVEE (MIDDLE PORTION)



SOIL LEGEND*

- NO SAMPLE
- CH: FAT CLAY
- CL: LEAN CLAY
- ML: SILT
- SC: CLAYEY SAND
- SM: SILTY SAND
- SP: SAND, POORLY GRADED
- WD: WOOD
- PT: PEAT
- FILL-BRICK, SHELLS, ORGANICS, ETC.-ARTIFICIALLY PLACED
- SI: SHELLS

*EUSTIS ENGINEERING COMBINED SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE UNIFIED SOIL CLASSIFICATION SYMBOLS.

SEE PG.I-3 APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING SOIL BORINGS.

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
A. HOLOCENE	NATURAL LEVEE: NARROW BAND OF SOILS PARALLELING RIVER COURSE.
	MARSH: HIGHLY ORGANIC SILTS & CLAYS.
	BEACH: COARSE GRAINED SHORE DEPOSITS.
	BAY-SOUND: MARINE DEPOSITS BOTTOMING BAYS & SOUNDS.
B. PLEISTOCENE	ANCIENT FORMER MISS. RIVER DELTAIC & NEAR SHORE DEPOSITS. OLDEST DEPOSITS ENCOUNTERED.

BORINGS 13 THRU 28 SAMPLED & CLASSIFIED BY EUSTIS ENGINEERING.
BORING 5-LUW SAMPLED & CLASSIFIED BY U.S. ARMY CORPS OF ENGINEERS.

HORIZONTAL SCALE: 1" = 250'

250' 125' 0 250' 500' 750' 1000' 1250'

VERTICAL SCALE: 1" = 10'

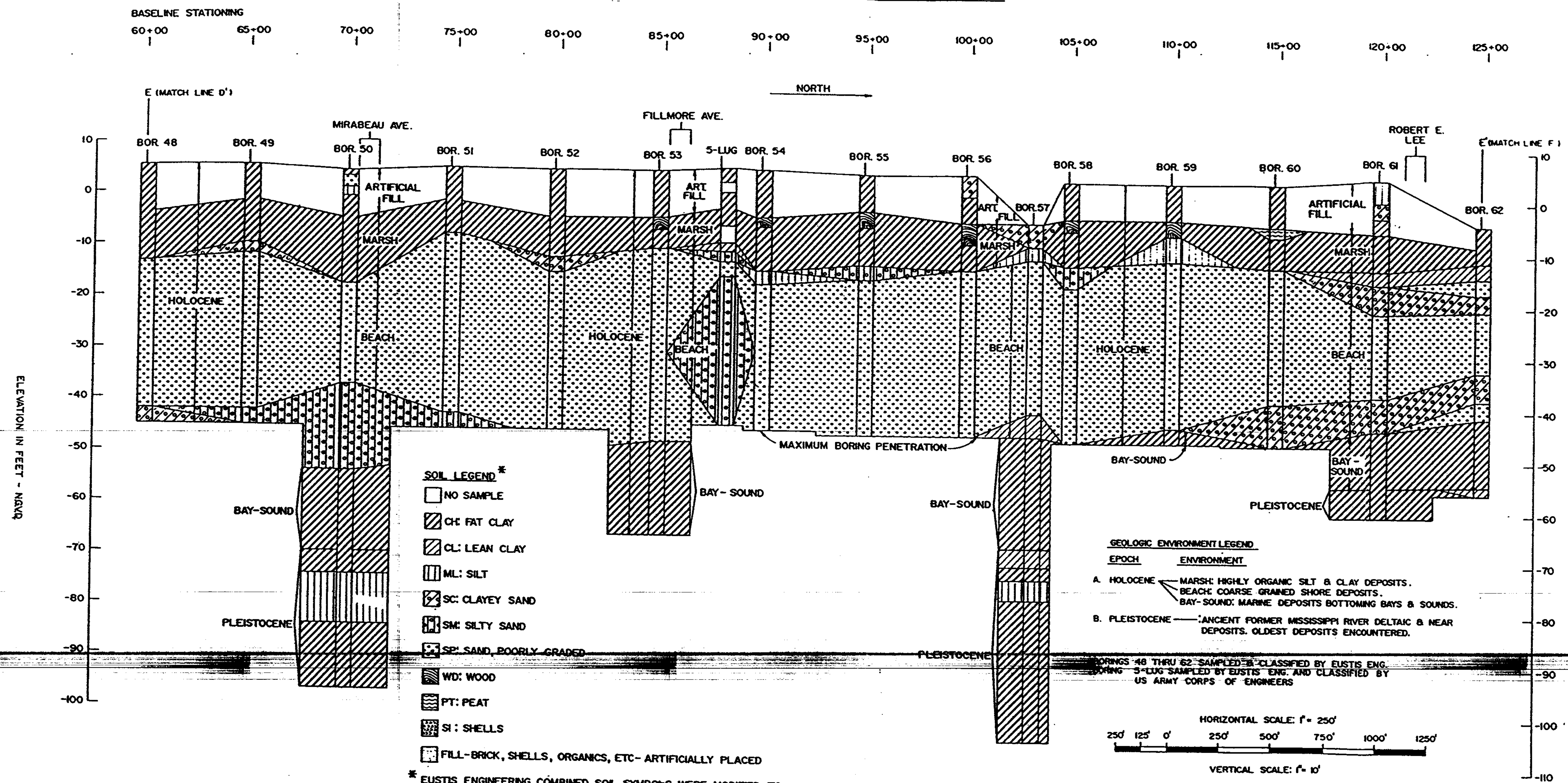
LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19A - GENERAL DESIGN
LONDON AVE. OUTFALL CANAL
ORLEANS PARISH

SOIL AND GEOLOGICAL PROFILE

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

DATE SEPT 1988 FILE NO H-2-30288

LONDON AVENUE OUTFALL CANAL - EAST LEVEE (MIDDLE SECTION)



SOIL LEGEND*

- NO SAMPLE
- CH: FAT CLAY
- CL: LEAN CLAY
- ML: SILT
- SC: CLAYEY SAND
- SM: SILTY SAND
- SP: SAND, POORLY GRADED
- WD: WOOD
- PT: PEAT
- SI: SHELLS
- FILL-BRICK, SHELLS, ORGANICS, ETC- ARTIFICIALLY PLACED

* EUSTIS ENGINEERING COMBINED SOIL SYMBOLS WERE MODIFIED TO ACCOMMODATE THE PREDOMINANT SOIL TYPE AND THE UNIFIED SOIL CLASSIFICATION SYMBOL.

SEE PG. I-3 APPENDIX A FOR LOCATION OF EUSTIS ENGINEERING SOIL BORINGS

GEOLOGIC ENVIRONMENT LEGEND

EPOCH	ENVIRONMENT
A. HOLOCENE	MARSH: HIGHLY ORGANIC SILT & CLAY DEPOSITS. BEACH: COARSE GRAINED SHORE DEPOSITS. BAY-SOUND: MARINE DEPOSITS BOTTOMING BAYS & SOUNDS.
B. PLEISTOCENE	ANCIENT FORMER MISSISSIPPI RIVER DELTAIC & NEAR DEPOSITS. OLDEST DEPOSITS ENCOUNTERED.

BORINGS 48 THRU 62 SAMPLED & CLASSIFIED BY EUSTIS ENG.
BORING 5-LUG SAMPLED BY EUSTIS ENG. AND CLASSIFIED BY US ARMY CORPS OF ENGINEERS

HORIZONTAL SCALE: 1" = 250'
250' 125' 0' 250' 500' 750' 1000' 1250'
VERTICAL SCALE: 1" = 10'

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 19A - GENERAL DESIGN
LONDON AVE. OUTFALL CANAL
ORLEANS PARISH

SOIL AND GEOLOGICAL PROFILE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
DATE SEPT 1988 FILE NO. H-2-30266

APPENDIX C

DOTD DESIGN STANDARDS

LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
DESIGN STANDARDS FOR COLLECTOR ROADS AND STREETS

ITEM No.	ITEM	RURAL			URBAN		
		RC-1	RC-2	RC-3	UC-1	UC-2	UC-3
1	Current Average Daily Traffic	0-400	Over 400	Over 400	N/A	N/A	N/A
2	Design Hourly Volume	N/A	100-200	Over 200	N/A	N/A	N/A
3	Design Speed (M.P.H.)	60 (14)	60 (14)	60	30	40	45
4	Level of Service	C	C	C	D	D	D
5	Number of Travel Lanes	2	2	2 to 4 (1)	2 to 4	2 to 4	2 to 4
6	Width of Travel Lanes (Ft.)						
	(A) With Curb	N/A	N/A	N/A	10 to 12	10 to 12	12
	(B) With Shoulder	11	11	12	11 to 12 (12)	11 to 12 (12)	12
7	Width of Parking Lanes (Where Used) (Ft.)	N/A	N/A	N/A	8 to 10	8 to 10	8 to 10
8	Width of Shoulders (Where Used) (Ft.)						
	(A) Outside	2(Min.)-4(Typ.)	6(Min.)-8(Des.) (11)	8(Min.)-10(Des.) (11)	8	8(Min.)-10(Des.) (13)	8(Min.)-10(Des.) (13)
	(B) Median	N/A	N/A	4	N/A	N/A	4
9	Type of Shoulders	Aggregate	Agg.(Min.)-Paved(Des.)	Paved	Paved	Paved	Paved
10	Width of Median (Ft.)						
	(A) Depressed	N/A	N/A	40(Min)-60(Des)	N/A	N/A	N/A
	(B) Raised	N/A	N/A	N/A	4(Min.)-30(Des.)	4(Min.)-30(Des.)	4(Min.)-30(Des.)
	(C) Two Way Left Turn Lanes	N/A	N/A	N/A	11(Min)-14(Typ)	11(Min)-14(Typ)	11(Min)-14(Typ)
11	Width of Sidewalk (Where Used) (Offset From Curb) (Ft.)	N/A	N/A	N/A	4	4	4
	Width of Sidewalk (Where Used) (Adjacent To Curb) (Ft.)	N/A	N/A	N/A	6	6	6
12	Fore Slope - Ratio	4:1	4:1	6:1	3:1(Min)-4:1(Des)	3:1(Min)-4:1(Des)	3:1(Min)-4:1(Des)
13	Back Slope - Ratio	3:1	4:1	4:1	2:1(Min)-3:1(Des)	2:1(Min)-3:1(Des)	3:1
14	Pavement Cross Slope (Ft. per Ft.) (2)	0.025	0.025	0.025	0.025	0.025	0.025
15	Stopping Sight Distance (Ft.) (3)	525-650	525-650	525-650	200	275-325	325-400
16	Maximum Superelevation (Ft. per Ft.)	0.10	0.10	0.10	0.04	0.04	0.04
17	Maximum Horiz. Curvature (W/out Superelevation) (+.025) (10)	N/A	N/A	N/A	23°00'	10°00'	N/A
	Maximum Horiz. Curvature (W/out Superelevation) (-.025) (10)	N/A	N/A	N/A	18°00'	8°00'	N/A
18	Maximum Horizontal Curvature (With Superelevation) (10)	5°00'	5°00'	5°00'	24°00'	11°00'	7°30'
19	Maximum Grade (%)	7	6	5	9	9	8
20	Minimum Vertical Clearance (Ft.)	15	15	15	15	15	15
21	Minimum Horizontal Clearance (Ft.)						
	(A) From Edge of Travel Lane	30	30	30	(8)	(8)	(9)
	(B) Outside (From Back of Curb)	N/A	N/A	N/A	1(Min.)-6(Typ.)	1(Min.)-6(Typ.)	6(Min.)-15(Des.)
	(C) Median (Where Used) (From Back of Curb)	N/A	N/A	N/A	1(Min.)-6(Typ.)	1(Min.)-6(Typ.)	4(Min.)-15(Des.)
22	Width of Right of Way (Minimum) (Ft.) (4)(5)						
	(A) From ℄	60	60	75	N/A	N/A	N/A
	(B) From Edge of Travelway	N/A	N/A	N/A	8(Min.)-11(Des.)	8(Min.)-11(Des.)	8(Min.)-17(Des.)
23	Bridge Design Load	HS-20	HS-20	HS-20	HS-20	HS-20	HS-20
24	Width of Bridges (Minimum) (Face to Face Bridge Rail)	30'	Shldr. Width (7)	Shldr. Width	Roadway Width Plus 8' (6)	Roadway Width Plus 8' (6)	Roadway Width Plus 8' (6)
25	Bridge End Treatment Required at Bridges	YES	YES	YES	YES	YES	YES

(1) For Rolling Terrain, Limited Passing Sight Distance and High Percentage Trucks, 4 Lanes May Be Required When DHV is Above 700.

(2) 2% Acceptable For Rehabilitation Projects.

(3) Minimum Values Shown Permissible For Rehabilitation Projects. Maximum Values Shown To Be Used Where Conditions Permit.

(4) Minimum Required For New Location And As Needed For Existing Alignment.

(5) Obtain Additional Right of Way For Future Lanes Where Justified.

(6) For Approach Roadways Without Curb Use Shoulder Width. 6' Sidewalk Behind Curb To Be Carried Across Bridge When Justified By Pedestrian Traffic.

(7) 30' Minimum Width Is Allowable With Aggregate Shoulders. 36' Required For Paved Shoulders.

(8) If Not Curbed, Clearance = 10'

(9) If Not Curbed, Clearance = 20'

(10) It May Be Necessary To Flatten The Degree Of Curve And/Or Increase The Shoulder Width (Maximum Of 12') To Provide Adequate Stopping Sight Distance On Structure.

(11) For Spot-Replacement Bridge Projects Where No Future Improvements To The Roadway Are Planned, Construction May Be To The Design Minimums.

(12) For DHV > 400 Use 12' Lanes.

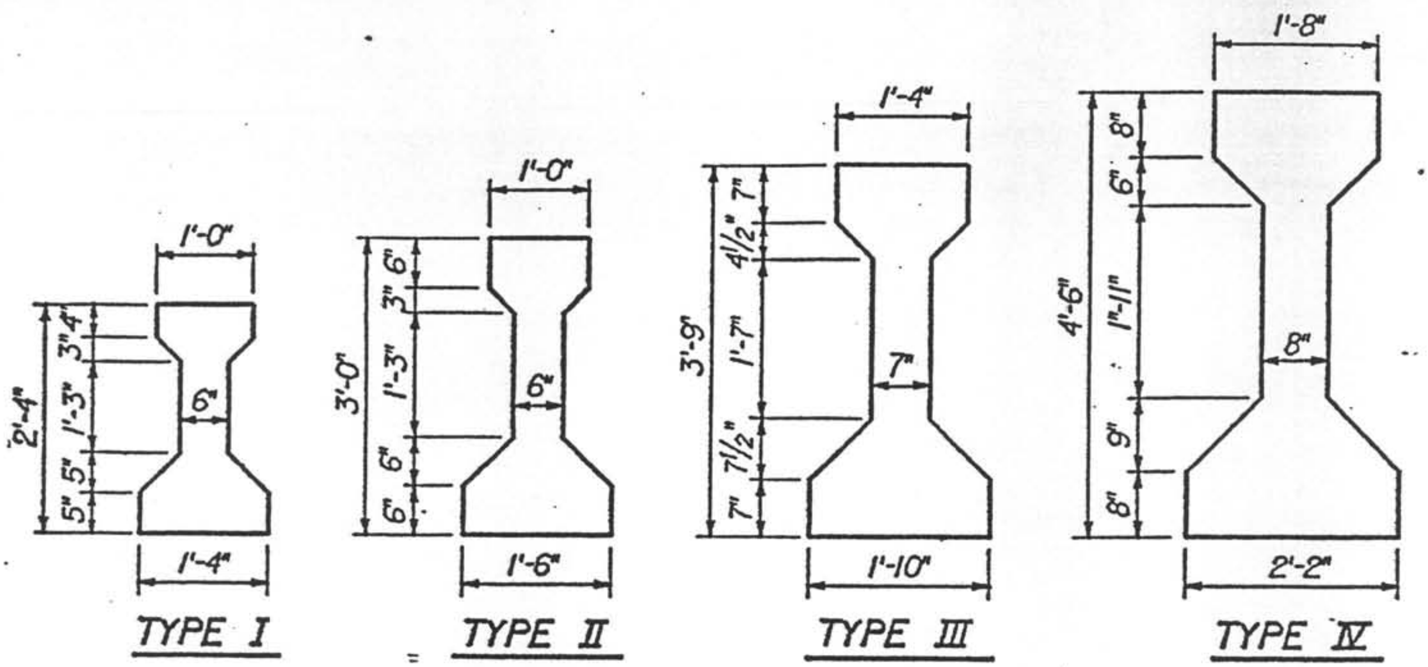
(13) For DHV > 200 Use 8'; For DHV > 400 Use 10'.

(14) For Spot Projects, Lesser Design Speeds May Be Used When Conditions Require.

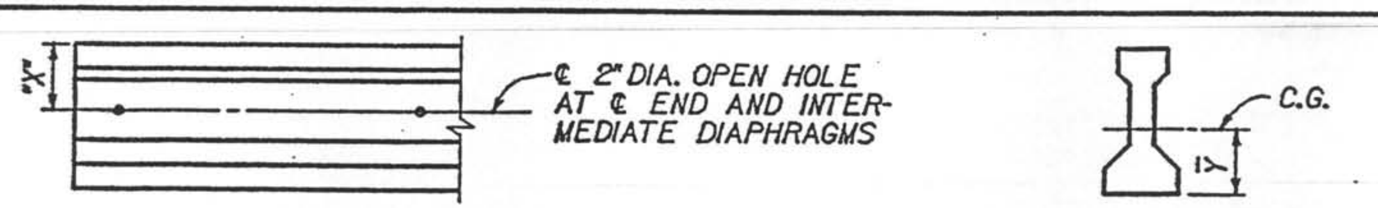
Sheet 3 of

DESIGN STANDARDS

Approved: Dempsey D. White (Chief Engineer) Jan. 22, 199[illegible] (Date)



BEAM PROPERTIES



BEAM TYPE	AREA INCHES²	AREA FEET²	"X" INCHES	Ȳ INCHES	MOMENT OF INERTIA INCHES⁴	WEIGHT LBS./FT.	BOTTOM SECT. MOD. INCHES³	TOP SECT. MOD. INCHES³
I	276	1.9167	12.5	12.59	22,750	288	1,805	1,307
II	369	2.5625	16.5	15.83	50,980	384	3,220	2,527
III	560	3.8889	21.0	20.27	125,390	583	6,186	5,070
IV	789	5.4792	25.5	24.73	260,730	822	10,543	8,908

* THIS DIMENSION MAY BE ADJUSTED TO CLEAR DRAPED STRANDS WHEN NECESSARY.
THIS DIMENSION IS TYPICAL FOR ALL GIRDERS REGARDLESS OF ROADWAY CROWN.

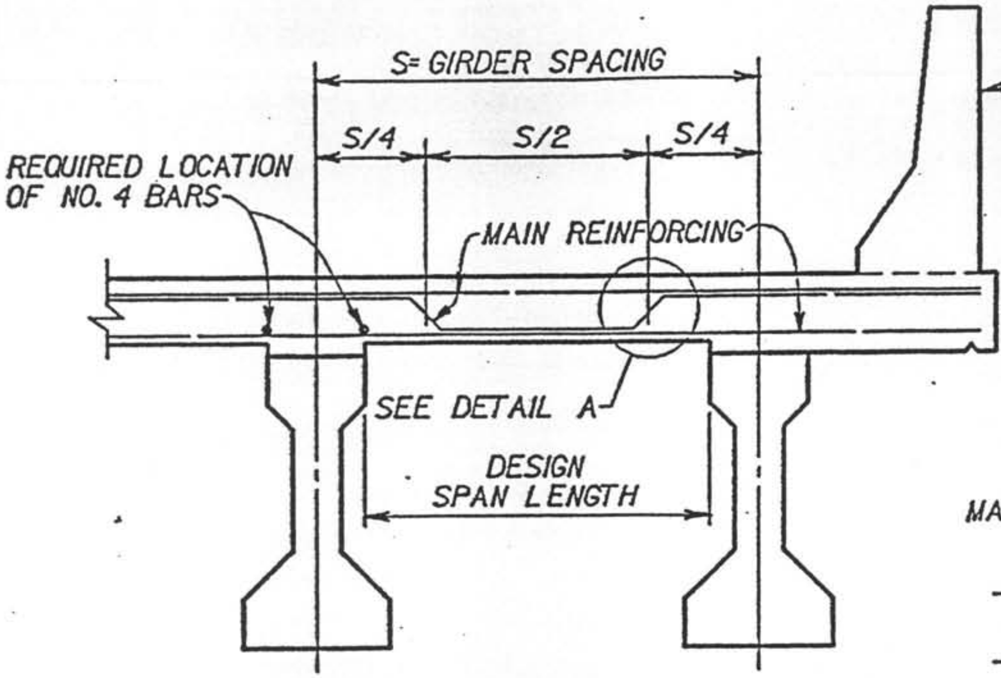
⊗ INTERIOR GIRDERS ONLY.

REVISIONS		
DATE	DESCRIPTION	BY

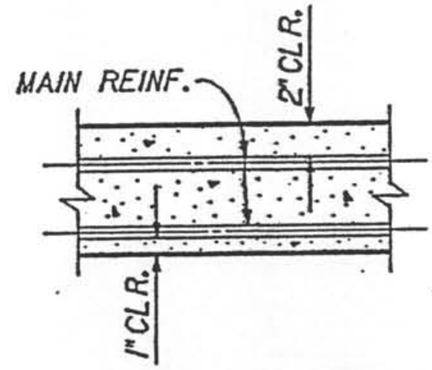
PRESTRESSED GIRDERS

DATE: 1/87

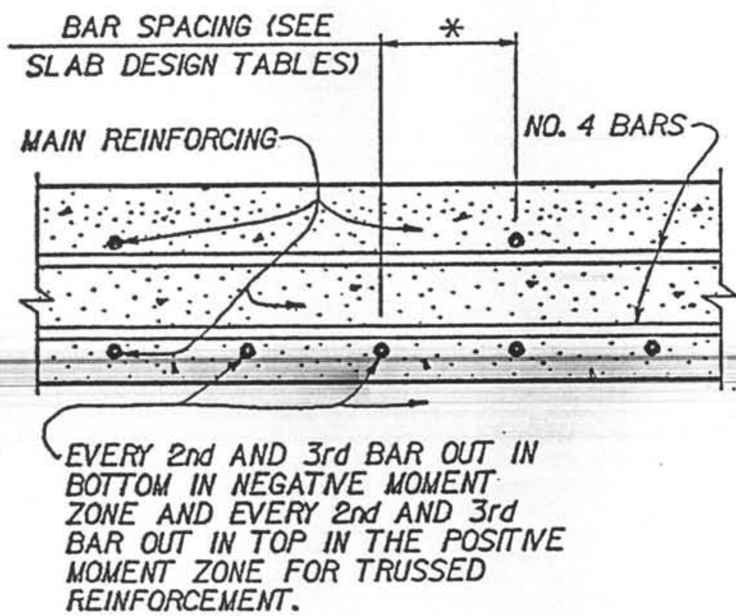
STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION & DEVELOPMENT
OFFICE OF HIGHWAYS
BRIDGE DESIGN SECTION



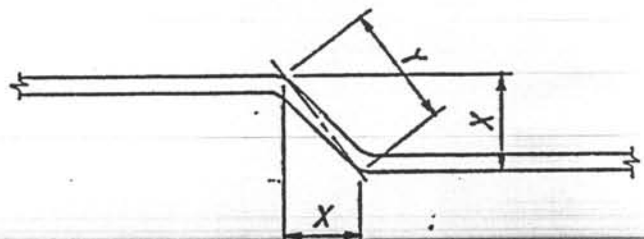
TYPICAL SLAB SECTION



STANDARD BAR CLEARANCES



BAR LAYOUT



DETAIL A

TRUSSED BAR DIMENSIONS ⊗							
7" SLAB		7½" SLAB		8" SLAB		8½" SLAB	
X	Y	X	Y	X	Y	X	Y
4"	5 11/16"	4½"	6⅜"	5"	7 1/16"	5½"	7¾"

⊗ FROM DETAIL A

SLAB DESIGN

DATE: 1/87

REVISIONS		
DATE	DESCRIPTION	BY

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION & DEVELOPMENT
OFFICE OF HIGHWAYS
BRIDGE DESIGN SECTION

SLAB DESIGN TABLE
STRAIGHT REINFORCING STEEL

SLAB THICK. (IN.)	MAX. DESIGN SPAN (FT.)	MAIN REINF. BAR NO.	MAIN REINF. BAR SPA. (INCHES)	NO. OF NO. 4 BARS IN BOTTOM MID 1/2 OF SPAN	COST $/SQ. FT.
7.0	7.2097	6	5.0	11	8.112
	6.8713	6	5.5	9	7.801
	6.5780	6	6.0	9	7.608
	6.3180	6	6.5	8	7.321
	5.9054	5	5.0	7	7.095
	5.3012	5	5.5	6	6.920
	4.7809	5	6.0	5	6.766
	4.3307	5	6.5	4	6.505
7.5	8.7338	6	5.0	14	8.464
	8.3410	6	5.5	12	8.103
	8.0003	6	6.0	11	7.875
	7.3802	6	6.5	10	7.702
	6.8301	6	7.0	9	7.550
	6.7329	5	5.0	8	7.383
	6.0660	5	5.5	7	7.209
	5.4921	5	6.0	6	7.059
	4.9956	5	6.5	5	6.925
	4.5597	5	7.0	4	6.685

SLAB THICK. (IN.)	MAX. DESIGN SPAN (FT.)	MAIN REINF. BAR NO.	MAIN REINF. BAR SPA. (INCHES)	NO. OF NO. 4 BARS IN BOTTOM MID 1/2 OF SPAN	COST $/SQ. FT.
8.0	10.2407	6	5.0	18	8.830
	9.7042	6	5.5	15	8.468
	8.9298	6	6.0	13	8.244
	8.2509	6	6.5	11	7.981
	7.6511	6	7.0	10	7.831
	7.5330	5	5.0	9	7.747
	7.1174	6	7.5	8	7.585
	6.8073	5	5.5	8	7.504
	6.1829	5	6.0	7	7.356
	5.6427	5	6.5	6	7.226
	5.1684	5	7.0	5	7.108
	4.7493	5	7.5	4	6.884
8.5	11.6267	6	5.0	21	9.167
	10.6554	6	5.5	17	8.820
	9.8207	6	6.0	15	8.550
	9.0893	6	6.5	12	8.269
	8.4433	6	7.0	11	8.119
	8.3055	5	5.0	10	8.038
	7.8683	6	7.5	9	7.953
	7.5248	5	5.5	9	7.874
	7.3535	6	8.0	8	7.759
	6.8530	5	6.0	7	7.618
	6.2716	5	6.5	6	7.487
	5.7610	5	7.0	5	7.368
	5.3097	5	7.5	5	7.308
	4.9078	5	8.0	4	7.099

NOTES:

(1) FUTURE WEARING SURFACE 12 LBS./SQ. FT.
(2) SLAB THICKNESS SHOWN ABOVE INCLUDES 1/2" OF WEARING SURFACE.
(3) COST OF STEEL = $0.40/LB.
(4) COST OF CONCRETE = $200.00/CU. YD.

SLAB DESIGN

DATE: 1/87

REVISIONS		
DATE	DESCRIPTION	BY

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION & DEVELOPMENT
OFFICE OF HIGHWAYS
BRIDGE DESIGN SECTION

APPENDIX D

TASK FORCE REPORT

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

February 1995

TASK FORCE REPORT to Mayor Marc H. Morial

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

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City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

Executive Order
MHM 94-024

TASK FORCE:
OUTFALL CANAL BRIDGES

By the authority vested in me as Mayor of the City of New Orleans by the Constitution of the State of Louisiana and the Home Rule Charter of the City of New Orleans, IT IS HEREBY ORDERED AS FOLLOWS:

1. **Purpose:** The Mayor's "Task Force on Outfall Bridges" is hereby created.

2. **Scope:** This Task Force shall:
    a. investigate and discuss all issues relating to the bridges over the Orleans Avenue and London Avenue Outfall Canals;
    b. evaluate and discuss the design of such outfall canal bridges;
    c. evaluate and discuss the measures needed to floodproof such outfall canal bridges;
    d. seek advice and comments on these and related issues through the use of public hearings;
    e. recommend to the Mayor an Outfall Canal Bridge design that would have minimal impact on the quality of life in each affected neighborhood and also provide maximum flood protection for the City;
    f. perform any other related activity assigned by the Mayor; and
    g. provide a final report to the Mayor detailing its activities and its findings.

3. **Composition:** The members of this Task Force are as follows:
    a. Cedric Grant, the Deputy Chief Administrative Officer, who shall act as Chair;
    b. Mrs. Blanche Francis;
    c. Mrs. June Marshall;
    d. Herman Scieneaux
    e. Charles Teamer;
    f. a representative designated by each of the following:
        1. London Avenue Canal Civic Association;
        2. Lakeview Civic Association;
        3. Lake Oaks Civic Improvement Association;
        4. Lake Vista Property Owners Association;
        5. The Director of the Department of Streets;
        6. The Director of the Department of Health; Office of Emergency Medical Services;

Continued....

7. The Director of the Office of Emergency Preparedness;
8. The Executive Director of the City Planning Commission;
9. The United States Army Corps of Engineers;
10. The Louisiana National Guard;

g. Hon. James Singleton, City Councilmember-at-Large
h. Hon. Peggy Wilson, City Councilmember-at-Large;
i. Hon. Suzanne Haik-Terrell, City Councilmember, District A;
j. Hon. Roy Glapion, City Councilmember, District D;
k. The Chief Engineer of the Orleans Levee District;
l. The Chairman of the Orleans Levee Board's Engineering Committee; and
m. The Mayor may, in writing, add or remove members of this Task Force.

4. The Chief Administrative Office shall staff and provide all necessary support for this Task Force.

5. All departments, agencies, boards and commissions of the Executive Department shall cooperate with and assist this Advisory Committee.

6. **Duration:** This Task Force shall have authority to act under the directives of this Executive Order for forty-five (45) days from the signing of this Order, unless the Mayor otherwise extends this date in writing.

FURTHERMORE, IT IS HEREBY ORDERED that such provisions be designed and formulated so as to effectuate the spirit, intent, and purpose of this Executive Order.

WITNESS MY HAND AND SEAL THIS 2 DAY OF November, 1994 AT NEW ORLEANS, LOUISIANA.

Marc Morial

MARC H. MORIAL
MAYOR, CITY OF NEW ORLEANS

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

Task Force Participants

The following list delineates the neighborhood residents that donated their time to work with the local, state and federal government officials and representatives in investigating the issues and proposing the recommendations contained in this report.

Ann Barnes	Lake Vista Property Owners
Frank Barrett	Lakeview Civic Improvement Association
Andrew Brown	Lakeshore Property Association
Gail S. Ford	Lake Oaks Civic Association
Blanche Francis	London Avenue Canal Civic Association
Mary Haase	Lake Vista Property Owners
Jerry Hardouin	Vista Park Civic Association
Marilyn Landiak	London Avenue Canal Civic Association
John A. Reinecke	Mirabeau Gardens Neighborhood Association
Cesily G. Roberts	Vista Park Civic Association
Herman F. Scieneaux	Gentilly Service Inc.
Charles C. Teamer	Dillard University
Hon. Peggy Wilson	City Councilmember-at-Large
Hon. Suzanne-Haik Terrell	City Councilmember District A
Hon. Roy E. Glapion, Jr.	City Councilmember District D
Cedric Grant, Chair	Deputy Chief Administrative Officer
Kristina Ford	Director, City Planning Commission
Betty Jo Everett	Director, Department of Streets
Robert Eichhorn	Deputy Director, Office of Emergency Preparedness
Jack Spanola	City Planning Commission
Amyre-Suane Romain	Department of Streets
Michael Nobile	Department of Health - EMS
Dawn Orgeron	Department of Health - EMS
Peter Abbotsford	City Planning Commission
Richard Sackett	Orleans Levee Board Commissioner
Stevan G. Spencer	Orleans Levee Board
Col. Tom Rodrigue	LA National Guard
Terral Broussard	U.S. Army Corps of Engineers
G. Gordon Hebert	U.S. Army Corps of Engineers

EXECUTIVE SUMMARY

On November 29, 1994, the Mayor's Task Force convened the first of its three meetings to discuss, investigate, and evaluate the measures required to floodproof eight roadways crossing the London and Orleans Avenue outfall canals. The canal crossings studied by the Task Force were limited to the following locations:

London Avenue Canal
* Filmore Avenue
* Gentilly Boulevard
* Leon C. Simon Drive
* Mirabeau Avenue
* Robert E. Lee Boulevard

Orleans Avenue Canal
* Filmore Avenue
* Harrison Avenue
* Robert E. Lee Boulevard

Created by Executive Order #MHM 94-024, the diverse group of concerned neighborhood residents, City, State and Federal officials responded by examining the following major issues and proposed floodproofing options:

Major Issues
* Flooding scenarios based on the five categories of hurricanes and their impact on City evacuation routes;
* Physical and visual impact of each flood protection alternative on the neighborhoods;
* Proximity of emergency services to each canal crossing;
* Existing structural conditions of each bridge; and
* Different roles of the City, State and Federal agencies responsible for public safety during emergency situations

Proposed Options
* High-rise bridges;
* Middle-level bridge;
* Sealed-bridges; and
* Floodgates

At the end of the second Task Force meeting that was held on December 20, 1994, the neighborhood representatives clearly delineated their constituents' preferences of sealed bridges (not to exceed the existing bridge elevations) and floodgates as the only acceptable methods of flood protection. The

Continued.....

neighborhood residents soundly rejected the High-rise bridge option proposed by the Orleans Levee District. Furthermore, the conceptual design of a Middle-level bridge alternative set forth by the City of New Orleans seemed incompatible with the neighborhood's desires as represented by the Task Force participants.

On January 10, 1995 the Task Force convened to finalize its recommendations to the Mayor. The following two important issues surfaced as part of the discussions:

1. The ability of the City to obtain waivers to the AASHTO's National Highway Standards concerning the requirement to reconstruct the bridge approaches to contemporary standards. City officials assured the group that if a waiver could not be obtained for any location, the Task Force would re-convene to study the matter; and

2. The need to address the physical and visual impact of the sealed-bridge alternative on neighborhoods. Specifically, the construction of new infrastructure should be a product of an integrated design process that stresses both engineering and urban design. City officials proposed to include this requirement as part of the bridge design process.

Proceeding from these discussions and according to the stated rationale and provisos, the Task Force agreed to forward the following flood protection recommendations to Mayor Morial:

FLOOD PROTECTION RECOMMENDATIONS

Sealed-Bridge Alternative

- ***London Avenue Canal***
  - Gentilly Boulevard
  - Mirabeau Avenue
  - Leon C. Simon Drive
  - Robert E. Lee Boulevard
- ***Orleans Avenue Canal***
  - Robert E. Lee Boulevard

Floodgate Alternative

- ***London Avenue Canal***
  - Filmore Avenue
- ***Orleans Avenue Canal***
  - Filmore Avenue
  - Harrison Avenue

Rationale:

1. Four-lane roadways provide better access to major evacuation routes and emergency services than two-lane roadways. Therefore, sealed bridges should be constructed where four-lane roadways cross the canals to allow for access at all times during emergency situations;
2. Constructing floodgates across a four-lane roadway narrows the cost differential between the floodgate and sealed-bridge alternatives; and
3. A sealed bridge is proposed at Robert E. Lee Boulevard at the London Avenue Canal because the City is responsible for its design and construction under a different funding mechanism.

Continued....

Provisos:

1. The sealed-bridge alternative is proposed at all locations with the stipulation that waivers of the AASHTO's National Highway Standards are granted concerning the need to reconstruct the bridge approaches. Traffic engineering enhancements including, but not limited to, caution lights and reduced speed limits should be examined to assist in obtaining the waivers. If a waiver cannot be obtained for a particular location, the matter will return to the Task Force for its consideration; and
2. The sealed-bridge alternative is proposed at all locations with the stipulation that the design process will include evaluation and implementation of appropriate urban design principles.

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

Summary of November 29, 1994 Meeting convened at the New Orleans Museum of Art at 7:00 p.m.

I. Presentation by City officials

Mr. Cedric Grant, Task Force Chair, welcomed the group and thanked them for their participation in this process. He emphasized that the City had no preconceived ideas and that all options were open to discussion and investigation. The Task Force would hold a series of meetings to fulfill its duties. Following these remarks, Mr. Robert Eichhorn, Deputy Director of the Office of Emergency Preparedness, conducted a slide presentation on the impact of various strength hurricanes on the topography of the City. Ms. Kristina Ford, Director and Mr. Jack Spanola, Principal Planner of the City Planning Commission, presented four options to achieve flood protection at each bridge location:

1. High-rise bridges;
2. Modifications to existing bridges;
3. Installation of flood gates; and
4. Middle Level bridges

II. Discussion

During the course of the meeting the following issues were raised by the group:

Evacuation and storm conditions:

What would be the water level in the canals when a hurricane was still 12 hours away from the City (the time when evacuation was no longer allowed by the authorities)? Would the design parameters change if people were already evacuated from the area?

Underpasses around the City could flood before the storm actually made landfall. How would the citizens be evacuated during this condition?

What streets are designated as emergency evacuation routes?

Bridge Options:

Installation of flood gates would prevent emergency access after the evacuation had occurred.

What is the feasibility of constructing hinged side walls on the existing bridges or on new bridges constructed at the same roadway height?

Continued....

Mr. Richard Sackett, Orleans Levee Board, commented that he did not believe that this alternative was viable because of a number of reasons: maintenance of the hinge mechanisms; the ability to operate because the walls or hinges had been damaged by vehicular impact or because of the walls themselves becoming warped; and the lack of experience with this system during storm conditions of this magnitude. Furthermore, Mr. Sackett stated that the only hinged wall system was on private property.

Due to the design of the existing bridges, it would be more cost effective to provide new sealed bridges instead of constructing side walls on the existing bridges.

Most of the existing bridges are in poor condition as described in the inspection report issued by Louisiana Department of Transportation & Development. Ms. Betty Jo Everett, Director of the Streets Department, postulated that there would be no bridge remaining if only flood gates were installed at certain locations.

Bridges would most likely sustain damage during a major storm, even though these same bridges survived storms in the past (due to age and structural deficiencies).

Why does each bridge receive the same flood protection option? Each canal crossing should be evaluated individually.

Financial:

What would be the financial implications on building new bridges if flood gates were erected as an interim measure? The Army Corps of Engineers would have to be involved in that decision.

Under the cost sharing plan, the Corps of Engineers would pay for a maximum of 70% of the cost of flood protection and the Levee Board would contribute 30% of the funding through a bond issue.

The cost to install flood gates is estimated at $6 million, while the cost to replace the bridges would be $25 - $30 million.

Given the age and structural condition of the bridges, this is an opportunity for the City to improve its infrastructure with little impact to its budget. The City owns the bridges not the Levee Board. Therefore, in order for the Levee Board to work on the bridges, the City would have to abandon the bridges, or the Levee Board would have to expropriate them.

Continued....

III. Conclusions

The group agreed to meet on December 13, 1994 at the same location and time. Furthermore, the City was requested to supply the following information:

1. A large map of the City with evacuation routes clearly defined;
2. The water level in the canals when the storm is 12 hours away from the City;
3. A prioritized list of the flood protection options for each bridge. Start with the Gentilly Blvd. bridge because it is in the worst condition; and
4. A new option that sets the height of the bridges based upon the existing length of the approaches.

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

Summary of December 20, 1994 Meeting convened at the New Orleans Museum of Art at 7:00 p.m.

I. Presentation by City officials

Cedric Grant, the Task Force Chair again welcomed the group to the second in a series of meetings. Attention was directed to the agenda at the front of the report distributed to all Task Force members. This report was compiled by the City Planning Commission and addressed evacuation issues, access to emergency service, the existing structural condition of the bridges, and an evaluation of flood protection alternatives.

Questions pertaining to the report were then fielded by the following City officials: Cedric Grant of the Chief Administrative Office, Kristina Ford of the City Planning Commission, Robert Eichhorn of the Office of Emergency Preparedness, Betty Jo Everett of the Department of Streets, Terral Broussard of the Corps of Engineers, and Richard Sackett of the Orleans Levee District.

II. Discussion

During the course of the meeting, the following issues were raised by the group:

Cost Estimates:

A member of the Lake Vista Property Owners Association questioned why the estimated cost of a floodgate was higher than that of a new sealed bridge at Robert E. Lee and Orleans, and why the cost was so high for a new sealed bridge incorporating floodgates at Filmore and London Avenues,, and at Mirabeau and London Avenues. In response to these questions, the Task Force Chairman said the City would review the cost estimates provided by the consultant, Hartman Engineering, and have this consultant provide a cost estimate for a New Middle Level Bridge. *

A citizen asked who decides whether a sealed bridge must be completely rebuilt, or can be rehabilitated. This citizen was suspicious that new bridges would be required for the sake of safety, but in actual fact be motivated by someone's desire to profit from unnecessary work. City officials replied that they would explore the possibility of a sealed bridge that does not require a complete or total restructuring; the Chairman also stated emphatically that any work performed would be necessary work, and not be the result of unscrupulous motives.

Continued....

Contribution of Outside Resources:

In response to questions about the resources (including monetary), the Corps and the Levee Board would contribute, the public was reminded that both entities are not in the business of building roads, but of providing flood protection. The Corps will not look favorably at building a new bridge, or expanding from two to four lanes a bridge if it does not have flood protection as an integral component of its design.

Therefore, it is important for the neighborhood groups to come together with a shared idea of what needs to be done in the future. If the Corps and the Levee Board are to be involved in the process, the focus must be on flood protection, not necessarily on what is the best thing to do structurally or technically for the bridges and their roads. Both entities understand the desirability of meshing cost savings with replacement strategies and told the group this will guide their flood protection efforts.

Time Frame:

The question was raised, how long will it take to build either floodgates or bridges. Richard Sackett of the Orleans Levee Board estimated that without legal obstacles, the length of time it will take to construct a raised bridge will be approximately three years from design to construction. With such obstacles, the length of time can stretch anywhere from six to eight years, or longer. Typically, floodgates can be constructed in a year; when the various stages of approval are taken into account, new bridges generally require about eight years to be completed.

Prioritization of recommendations:

According to Bob Eichorn of the Office of Emergency Preparedness, bridge construction is prioritized by the four main arteries used as evacuation routes in the event of a storm (discussed in the Task Force report). It was asked what the impact would be on those locations where bridges need to be raised, such as the homes next to Gentilly. And if new bridges are built, must new approaches to the bridges also be built? It was asked what would be required for Filmore Street to be passable in a major storm, which brought up the issue of access -- if new bridges are built, can they be reached during a flood? The Streets Department said they would supply further information about access to the bridges in the event of street flooding.

III. Conclusions

Kristina Ford of the City Planning Commission thanked the group for its praise of the clarity of the information and the way it was organized in the report; she then asked of the group, what else was needed to move the process forward? The neighborhood organizations reached a consensus in favor of sealed bridges, and against raised bridges.

Continued....

Needed from the City for the next meeting was more information on sealed bridges and their effects:

- What is meant by "sealed bridge" -- is it a new bridge or a reconstructed bridge?
- Who decides whether a sealed bridge has to be completely rebuilt?
- What are the criteria used to decide whether a bridge has to be rebuilt?
- Why are some sealed bridges so costly while others are not?
- How do sealed bridges compare to mid-level bridges in terms of cost?
- If the streets flood, will there still be access to the bridges?
- Do new approaches have to be built if new bridges are built?
- Which approaches are deficient?

The group agreed to meet again on 10 January 1995 at 7:00 P.M.

Summary of the January 9, 1995 Public Hearing convened at St. Frances Cabrini Parish School at 7:00 p.m.

This public hearing was organized by Ms. Marilyn Landiak, representative of the London Avenue Canal Civic Association, to allow the neighborhood residents most affected by the Task Force recommendations to express their views to City officials. In addition to Mr. Cedric Grant, Deputy Chief Administrative Officer, and the Hon. Roy Glapion, Councilmember District 'D', representatives from the City Planning Commission, the Department of Streets, the Office of Emergency Preparedness, and the Corps of Engineers attended the meeting.

Mr. Grant explained to those in attendance that the City's position was one of inclusion and that the opinions and desires of the community would be taken into consideration by the Task Force in its evaluation of flood protection alternatives. After comments by Councilmember Glapion, a question and answer period followed where the public was able to voice their concerns. Comments typically revolved about the desirability of a particular type of flood protection at the canal crossing nearest a speaker's residence. Specifically, the group was against the Orleans Levee Board's high-rise bridge alternative, or any type of elevated bridge for that matter. The consensus of the group was that floodgates and sealed bridges at the existing roadway elevations would be acceptable methods of flood protection.

At the end of the meeting, Mr. Grant thanked the people for attending the meeting and assured them that the City's position to use a combination of floodgates and sealed bridges was in agreement with the comments voiced during the meeting.

City of New Orleans
Mayor's Task Force
London & Orleans Avenue Outfall Canal Bridges

Summary of January 10, 1995 Meeting convened at Dillard University at 7:00 p.m.

I. Presentation by City officials
Mr. Cedric Grant, Task Force Chair, welcomed the members to the third meeting convened to address the issue of flood protection along the London and Orleans Avenue outfall canals. Mr. Grant stated that City officials were prepared to present recommendations to the group for its consideration. However, Mr. Grant believed that it was important to first address the questions generated by the group at its last meeting on December 20, 1995.

II. Discussion
Mr. Jack Spanola, Principal City Planner of the City Planning Commission, explained that although a number of topics were discussed during the December 20, 1994 Task Force meeting, the City representatives believed that the following questions represented the core issues discussed by the group:

1. Does the Sealed-Bridge alternative connote building an entire new bridge structure, and what is the process to arrive at this decision?

The Task Force recommendations to the Mayor will articulate the preferred flood protection alternative for each canal crossing. Once the goal for each crossing is established, the detailed engineering work can be commissioned to achieve the desired results. Should the engineering analysis suggest alterations to the recommendations, the matter will be brought back to the Task Force for its consideration.

2. Why are the cost estimates for the proposed sealed-bridges that cross the London Avenue Canal at Filmore and Mirabeau Avenues so much higher than the other locations?

The "Draft" engineering report supplied to the City indicates that the sealed-bridge alternative for these two locations includes the installation of flood gates and relocation of certain utilities in and around the canals.

3. If severe street flooding is prevalent at a particular location, will there still be access to the bridge?

Continued....

The method of flood protection proposed by the City in the following section will indicate the installation of flood gates at the locations where street flooding would prevent access to a bridge.

4. Is construction of new approaches required if new bridges are constructed?

Waivers to the AASHTO's National Highway Standards will be requested (where sealed bridges are proposed) to limit intrusions into the neighborhoods. Traffic engineering enhancements including, but not limited to, caution lights and reduced speed limits will be examined to assist in obtaining the waivers. Again, alterations to the recommendations would be brought back to the Task Force for its consideration.

II. Recommendations

Proceeding from this explanation and according to the stated rationale, Mr. Grant proposed the following recommendations for flood protection with two provisos:

London Avenue Canal:

Flood Gates: Filmore Avenue

Sealed Bridge: Gentilly Avenue, Leon C. Simon Drive, Mirabeau Avenue, Robert E. Lee Boulevard

Orleans Avenue Canal:

Flood Gates: Filmore Avenue and Harrison Avenue

Sealed Bridge: Robert E. Lee Boulevard

Rationale:

1. Four-lane roadways provide better access to major evacuation routes and emergency services than two-lane roadways. Therefore, sealed bridges should be constructed where four-lane roadways cross the two canals to allow for access at all times during emergency situations;
2. Constructing floodgates across a four-lane roadway narrows the cost differential between the floodgate and sealed-bridge alternatives; and
3. A sealed bridge is proposed at Robert E. Lee Boulevard because the City is responsible for its design and construction under a different funding mechanism.

Provisos:

1. The sealed-bridge alternative is proposed at all locations with the stipulation that waivers of the AASHTO's National Highway Standards are granted concerning the need to reconstruct the bridge approaches. Traffic engineering

Continued....

enhancements including, but not limited to, caution lights and reduced speed limits will be examined to assist in obtaining the waivers. If a waiver cannot be obtained for a particular location, the matter will return to the Task Force for its consideration; and

2. The aesthetics of the sealed bridge alternative is an important consideration that will have a visual impact on the neighborhoods. The construction of the sealed bridges presents the City with an opportunity to integrate urban design principles with infrastructure requirements.

   Therefore, the sealed-bridge alternative is proposed at all locations with the stipulation that the design process will include an evaluation and implementation of appropriate urban design standards. Means to accomplish this objective would be through the implementation of joint ventures between engineers and architects, and/or a Request for Proposal process eliciting design alternatives.

Mr. Grant then informed the Task Force members that a public hearing was held on January 9, 1995 to allow for public input on the different flood protection alternatives. The consensus of public opinion supported the City recommendations for a combination of flood gates and sealed bridges.

Mr. Gordon Hebert, Corps of Engineers, stated that value engineering studies already conducted by the Corp indicated that new bridge construction would be more economical than undertaking renovations to the existing bridges.

Finally, the group suggested that the City and/or Levee Board develop a plan that coordinated the new construction proposed for all eight canal crossings. Mr. Grant assured the Task Force that the City would work with the Orleans Levee Board on this matter.

III. Conclusion

Without further discussion, the Task Force agreed to accept the flood protection recommendations stated above and to forward its conclusions to Mayor Morial. Mr. Grant reiterated the City's position that the Task Force would reconvene if the provisos associated with the recommendations could not be met. Furthermore, Mr. Grant promised a copy of the final Task Force report to each member of the group.

APPENDIX E

ROADWAY CURVE LENGTH DESIGN CRITERIA AND ASSUMPTIONS

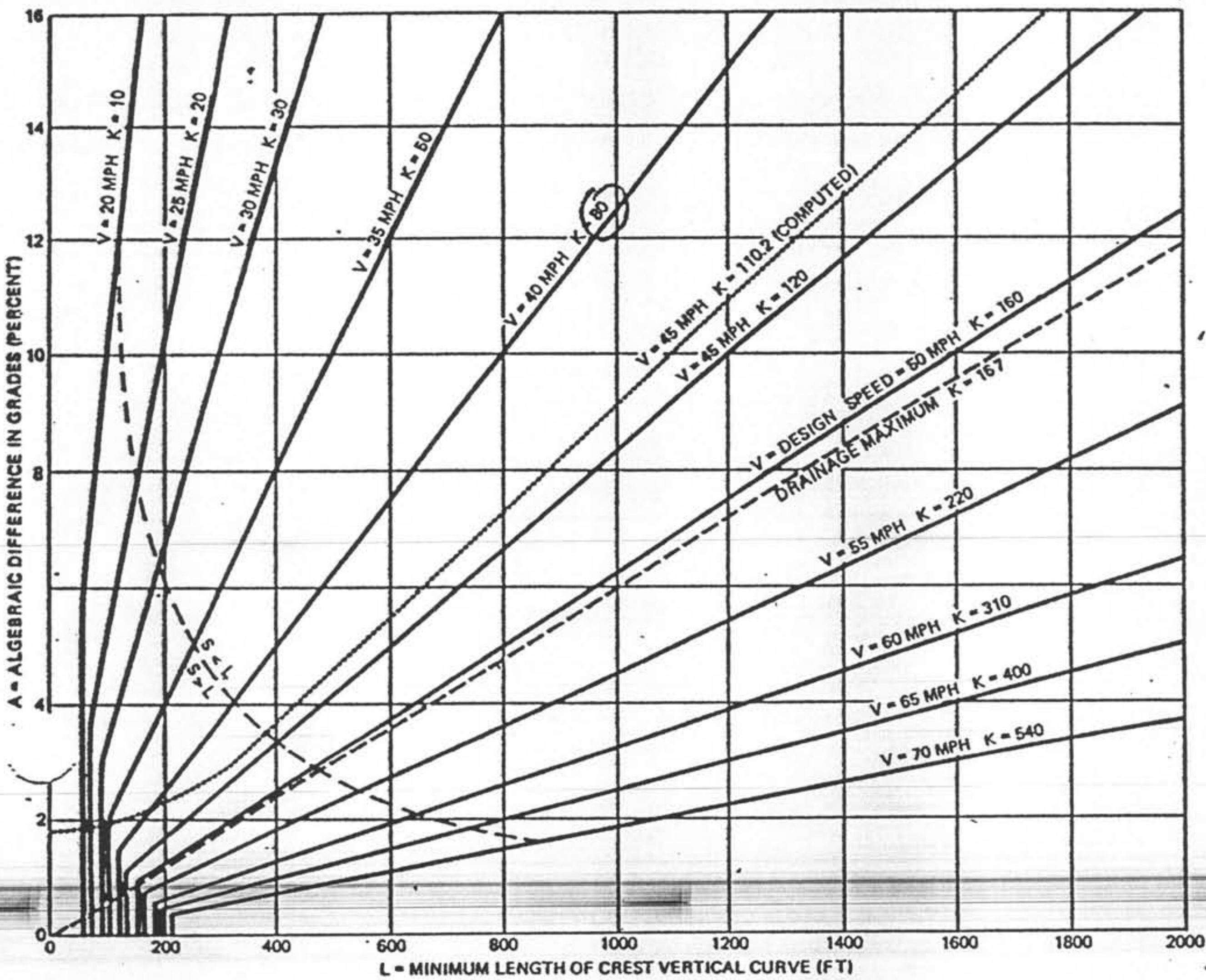

Figure III-41. Design controls for crest vertical curves, for stopping sight distance and open road conditions—upper range.

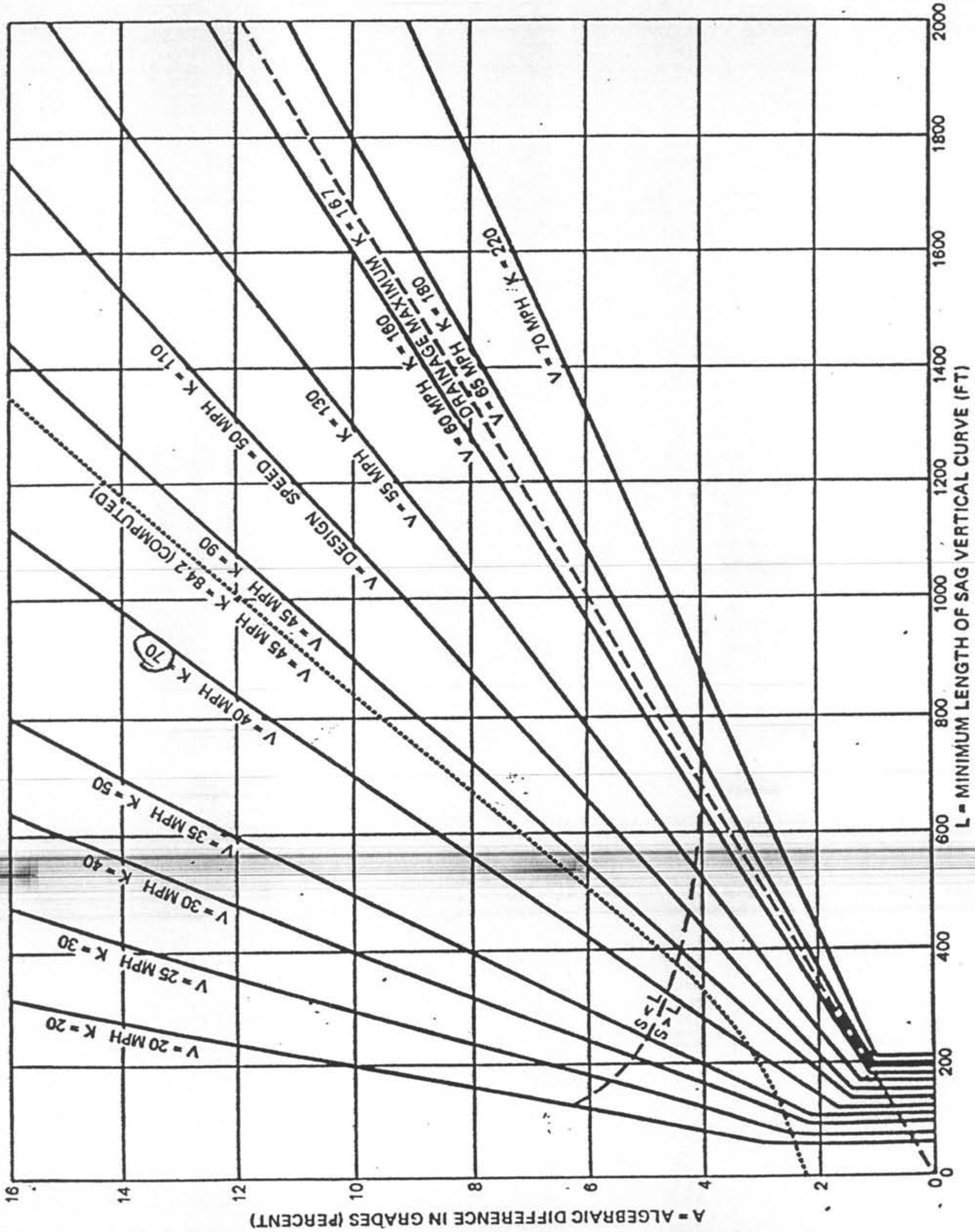

Figure III-43. Design controls for sag vertical curves, open road conditions—upper range.

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JOB London Ave. Canal Bridges 9362
SHEET NO. ______ OF ______
CALCULATED BY AMT DATE ______
CHECKED BY ______ DATE ______
SCALE ______

Filmore Avenue - London Ave. Outfall Canal

Sealed Bridge (3-Sided Tunnel)

Design Speed = 40 mph 4% grade

K for crest vertical curve = 80
K for sag vertical curve = 70

Length = KA

Length crest curve = 80 (8) = 640'

Length sag curve = 70 (4) = 280'

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JOB London Ave. Canal Bridges 9362
SHEET NO. ____ OF ____
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CHECKED BY ____ DATE ____
SCALE ____

Mirabeau Avenue - London Ave. Outfall Canal

Sealed Bridge (3-Sided Tunnel)

Design Speed = 40 mph   4% grade

K for crest vertical curve = 80
K for sag vertical curve = 70

Length = KA

Length crest curve = 80(8) = 640'

Length sag curve = 70(4) = 280'

APPENDIX F

DESIGN CALCULATIONS

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JOB LONDON AVE. CANAL BRIDGES
SHEET NO. 1 OF A/E 93628
CALCULATED BY JCS DATE 01-05-96
CHECKED BY ____ DATE ____
SCALE ____

BRIDGE DECK THICKNESS -:

MINIMUM DEPTH FOR SIMPLE SPANS = 1.2(S+10)/30
(PER AASHTO.) SEE ATTACHED PAGE 62 FROM AASHTO Book
WHERE S = SPAN LENGTH IN FEET

(1) FOR SPAN LENGTH = 30'

T = THICKNESS OF SLAB = $\frac{1.2(30+10)}{30}$

= 1.6' = 19.2" ≈ 20" MIN.

BUOYANCY FORCE -:

(1) FILMORE BRIDGE:

HIGH WATER ELEV. = 11.90'
BOTTOM OF DECK = 5.33' TOP OF SIDEWALK = 7.83'
DEPTH OF WATER = 6.57'
BUOYANCY FORCE = 6.57' × 62.4 #/CF = 410 LBS/SQ FT
BUOYANCY FORCE ACROSS BRIDGE / FT = 410 × 46.66 = 19,131 #/FT.

COUNTER ACTING FORCE -:
WT. OF SECTION

(1) BARRIER RAIL = (13.9' − 7.83') ($\frac{1' + 1.33'}{2}$) × 2 = 14.14
(2) SIDEWALK = 2.5' × 7.33' × 2 = 36.65
(3) MEDIAN = 4' × 2.50' = 10
(4) ROADWAY = 14' × 2 × 1.67' = 46.80

TOTAL = 107.59 SQ FT.

WT. OF CONCRETE = 107.59 FT² × 150 #/FT³ = 16,139 LBS./FT.

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JOB LONDON AVE. CANAL BRIDGES
SHEET NO. 2 OF AIF 93628
CALCULATED BY JES DATE 01-05-96
CHECKED BY ______ DATE ______
SCALE ______

PILE CAP WEIGHT :-

ASSUME - 2' × 3'-6" CONCRETE CAP - 30' SPACING

WT. PER FOOT = 2' × 3.5' × 46.66' × 150 #/CF / 30'

= 1633 #/FT.

HAUNCH & OTHER MISC. WEIGHT = 500 #

TOTAL COUNTER WEIGHT = 16,139# + 1633# + 500#

= 18,272 #/FT.

TOTAL UPLIFT FORCE F.L.F. = 19,131 - 18,272

= 859 #/FT. / 46.6'

= 18.41 #/SF.

PER PILE TENSION FORCE = 18.41 #/SF × 30' × 6'

= 3,313 #

= 1.7 TONS TENSION CAPACITY

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JOB LONDON AVE. CANAL BRIDGES
SHEET NO. 3 OF A/E 9362B
CALCULATED BY JCJ DATE 01-05-96
CHECKED BY ______ DATE ______
SCALE ______

(2) MIRABEAU BRIDGE :

HIGH WATER ELEV. = 11.90'
BOTTOM OF DECK ELEV. = 6.57'
DEPTH OF WATER = 5.33'
TOP OF SIDE WALK = 9.07'
BUOYANCY FORCE = 5.33' × 62.4 #/CF = 332.60 #/SF
BUOYANCY FORCE ACROSS BRIDGE / FT = 332.60 × 70.67'
= 23,505 #/FT.

COUNTER ACTING FORCE :

Wt. of SECTION :

(1) BARRIER RAIL = $(13.95 - 9.07)\left(\frac{1 + 1.33}{2}\right) \times 2$

= 11.25

(2) SIDE WALK = 2.5' × 7.33' × 2 = 36.68

(3) MEDIAN = 4 × 2.50' = 10

(4) ROADWAY = 26' × 2 × 1.67' = 86.84

TOTAL AREA = 144.77 SQ FT.

TOTAL Wt. = 144.77 SF × 150 #/CF = 21,716 #/FT.

Wt. OF PILE CAP :

ASSUMING - 2' × 3.6' CAP
Wt. OF PILE CAP = $\frac{2' \times 3.5' \times 70.67' \times 150 \#/CF}{30'}$ = 2473.45 #/FT.

HAUNCH & OTHER MISC ITEMS = 600 #
TOTAL COUNTER Wt. = 21,716 + 2474 + 600 = 24,790 #/FT.
24,790 #/FT > 23,505 #/FT. NO TENSION

ABCDEF

span plus the depth of the member but need not exceed the distance between centers of supports.

8.8.2 In analysis of continuous and rigid frame members distances to the geometric centers of members shall be used in the determination of moments. Moments at faces of support may be used for member design. When fillets making an angle of 45 degrees or more with the axis of a continuous or restrained member are built monolithic with the member and support, the face of support shall be considered at a section where the combined depth of the member and fillet is at least one and one-half times the thickness of the member. No portion of a fillet shall be considered as adding to the effective depth.

8.8.3 The effective span length of slabs shall be as specified in Article 3.24.1.

8.9 CONTROL OF DEFLECTIONS

8.9.1 General

Flexural members of bridge structures shall be designed to have adequate stiffness to limit deflections or any deformations that may adversely affect the strength or serviceability of the structure at service load plus impact.

8.9.2 Superstructure Depth Limitations

The minimum depths stipulated in Table 8.9.2 are recommended unless computation of deflection indicates that lesser depths may be used without adverse effects.

8.9.3 Superstructure Deflection Limitations

When making deflection computations, the following criteria are recommended.

8.9.3.1 Members having simple or continuous spans preferably should be designed so that the deflection due to service live load plus impact shall not exceed 1/800 of the span, except on bridges in urban areas used in part by pedestrians whereon the ratio preferably shall not exceed 1/1000.

8.9.3.2 The deflection of cantilever arms due to ser vice live load plus impact preferably should be limited to 1/300 of the cantilever arm except for the case including pedestrian use, where the ratio preferably should be 1/375.

TABLE 8.9.2 Recommended Minimum Depths for Constant Depth Members

Superstructure Type	Minimum Depth in feet[a] Simple Spans	Continuous Spans
Bridge slabs with main reinforcement parallel to traffic	1.2(S + 10)/30	(S + 10)/30 ≥ 0.542
T-Girders	0.070S	0.065S
Box-Girders	0.060S	0.055S
Pedestrian Structure Girders	0.033S	0.033S

[a] When variable depth members are used, values may be adjusted to account for change in relative stiffness of positive and negative moment sections.

S = span length as defined in Article 8.8 in feet.

8.10 COMPRESSION FLANGE WIDTH

8.10.1 T-Girder

8.10.1.1 The total width of slab effective as a T-girder flange shall not exceed one-fourth of the span length of the girder. The effective flange width overhanging on each side of the web shall not exceed six times the thickness of the slab or one-half the clear distance to the next web.

8.10.1.2 For girders having a slab on one side only, the effective overhanging flange width shall not exceed 1/12 of the span length of the girder, six times the thickness of the slab, or one-half the clear distance to the next web.

8.10.1.3 Isolated T-girders in which the T-shape is used to provide a flange for additional compression area shall have a flange thickness not less than one-half the width of the girder web and an effective flange width not more than four times the width of the girder web.

8.10.1.4 For integral bent caps, the effective flange width overhanging each side of the bent cap web shall not exceed six times the least slab thickness, or 1/10 the span length of the bent cap. For cantilevered bent caps, the span length shall be taken as two times the length of the cantilever span.

8.10.2 Box Girders

8.10.2.1 The entire slab width shall be assumed effective for compression.

8.10.2.2 For integral bent caps, see Article 8.10.1.4.

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Dead Loads

Slab weight $= \left(\frac{20''}{12}\right)(150 \text{ \#/CF}) = 250 \text{ \#/SF}$

Overlay $= 12 \text{ \#/SF}$

Sidewalk $= \left(\frac{10''}{12}\right)(150 \text{ \#/CF}) = 125 \text{ \#/SF}$

Parapet wall $= (13.9' - 7.5)(150 \text{ \#/CF}) = 960 \text{ \#/SF}$

Median $= \left(\frac{10'}{12}\right)(150 \text{ \#/CF}) = 125 \text{ \#/SF}$

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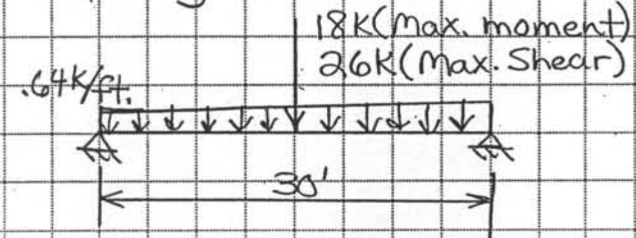
30' slab span (Mirabeau & Filmore Ave. Bridges)

Live Loads (Lane Loading or Truck Loading)

A) Lane Loading HS20



$$\text{Max. moment} = \frac{(.64)(30)^2}{8} + \frac{18(30)}{4} = 207 \text{ ft.k.}$$

$$\text{max. shear} = \frac{(.64)(30)}{2} + \frac{26}{2} = 22.6 \text{ K.}$$

B) Truck Loading HS20

Max. moment = 282.1 ft.-k
Max. shear = 49.6 k. ∴ Truck Loading governs

$$\frac{\text{Max. moment}}{\text{ft.}} = \frac{282.1 \text{ ft.-k}}{12 \text{ ft.}} = 23.5 \text{ ft.-k./ft.}$$

$$\frac{\text{Max. shear}}{\text{ft.}} = \frac{49.6 \text{ k.}}{12 \text{ft.}} = 4.13 \text{ K./ft.}$$

$$\text{Impact} = \frac{50}{L+125} = \frac{50}{30+125} = 0.32 \quad (\text{max. } 30\%) \therefore I = 1.30$$

Group I Loading factor = 1.67

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30'

Factored live load moment = (23.5)(1.3)(1.67)(1.7)(1.3) = 112.8 ft.k.

Factored live load shear = (4.13)(1.3)(1.67)(1.7)(1.3) = 19.8 k.

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JOB London Canal - Mirabeau & Filmore 93621
SHEET NO. 8 OF 27
CALCULATED BY AMT DATE 7-3-97
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Interior Slab Span (30' Span)

Factored Live Load Moment = 112.8 ft.-k.

Factored Live Load Shear = 19.8 k.

Dead Loads
Median = 125 #/SF
Slab weight = 125 #/SF
Overlay = 12 #/SF
262 #/SF

Dead load moment $= \frac{(262 \#/SF)(30')^2}{8} = 29.5$ k.-ft.

Factored dead load moment = (29.5)(1.7)(1.3) = 65.1 k-ft.

Dead load shear $= \frac{(262 \#/SF)(30')}{2} = 3.9$ k

Factored dead load shear = (3.9)(1.7)(1.3) = 8.7 k.

M_u = Total max. moment = 112.8 + 65.1 = 177.9 k-ft.

P_u = Total max. shear = 19.8 + 8.7 = 28.5 k.

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JOB London Canal - Mirabeau + Filmore 93621

CALCULATED BY AMT DATE 7-3-97
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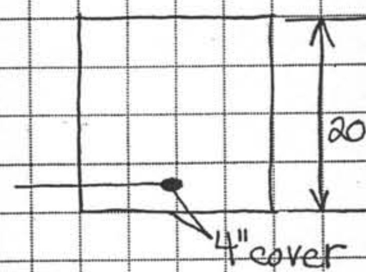
SCALE ______

30' Int.

$M_n = \frac{M_u}{\phi} = \frac{177.9}{0.9} = 197.7$ k-ft.



$R_u = \frac{M_n}{bd^2} = \frac{(197.7 \text{ k-ft})(12"/\text{ft})}{(12")(15")^2} = 0.879$ ksi

$\frac{200}{f_y} \le \rho \le 0.75\rho_{bal}$ $\quad \frac{200}{60{,}000} \le \rho \le 0.75(0.029)$

$\rho_{bal} = \frac{(0.85)\beta_1 f'_c}{f_y}\left[\frac{87{,}000}{87{,}000+f_y}\right] = \frac{(0.85)(0.85)(4{,}000)}{60{,}000}\left[\frac{87{,}000}{87{,}000+60{,}000}\right]$

$\rho_{bal} = 0.029$

$0.0033 \le \rho \le 0.0214$ (.0124)

$m = \frac{f_y}{0.85f'_c} = \frac{60{,}000}{0.85(4{,}000)} = 17.65$

$\rho_{req} = \frac{1}{m}\left[1 - \sqrt{1 - \frac{2mR_u}{f_y}}\right] = \frac{1}{17.65}\left[1 - \sqrt{1 - \frac{2(17.65)(0.879)}{60}}\right] = 0.0173$

$A_{st_{req}} = \rho bd = (0.0173)(12")(15") = 3.11$ in²/ft.

#9@3.5"

$\text{Spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{1}{3.11}(12) = 3.85"$

$A_s = \frac{A_{s(1)}}{\text{spac}}(12) = \frac{1}{3.5}(12) = 3.43$

$\rho = \frac{A}{bd} = \frac{3.43}{(12")(15")} = 0.019 > \rho_{min.}$

$M_n = A_{st} f_y\left[d - 0.59\frac{A_{st} f_y}{f'_c b}\right] = \frac{3.43(60{,}000)\left[15 - \frac{0.59(3.43)(60)}{4(12)}\right]}{12"/\text{ft.}}$

$M_n = 213.9$ k-ft. > 197.7 k-ft. ✓

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30' Int.

Temp & Shrinkage Steel

$A_{st} = 0.0028(b)(h) = 0.0028(12'')(20'') = 0.672 \text{ in}^2$

$\text{spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{0.20}{0.672}(12) = 3.57''$ #4 @ 3.5"

$A_{st} = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.2}{3.5}(12) = 0.686 > 0.672 \text{ in}^2$

∴ Use #4 @ 3.5"

Shear check

$\phi = 0.85$

$V_u = 28.5 \text{ K.}$

$V_u \leq \phi V_n$ $V_n = V_c + V_{st}$

$V_c = 2\sqrt{f'_c}\, bd = 2\sqrt{4{,}000}\,(12'')(15'') = 22.8 \text{ K.}$

#3 @ 9" $A_s = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.11}{9}(12) = 0.15 \text{ in}^2$

$V_{st} = \frac{A_v F_y d}{s} = \frac{0.15(60{,}000)(15)}{9} = 15.0 \text{ K}$

$V_n = V_c + V_{st} = 22.8 + 15.0 = 37.8 \text{ K.}$

$\phi V_n = 0.85(37.8) = 32.13 \text{ K} > V_u$ ✓

∴ Shear reinf. = #3 @ 9"

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Exterior Slab Span (30' Span)

Live Load (Sidewalk) = 85 #/SF

Live Load Moment = $\frac{(85\text{ \#/SF})(30')^2}{8}$ = 9.6 k-ft.

Factored Live Load Moment = 9.6(1.7)(1.3) = 21.1 k-ft.

Live Load Shear = $\frac{(85\text{ \#/SF})(30')}{2}$ = 1.3 k.

Factored Live Load Shear = (1.3)(1.7)(1.3) = 2.9 k.

Dead Loads

Slab = 125 #/SF
Sidewalk = 125 #/SF
Parapet wall = 960 #/SF
1,210 #/SF

Dead Load Moment = $\frac{(1{,}210\text{ \#/SF})(30')^2}{8}$ = 136.1 k-ft.

Factored dead load moment = (136.1)(1.7)(1.3) = 300.8 k-ft.

Dead Load Shear = $\frac{(1{,}210\text{ \#/SF})(30')}{2}$ = 18.2 k.

Factored dead load shear = (18.2)(1.7)(1.3) = 40.1 k.

Total max. moment = 21.1 + 300.8 = 321.9 k-ft.

Total max. shear = 2.9 + 40.1 = 43 k.

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30' Ext.

$$M_n = \frac{M_u}{\phi} = \frac{321.9}{0.9} = 357.7 \text{ k-ft.}$$

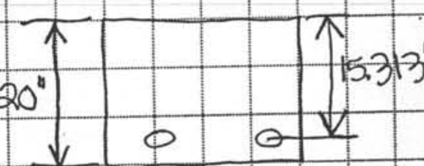
$$R_u = \frac{M_n}{bd^2} = \frac{(357.7 \text{ k-ft.})(12''/\text{ft.})}{(12'')(15.313)^2} = 1.53 \text{ ksi}$$

$$m = \frac{f_y}{0.85 f'_c} = \frac{60{,}000}{0.85(4{,}000)} = 17.65$$

$$\rho_{req} = \frac{1}{m}\left[1 - \sqrt{1 - \frac{2mR_u}{f_y}}\right] = \frac{1}{17.65}\left[1 - \sqrt{1 - \frac{2(17.65)(1.53)}{60}}\right] = 0.0388$$

$$A_{st_{req}} = \rho bd = (0.0388)(12'')(15.313'') = 7.13 \text{ in}^2/\text{ft.}$$

#11 @ 3.5"

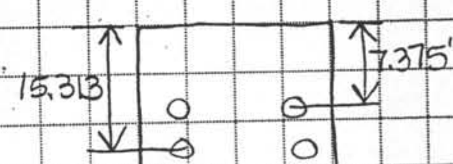


$$A_{st} = \frac{A_{s(1)}}{\text{Spacing}}(12) = \frac{1.56}{3.5}(12) = 5.35 \text{ in}^2$$

$$M_{n_{bott.}} = A_{st} f_y \left[d - 0.59 \frac{A_{st} f_y}{f'_c b}\right] = \frac{(5.35)(60{,}000)\left[15 - 0.59 \frac{(5.35)(60)}{4(12)}\right]}{12''/\text{ft.}} = 295.7 \text{ k-ft}$$

$$M_{n_{top}} = \frac{(5.35)(60{,}000)\left[7.375 - 0.59 \frac{(5.35)(60)}{4(12)}\right]}{12''/\text{ft.}}$$

$$M_n = 91.7 \text{ k-ft.}$$



$$M_{n_{total}} = 295.7 + 91.7 = 387.4 > 357.7 \text{ k-ft.} \checkmark$$

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JOB London Canal - Mirabeau & Filmore 9362B
SHEET NO. 13 OF 27
CALCULATED BY AMT DATE 7-3-97
CHECKED BY ______ DATE ______
SCALE ______

30' Ext.

Temp. & Shrinkage Steel

$A_{st} = 0.0028(b)(h) = 0.0028(12'')(20'') = 0.672 \text{ in}^2$

$\text{Spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{0.20}{0.672}(12) = 3.57''$ #4 @ 3.5"

$A_s = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.20}{3.5}(12) = 0.686 > 0.672 \text{ in}^2$

∴ Use #4 @ 3.5"

Shear Check

$\phi = .85$

$V_u = 43 \text{ K}$

$V_u \le \phi V_n$ $V_n = V_c + V_{st}$

$V_c = 2\sqrt{f'_c}\,bd = 2\sqrt{4{,}000}(12'')(15.313) = 23.2 \text{ k.}$

#3 @ 6"

$V_{st} = \frac{A_v f_y d}{s} = \frac{0.22(60{,}000)(15.313)}{6} = 33.7 \text{ k.}$

$V_n = V_c + V_{st} = 23.2 + 33.7 = 56.9 \text{ k.}$

$\phi V_n = (0.85)(56.9) = 48.4 \text{ k.} > V_u$ ✓

∴ Shear reinf. = #3 @ 9

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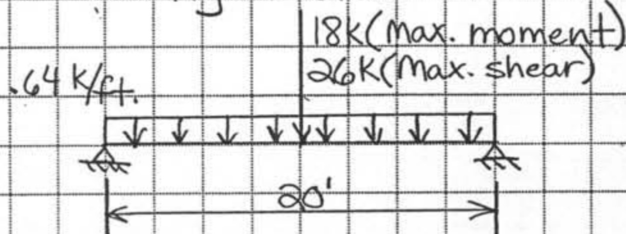
20' slab span (Mirabeau Ave. Bridge)

Live Loads (Lane Loading or Truck Loading)

A) Lane Loading HS20



$$\text{Max. moment} = \frac{(.64)(20)^2}{8} + \frac{18(20)}{4} = 122 \text{ ft.-k.}$$

$$\text{Max. shear} = \frac{(.64)(20)}{2} + \frac{26}{2} = 19.4 \text{ k.}$$

B) Truck Loading HS20

max. moment = 160 ft.-k.
Max. shear = 41.6 k. ∴ Truck Loading governs

$$\frac{\text{Max. moment}}{\text{ft.}} = \frac{160 \text{ ft.-k.}}{12 \text{ ft.}} = 13.33 \text{ ft. k./ft.}$$

$$\frac{\text{Max. shear}}{\text{ft.}} = \frac{41.6 \text{ ft.-k.}}{12 \text{ ft.}} = 3.5 \text{ k./ft.}$$

$$\text{Impact} = \frac{50}{L+125} = \frac{50}{20+125} = 0.34 \text{ (max 30\%)} \quad \therefore I = 1.30$$

Group I loading factor = 1.67

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Factored live load moment = (13.33)(1.3)(1.67)(1.7)(1.3) = 64.0 ft.-k.

Factored live load shear = (3.5)(1.3)(1.67)(1.7)(1.3) = 16.8 k.

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JOB London Canal-Mirabeau & Filmore 9362B

CALCULATED BY AMT DATE 7-3-97
CHECKED BY ______ DATE ______
SCALE ______

Interior Slab Span Design (20' Slab Span)

Factored Live Load Moment = 64.0 ft.-k.

Factored Live Load Shear = 16.8 k.

Dead Loads
Median = 125 #/SF
Slab = 125 #/SF
Overlay = 12 #/SF
262 #/SF

Dead load moment = $\frac{(262\ \#/SF)(20')^2}{8}$ = 13.1 k-ft.

Factored dead load moment = (13.1)(1.7)(1.3) = 29.0 k.-ft.

Dead load shear = $\frac{(262\ \#/SF)(20')}{2}$ = 2.6 k.

Factored dead load shear = (2.6)(1.7)(1.3) = 5.7 k.

Total max. moment = 64.0 + 29.0 = 93.0 k.-ft.

Total max. shear = 16.8 + 5.7 = 22.5 k.

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SHEET NO. 17 OF 27
CALCULATED BY AMT DATE 7-3-97
CHECKED BY ____ DATE ____
SCALE ____

20' Int.

$M_n = \frac{M_u}{\phi} = \frac{93.0}{0.9} = 103.3$ k-ft.

$R_u = \frac{M_n}{bd^2} = \frac{103.3 \text{ k-ft.} (12''/\text{ft.})}{(12'')(15'')^2} = 0.459$ ksi

$m = \frac{f_y}{0.85 f'_c} = \frac{60{,}000}{0.85(4{,}000)} = 17.65$

$\rho_{req} = \frac{1}{m}\left[1 - \sqrt{1 - \frac{2mR_u}{f_y}}\right] = \frac{1}{17.65}\left[1 - \sqrt{1 - \frac{2(17.65)(0.459)}{60}}\right] = 0.0083$

$A_{s\,req} = \rho bd = (0.0083)(12'')(15'') = 1.49$ in²/ft.

#8 @ 6"

Spacing $= \frac{A_{s(1)}}{A_s}(12) = \frac{0.79}{1.49}(12) = 6.36''$

$A_s = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.79}{6}(12) = 1.58$ in²

$\rho = \frac{A}{bd} = \frac{1.58 \text{ in}^2}{(12'')(15'')} = 0.0088 > \rho_{min.}$

$M_n = A_{st} f_y \left[d - 0.59 \frac{A_{st} f_y}{f'_c b}\right] = \frac{(1.58)(60{,}000)\left[15 - \frac{0.59(1.58)(60)}{4(12)}\right]}{12''/\text{ft.}}$

$M_n = 109.3$ k-ft. > 103.3 k-ft. ✓

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Temp & Shrinkage Steel

$A_{st} = 0.0028(b)(h) = 0.0028(12'')(20'') = 0.672 \text{ in}^2$

$\text{spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{0.20}{0.672}(12) = 3.57''$ #4@3.5''

$A_{st} = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.2}{3.5}(12) = 0.686 > 0.672 \text{ in}^2$

∴ Use #4 @ 3.5''

Shear Check

$\phi = 0.85$

$V_u = 22.5 \text{ k.}$

$V_u \leq \phi V_n \quad V_n = V_c + V_{st}$

$V_c = 2\sqrt{f'_c}\,bd = 2\sqrt{4{,}000}(12'')(15'') = 22.8 \text{ k.}$

#3@12

$V_{st} = \frac{A_v f_y d}{s} = \frac{0.11(60{,}000)(15)}{12} = 8.25 \text{ k.}$

$V_n = V_c + V_{st} = 22.8 + 8.25 = 31.05 \text{ K.}$

$\phi V_n = 0.85(31.05) = 26.4 \text{ k} > V_u$ ✓

∴ Shear reinf. = #3 @ 12''

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Exterior Slab Span (20' Slab Span)

Live Load (sidewalk) = 85 #/SF

Live Load Moment = $\frac{(85\ \#/SF)(20')^2}{8}$ = 4.3 K-ft.

Factored live load moment = 4.3(1.7)(1.3) = 9.4 K-ft.

Live load shear = $\frac{(85\ \#/SF)(20')}{2}$ = 0.85 K.

Factored Live load shear = (0.85)(1.7)(1.3) = 1.9 K.

Dead Loads

Slab = 125 #/SF
Sidewalk = 125 #/SF
Parapet wall = 960 #/SF
1,210 #/SF

Dead Load Moment = $\frac{(1{,}210\ \#/SF)(20')^2}{8}$ = 60.5 K-ft.

Factored dead load moment = (60.5)(1.7)(1.3) = 133.7 K-ft.

Dead Load Shear = $\frac{(1{,}210\ \#/SF)(20)}{2}$ = 12.1 K.

Factored dead load shear = (12.1)(1.7)(1.3) = 26.7 K-ft.

Total max. moment = 9.4 + 133.7 = 143.1 K-ft.

Total max. shear = 1.9 + 26.7 = 28.6 K.

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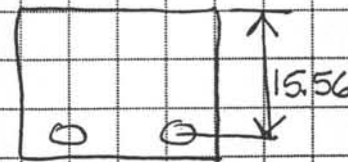
20' Ext.

$M_n = \frac{M_u}{\phi} = \frac{143.1 \text{ k-ft.}}{0.9} = 159.0 \text{ k-ft.}$

$R_u = \frac{M_n}{bd^2} = \frac{159.0 \text{ k-ft.}(12''/\text{ft.})}{(12'')(15.56'')^2} = 0.657 \text{ ksi}$



$m = \frac{f_y}{0.85 f'_c} = \frac{60{,}000}{0.85(4{,}000)} = 17.65$

$\rho_{req} = \frac{1}{m}\left[1 - \sqrt{1 - \frac{2mR_u}{f_y}}\right] = \frac{1}{17.65}\left[1 - \sqrt{1 - \frac{2(17.65)(0.657)}{60}}\right] = 0.0123$

$A_{s\,req} = \rho bd = (0.0123)(12'')(15.56) = 2.29 \text{ in}^2/\text{ft.}$

$\text{Spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{0.60}{2.29}(12) = 3.14''$ #7 @ 3"

$A_s = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.60}{3''}(12) = 2.4 \text{ in}^2/\text{ft.}$

$\rho = \frac{A}{bd} = \frac{2.4}{(12)(15.56)} = 0.0129 > \rho_{min}$ ✓

$M_n = A_{st} f_y \left[d - 0.59 \frac{A_{st} f_y}{f'_c b}\right] = \frac{2.4(60{,}000)\left[15.56 - 0.59 \frac{(2.4)(60)}{4(12)}\right]}{12''/\text{ft.}}$

$M_n = 165.5 \text{ k-ft.} > 159.0 \text{ k-ft.}$ ✓

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Temp. & Shrinkage Steel

$A_{st} = 0.0028(b)(h) = 0.0028(12'')(20'') = 0.672\ in^2$

$\text{spacing} = \frac{A_{s(1)}}{A_s}(12) = \frac{0.20}{0.672}(12) = 3.57''$ #4 @ 3.5"

$A_{st} = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.2}{3.5}(12) = 0.686 > 0.672\ in^2$

∴ Use #4 @ 3.5"

Shear Check

$\phi = 0.85$

$V_u = 28.6\ k.$

$V_u \leq \phi V_n \quad V_n = V_c + V_{st}$

$V_c = 2\sqrt{f'_c}\,bd = 2\sqrt{4{,}000}(12'')(15.56'') = 23.6\ k.$

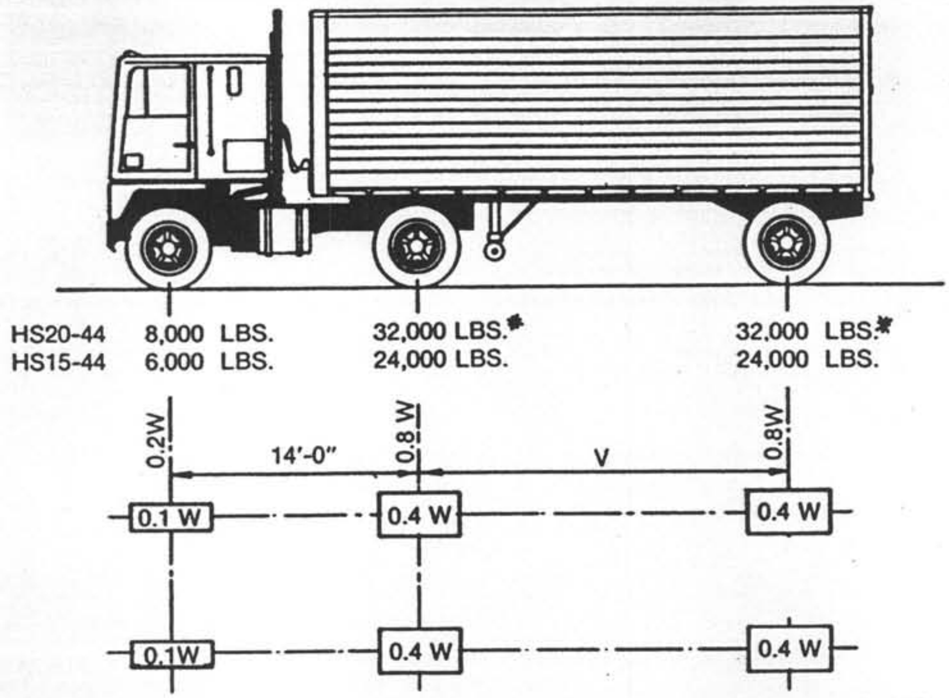
#3 @ 9"

$V_{st} = \frac{A_v f_y d}{s} = \frac{0.15(60{,}000)(15.56)}{9} = 15.56\ k.$

$V_n = V_c + V_{st} = 23.6 + 15.56 = 39.2\ k.$

$\phi V_n = 0.85(39.2) = 33.3\ k. > V_u$ ✓

∴ Shear reinf. = #3 @ 9"



W = COMBINED WEIGHT ON THE FIRST TWO AXLES WHICH IS THE SAME AS FOR THE CORRESPONDING H TRUCK.

V = VARIABLE SPACING — 14 FEET TO 30 FEET INCLUSIVE. SPACING TO BE USED IS THAT WHICH PRODUCES MAXIMUM STRESSES.

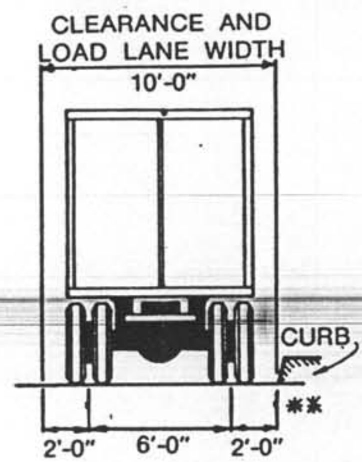


Figure 3.7.7A. Standard HS Trucks

*In the design of timber floors and orthotropic steel decks (excluding transverse beams) for HS 20 loading, one axle load of 24,000 pounds or two axle loads of 16,000 pounds each, spaced 4 feet apart may be used, whichever produces the greater stress, instead of the 32,000-pound axle shown.

**For slab design, the center line of wheels shall be assumed to be 1 foot from face of curb. (See Article 3.24.2.)

LOADING—HS 20-44 (MS18)

TABLE OF MAXIMUM MOMENTS, SHEARS AND REACTIONS—SIMPLE SPANS, ONE LANE

Spans in feet; moments in thousands of foot-pounds; shears and reactions in thousands of pounds.

These values are subject to specification reduction for loading of multiple lanes.

Impact not included.

Span	Moment	End shear and end reaction (a)	Span	Moment	End shear and end reaction (a)
1	8.0(b)	32.0(b)	42	485.3(b)	56.0(b)
2	16.0(b)	32.0(b)	44	520.9(b)	56.7(b)
3	24.0(b)	32.0(b)	46	556.5(b)	57.3(b)
4	32.0(b)	32.0(b)	48	592.1(b)	58.0(b)
5	40.0(b)	32.0(b)	50	627.9(b)	58.5(b)
6	48.0(b)	32.0(b)	52	663.6(b)	59.1(b)
7	56.0(b)	32.0(b)	54	699.3(b)	59.6(b)
8	64.0(b)	32.0(b)	56	735.1(b)	60.0(b)
9	72.0(b)	32.0(b)	58	770.8(b)	60.4(b)
10	80.0(b)	32.0(b)	60	806.5(b)	60.8(b)
11	88.0(b)	32.0(b)	62	842.4(b)	61.2(b)
12	96.0(b)	32.0(b)	64	878.1(b)	61.5(b)
13	104.0(b)	32.0(b)	66	914.0(b)	61.9(b)
14	112.0(b)	32.0(b)	68	949.7(b)	62.1(b)
15	120.0(b)	34.1(b)	70	985.6(b)	62.4(b)
16	128.0(b)	36.0(b)	75	1,075.1(b)	63.1(b)
17	136.0(b)	37.7(b)	80	1,164.9(b)	63.6(b)
18	144.0(b)	39.1(b)	85	1,254.7(b)	64.1(b)
19	152.0(b)	40.4(b)	90	1,344.4(b)	64.5(b)
20	160.0(b)	41.6(b)	95	1,434.1(b)	64.9(b)
21	168.0(b)	42.7(b)	100	1,524.0(b)	65.3(b)
22	176.0(b)	43.6(b)	110	1,703.6(b)	65.9(b)
23	184.0(b)	44.5(b)	120	1,883.3(b)	66.4(b)
24	192.7(b)	45.3(b)	130	2,063.1(b)	67.6
25	207.4(b)	46.1(b)	140	2,242.8(b)	70.8
26	222.2(b)	46.8(b)	150	2,475.1	74.0
27	237.0(b)	47.4(b)	160	2,768.0	77.2
28	252.0(b)	48.0(b)	170	3,077.1	80.4
29	267.0(b)	48.8(b)	180	3,402.1	83.6
30	282.1(b)	49.6(b)	190	3,743.1	86.8
31	297.3(b)	50.3(b)	200	4,100.0	90.0
32	312.5(b)	51.0(b)	220	4,862.0	96.4
33	327.8(b)	51.6(b)	240	5,688.0	102.8
34	343.5(b)	52.2(b)	260	6,578.0	109.2
35	361.2(b)	52.8(b)	280	7,532.0	115.6
36	378.9(b)	53.3(b)	300	8,550.0	122.0
37	396.6(b)	53.8(b)			
38	414.3(b)	54.3(b)			
39	432.1(b)	54.8(b)			
40	449.8(b)	55.2(b)			

(a) Concentrated load is considered placed at the support. Loads used are those stipulated for shear.

(b) Maximum value determined by Standard Truck Loading. Otherwise the Standard Lane Loading governs.

are desired, they shall be obtained by proportionately changing the weights shown for both the standard truck and the corresponding lane loads.

3.7.3 Designation of Loadings

The policy of affixing the year to loadings to identify them was instituted with the publication of the 1944 edition in the following manner:

H 15 Loading, 1944 Edition shall be designated	H 15-44
H 20 Loading, 1944 Edition shall be designated	H 20-44
H 15-S 12 Loading, 1944 Edition shall be designated	HS 15-44
H 20-S 16 Loading, 1944 Edition shall be designated	HS 20-44

The affix shall remain unchanged until such time as the loading specification is revised. The same policy for identification shall be applied, for future reference, to loadings previously adopted by the American Association of State Highway and Transportation Officials.

3.7.4 Minimum Loading

Bridges supporting Interstate highways or other highways which carry, or which may carry, heavy truck traffic, shall be designed for HS20-44 Loading or an Alternate Military Loading of two axles four feet apart with each axle weighing 24,000 pounds, whichever produces the greatest stress.

3.7.5 H Loading

The H loadings consist of a two-axle truck or the corresponding lane loading as illustrated in Figures 3.7.6A and 3.7.6B. The H loadings are designated H followed by a number indicating the gross weight in tons of the standard truck.

3.7.6 HS Loading

The HS loadings consist of a tractor truck with semitrailer or the corresponding lane load as illustrated in Figures 3.7.7A and 3.7.6B. The HS loadings are designated by the letters HS followed by a number indicating the gross weight in tons of the tractor truck. The variable axle spacing has been introduced in order that the spacing of axles may approximate more closely the tractor trailers now in use. The variable spacing also provides a more satisfactory loading for continuous spans, in that heavy axle loads may be so placed on adjoining spans as to produce maximum negative moments.

3.8 IMPACT

3.8.1 Application

Highway Live Loads shall be increased for those structural elements in Group A, below, to allow for dynamic, vibratory and impact effects. Impact allowances shall not be applied to items in Group B. It is intended that impact be included as part of the loads transferred from superstructure to substructure, but shall not be included in loads transferred to footings nor to those parts of piles or columns that are below ground.

3.8.1.1 Group A—Impact shall be included.

(1) Superstructure, including legs of rigid frames.
(2) Piers, (with or without bearings regardless of type) excluding footings and those portions below the groundline.
(3) The portions above the groundline of concrete or steel piles that support the superstructure.

3.8.1.2 Group B—Impact shall not be included.

(1) Abutments, retaining walls, piles except as specified in 3.8.1.1 (3).
(2) Foundation pressures and footings.
(3) Timber structures.
(4) Sidewalk loads.
(5) Culverts and structures having 3 feet or more cover.

3.8.2. Impact Formula

3.8.2.1 The amount of the impact allowance or increment is expressed as a fraction of the live load stress, and shall be determined by the formula:

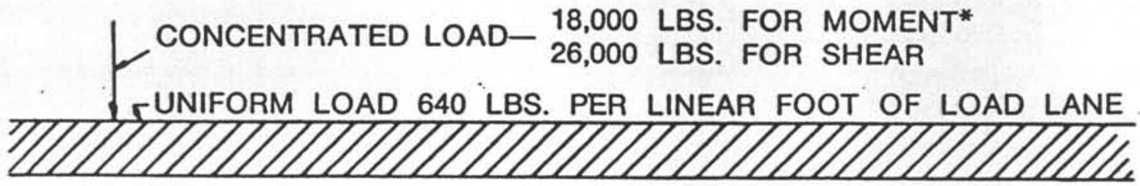
$$I = \frac{50}{L + 125} \qquad (3\text{-}1)$$

in which

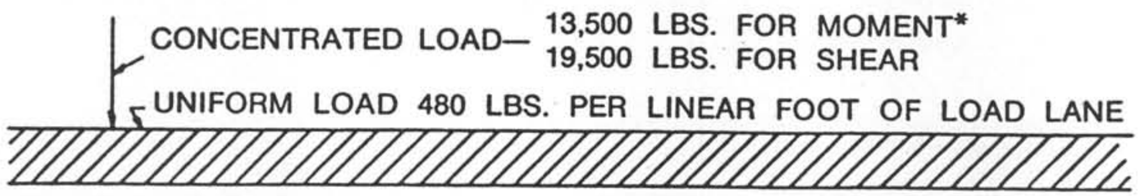
I = impact fraction (maximum 30 percent);
L = length in feet of the portion of the span that is loaded to produce the maximum stress in the member.

3.8.2.2 For uniformity of application, in this formula, the loaded length, L, shall be as follows:

(a) For roadway floors: the design span length.



H20-44 LOADING
HS20-44 LOADING



H15-44 LOADING
HS15-44 LOADING

Figure 3.7.6B. Lane Loading

*For the loading of continuous spans involving lane loading refer to Article 3.11.3 which provides for an additional concentrated load.

(b) For transverse members, such as floor beams: the span length of member center to center of supports.

(c) For computing truck load moments: the span length, or for cantilever arms the length from the moment center to the farthermost axle.

(d) For shear due to truck loads: the length of the loaded portion of span from the point under consideration to the far reaction; except, for cantilever arms, use a 30 percent impact factor.

(e) For continuous spans: the length of span under consideration for positive moment, and the average of two adjacent loaded spans for negative moment.

3.8.2.3 For culverts with cover

0′ to 1′-0″ inc. I = 30%
1′-1″ to 2′-0″ inc. I = 20%
2′-1″ to 2′-11″ inc. I = 10%

3.9 LONGITUDINAL FORCES

Provision shall be made for the effect of a longitudinal force of 5 percent of the live load in all lanes carrying traffic headed in the same direction. All lanes shall be loaded for bridges likely to become one directional in the future. The load used, without impact, shall be the lane load plus the concentrated load for moment specified in Article 3.7, with reduction for multiple-loaded lanes as specified in Article 3.12. The center of gravity of the longitudinal force shall be assumed to be located 6 feet above the floor slab and to be transmitted to the substructure through the superstructure.

3.10 CENTRIFUGAL FORCES

3.10.1 Structures on curves shall be designed for a horizontal radial force equal to the following percentage of the live load, without impact, in all traffic lanes:

$$C = 0.00117\, S^2 D = \frac{6.68\, S^2}{R} \qquad (3\text{-}2)$$

where

C = the centrifugal force in percent of the live load, without impact;
S = the design speed in miles per hour;

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Parapet Wall

Design parameters:

wall thickness = 12"
$f'_c = 4{,}000$ psi
$f_y = 60$ ksi

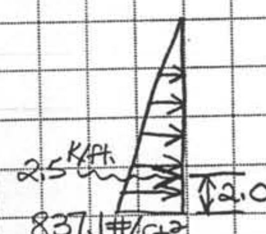
Design water surface elevation = 11.90'
Top of sidewalk = 7.83'
Top of wall = 13.9'
Wall height = 13.9 - 7.83 = 6.07'

Group I

Loads

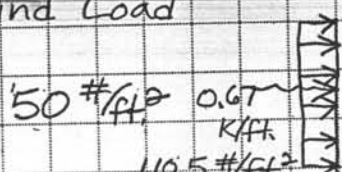
Water pressure

$(62.4\ \#/ft^3)(6.07') = 378.8\ \#/ft^2\ (1.3)(1.7) = 837.1\ \#/ft^2$



$M_{wp} = 2.5(2)(1)$
$M_{wp} = 5$ k-ft.

Wind Load

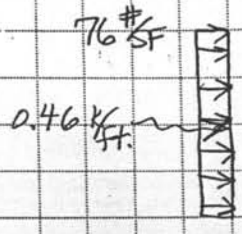


$50\ \#/ft^2 (1.3)(1.7) = 110.5\ \#/ft^2$

$M_w = (0.67\ K/ft)(3.0')(1') = 2.0$ k-ft.

Canal Flow

$P = KV^2 = (1\ 3/8)(5\ ft/sec)^2 = 34.4\ \#/ft^2 (1.3)(1.7) = 76.0\ \#/ft^2$



$M_{CF} = .46(3.0')(1') = 1.38$ k-ft.

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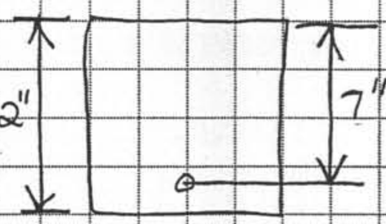
JOB London Canal - Mirabeau + Filmore 93621

CALCULATED BY AMT DATE 7-3-97
CHECKED BY ____ DATE ____
SCALE ____

Max. moment = 5 + 1.38 = 6.38 k-ft.

$M_n = \frac{M_u}{\phi} = \frac{6.38\text{ k-ft.}}{0.9} = 7.1\text{ k-ft.}$



$R_u = \frac{M_n}{bd^2} = \frac{7.1\text{ k-ft.}(12''/\text{ft.})}{(12'')(7'')^2} = 0.145\text{ ksi}$

$m = \frac{f_y}{0.85 f'_c} = \frac{60{,}000}{(0.85)(4{,}000)} = 17.65$

$\rho_{req} = \frac{1}{m}\left[1 - \sqrt{1 - \frac{2mR_u}{f_y}}\right] = \frac{1}{17.65}\left[1 - \sqrt{1 - \frac{2(17.65)(0.145)}{60}}\right] = .0025$

$A_{st\,req} = \rho b d = 0.0025(12'')(7'') = 0.21$

#3 @ 6"

$\rho = \frac{A}{bd} = \frac{0.22}{(12'')(7'')} = .0026$

$M_n = A_{st} f_y\left[d - 0.59\frac{A_{st} f_y}{f'_c b}\right] = \frac{(0.21)(60{,}000)\left[7 - \frac{(0.59)(0.22)(60)}{4(12)}\right]}{12''/\text{ft.}}$

$M_n = 7.2\text{ k-ft.} > 7.1\text{ k-ft.}$ ✓

Temp. + Shrinkage Steel

$A_{st} = 0.0028(b)(h) = .0028(12)(7) = 0.235\text{ in}^2$

#3 @ 4"

$A_{st} = \frac{A_{s(1)}}{\text{spacing}}(12) = \frac{0.11}{4}(12) = 0.33 > 0.235\text{ in}^2$

∴ Use #3 @ 4"