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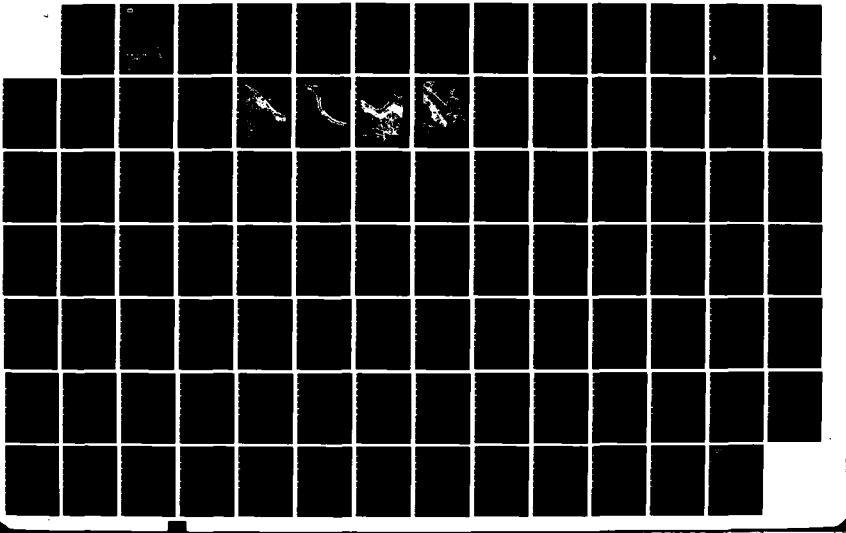
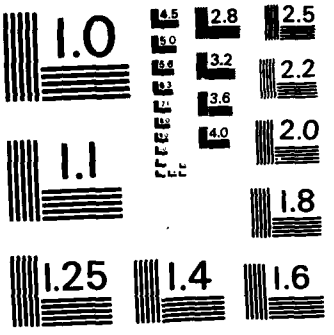
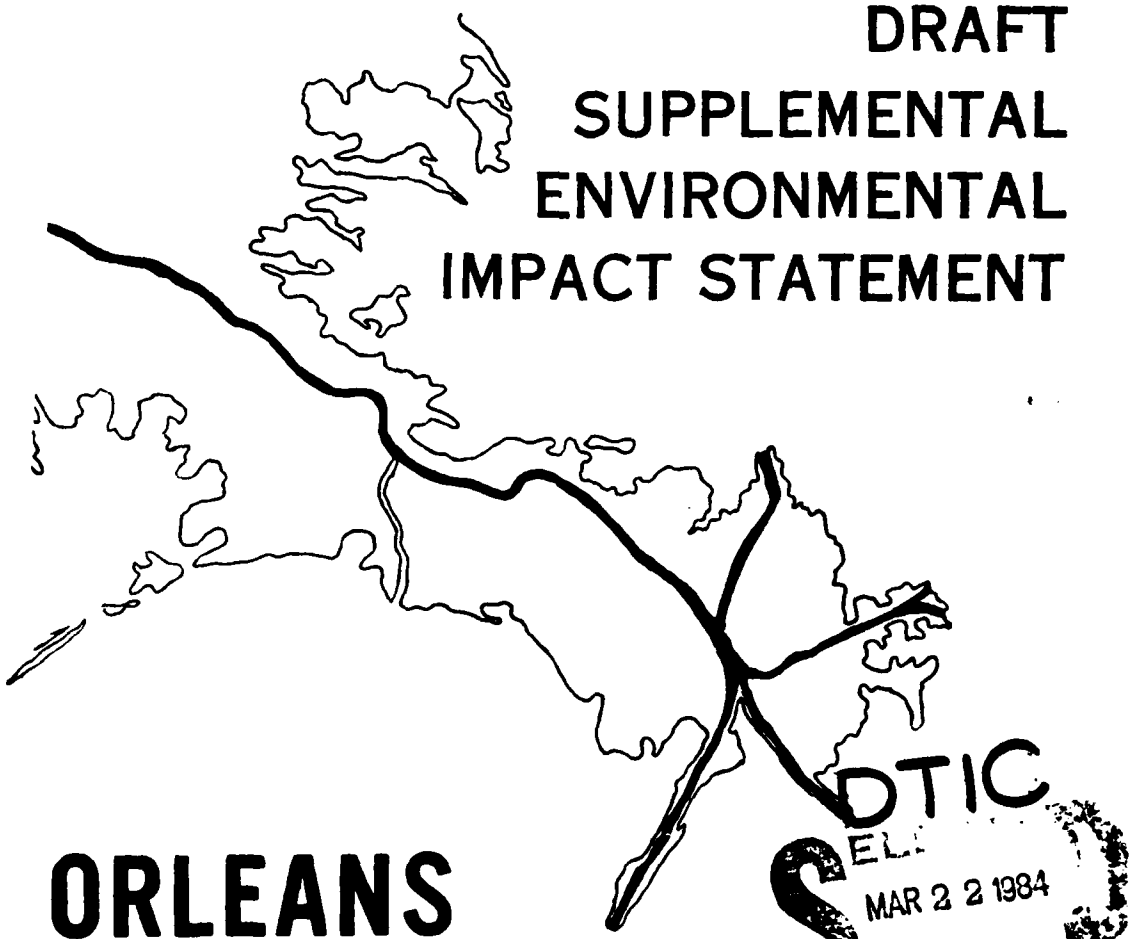




US Army Corps
of Engineers
New Orleans District

February 1984

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT



NEW ORLEANS TO VENICE

LOUISIANA

HURRICANE PROTECTION PROJECT

DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

NEW ORLEANS TO VENICE, LA.

PLAQUEMINES PARISH WEST BANK

ABSTRACT

This Draft Supplemental Environmental Impact Statement (EIS) addresses issues not adequately assessed in the original New Orleans to Venice, Louisiana, Hurricane Protection Final EIS which was filed with the Council on Environmental Quality on 16 January 1975. These issues include water quality, wetland loss, oyster and shrimp impacts, endangered species, cultural resources, economic and social impacts, and mitigation.

Plaquemines Parish, Lousiana, is composed of the lands adjacent to the Mississippi River below New Orleans, Louisiana. The New Orleans District has been directed by Congress to provide hurricane protection for the residents of Plaquemines Parish. The west bank portion of the project from Tropical Bend south to Venice is currently under construction by the sand core, hydraulic clay method, while work from Tropical Bend north to City Price has not begun. Eight plans for levee construction were initially considered for the northern segment, and two plans, sand core, hydraulic clay (SCHC) and "I" wall, levee plug (I-Wall), were retained for detailed evaluation. The SCHC plan would provide appropriate hurricane protection, but would result in the loss of more marsh than would occur without construction of the project. The I-Wall plan would provide appropriate hurricane protection and would result in a minor loss of marsh. The SCHC plan has been recommended because of its performance in addressing the identified public concerns and its net positive contribution to the goal of National Economic Development. As a mitigative measure, it is proposed that 297 acres of freshwater marsh be created on the Delta-Breton National Wildlife Refuge.

Please send your comments to the District Engineer by April 30, 1984.

For further information, you may contact Mr. E. Scott Clark, US Army Engineer District, New Orleans, P.O. Box 60267, New Orleans, Louisiana 70160; telephone (504) 838-2521.

LEAD AGENCY. U.S. ARMY CORPS OF ENGINEERS DISTRICT

NEW ORLEANS. LOUISIANA

1. SUMMARY

1.1. MAJOR CONCLUSIONS AND FINDINGS

1.1.1. The purpose of this supplemental study is to address deficiencies in the New Orleans to Venice, Louisiana, Hurricane Protection Final Environmental Impact Statement (FEIS) filed with the Council on Environmental Quality on 16 January 1975. Significant issues not adequately addressed in the FEIS include water quality, wetland loss, impacts on oysters and shrimp, endangered species, cultural resources, economics, and social impacts, and mitigation. Two levee construction plans, sand core, hydraulic clay fill (SCHC) and "I" wall, levee plug, (I-Wall) were studied in detail.

1.1.2. The authorized project would provide hurricane protection to the developed areas of Plaquemines Parish. Levees would be constructed or raised along the lower Mississippi River Delta from City Price to Venice (36 miles) on the west bank, and Phoenix to Mile 10 Above Head of Passes (50 miles) on the east bank. This assessment only supplements the west bank work. Work has not begun on the west bank section from City Price to Tropical Bend (Reach A; 13 miles); however, the portion from Tropical Bend to Venice (Reach B; 13 miles) is currently under construction. The east bank reach from Phoenix to Bohemia (Reach C; 16 miles) was constructed by local interests, and the remainder (East Bank Barrier; 34 miles) has not begun due to lack of local assurances.

1.1.3. The sand core, hydraulic clay fill plan (SCHC) has been designated as the National Economic Development (NED) plan. It would provide maximum benefits to the property and residents of the "ridge" area of the parish, and yield maximum average annual excess benefits over costs.

1.1.4. The "I" wall/levee plug plan (I-Wall) has been designated as the Least Environmentally Damaging (LED) Plan. The impact of this plan on area marshes was the primary consideration in the LED Plan designation because erosion, subsidence, and man's activities are

causing significant losses of this habitat. This plan would result in the loss of 20 acres of marsh and 20 acres of upland. Because the upland area utilized for borrow is presently cleared, the impacts would be minimal. The borrow on upland areas would be backfilled with sand from the Mississippi River.

1.1.5. The SCHC design has been designated as the Tentatively Selected Plan. In the analysis leading to this designation, the SCHC plan would be more desirable from NED perspectives. This plan would provide the desired protection at the least cost and is preferred by the local agencies. This plan would impact 13,915 acres, of which 9,170 are marsh; 4,224, shallow estuarine open water; 261, shrub-scrub; and 260, old levee. Of the 9,170 acres of marsh affected by this plan, 1,078 acres would be permanently altered and 8,092 acres temporarily impacted.

1.1.6. The SCHC plan is not likely to jeopardize the existence of any endangered and/or threatened species or critical habitat. The marsh loss would have a limited effect on the biological productivity of the delta area.

1.1.7. The authorized improvements would provide 100-year protection against tidal and fluvial overflows. In the short term, the potential for economic growth in the protected area would be relatively high. The area's mild climate, vast mineral and fishery resources, close proximity to the Port of New Orleans, and abundant water supply, make development attractive. The population of Reach A is projected to grow at a moderate annual rate of 0.5 percent and Reach B, at a rate of 0.7 percent.

1.1.8. Because of the extensive wetlands in the project area, there are no practicable alternatives to locating some project features of the recommended plan in these areas. Much of the impact on the 13,394 acres of wetland would be temporary, and these areas should revert to marsh i

time. The wetland damage would be minimized to the maximum extent practicable. To compensate for project-induced losses, marsh would be created on the Delta-Breton National Wildlife Refuge.

1.2. AREAS OF CONTROVERSY AND UNRESOLVED ISSUES

There are no areas of controversy or unresolved issues at this time.

1.3. RELATIONSHIP OF PLAN TO ENVIRONMENTAL REQUIREMENTS

1.3.1. Table 1.1. indicates the relationship of each plan to Federal and state environmental protection statues and requirements. If at this stage of project planning all necessary steps have been taken to comply with the statue in question, then the plan is listed as being in full compliance. A compliance determination of the Louisiana Coastal Resources Program - Coastal *Use Guidelines* is included in Appendix A, and the Section 404 Evaluation of the Clean Water Act in Appendix B. A Mitigation Report is in Appendix C, Modified Man-day and Habitat Analysis in Appendix D, US Fish and Wildlife Service Fish and Wildlife Coordination Act Report in Appendix E, and Biological Assessment of Threatened and Endangered Species in Appendix F.

1.3.2. Project features of the SCHC plan were evaluated with respect to Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material, published by the US Environmental Protection Agency on 24 December 1980. The selected methodology of confined material stockpiling, retention of drainage waters, and subsequent controlled discharge of those waters would have less environmental impacts than unconfined stockpiling. Water quality changes during construction would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. Adverse effects on the life stages

TABLE 1.1. Relationship of the plan to applicable environmental requirements.

POLICIES OR STATUES	COMPLIANCE STATUS[a]	
	SCHC	I-WALL
FEDERAL - Public Laws		
Archeological and Historic Preservation Act	Full	Full
Bald Eagle Act	Full	Full
Clean Air Act	Full	Full
Clean Water Act	Full	Full
Coastal Zone Management Act of 1972	Full	Full
Endangered species Act of 1973	Full	Full
Estuary Protection Act	Full	Full
Federal Water Project Recreation Act	Full	Full
Fish and Wildlife Coordination Act of 1958	Full	Full
Marine Protection, Research, and Sanctuaries Act	N/A	N/A
National Environmental Policy Act	Full	Full
National Historic Preservation Act	Full	Full
River and Harbor Act	N/A	N/A
Watershed Protection and Flood Prevention Act	N/A	N/A
Wild and Scenic Rivers Act	Full	N/A
FEDERAL - Executive Orders		
Flood Plan Management (E.O. 11988)	Full	Full
Protection and Enhancement of Environmental Quality (E.O. 11991)	Full	Full
Protection of Wetlands (E.O. 11990)	N/A[b]	N/A[b]
FEDERAL - Other Policies		
Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing the National Environmental Policy Act (CEQ)	Full	Full
Environmental Quality and Water Resources Management	N/A	N/A
STATE OF LOUISIANA		
Air Control Act	Full	Full
Louisiana Coastal Zone Management Plan	Full	Full
Protection of Cypress Trees	Full	Full
Water Control Act	Full	Full

[a] Full = Full Compliance. All regulation requirements at this state of the EIS process have been met.

[b] N/A = Not Applicable. This E.O. is not applicable because the FEIS was filed prior to October 1977.

of aquatic and terrestrial organisms would be minimal. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, esthetic, and economic values would not occur. Violations of the Louisiana State Water Quality Standard might occur for dissolved oxygen (DO); however, they would be highly localized and of short duration. Although Toxic Effluent Criterion of Section 307 of the Clean Water Act have not been accepted as regulatory for the State of Louisiana, they have been examined. Based on the 40 CFR 230, the designated levee and ponding sites comply with the guideline requirements to minimize pollution or adverse effects to the affected aquatic ecosystem. Application has been made for a state water quality certificate.

1.3.3. Executive Order (E.O.) 11990, Protection of Wetlands, recognizes the significant value of wetlands. The "I" wall/levee plug plan would minimize the wetland impacts; however, it would not provide the maximum benefits and protection at a minimal cost. The SCHC plan has incorporated measures to minimize adverse environmental impacts. Because the project was begun prior to May 1977, this E.O. is not applicable; however, wetland impacts are reduced where practical.

1.3.4. Executive Order 11988, Floodplain Management, recognizes the significant value of floodplains. The marshes along the Mississippi River no longer function as a natural floodplain system because of the river training as a result of the river levees. For this reason, neither the I-Wall nor SCHC plan would significantly impact the floodplain's function. The SCHC plan would affect the existing environment, however. This impact has been minimized where possible and is consistent with E.O. 11988.

A-1

2. TABLE OF CONTENTS

3. NEED FOR AND OBJECTIVES OF ACTION

3.1. STUDY AUTHORITY

3.1.1. The New Orleans to Venice Hurricane Protection project, formerly entitled Mississippi River Delta at and below New Orleans, is an authorized project of the US Army Corps of Engineers. Public Law 874, 87th Congress, 2d Session, approved 23 October 1962, authorized the construction in accordance with the recommendations of the Chief of Engineers in House Document No. 550, 87th Congress, 2d Session. The general area of the project includes the delta portion of the Mississippi River south of New Orleans. A project map is on Plate 1.

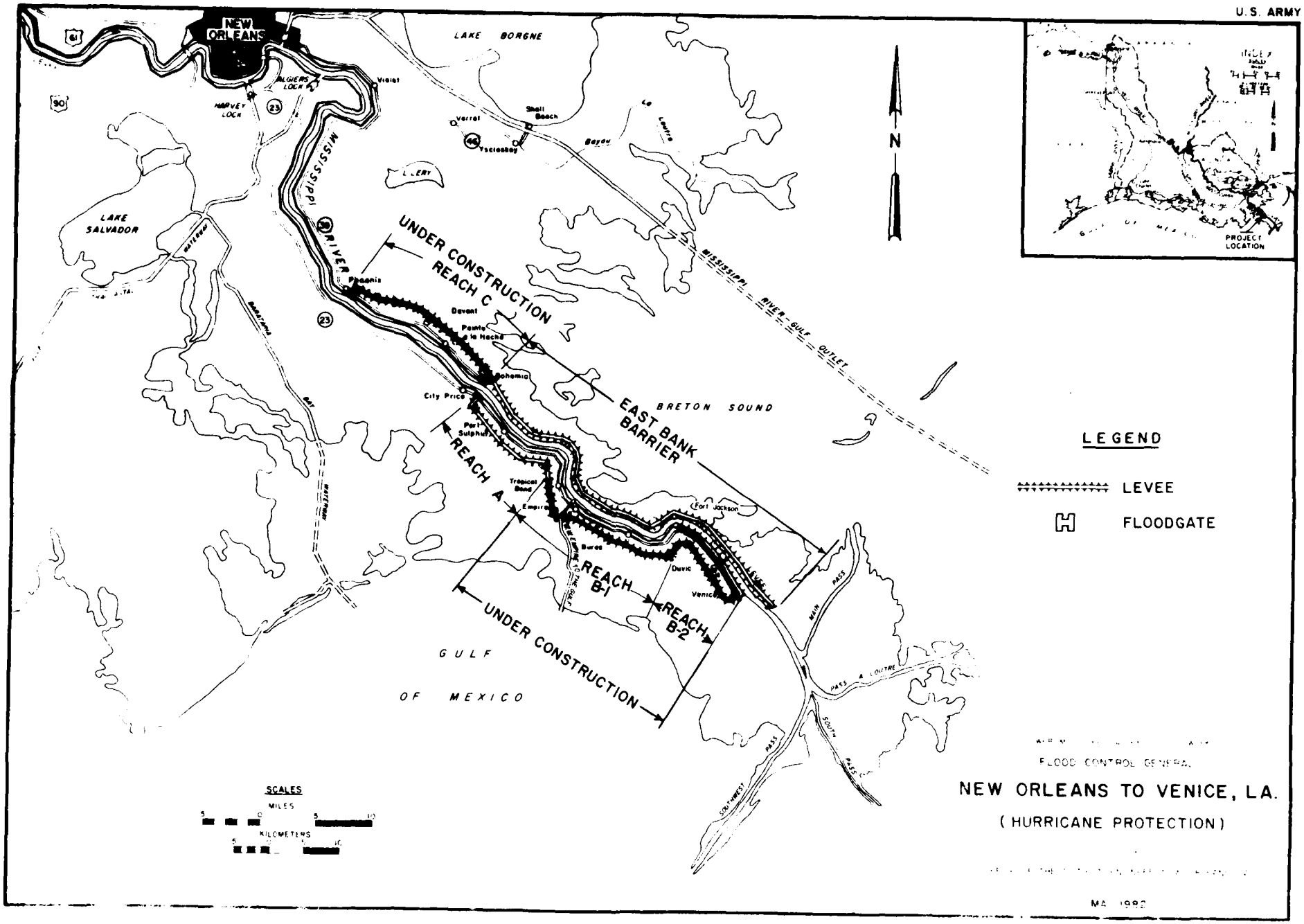
3.1.2. The project is intended to provide hurricane protection to the developed areas of Plaquemines Parish along the Mississippi River below New Orleans. It involves the enlargement of the locally constructed back levee from City Price to Venice on the west bank, and bringing the existing levee from Phoenix to Bohemia up to grade on the east bank. Construction of the East Bank Barrier reach from Bohemia south to mile 10 Above Head of Passes 34 miles has not begun. Project construction started in 1969.

3.2. PUBLIC CONCERNS

Public concerns for this project involve the reduction of flood losses due to hurricanes. The inundation of the developed areas creates hazards to life, damages public and private property, disrupts community and business life, and requires extensive expenditures of private and public funds for evacuation and rehabilitation activities. The loss of wetlands and potential effects on plant and animal life are major environmental issues. The project impacts on commercially important shellfish, finfish, and mammals; as well as on sport fish and game.

CORPS OF ENGINEERS

U.S. ARMY



FLOOD CONTROL GENERAL

NEW ORLEANS TO VENICE, LA.

(HURRICANE PROTECTION)

MAY 1982

EIS-10

PLATE 1

3.3. PLANNING OBJECTIVES

3.3.1. The following planning objectives were established in response to the economic, biological, cultural, and recreational needs of the area: provide hurricane protection to the residents and prevent losses due to flooding; preserve the cultural heritage; prevent the loss of recreational potential; preserve, enhance, and create as much marsh as practical; and protect the flora and fauna of the study area.

3.3.2. This report is prepared in accordance with the National Environmental Policy Act of 1969 as reflected by the US Army Corps of Engineers regulation ER 200-2-2 and utilizes a systematic, interdisciplinary approach. This document discusses the environmental concerns examined while developing a means to provide the necessary hurricane protection and reduce the environmental impacts as much as practicable. The following sections include a discussion of the alternatives, environment to be affected, significant resources, and impacts of the various alternatives on the significant resources.

4. ALTERNATIVES

4.1. PLANS ELIMINATED FROM FURTHER STUDY

4.1.1. The following plans, except the "no-action" and nonstructural options, would provide hurricane protection to the developed areas of Plaquemines Parish between City Price and Tropical Bend. They were considered in the preliminary stages of planning; however, they have since been rejected. The segment from Tropical Bend to Venice is currently under construction by the sand core, hydraulic clay method.

4.1.2. A sand core, cast clay levee would require the excavation of a trench and 2 million cubic yards of sand fill from the Mississippi River pumped into it to construct a sand core. The clay cover material would be obtained with a dragline from borrow areas immediately adjacent to the levee, and cast over the core where it would be shaped into the proper design with earthmoving equipment. This plan was found to be economically infeasible because of the high cost of handling the large amount of clay required.

4.1.3. An all cast clay levee would be constructed by using a dragline to place materials from an adjacent borrow site to the levee area. This plan was eliminated because of the high cost due to handling materials.

4.1.4. A hydraulic clay levee could be constructed by dredging the necessary materials for the levee from the marsh. This plan is not under consideration because of the extensive environmental degradation due to the large borrow and ponding areas required.

4.1.5. A hauled clay levee could be constructed by the transport of upland borrow to the levee site; however, this plan was found to be economically infeasible.

4.1.6. An upland borrow levee would utilize a sand core

hydraulically pumped from the Mississippi River. The clay covering for the levee would be obtained from upland borrow pits, hauled to the levee site by truck, then shaped with earthmoving equipment. This plan was rejected because of the high cost of transporting the upland borrow.

4.1.7. The no-action and nonstructural alternatives would result in inadequate protection for the residents and property of the parish.

4.2. WITHOUT CONDITIONS

4.2.1. If no Federal action is taken to address the planning objectives, the present, locally-constructed levees would be easily overtopped during a hurricane and the developed area would be subject to inundation. Over time, the present non-Federal back levee would provide even less protection due to subsidence and erosion.

4.2.2. Land losses in the Mississippi Deltaic Plain region have been estimated to be about 200,000 acres per year (Fruge, 1981). Based on Wicker (1960), losses in the Barataria Bay Basin are about one percent per year and are estimated to be 1.2 percent per year in the study area. Although coastal areas are subject to alteration through the natural process of deposition and erosion, activities such as dredging canals, altering sediment transport, and reclaiming land have greatly accelerated wetland losses. These activities have resulted in negative impacts like saltwater intrusion, eutrophication, reduction of storm buffering capacity, loss of natural waste treatment, and decline of nursery grounds for fish and shellfish. Craig et al. (1979) found that dredged canals widen about 4 to 15 percent each year, and that a direct relationship existed between the land loss rate and canal density for sections of Barataria Bay. Wetland loss due to canals might be close to 10 percent of the total wetland area.

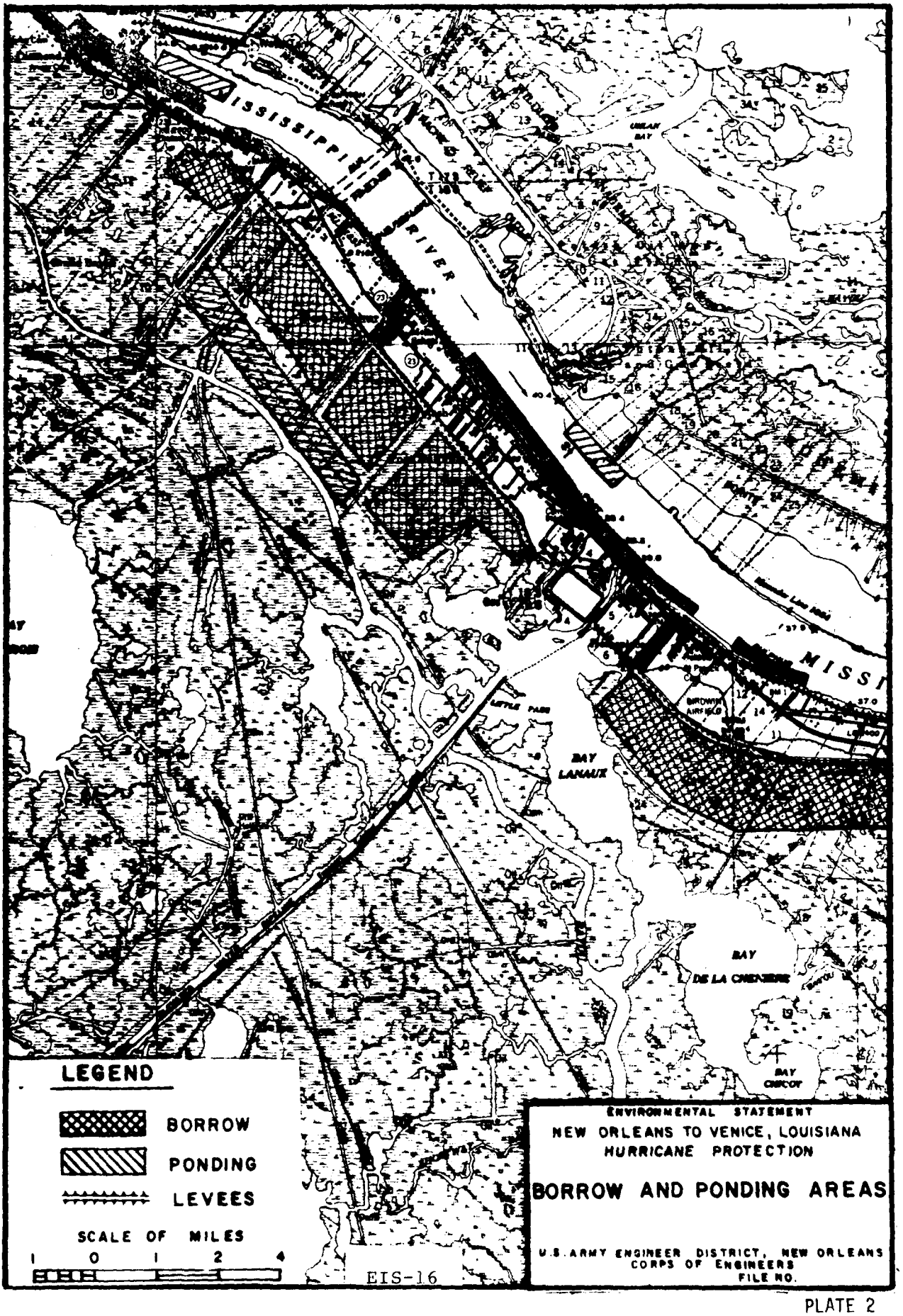
4.2.3. Because of the Mississippi River levees, the historical depositional mechanism of the river is no longer effective. Erosion, subsidence, and a general relative sea level rise are resulting in

considerable marsh loss as the land slowly recedes into estuarine water bodies. The character of the marsh is not only changing as a result of subsidence, but salinity increases are modifying existing vegetation patterns and the distribution of valuable shellfish, fish, and furbearers. The salinity problem has been especially aggravated by numerous canals for navigation and oil recovery. Many commercially important species such as menhaden, shrimp, and oysters are probably being harvested at or near the maximum sustained yield, and the possibility of significantly increased harvests is remote. Although fluctuations occur on a year-to-year basis, and management might temporarily increase production, a decline in catches is probable as a result of pollution, marsh loss, and salinity changes.

4.3. PLANS CONSIDERED IN DETAIL

4.3.1. The following two plans are the most feasible alternatives for providing the required hurricane protection. The impacted areas are shown in Plates 2-5.

4.3.2. Plan 1, sand core, hydraulic clay fill (SCHC), would provide the necessary protection by the use of a hydraulically constructed sand core, clay blanket, levee. Construction involves the excavation of a central core parallel to the existing back levee and hydraulically filling the trench with 10.2 million cubic yards of sand from the Mississippi River borrow areas. A clay cover, which would be hydraulically pumped from borrow pits in the marsh, would be placed over the core. Of the 33.3 million cubic yards of materials removed from the marsh for the cover, 14.9 million cubic yards would be utilized, and the remainder would be diverted to ponding areas. The ponding area would retain the light, fine sediments, and reduce the turbidity of the effluent discharged into the marsh. After several years of consolidation in the retaining area, the clay would be shaped into the final levee design with earthmoving equipment. The levee would be seeded, and the grass maintained.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ENVIRONMENTAL STATEMENT
NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION
BORROW AND PONDING AREAS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
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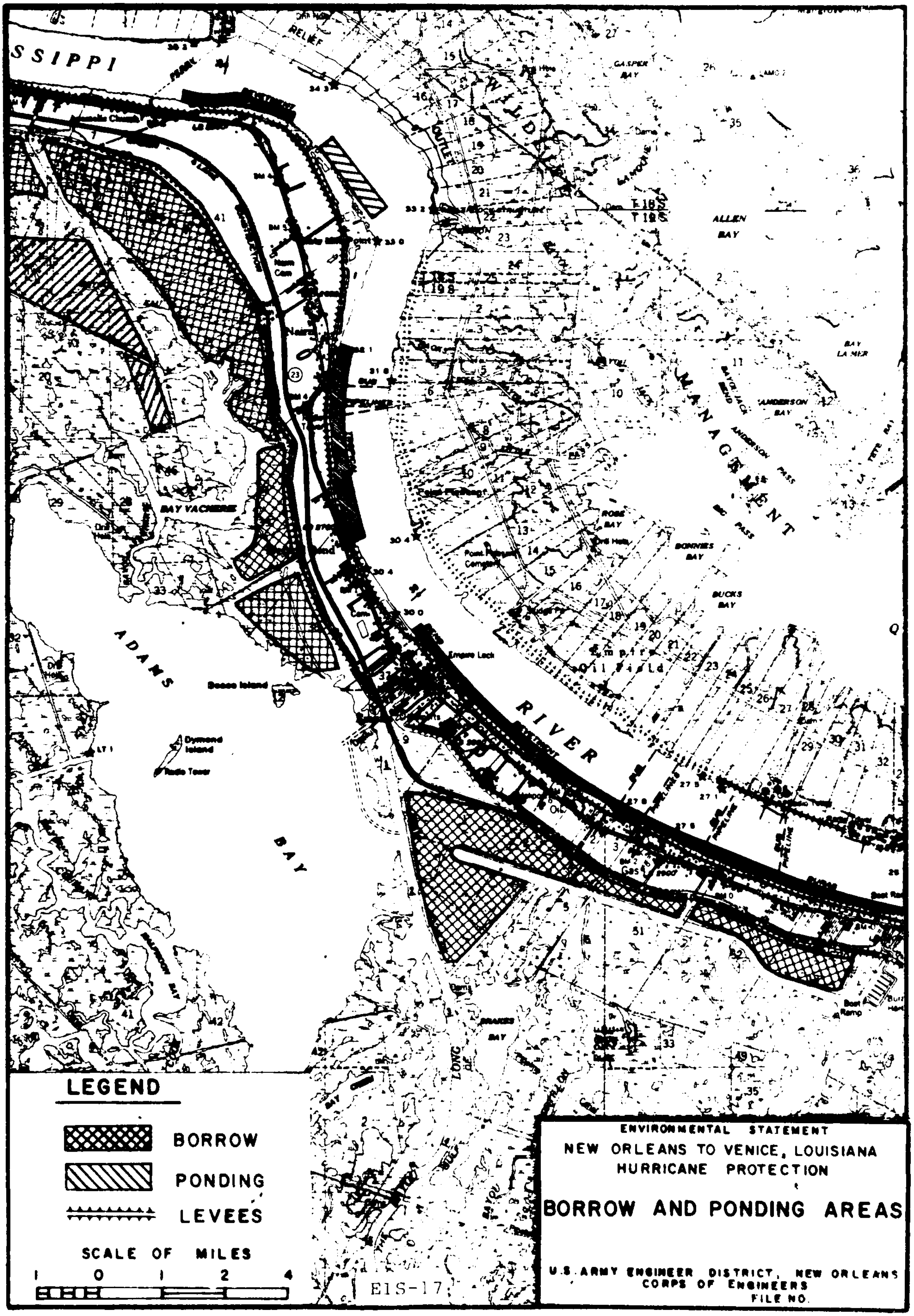
PLATE 2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ROSE BAY
BONNIES BAY
BUCKS BAY
DRAKES BAY
Empire Lock
Bosco Island
Dymond Island
Radio Tower
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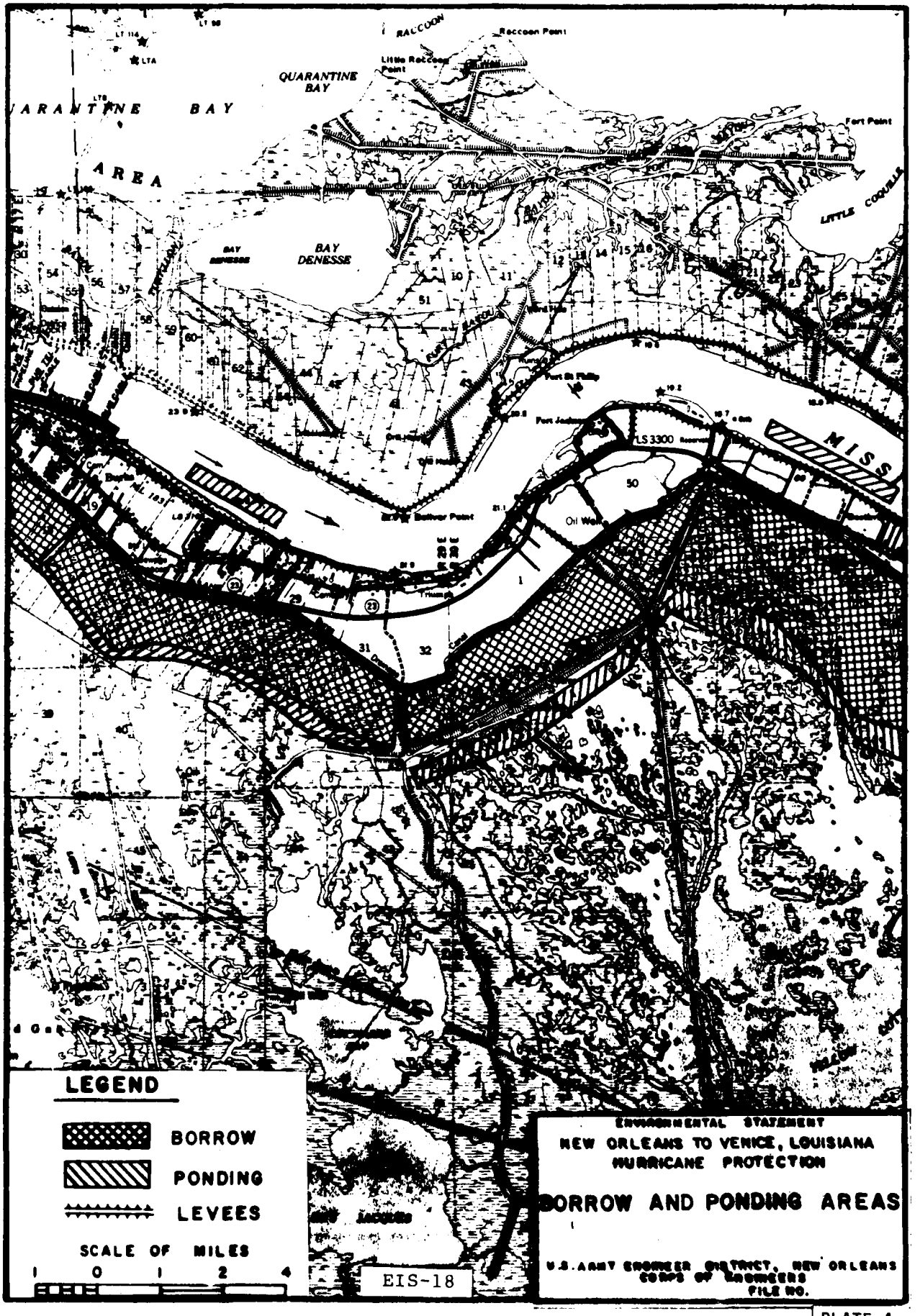
ENVIRONMENTAL STATEMENT
NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION
BORROW AND PONDING AREAS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO.

PLATE 3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BAY
AREA
RACCOON
Raccoon Point
Little Raccoon Point
Fort Point
LITTLE COQUILLE
BAY DENESSE
MISS
LS 3300
Oil Wells
LEGEND
BORROW
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LEVEES
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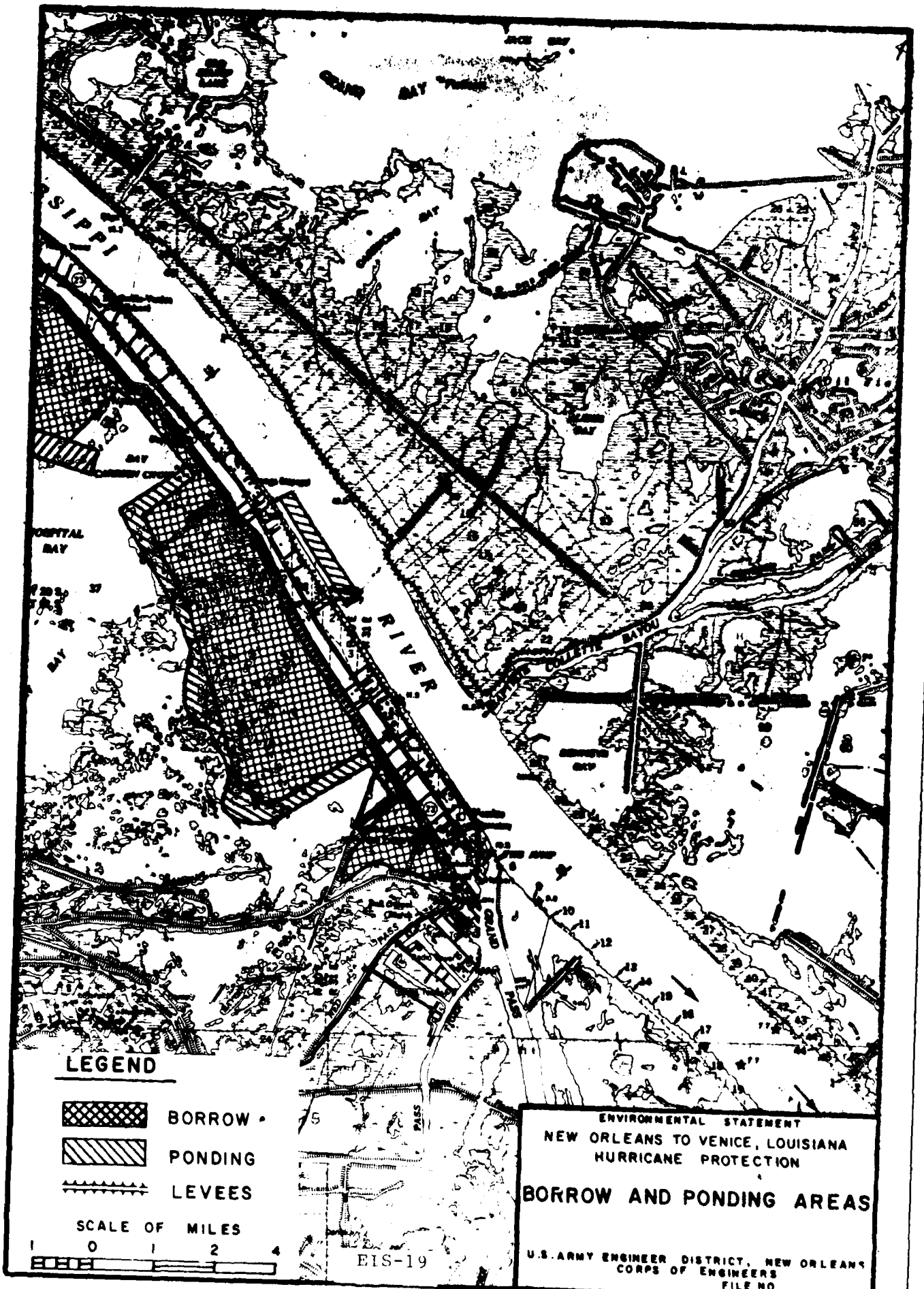
ENVIRONMENTAL STATEMENT
NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION
BORROW AND PONDING AREAS
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO.

PLATE 4



ENVIRONMENTAL STATEMENT
NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION

BORROW AND PONDING AREAS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO

PLATE 5

4.3.3. Plan 2, "I" wall/levee plug (I-Wall), would involve the construction of a concrete floodwall in the existing back levee with earthen segments at marinas, bridge crossings, and other points of convenience. In most cases, at least one plug would be placed into the wall every mile. Fill material for the plugs would be obtained from a 20-acre upland borrow site which would later be backfilled with sand from the Mississippi River.

4.3.4. The cost-sharing responsibility for the plans is summarized in Tables 4.3.1. and 4.3.2.

4.3.5. Plan 1 (SCHC) has been designated as the National Economic Development (NED) plan and Plan 2 (I-Wall) as the Least Environmentally Damaging (LED) plan. The Tentatively Selected Plan (TSP) is Plan 1.

4.4. MITIGATION

4.4.1. Mitigation would be required with the implementation of the SCHC plan. Of the 13,915 acres of land impacted by the project, 13,394 acres are marsh and estuarine open water. A total of 2,899 acres of these habitats would be permanently lost, of which 1,235 acres would be buried under the levee, and 1,664 acres would became borrow pits. The remaining 10,495 acres would be ponding areas which would begin to revert to marsh within a year. About 9,170 acres of marsh would be affected, of which 8,092 acres would be temporarily lost due to ponding areas, and 1,078 acres would be permanently lost because of borrow pits and levee sites. The marsh impacts represent an annualized 618-acre loss. A summary of the habitat impacted is in Tables 4.4.1. and 4.4.2. To compensate for this wetland loss, a natural marsh creation project is proposed in the Delta-Breton National Wildlife Refuge. Marsh would be created by opening holes in the southern levee along Main Pass and allowing sediment-rich river waters to enter the shallow water areas. The result would be the gradual development of small delta splays or

Table 4.3.1. The cost estimates of the Sand Core, Hydraulic Clay Fill Plan for the New Orleans to Venice Hurricane Protection Projects. The data analysis utilized October 1982 price levels, 2 7/8% interest rate, 100-year project life and a base year of 1993.

ECONOMIC VARIABLE	IMPLEMENTATION RESPONSIBILITY		TOTAL
	Federal ($)	Non-Federal ($)	($)
FIRST COSTS			
Total construction cost[a/]	142,532,000	49,013,000	191,545,000
Remaining construction cost	114,542,900	20,978,100	135,521,000
Present value, Remaining cost	119,934,400	22,460,600	142,395,000
Total mitigation cost	301,000	133,000	434,000
Present value mitigation cost	309,000	134,500	443,600
AVERAGE ANNUAL CHARGES			
Interest (2 7/8%)	3,461,000	648,000	4,109,000
Amortization (100 years)	215,000	40,000	256,000
Operation and Maintenance	-	225,000	225,000
Replacements	-	34,000	34,000
Mitigation Losses	11,000	5,000	16,000
Mitigation Cost			
Interest (2 7/8%)	9,000	4,000	13,000
Amortization (100 years)	1,000	-	1,000
Total	3,698,000	956,000	4,654,000
AVERAGE ANNUAL BENEFITS			
Inundation Reduction			$9,351,000
Intensification			73,000
Mitigation			11,000
Total			$9,435,000
REMAINING BENEFIT-TO-COST RATIO			2.0 to 1

[a/] This analysis excludes Reach C because it has been completed. Cost of this segment totaled $13,040,000 of which $12,429,000 was non-Federal.

Table 4.3.2. The cost estimates of the "I" Wall Plan for the New Orleans to Venice Hurricane Protection Projects. The data analysis utilized October 1982 price levels, 2 7/8% interest rate, 100-year project life and a base year of 1993.

ECONOMIC VARIABLE	IMPLEMENTATION RESPONSIBILITY		TOTAL
	Federal ($)	Non-Federal ($)	($)
FIRST COSTS			
Total construction cost[a/]	147,131,000	50,980,000	198,111,000
Remaining construction cost	99,785,400	42,735,600	142,521,000
Present value, Remaining cost	106,945,900	45,807,200	152,753,000
AVERAGE ANNUAL CHARGES			
Interest (2 7/8%)	3,075,000	1,317,000	4,392,000
Amortization (100 years)	191,000	82,000	273,000
Operation and Maintenance	-	225,000	225,000
Replacements	-	34,000	34,000
Total	3,266,000	1,658,000	4,924,000
AVERAGE ANNUAL BENEFITS			
Inundation Reduction			$9,351,000
Intensification			73,000
Total			$9,424,000
REMAINING BENEFIT-TO-COST RATIO			1.9 to 1

[a/] This analysis excludes Reach C because it has been completed. Cost of this segment totaled $13,040,000 of which $12,429,000 was non-Federal.

TABLE 4.4.1. The habitats, in acres, impacted by the SCHC plans as of 1969. This period represents the start of the New Orleans to Venice construction.

IMPACTED AREA	HABITAT			
	Marsh	Estuarine Open Water	Shrub Scrub	Present Levee
Borrow	1,078	586	6	0
Ponding[a/]	8,092	3,638	255	260
Total	9,170	4,224	261	260

a/ Ponding area in this table includes the retention site and the wetland area adjacent to the locally constructed levee which would be impacted by project. The increased levee width and retention area represents a total of 1,235 acres of which 683 are marsh and 552 estuarine open water. The total wetland (marsh and estuarine open water) impacted is 13,394 acres.

TABLE 4.4.2. The wetland (marsh and estuarine open water), in acres, impacted on a permanent and temporary nature of the year 1969.

HABITAT	IMPACT		
	Permanent[a/]	Temporary[b/]	Total
Marsh	1,761	7,409	9,170
Estuarine Open Water	1,138	3,086	4,224
Total	2,899	10,495	13,394

a/ Permanent impacts would be on the borrow sites and the retention/levee rights-of-way.

b/ Temporary impacts would be on the ponding areas.

which natural fresh marsh could be established. In the event this methology is unsuitable, marsh would be created on the refuge with dredged material. Details of the mitigation plans are in Appendix C.

4.4.2. The basis for mitigation of the SCHC plan is in Table 4.4.3. which summarizes the man-day and habitat analysis contained in Appendix D, and is similar to the analysis contained in the Fish and Wildlife Coordination Act Report (FWCAR) in Appendix E. Differences between the two analyses are due to the use of varying man-day values. Those values used in this analysis were developed by the Water Resources Council and are those found in their Principles and Guidelines of September 1982, whereas the FWCAR values were from various sources. The man-day analysis was conducted only for the Tentatively Selected Plan.

4.5. COMPARATIVE IMPACTS OF ALTERNATIVES

4.5.1. A comparative summary of the project impacts is in Table 4.5.1.

TABLE 4.4.3. An annualized man-day and habitat analysis summary between the Future Without-Project (FWOP) and the Tentatively Selected Plan (TSP) for the New Orleans to Venice Hurricane Protection Project.

ANNUALIZED DATA	HABITATS				
	Marsh	Estuarine Open Water	Shrub-Scrub	Levee	Borrow
Area (acres)					
FWOP	4,750	8,643	261	260	0
TSP	4,582	3,389	3,069	1,372	1,503
Man-days per Acre (MDA)	6.70	0[a/]	0.2	0	0
Habitat Unit Value (HUV)	0.368	.186	0.192	0.078	0.157
Value per Acre ($) (VPA)	29.92	0[a]	0.78	0	0
Area in acres (ACAR)[b/]	-168	-5,254.	+2,808	+1,112	+1,503
Habitat Units (ACHU)[c/]	-61.8	-977.2	+539.1	+86.7	+236.0
Monetary Man-days (ACMD)[d/]	-11,259	0	+561.6	0	0
Value ($) (ACMV)[e/]	-5026.56	0	+2,190.24	0	0

[a/] Because the value of open water is dependent on marsh productivity, MDA and VPA were included with marsh.
[b/] ACAR = FWP Area - TSP Area
[c/] ACHU = (ACAR) (HUV)
[d/] ACMD = (ACAR) (MDA)
[e/] ACMV = (ACAR) (VPA)

TABLE 4.5.1. - COMPARATIVE IMPACTS OF ALTERNATIVES

MARSHES

Base Conditions	About 9,170 acres of marsh are present in the project area.
Future-Without-Project	Marsh would continue to degrade, and would be lost at a rate of 1.2 percent per year. By the end of the project life, 2,004 acres would remain. Encroachment into the marshes for development would continue.
SCHC	Of the 9,170 acres of marsh impacted by the project, 1,078 acres would be converted to deep, open water in the borrow areas, and the remaining acreage would be disposed upon for the levee and ponding areas. The 683 acres of marsh required for the levee would be permanently impacted while the ponding areas would eventually revert to marsh. The annualized marsh lost represents 62 habitat units with a monetary value of $5,027[1/]. To compensate for this marsh loss, about 300 acres of fresh/intermediate marsh would be created by the delta splay method on the Delta-Breton National Wildlife Refuge. Open-water habitat would be lost as marsh is created. The creation of a more favorable developmental environment could induce additional marsh loss.
I-Wall	The direct impacts of the I-Wall plan on marsh would be negligible. The potential for marsh loss due to development would be the same as the SCHC plan.

[1/] Habitat Units (HU) are derived by multiplying acres of a habitat by a Habitat Unit Value (HUV) for that habitat. The monetary value of the habitat is derived by multiplying acres of the habitat by a value/acre figure for that habitat. Information on the HUV and monetary values is in Appendix D and E.

SHALLOW WATER BODIES

Base Conditions	About 4,224 acres of estuarine water bodies are presently in the project area.
Future-Without-Project	Shallow estuarine water bodies would continue to expand at a rate of 1.2 percent per year.
SCHC	Of the 4,224 acres of estuarine water bodies, 586 acres would be converted to deep borrow areas and 3,638 acres would be filled for ponding and levee areas. About 300 acres of shallow water would be converted to fresh marsh as project mitigation.
I-Wall	The I-Wall plan would have a negligible impact on estuarine water bodies.

NATURAL RIDGE

Base Conditions	The natural ridge is currently protected by levees and is used for agricultural and developmental purposes.
Future-Without-Project	Land within the natural ridge would be subject to further development. Subsidence would continue in this area.
SCHC	This plan would not impact the natural ridge; however, a small section of bank along Main Pass would be degraded to allow for migitation. Additional hurricane protection would be provided to the natural ridge.
I-Wall	About 100 acres of natural ridge would be used for fill. This borrow area would then be back filled with Mississippi River sand. The natural ridge would be provided with additional hurricane protection.

MISSISSIPPI RIVER

Base Conditions	The Mississippi River provides habitat for fish and other aquatic organisms. The river would continue to be used for waterborne commerce, and as a source of municipal and industrial water.
Future-Without-Project	The river would continue to provide water and be utilized for waterborne commerce.
SCHC	About 10 million cubic yards of sand would be removed from the river from the levee core. This would result in a borrow area which would eventually fill back in with sand and silt.
I-Wall	The I-Wall plan would have no impact on the river.

SHRIMP AND OYSTERS

Base Conditions	The Barataria Bay complex produces the largest number of shrimp, and second largest number of oysters, in the state.
Future-Without-Project	Because of marsh subsidence and saltwater intrusion, this fishery would decline. Primary oyster beds would continue to move inland as the above conditions enhance the invasion of disease and predatory organisms, including the oyster drill.
SCHC	This plan would impact 5 acres of oyster leases and 25 acres of requested sites. About 4,224 acres of estuarine open water would be impacted, of which 1,138 acres would permanently lost.
I-Wall	This plan would not affect oysters or shrimp.

INVERTEBRATES

Base Conditions	The marshes and estuarine open waters support a wide variety of invertebrate species. Terrestrial insects are common, especially disease vectors such as mosquitos, deerflies, and midges.
Future-Without-	The production of invertebrates would decline because of the loss of marshes due to saltwater intrusion, subsidence, and erosion.
SCHC	Those wetlands in the borrow and levee areas would be effectively eliminated for invertebrates, and the open-water bodies in the ponding area would be filled. A total of 4,224 acres of estuarine open water would be impacted. Turbidity and pollution would be associated with the effluent release from the ponding areas. The terrestrial insect population would not be significantly impacted.
I-Wall	The I-Wall plan would have negligible impacts on invertebrates.

F I S H

Base Conditions	Fisheries resources are commensurate with the extent of the Mississippi River, estuarine water bodies, and marshes present in the project area.
Future-Without-Project	The marshes would convert to estuarine open-water bodies at a rate of 1.2 percent per year.
SCHC	The shallow estuarine waters provide habitat to a variety of sport and commercial saltwater fish. The marshes function as a nursery area and produce large amounts of organic detritus that are transported into adjacent water bodies. This supports the estuarine food web which is vital to maintaining Louisiana's high level of fishery production. Marshes and associated shallow water bodies are used by various life stages of many estuarine-dependent species that take advantage of the protection from predators, warmer temperatures, optimal salinity regimes, and the detrital food chain. About 4,224 acres of estuarine open water and 9,170 acres of marsh would be impacted. This represents about 1,664 acres of wetland which would be converted to deep water by borrow removal, and the filling of 11,730 acres for ponding and levee areas. Turbidity and pollution would be associated with the effluent release from the ponding areas. About 300 acres of shallow water would be impacted by mitigation; however, this would be partially compensated for by the increased productivity of the area due to marsh creation.
I-Wall	This plan would have no impact on fisheries.

W I L D L I F E

Base Conditions	Wildlife resources are commensurate with the extent of marshes and shallow estuarine open-water bodies.
Future-Without-Project	With no action, about 1.2 percent of the marsh would be lost per year, and a similar decline in wildlife could be expected.
SCHC	Of the 13,394 acres of marsh and shallow estuarine water habitat impacted, 1,664 acres would be permanently lost and 11,730 acres temporarily affected. This represents an annual loss of 62 habitat units. In some instances, the displaced wildlife might affect adjacent habitats and populations. Wildlife impacted would include waterfowl, wading birds, seabirds, and furbearers. It is proposed that the wildlife habitat negatively impacted would be mitigated by fresh/intermediate marsh creation. The grassy levees would be used to a limited extent.
I-Wall	The I-Wall alternative would have a minor impact on wildlife. The plugs, which would be placed every mile, would provide access from the marsh to the upland areas and vice versa. This type of construction would prevent the passage of some animals, especially semi-aquatic species.

ENDANGERED AND BLUE LIST SPECIES

Base Conditions	Several endangered or threatened species are, or could be, residents or transients in the study area. The normal range of 16 blue list species occurs within the project.
Future-Without-Project	The natural marsh loss would affect the food resources of these species by impacting the productivity of prey items.
SCHC	The impacts would be the same as the without condition, but would occur at a slightly greater rate.
I-Wall	The impacts of this plan would be negligible.

RECREATIONAL RESOURCES

Base Conditions	Fishing, hunting, and boating are major activities in the study area. Recreational use of the Mississippi River is limited due to a lack of access.
Future-Without-Project	Increased recreational demands on public lands would occur.
SCHC	Long-term effects of SCHC levee construction on recreational resources would be minimal; however, short-term effects such as localized noise and turbidity would temporarily impact recreational activities. Boat launch ramps existing in the project area would not be affected due to their location in the marsh, west of the project impact zone.
I-Wall	With the exception of turbidity, the impacts of the I-Wall would be similar to the SCHC plan. Access would be limited through the I-Wall due to the placement of openings approximately every mile.

NATIONAL REGISTER OF HISTORICAL PLACES

Base Conditions	Fort Jackson is the only property listed, or proposed for listing, on the National Register of Historic Places that is near the project area.
Future-Without-Project	Fort Jackson would remain in its present status and condition.
SCHC	No effects on National Register properties or eligible properties are expected.
I-Wall	Same as above.

WATER QUALITY

Base Conditions	The Mississippi River is affected by saltwater intrusion from the gulf. High concentrations of fecal coliform bacteria, toxic metals, and synthetic volatile organics occur frequently. Occasional high fecal coliform densities in shellfish harvesting areas are a primary concern.
Future-Without-Project	Saltwater intrusion in the river would continue. Bacteria densities should decrease as existing treatment facilities are upgraded and new facilities come on line. Improvements in raw material recovery techniques might slow the rate of increasing heavy metals loadings from industry. There would still be occasional toxic material spills on the river. Periodically, high bacterial densities in the estuarine waters would continue unless treatment of storm drainage water is initiated.
SCHC	This plan should have minimal effects on the river water quality. High turbidity, metals, and nutrient levels would occur in the marsh areas during dredging operations. The short-term release of contaminants due to elutriation of levees by rainfall and long-term leaching of contaminants from the levee material to the marsh waters are possible. Differences in the chemistry of surface and bottom waters would be induced by the depth of the clay borrow pits. Project induced business, industrial and residential development could degrade water quality in project area.
I-Wall	Water quality impacts on the river would not be significant. Short-term release of contaminants due to elutriation of earthen levee plugs by rainfall is possible.

NAVIGATION

Base Condition	The Mississippi River is designated as part of the Port of New Orleans. In 1980 total traffic was estimated to be 177 million tons, surpassing the Port of New York for the second consecutive year. The total volume for the more flood-prone areas below New Orleans' corporate limits, however, has tended to decline in recent years.
Future-Without-Project	In the near future, growth of the port would probably occur more rapidly in the more protected areas upriver.
SCHC	In general, improved flood protection could facilitate the growth of port activites in the area over time.
I-Wall	Similar to SCHC Plan

FLOOD CONTROL

Base Conditions	The project area is now subject to relatively frequent and sometimes devastating hurricane induced tidal overflows. Flooding from storm tides has occurred on one or both sides of the Mississippi River on an average of once every six years since the mid-1800's.
Future-Without-Project	The pattern of periodic flooding with attending severe flood losses in the project area would continue.
SCHC	Flood damages caused by hurricane tidal overflows would be substantially reduced. Complete protection up to a 100-year frequency storm would be provided.
I-Wall	Similar to SCHC Plan.

LAND USE

Base Conditions	Plaquemines Parish covers an area of 660,000 acres, most of which are wetlands. Reaches A and B along the west bank of the river would inclose approximately 10,400 acres, including: 220 acres of public and semi-public land; 300 acres used for commercial and industrial purposes; 460 acres of residential land; 950 acres of improved pasture and citrus groves; 1330 acres of woods; and 7,140 acres of undeveloped land and water.
Future-Without-Project	Existing conditions would continue.
SCHC	Reduction of flooding in the project area would enhance use for urban development.
I-Wall	Similar to SCHC Plan.

PROPERTY VALUES

Base Conditions	Property values are depressed due to exposure to frequent and severly damaging tidal overflows and to associated building restrictions.
Future-Without-Project	Property values would continue to remain depressed.
SCHC	Building restrictions would ease and the area could be more efficiently developed. Property values would rise substantially.
I-Wall	Similar to SCHC Plan.

MINERALS & ENERGY	
Base Conditions	Plaquemines Parish is among the richest sources of mineral production in the United States. Among the mineral products in the parish are crude petroleum, natural gas, sulfur, natural gas liquids, and salt. Nearly all of this production occurs outside the project area. In 1975, the value of mineral production in the parish was $1.7 billion, or 2.7 percent of the U.S. total. Crude oil production in Louisiana's Gulf Coast (including offshore production) in 1981 exceeded 414 million barrels or 13.2 percent.
Future-Without-Project	The current trend would continue, declining as the economically recoverable resources are depleted.
SCHC	Current production trends would continue. Increased flood protection would help in controlling the rising cost of mineral production in the area by providing a closer, more dependable base of operations.
I-Wall	Similar to SCHC Plan.

BUSINESS AND INDUSTRIAL ACTIVITY	
Base Conditions	Port activities, industrial plants, mineral production, commercial fishing activities, and various small supporting commericial businesses are located along the river. They are subject to periodic, severely damaging tidal overflows.
Future-Without-Project	Industrial and commercial activity along the river would continue, experiencing problems caused by flooding and hurricanes. Growth would be retarded by potentially huge losses.
SCHC	Existing commercial and industrial activities located along the river would continue to operate. Added flood protection most probably would induce more business and industrial developments in the project area. Overall growth would be stimulated.
I-Wall	Similar to SCHC Plan.

EMPLOYMENT

Base Conditions	The economic activity in Plaquemines Parish is heavily oriented to petroleum exloration and production; employment opportunities associated therewith have been widespread. Although much of the oil industry labor is provided by New Orleans, the New Orleans Standard Metropolitan Statistical Area (SMSA) has suffered from significant unemployment and underemployment in recent years. In November of 1982, unemployment in Plaquemines Parish was estimated to be 6.8 percent while unemployment for the New Orleans SMSA was 9.7 percent.
Future-Without-Project	Existing conditions would continue, fluctuating with resource production trends.
SCHC	Construction activities would stimulate minor increases in employment for local residents and workers living in the New Orleans SMSA. Residential and industrial growth throughout the project areas would also stimulate employment.
I-Wall	Similar to SCHC Plan; differences in design would result in somewhat greater employment during construction.

PUBLIC FACILITIES AND SERVICES

Base Conditions	Louisiana State Highway 23 and various local roads, schools, churches, local police and fire protection facilities, and other public facilities and services are located in the project area.
Future-Without-Project	These facilities and services would continue to suffer from flood occurences.
SCHC	The project would reduce flood damage to these facilities and aid in maintaining existing services.
I-Wall	Similar to SCHC Plan.

TAX REVENUES

Base Conditions	Tax revenues are essentially commensurate with the current level of development.
Future-Without-Project	Tax revenues are expected to slowly increase as a result of additional developments and greater business activity in the area. The tax base would depend on future activity levels of the oil industry.
SCHC	Induced commerical and industrial developments as well as increased residential construction activity would spur larger tax revenues. The tax base would have greater stability.
I-Wall	Similar to SCHC Plan.

COMMUNITY AND REGIONAL GROWTH

Base Conditions	Plaquemines Parish experienced rapid growth during the 1950's as a result of the expansion of petrochemical industries. Increases since then have moderated due to the adverse impacts of Hurricanes Betsy (1965) and Camille (1969). Large portions of the urban-type developments were destroyed on those occasions and massive relocations resulted.
Future-Without-Project	The limited availability of land in the area as well as potential flood and hurricane damages would restrict growth in the area.
SCHC	The proposed plan would encourage growth in the local communities; however, the plan is not likely to significantly influence regional growth patterns
I-Wall	Similar to SCHC Plan.

N O I S E

Base Conditions	Plaquemines Parish is a sparsely populated area with the primary sources of noise coming from the river traffic, industrial plants, and vehicles traveling on Louisiana Highway 23.
Future-Without-Project	Noise conditions would gradually increase due to the anticipated increase in resident population and overall business activity.
SCHC	Any socioeconomic activity which the plan stimulates would result in an increase in noise levels; however, no increases to highly objectionable or dangerous levels are anticipated as a result of the project. Noise levels would be temporarily increased around construction sites.
I-Wall	Similar to SCHC Plan.

P O P U L A T I O N

Base Conditions	Based on the 1980 Census, the estimated population of Reaches A and B is approximately 12,400. The potential for population displacement is relatively high due to the frequent threat of hurricanes and tidal surges. For example, an estimated 11,000 people living below Port Sulphur were left homeless due to the damages caused by Hurricane Camille in 1969.
Future-Without-Project	Population in the area would grow slowly due to the potential for devastating hurricane related flood damage.
SCHC	Improved flood protection would encourage moderate population growth throughout the area on the west bank of the river.
I-Wall	Similar to SCHC Plan.

ESTHETIC VALUES

Base Conditions	Changes in the visual horizon have occurred in the project area due to installation of the urban-type developments in an otherwise natural marshlands and low lying deltaic areas.
Future-Without-Project	Base conditions would slowly change with the evolution of an urban environment from a natural one. The rural agrarian and wetland landscape is expected to shift slightly toward a more industrial urban setting.
SCHC	The net effect of the project would induce additional changes in the natural environment as further development in the area occurs.
I-Wall	Similar to SCHC Plan, but this plan would not adversely impact marshes.

COMMUNITY COHESION

Base Conditions	As indicated by several residents, and the sponsorship of the local governing body (Plaquemines Parish Commission Council), the local community supports improved hurricane protection and environmental preservation.
Future-Without-Project	The various local interests would probably continue efforts to discourage environmental damage and improve flood protection. The limitations of a piecemeal effort, however, could have a periodic unsettling effect on the social security and harmony of the communities located along the west bank.
SCHC	As indicatedy by the Plaquemines Parish Commision Council, no significant adverse impacts to the structures of local communities are anticipated. The improved economic stability, which additional flood protection would provide, could enhance community cohesion as well.
I-Wall	Local interests are less inclined to support this alternative due to its additional cost and operating requirements. Under threat of a hurricane, evacuation procedures would require closure of the gates along the wall. Overall impacts would approximate those for the SCHC Plan.

PLAN ECONOMICS[a]
(thousands of dollars)

	First Costs[b]	Remaining First Costs	Remaining Average Annual Charges	Remaining Average Annual Benefits	Remaining B/C Ratio
Base Conditions	N/A	N/A	N/A	N/A	N/A
Without-Project Condition[c]	0	0	0	0	0
SCHC	$191,545,000	$135,521,000[d]	$4,654,000	$9,435,000	2.0 to 1
I-Wall	$198,111,000	$142,521,000[e]	$4,924,000	$9,424,000	1.9 to 1

[a] A comparison of the estimated costs and preliminary evaluations of the anticipated benefits as of October 1982, assuming a 2 7/8 percent discount rate over 100 years, and a base year of 1993.

[b] Because Reach C is completed, it has been excluded from analysis.

[c] The Without-Project Condition involves maintaining the existing levees and requires no additional authorization; therefore, a benefit analysis is not applicable.

[d] Present value = $142,395,200; excludes $434,000 of mitigation costs.

[e] Present value = $152,753,100

5. AFFECTED ENVIRONMENT

5.1. ENVIRONMENTAL CONDITIONS

The study area encompasses the modern subdelta of the Mississippi Deltaic Plain region of Southeastern Louisiana and is characterized by low elevations from 5 feet National Geodetic Vertical Datum (NGVD) to sea level. For environmental analysis, that area along the Mississippi River from City Price to Venice and out to the 40 arpent line (a line parallel to the Mississippi River about 7,500 feet from the river edge) was examined in most detail. Water levels in the marshes, river passes, and Mississippi River outlets are tidal and/or wind-influenced. Due to its proximity to the Gulf of Mexico, the study area has a subtropical marine climate. The major natural vegetative communities are marshes and levee forests. Between the Mississippi River and hurricane protection levees, agricultural crops such as sugarcane, soybeans, cotton, corn, pecans, and citrus fruit are grown. The marshes and estuarine water bodies, by virtue of their spawning and nursery areas, provide the basis for a good sport and commercial fishery for fin and shellfish. Harvestable animal species include furbearers and migratory waterfowl as well as the alligator and deer. Numerous nongame, wetland species are present. Fishing, hunting, boating, camping and picnicking are popular recreational activities in the study area.

5.2. SIGNIFICANT RESOURCES

5.2.1. Marshes

The coastal marshes in the study area lie immediately to the bay side of the natural ridge along the Mississippi River and range in elevation between 1 and 2 feet NGVD. Because the marsh is interlaced with many bayous and tidal creeks, it is brackish to saline. Despite

low vegetative diversity, productivity in the marsh is high and a large animal population is supported. Day, et al. (1973) estimated that the net production of the Barataria saline marshes was 1,518 g dry wt/m^2/yr of which 50 percent was available for export to surrounding estuarine waters. Productivity of Louisiana marsh is one to two times greater than Atlantic Coast marshes. The dominant plant in the marshes is oystergrass, Spartina alterniflora, and it comprises about 65 percent of the total salt marsh. Other plants found in the salt marsh are glasswort, blackrush, saltwort, black mangrove, and saltgrass; however, in the less brackish areas, wiregrass, three-cornered grass, leafy three-square, and widgeon grass are common. Epiphytic algae and diatoms are also important aspects of the marsh. Because the marsh food chain is based on detritus, the predominate animals are detrital feeders such as crabs, snails, and insects. Vertebrates, such as wading birds, waterfowl, raccoons, muskrats, and nutria, are also common.

5.2.2. **Shallow Water Bodies**

Louisiana estuaries are very important nursery grounds for commercial and sport fish as well as shrimp, oysters, and crabs. The energy input for the estuaries comes from the marshes; although, aquatic photoplankton and benthic plants provide limited supplies. Vascular plants are extremely limited in the estuarine waters of the study area. The highest concentrations of organisms are found within the mud and include nematodes, copepods, and amphipods; however, a few sessile organisms exist on the soft, muddy bottoms.

5.2.3. **Natural Ridge**

The natural alluvial ridge, which varies in elevation from 2 to 5 feet NGVD, is located between the coastal estuarine areas and the Mississippi River. The lands, historically, were vegetated with forested wetland species including water oak, live oak, hackberry,

American elm, swamp red maple, and sweet gum with an understory of elderberry, poison ivy, trumpet creeper, and Virginia creeper. In recent years, much of the natural ridge has been cleared for urbanization and agriculture.

5.2.4. Mississippi River

In the project area, the Mississippi River provides water for both domestic and agricultural uses. The river is quite turbid, polluted, and has been channelized. Vascular plants are extremely limited; however, green flagellates and centric diatoms are common. The river benthos is influenced to a great extent by substrate type, bottom stability, river velocity, salinity, and the vegetation present. Waters near the riverbanks have a lower velocity, and the bottom substrate is finer than the middle.

5.2.5. Invertebrates

Numerous invertebrate species occur throughout the estuarine area and range from small zooplankton to commercial shellfish. Populations of these organisms are higher near shore and decrease into the marsh. Benthic organisms in the marsh are nematodes, copepods, amphipods, foraminiferans, ostracods, barnacles, midge larvae, polychaetes, oligochaetes, and ciliate protozoans. Zooplankton such as cladocerans, decapod larvae, arrow-worms, urochordates, cumaceans, isopods, barnacle nauplii, comb jellies, and protozoans are present. The copepod, Acartia tonsa, is especially common. Free-swimming invertebrates include brown and white shrimp, blue crab, mantis shrimp, squid, and netclingers. The mudflats have a characteristic group of organisms including fiddler and other crabs, and certain clams. Insects common to the marshes include: dragonflies, mosquitos, bees, and fire ants. The most important shellfish in this area are oysters, shrimp, and blue crabs. Although invertebrates present in the Mississippi River

are minimal, tubificids, chironomids, and spionids are common in the shallow areas, while Corbicula, the Asiatic clam, predominates in the center. In the water column, rotifers and cladoceran nauplii are frequently noted microinvertebrates. Common terrestrial insects include grasshoppers, wasps, flies, fire ants, butterfiles, and moths. Although deerflies and bitting midges often occur in the area, mosquitos are the most notable insects. Mosquitos can transmit diseases as malaria, yellow fever, and encephalitis. Based on habitat requirements, they can be grouped into flood-water (Psorophora columbia, Ades vexans) and permanent-water (Culex salmarius, Anopheles quadrimaculatus) species.

5.2.6. **Oysters and Shrimp**

5.2.6.1. The oyster, (Crassocstrea virginica), fishery in Louisiana is estimated to be worth about 10 million dollars per year, and the Barataria Bay complex is the second largest oyster production area in the state. In the delta area, young oysters are reared on seed grounds with moderate salinity water of 5 to 15 parts per thousand (o/oo). After 1 to 1 1/2 years, the seed oysters, which are 1 1/2 to 2 inches long, are moved to fattening beds in estuarine areas of 10 to 25 o/oo where they remain for 6 months before harvesting.

5.2.6.2. Shrimp are some of the most important commercial species in Louisiana, and they rank first in dollar value and second in poundage. Six species of shrimp are caught in Louisiana; however, only two, the white (Penaeus setiferus) and brown (P. aztecus), are abundant. The life cycles of these shrimp are essentially the same. After the adults spawn in the gulf, the fertile eggs hatch into free-swimming larvae which pass through a series of molts until they reach the post-larval stage. In this stage, the juvenile shrimp migrate into estuarine areas and adopt a more benthic existence where they feed on detritus, algae, and microfauna. The estuarine phase is critical because fluctuations in temperature and salinity dramatically affect the amount of suitable

marsh available. As the shrimp grow, they gradually move into deeper water and eventually return to the gulf.

5.2.7. Fish

Two major fish habitats, the Mississippi River and estuarine marsh, are found in the project area. Because of the rich marshes and interaction between fresh and salt water, a diversity of fishes exists in the estuarine area. The main channel and shallow edges typify the aquatic habitats in the turbid Mississippi River. Fishes in the main channel include the paddle fish, gar, sturgeon, and buffalo. In the shallow areas, minnows, shad, sunfish, and catfish occur. In the estuaries, the most abundant sport and commercial species are young and adults of the Atlantic croaker, spot, gulf menhaden, spotted seatrout, black drum, red drum, sheepshead, southern flounder, sea and gafftopsail catfish, striped mullet, and silver perch. Small estuarine fish important in the food web are: the bay anchovy, killifish, blennies, gobies, and silversides.

5.2.8. Wildlife

5.2.8.1. Because of the extensive primary productivity of the marsh, the area is quite diverse and provides for a number of species. A few reptiles are found in the study area, and these include the gulf saltmarsh snake, diamondback terrapin, and alligator. Sea turtles may enter the bays. Nongame birds present include grebes, loons, cormorants, and pelicans; egrets, ibis, and herons; marsh and red-shouldered hawks, kestrels, barred owls, and ospreys; sandpipers, willets, black-necked stilts, and killdeer; and gulls, terns, and skimmers. Mammals found here are the skunk, opossum, and armadillo as well as rats, mice, and shrews.

5.2.8.2. Most of harvestable wildlife are birds and mammals. Because of the large populations of nutria, muskrat, mink, otter, and raccoon, Louisiana leads all states in fur production. Deer and rabbits are

hunted in the marsh and natural levee areas. Large populations of migratory waterfowl utilize the study area bays and marshes during the winter. These species include snow geese, blue-winged teal, mallards, pintails, green-winged teal, gadwall, widgeon, and lesser scaup. The mottled duck is a resident species of waterfowl. In addition, coots, gallinules, rails, mourning doves, and snipe are important game bird species.

5.2.9. Endangered and Blue List Species

5.2.9.1. Various endangered or threatened species are, or could be, residents or transients in the study area. The leatherback sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, Arctic peregrine falcon, bald eagle, Eskimo curlew, eastern brown pelican, and sperm, humpback, sei, fin and right whales are classified as endangered by the US Fish and Wildlife Service. The loggerhead sea turtle and green sea turtle are classified as threatened. The American alligator is also classified as threatened; however, in the study area, this classification has been reduced to threatened "due to similarity of appearance." Additional information on the above species is in the Biological Assessment of Threatened and Endangered Species in Appendix F.

5.2.9.2. The "Blue List," published by the National Audubon Society cites bird species that are showing indications of noncyclical population decline or range contraction, either locally or throughout their range. This list, compiled by interested observers throughout the country, serves as an early warning system to indicate those species that might be in danger of extinction in the future. The 1982 Blue List includes 30 species of which 16 might be in the study area, and these are listed in Table 5.2.1.

TABLE 5.2.1. The 1982 Blue Listed species which could be found in the New Orleans To Venice project area.

1. Western Grebe	9. Snowy Plover
2. Least Bittern	10. Long-billed Curlew
3. American Bittern	11. Least Tern
4. Sharp-shinned Hawk	12. Ruby-throated Hummingbird
5. Red-shouldered Hawk	13. Hairy Woodpecker
6. Marsh Hawk	14. Eastern Bluebird
7. King Rail	15. Loggerhead Strike
8. Piping Plover	16. Eastern Meadowlark

5.2.10. **Recreational Resources**

Existing recreational activities in the project area are outdoor oriented and include hunting, fishing, crabbing, boating, skiing, birdwatching, picnicking, and camping. Refuges in the area include Delta-Breton National Wildlife Refuge (48,834 acres), Biloxi Wildlife Management Area (39,583 acres), Bohemia Wildlife Management Area (33,000 acres), and Pass-a-Loutre Waterfowl Management Area (66,000 acres). These areas provide consumptive and nonconsumptive recreational opportunities. Along the project reach, 11 access points exist for recreational boat use. Of these access points, seven contain marinas (five commercial and two public). One public boat harbor exists in the linear project impact zone; adjacent marshes and estuarine water bodies west of the construction area would continue to attract sportsmen and outdoor recreationists. The Mississippi River and its major passes provide limited recreatonal opportunities due to its inaccessibility, size, and current.

5.2.11. **National Register of Historic Places**

The National Register of Historic Places, as published in the "Federal Register" dated March 18, 1980 and monthly supplements through January 1984, were consulted. Only one National Register site, Fort Jackson, is near the project area. Two surveys were conducted, one in 1978 for Reach A and one in 1972 for Reach B. Both surveys addressed the location of eligible National Register properties; none were found.

5.2.12. **Water Quality**

5.2.12.1 Surface waters which could be impacted include the Mississippi River below river mile 45 above Head of Passes (AHP), Bay Lanaux, Bay de la Cheniere, Bay Pomme d'Or, Adams Bay, Hospital Bay, and numerous smaller shallow lakes and streams in the tidal marsh west of the Mississippi River. The Louisiana Department of Natural Resources (LDNR) has classified the reach of the Mississippi River within the

project area as suitable for secondary contact recreation, propagation of fish and wildlife, and a source of raw water for domestic and industrial use. The LDNR has designated uses of the estuarine waters of the project to include secondary contact recreation and propagation of fish and wildlife (particularly shellfish). Louisiana State Water Quality standards applicable to surface waters in the project area are presented in Table 5.2.2. Generally, the standards for fresh waters address maximum accepted concentrations of chlorides (Cl), sulfates (SO_4), and total dissolved solids (TDS), minimum dissolved oxygen (DO), maximum temperature and bacteria density, and optimal pH range. Chloride, sulfate, and total dissolved solids standards are not applicable to estuarine (tidally influenced) water.

5.2.12.2. Cities in the project area which draw water from the river for domestic use include Port Sulphur, Pointe a la Hache, and Boothville-Venice. Individual households in some small communities collect and store rainwater in cisterns. At river discharges of less than 175,000 cfs at Tarbert Landing, the water treatment plants are affected by salt water which intrudes upstream from the Gulf of Mexico. Treated and partially treated sanitary wastewaters from the larger communities and industries are discharged into the river. Smaller communities in the project area discharge partially treated wastewaters to adjacent marshes. The quality of the river water is generally acceptable for its designated uses. However, high concentrations of fecal coliform bacteria, toxic metals, and man-made organics compounds often result from sanitary, storm, and process wastewater discharges. The quality of the estuarine waters is generally good. The principal water quality concern in these areas is with the potential contamination of oyster beds by fecal coliform bacteria. Occasionally, high bacteria densities in the oyster harvesting areas result from discharges of storm drainage and sanitary wastewaters.

TABLE 5.2.2. LDNR designated uses and water quality standards for the project area.

AGENCY ID	SEGMENT DESCRIPTION	WATER USES[a]	Cl	SO4	DO	pH RANGE	BAC	TEMP	TDS
		A B C D	mg/l	mg/l	mg/l	su	STD[b]	°C	mg/l
070060	Mississippi River: From Huey P. Long Bridge to Head of Passes	X X X	75	120	5.0	6.5 TO 9.0	3[c]	32	400
070080	Bastian Bay, Adams Bay, Scofield Bay, Coquette Bay, Tambour Bay and Bay Jacques (Tidal)	X X	N/A	N/A	5.0	6.5 TO 9.0	4[d]	35	N/A

[a] LDNR Water Uses

A: primary contact recreation
B: secondary contact recreation
C: propagation fish and wildlife
D: domestic raw water supply

[b] Bacteria Standards

[c] Public Water Supply. The monthly arithmetic average of total coliform most probable number (MPN) shall not exceed 10,000/100 ml, nor shall the monthly arithmetic average of fecal coliforms exceed 2,000/100 ml.

[d] Shellfish Propagation. The monthly total coliform median MPN shall not exceed 70/100 ml and not not more than 10 percent of the samples ordinarily exceed an MPN of 230/100 ml.

5.2.13. **Navigation**

While the actual transfer of cargo is centered largely farther upriver, the port facilities adjacent to the proposed levee system are designated as a part of the Port of New Orleans, the nation's leading waterborne commerce market. In 1980, the commodity movements at the port included 38 million tons of corn, 23 millions tons crude petroleum, 16 million tons of residual fuel oil, 16 million tons of soybeans, 13 million tons of coal and lignite, and 12 million tons of wheat (Corps of Engineers, 1982). Table 5.2.3 indicates tonnage movement trends in recent years.

5.2.14. **Flood Control**

Historically, land development along the Lower Mississippi River has involved the construction of levees with drainage through a system of pumps. Local officials recognize these procedures as a trade-off, balancing the needs for hurricane protection and land development against reducing the adjacent wetlands which are also considered valuable resources. Whereas wetlands in Plaquemines Parish are experiencing a decline, they make up a majority of the land resources in the parish relative to the narrow strip of land located along the banks of the river. The project area is now subject to relatively frequent and sometimes devasting hurricane induced tidal overflows. Flooding from storm tides has occurred on one or both sides of the Mississippi River on an average of once every six years since the mid-1800's.

5.2.15. **Land Use**

Table 5.2.4 indicates 1978 land use on the west bank of the New Orleans to Venice project area as determined by the latest economic benefit analysis.

TABLE 5.2.3. Total traffic at the Port of New Orleans, Louisiana.

YEAR	CORPORATE LIMITS OF NEW ORLEANS	POINTS ABOVE CORPORATE LIMITS	POINTS BELOW CORPORATE LIMITS	PORT OF NEW ORLEANS	DEEP DRAFT THROUGH TRAFFIC	PASSENGERS
1970	47,015,468	26,848,183	49,810,557	123,674,208	32,819,754	461,137
1971	44,665,265	24,596,611	50,805,063	120,066,944	34,443,504	658,221
1972	49,682,061	31,373,424	44,663,893	125,719,378	38,208,312	663,325
1973	57,526,375	36,276,707	42,301,233	136,104,315	42,751,760	487,346
1974	60,589,800	43,609,602	39,990,007	144,189,409	48,266,837	532,282
1975	56,845,548	44,750,731	38,812,989	140,409,268	61,940,455	460,031
1976	59,288,160	59,630,996	37,630,996	155,990,247	85,503,809	517,488
1977	69,145,644	59,872,866	33,973,475	162,991,985	110,506,269	584,339
1978	58,595,360	68,930,751	33,085,628	160,611,739	126,032,260	548,598
1979	62,520,874	69,297,585	35,316,767	167,135,226	134,083,106	506,876
1980	62,920,663	75,882,453	38,512,684	177,315,800	134,568,412	503,591

TABLE 5.2.4. The 1978 Land-use distribution (in acres) for the New Orleans to Venice, Louisiana, (West Bank).

CATEGORY	CITY PRICE TO TROPICAL BEND	TROPICAL BEND TO VENICE	TOTAL
Residential	210	250	460
Commercial & Industrial	120	180	300
Public and Semipublic	100	120	220
Agricultural[a/]	420	530	950
Other Cleared[b/]	2,805	4,335	7,140
Wooded	645	685	1,330
TOTAL ACRES	4,300	6,100	10,400

a/ Includes citrus groves and improved pasture.

b/ Marshland, unimproved pasture, water, and lands devoted to transportation, communication, and utilities.

5.2.16. **Property Values**

The limited availability of protected land creates pressures on existing property values. The threat of floods from hurricane tidal surges adds an uncertain dimension to property value trends by impairing orderly developments.

5.2.17. **Minerals and Energy**

The combined onshore and offshore crude petroleum reserves in Plaquemines Parish are among the richest sources of domestic production discovered to date. By 1975, annual mineral production in the parish was valued at $1.7 billion, or 20 percent of the value of all minerals produced in Louisiana, and about 2.7 percent of the U. S. total. While crude petroleum production is not expected to continue at present levels for the 100-year life of the project, mineral production including petroleum, natural gas, sulphur, natural gas liquids, and salt production is expected to remain a significant factor in the parish's economic future for many years. Since 1975, the rising price of mineral production, and crude petroleum in particular, has become of growing importance. For example, the unadjusted price of crude petroleum increased from $7.67/bbl. in 1975 to $21.19/bbl. in 1980. In 1981, crude petroleum production in Coastal Louisiana was 13 percent of the U. S. total. While the recent economic recession and temporary decline in the demand for crude petroleum has rsulted in more stable oil prices during 1982 and 1983, few analysts predict domestic production to return to the previous levels. It is anticipated that as demand increases in the future for this increasingly scarce resource, costs for production and prices received will increase proportionately.

5.2.18. **Business and Industrial Activity**

Mineral production, commercial fishing, and related marine activities make up the area's primary economic base. Support sales and service businesses have also been attracted to these operations. Table

5.2.5. compares several 1977 census data for commerce and industry in Plaquemines Parish with that of the state. Although Plaquemines Parish is largely rural, the latest (1978) agricultural census reported harvested cropland in the parish at only 2,300 acres, reflecting the larger amount of wetland in the area. The market value of all agricultural products sold (primarily catttle, calves, fruits, and vegetables) was $1.2 million, less than 0.1 percent of the state total. In 1978, the value (to the fishermen) of commercial landings of fish and shell-fish in the parish exceeded $15.1 million, plus a significant portion of the 1.5 billion pounds of the menhaden landed in Louisiana valued at $64.5 million.

5.2.19. **Employment**

Economic activity in Plaquemines Parish has been sufficient to maintain a relatively healthy level of employment. In December of 1983, unemployment in the parish was estimated at 7.3 percent, significantly less than the 10.1 percent figure for the state. However, the adjacent New Orleans metropolitan area has suffered from high levels of unemployment for a number of years. In the New Orleans Metropolitan Statistical Area (MSA), unemployment in December of 1983 was estimated at 9.0 percent.

5.2.20. **Public Facilities and Services**

Public facilities include Louisiana State Highway 23, local roads, schools, and churches. Public services include police, fire protection, and medical facilities.

5.2.21. **Tax Revenues**

Economic activity in Plaquemines Parish generally has been sufficient to generate adequate tax revenue. In recent years, more than

TABLE 5.2.5. Comparative business and manufacturing data for Louisiana and Plaquemines Parish in 1977, population in 1980.

DATA	LOUISIANA	PLAQUEMINES PARISH	PERCENT (%)
Population (1980)[a/]	4,206,312	26,049	0.6
Retail Trade (1977)[b/]			
No. of Establisments	32,049	207	0.7
Sales ($1,000's)	12,417,144	56,088	0.4
Wholesale Trade (1977)[c/]			
No. of Establishments	6,800	65	1.0
Sales ($1,000's)	19,568,473	150,630	0.8
Service Industries (1977)[d/]			
No. of Establishments	27,534	170	0.6
Receipts ($1,000's)	1,941,031	34,795	1.2
Manufactures (1977)[e/]			
No. of Establishments	4,276	43	1.0
Employees (1,000's)	194.8	2.5	1.3
Values Added by Manufacture ($ millions)	9,418.3	240.9	2.6

Sources:

a/ US Dept of Commerce, Bureau of the Census 1980 Census of Population, "Number of Inhabitants Louisiana."

b/ US Dept of Commerce, Bureau of the Census, 1977 Census of Retail Trade, "Louisiana."

c/ Us Dept of Commerce, Bureau of the Census, 1977 Census of Wholesale Trade, "Louisiana."

d/ Us Dept of Commerce, Bureau of the Census, 1977 Census of Services Industires, " Louisiana."

e/ Us Dept of Commerce, Bureau of the Census, 1977 Census of Manufacturers, "Louisiana."

one-third of the state's total revenue has come from oil and gas severence taxes with Plaquemines Parish ranking first among all Louisiana parshes in the collection of these taxes.

5.2.22. **Community and Regional Growth**

Plaquemines Parish has experienced minimal population increases (1960-1980), although mineral production in the area has been very active. The limited availability of land and threat of hurricane-related floods have discouraged growth in the immediate area, while offshore oil activity has provided strong economic growth in the region.

5.2.23. **Noise**

Noise in the vicinity of the project is generated by vehicular traffic, agricultural developments, and the industrial plants along river. No objectionable levels have been reported in conjunction with recent studies.

5.2.24. **Population**

As of the 1980 census, the resident population of the A and B Reaches totaled approximately 12,400, about the same as the 1970 figure. Although the area appears to be primarily rural in nature due to the strip-type development, population densities are such that a large portion could be characterized as urban. Growth has been retarded by the devastating hurricanes and associated flooding in 1965 and 1969. Historical and projected population trends are presented in Table 5.2.6.

TABLE 5.2.6. Population projections for New Orleans, LA; Plaquemines Parish, LA; and Project Area.

LOCATION	YEAR								
	1950	1960	1970	1980	1990	1993	2000	2030	2043
New Orleans (1,000's)[a/]	712	907	1,046	1,187	1,328	-	1,444	1,718	-
Plaquemines Parish[b/]	14,239	22,545	25,225	26,049	-	27,083	28,438	33,028	35,240
Ward 3	-	-	6,414	7,220	-	-	-	-	-
Ward 4	-	-	7,084	5,656	-	-	-	-	-
Project Area[b/]									
City Price to Tropical Bend (Reach A)	-	-	4,900	4,400	-	4,600	4,800	5,600	6,000
Tropical Bend to Venice (Reach B-1, B-2)	-	-	7,800	8,000	-	8,500	9,200	11,300	12,100
Project Area Total	-	-	12,700	12,400	-	13,100	14,000	16,900	18,100

[a/] Standard Metropolitan Statistical Area; from the US Department of Commerce., Bureau of the Census and OBERS BEA projections.

[b/] Projections based on 1980 census data and NOD estimates.

5.2.25. Esthetic Values

The primary esthetic values of lower Plaquemines Parish are generally considered the rustic landscape and unique natural environment.

5.2.26. Community Cohesion

As indicatd by several residents and the sponsorships of the project by the local governing body (Plaquemines Parish Commission Council), the local community supports both improved flood protection and environmental preservation. Past efforts to limit the flooding effects of the storms which frequently pass through the area have required close cooperation within the community.

6. ENVIRONMENTAL EFFECTS

6.1. GENERAL

This section briefly describes the effects of each detailed plan on the previously described significant resources and is designed to supplement the "Comparative Impacts of Alternatives" analysis in Table 4.3.3. The acreages, by habitat, impacted are presented in Table 4.4.1.

6.2. EFFECTS ON SIGNIFICANT RESOURCES

6.2.1 Marshes

6.2.1.1. Future-Without-Project

The study area marshes are disappearing at a rate of 1.21 percent per year. The estimated 9,170 acres of marsh in the project area would be expected to erode to about 2,009 acres by 2094, a 78 percent reduction. Marsh loss due to development outside the protected area would occur.

6.2.1.2. SCHC

Permanent marsh impacts associated with this plan would be adverse, and attributable to the destruction of 1,761 acres of brackish to saline marsh for borrow pits and levee sites. About 7,409 acres would be used as a ponding area and would be temporarily impacted by the burial of the existing marsh. A new ground level elevation would be established that would initially be higher than that tolerated by marsh plant species. Because of subsidence, compaction, and erosion, the ponding areas should eventually return to marsh in 10 to 20 years. In both cases, the results would be the loss of valuable habitat which provides food, cover, and reproductive habitat for various fish and

wildlife species. These species, in turn, provide commercial, recreational, and scientific benefits to man. The channel connecting the borrow pits would further increase salinities in the surrounding marshes, and this increase would probably convert more brackish marsh into saline marsh. About 300 acres of fresh/intermediate marsh would be created for project mitigation. The creation of a more favorable developmental environment could ultimately result in a need for additional lands. Although the levees would tend to restrict growth to the protected area, additional development beyond could occur. This development would be controlled by state and Federal permitting processes.

6.2.1.3. I-Wall

This alternative is the least environmentally damaging option. About 20 acres of marsh would be lost due to construction of access ramps over the levee. Development of the marshes would be similar to the SCHC plan.

6.2.2. **Shallow Water Bodies**

6.2.2.1. Future Without-Project

The study area estuarine open waters are increasing at a rate of 1.21 percent per year. The 4,244 acres within the project area are projected to increase to 11,390 acres by 2094; a 168 percent increase.

6.2.2.2. SCHC

About 4,224 acres of estuarine open-water bodies would be lost. Estuarine areas within the borrow sites would be permanently lost because the borrow areas would be dredged to a depth that would make them relatively unproductive, and those estuarine bodies in the ponding

areas would be filled. Mitigation by the delta splay method would result in the loss of approximately 300 acres of shallow water.

6.2.2.3. I-Wall

This plan would not impact open-water estuarine sites.

6.2.3. **Natural Ridge**

6.2.3.1. Future Without-Project

The natural ridge would continue to be used for urban and agricultural purposes.

6.2.3.2. SCHC

The SCHC plan would have no impact on the natural ridge, except for small openings in the Main Pass bank to create a delta splay.

6.2.3.3. I-Wall

With the I-Wall plan, about 20 acres of disturbed agricultural land would be impacted for borrow.

6.2.4. **Mississippi River**

6.2.4.1. Future Without-Project

The Mississippi River would be expected to remain essentially the same.

6.2.4.2. SCHC

Approximately 10.2 million cubic yards of material would be hydraulically-dredged from the river to construct the levee sand core. Although a temporary increase in turbidity might be observed, the effect of this dredging would be minimal because of the present high background turbidity levels in the Mississippi River. The borrow area would be rapidly filled.

6.2.4.3. I-Wall

This plan would not impact the Mississippi River.

6.2.5. **Invertebrates**

6.2.5.1. Future Without-Project

The invertebrate populations in the Mississippi River and natural ridge would not significantly change. The semi-terrestrial and terrestrial species outside the above areas would decline as the marsh erodes and subsides. This loss would be expected to equal the marsh loss rate of 1.21 percent per year, and 70 to 80 percent of the present population would be expected to disappear by 2094. Although aquatic invertebrates populations would expand, the numbers would eventually be impeded as the detritus food base from the marshes declines. Terrestrial insect populations would decrease concurrently with marsh loss.

6.2.5.2. SCHC

Dredging and disposal operations associated with this plan would impact about 13,394 acres of wetland, and result in the permanent destruction of 2,899 acres of this area and temporarily impact 10,495 acres. The destruction of marsh through dredging and disposal of materials would also mean the loss of productive nursery habitat for

many invertebrates. The permanent destruction of 1,761 acres of brackish to saline marsh, and temporary loss of 7,409 acres of marsh, would be significant in light of the current high rate of marsh loss in coastal Louisiana. Direct burial of benthic organisms within the ponding areas, and destruction of organisms as they pass through the hydraulic dredge, would be the major adverse impact of the dredging operations. Epibenthic organisms, such as crabs, would be able to escape burial while most sessile or slow-moving organisms, such as oysters, would be lost. Turbidities would be increased in the vicinity of dredging and disposal operations with the major impact being a reduction in primary productivity. The impacts of dredging in the Mississippi River would be minimal due to the high ambient turbidity and bottom disturbance in the river. Although this work is not expected to increase the mosquito population significantly, the species composition might change. After construction, the ponding area levees would be opened and normal tidal exchange would resume.

6.2.5.3. I-Wall

This plan would have a negligible impact on invertebrates.

6.2.6. **Shrimp and Oysters**

6.2.6.1 Future Without-Project

6.2.6.1.1. Shrimp would be harvested from the estuarine area; however, the catch would slowly decline as the marshes erode and subside. Turner (1977) observed a close relationship between the area of coastal marsh and inshore shrimp harvest. This relationship was found to be closer than that between inland open water and inshore harvest. A reduction of about 70 to 80 percent could be expected in the project area by 2004.

6.2.6.1.2. Oysters would continue to be harvested from the study area; however, the catch would gradually decline. This would be due to a reduction in marsh productivity and salinity increases. As the marsh

subsides, saltwater intrusion could eventually increase the salinity above the 15 parts per thousand level, at which point oyster drills (Thais haemastoma) invade the beds.

6.2.6.2. SCHC

6.2.6.2.1. The wetland lost could result in a decrease of the detritus on which shrimp feed as well as a decline in the quality and quantity of shrimp habitat. Because most of the impacts are temporary, this decline would not be significant.

6.2.6.2.2. Although a number of oyster leases are located in the project vicinity, the project would only directly impact about 5 acres. One 300-acre bed is located about 2,000 feet from a borrow area. Because oysters are bottom-dwelling filter feeders, toxicants and sediment are also of concern.

6.2.6.2.3. Unless soon uncovered by currents, adult oysters covered by dredged materials are killed. Most of the mud discharges during a dredging operation moves along the bottom as fluid mud in a definite, dense layer with a low dissolved oxygen content. Fortunately, these flows quickly settle, and many oyster reefs are raised sufficiently off the bottom not to be affected (McKinney, 1976). In this project, diked ponding areas would be used to contain the dredge slurry and allow the sediment particles to settle. The ponding area supernatant, which has a minor quantity of silt, would be released into the marsh. The siltation thus caused by the dredging would be minimal. Oyster larvae are much more sensitive to dredging than adults because a layer of silt 1 to 2 mm thick can prevent attachment to hard surfaces (Galtsoff, 1964). The area affected with at least 1 mm of silt around the project is unknown. Setting and survival of spat were not affected by turbid waters from an operating dredge as close as 50 yards (Wilson, 1950 in Hopkins and McKinney, 1976). Muddy discharge (turbidity) apparently does not kill oysters, even if they are exposed to high concentrations for several weeks (McKinney, 1976). May (1973) found the typical

shallow gulf bay turbidity to exceed 100 ppm, and Mackin (1962, in McKinney, 1976) showed oysters could tolerate at least 700 ppm. May also observed that the mud plume associated with dredging operations usually contained less than 100 ppm of sediment beyond 100 feet. Turbidity is not expected to present a problem to the oyster population.

6.2.6.2.4. Oysters can absorb and bioaccumulate high concentrations of toxic materials from the environment. Aquatic sediments are depositories for environmental contaminants such as heavy metals, pesticides, biphenyls, and petroleum hydrocarbons; during dredging operations, many of these toxic materials would be freed and mobilized where they could become available to benthic organisms. The effects of dredging and release of these toxins are unknown and dependent on numerous factors such as temperature, DO, pH, water turnover, etc. The background levels of coilform bacteria and maganese are especially high in the project area. However, there was no indication that toxic levels of pollutants were released during previous construction. The use of a diked ponding area would reduce the release of these materials. Thus, this project should not cause accumulation of toxins in oysters.

6.2.6.2.5. The use of channels to connect borrow pits might further increase the salinity of the marsh in the project area and allow the oyster drill to expand its range. During the warm summer, the minimum survival salinity for the drill is about 12 to 17 parts per thousand, whereas the oyster can exist in water as fresh as 5 o/oo. Oysters can also tolerate lower salinities for a longer period of time than drills.

6.2.6.2.6. Although the borrow pits and ponding areas were selected to minimize oyster bed impacts, the project is expected to directly affect 5 acres of oyster leases and about 25 acres of lease requested sites. The indirect impacts would be negligible in most instances. Because oyster leases in much of Barataria Basin are seeded with small oysters, the possibility of silt preventing the attachment of larvae would not be a problem in these sites.

6.2.6.3. I-Wall

This option would have no impact on shrimp or oysters.

6.2.7. **Fish**

6.2.7.1. Future Without-Project

Although the estuarine open-water habitat would increase by 168 percent in 2094, the detritus - dependent fishery would be expected to decline as the marshes erodes.

6.2.7.2. SCHC

Most estuarine fish species are sufficiently mobile to avoid direct adverse impacts. Some young or slow-moving fish would be destroyed as ponding areas are filled. The ponding areas would no longer be available as nursery areas nor would they provide detritus to the estuary. This would cause a slight reduction in fisheries in the project area. As subsidence occurred over a 10- to 20-year period, this area would again function to support fisheries. The open-water or marsh areas that become borrow pits would be of less value to fisheries after the project. The pits would become anoxic at the bottom and, thus, support no benthos. Fishery habitat would be confined to the upper portions of the pits. The temporary turbidity caused by dredging sand from the river would have only a minimal impact on Mississippi River fisheries because it would not significantly raise turbidity above background levels. Turbidity caused by construction and use of ponding areas would be temporary and localized, but could clog the gills of some fish and affect the behavior of others. The project is not expected to significantly increase, or decrease, the fisheries of this area.

6.2.7.3. I-Wall

There would be no impact of the plan on fisheries.

6.2.8. **Wildlife**

6.2.8.1. Future Without-Project

The wildlife populations found in the "ridge" area would gradually decline as urban and agricultural interests modify the land. Those populations found in the marshes would decline as the marsh habitat subsides and erodes. There would be approximately 78 percent marsh loss by 2094, and the reduction in marsh dependent wildlife species would follow this trend.

6.2.8.2. SCHC

The wildlife impacts associated with this plan would be adverse and attributable to the significant loss of marsh and open-water estuarine areas. These losses would be comprised of direct loss through burial of slow-moving wildlife and their habitat during disposal as well as indirect losses resulting from the displacement of resident wildlife species to adjacent habitat. The majority of these displaced species would be lost due to competition for their life requisities with residents of the adjacent habitats, while these adjacent habitats would be degraded due to overcrowding. The ponding area, although temporarily converted to uplands, would retain some value to resident wildlife and would eventually revert to wetlands. The grassy levees would be grazed by some herbivorous species.

6.2.8.3. I-Wall

This plan would have minor wildlife impacts. Movement by terrestrial animals from the marsh to the ridge would be restricted and mortality of small or slow-moving animals could occur during high water in the parish.

6.2.9. **Endangered and Blue List Species**

6.2.9.1. Future Without-Project

Because of the current loss of marsh, habitat available to potentially support endangered, threatened, or Blue List species would decline as would these populations in the area. Possible exceptions to this would be the sea turtles. They would benefit by the increased shallow water habitats available; however, prey availability could be expected to decline as the marshes disappear.

6.2.9.2. SCHC

This plan would not jeopardize the existence of any endangered, threatened, and "Blue List" species or adversely affect critical habitat. A loss of marsh, and the resultant reduction in productivity, could reduce food resources for some species. A biological assessment for threatened and endangered species, as well as associated correspondence, is contained in Appendix F.

6.2.9.3. I-Wall

Same as 6.2.9.2.

6.2.10. **Recreational Resources**

6.2.10.1. Future Without-Project

The future-without-project conditions would have a minor effect on current recreational activities in the area. The absence of construction, noise, and localized turbidity in the proposed project area would not result in the temporary relocation of recreationalists. Hunting in the vicinity of the proposed levee which would have been lost due to implementation of the project would be retained.

6.2.10.2. SCHC

This plan would increase localized turbidity in the vicinity of borrow areas. Pedestrian access would be limited during construction. Hunting on the levees would be adversely affected during and shortly after construction.

6.2.10.3. I-Wall

This plan would not require hydraulic borrow material; therefore, no problem associated with turbidity would occur. The plan provides for levee sections to be incorporated into the alinement approximately every mile to allow passage across the protective system. Access in this area is presently limited due to the existence of a locally constructed drainage canal.

6.2.11. **National Register Of Historic Places**

6.2.11.1. Future Without-Project

Fort Jackson would remain listed. It appears no other properties in the area would become eligible.

6.2.11.2. SCHC

One National Register property, Fort Jackson, is within the west bank section of the hurricane protection system, and is 1.2 statue miles from the nearest construction activities. The surveys referenced in Section 5.2.11 did not locate any additional eligible National Register sites. Thus, at this time, and given the level of survey required, no effects on National Register properties or eligible properties are expected.

6.2.11.3. I-Wall

This plan would impact no National Register properties.

6.2.12. **Water Quality**

6.2.12.1. Future Without-Project

Generally, as population growth and industrialization continue, waste and storm-water discharges to the river and adjacent marshes would be expected to increase. The sanitary quality of the river and estuarine areas is expected to improve as wastewater treatment facilities are upgraded and new treatment systems come on-line. However, pumpage of bacteria laden urban storm water to the marshes would continue. Growth of the Port of New Orleans, with attendant increases in vessel traffic, would increase opportunities for hazardous material spills. Atmospheric fallout, washout, and direct discharge from oil refiners and chemicals producers would ensure a generally low level, but essentially constant, input of potentially toxic substances to local waterbodies.

6.2.12.2. SCHC

Dredging would increase suspended solids levels in the Mississippi River and marsh areas. There would be a concomitant increase in turbidity, heavy metals, and nutrients; a decrease in DO and primary productivity; and a deterioration of water column esthetics in adjacent areas. Generally, water quality impacts on the river would not be significant. Increased heavy metals concentrations could cause short-term adverse effects to some aquatic species in the marsh areas. Borrow areas in the marsh could be up to 70 feet deep. The lower water levels would be devoid of oxygen, and anoxic, anaerobic condition would exist most of the time. Project-induced residential, industrial, and commercial development could slightly degrade water quality of the project area.

6.2.12.3. I-Wall

Impacts on the river-water quality would not be significant; however, localized, short-term release of contaminants due to elutriation of the earthen levee plugs by rainfall could possibly impact the marsh areas.

6.2.13. **Navigation**

6.2.13.1. Future Without-Project

Without the additional flood protection offered by the project, the potential for continued development of navigational activities along the lower reaches of the Port of New Orleans would be somewhat less due to the limited availability of protected land needed for the growth of related sales and service industries.

6.2.13.2 SCHC

Additional flood protection would benefit any existing port-related activities within the protected area and would induce new developments.

6.2.13.3. I-Wall

Impacts would be similar to those of the SCHC plan.

6.2.14. **Flood Control**

6.2.14.1. Future Without-Project

The passage through the project area of two major hurricanes in 1965 and 1969 devastated most of the improvements in the project area. Much of the area has been rebuilt, incorporating changes which would reduce potential flood losses. However, the area would remain vulnerable to catastrophic losses.

6.2.14.2. SCHC

The improved levee system is expected to substantially reduce flood damages from storm surges and to enhance the area for further development.

6.2.14.3. I-Wall

Impacts would be essentially similar to those of the SCHC Plan.

6.2.15 **Land Use**

6.2.15.1. Future Without-Project

Without the proposed flood protection, existing land-use patterns would probably continue although limited by the threat of future hurricanes.

6.2.15.2. SCHC

This alternative would generally define the areas of the west bank to be developed in the future and provide 100-year protection. This alternative would also involve the temporary disruption of 10,500 acres of marsh and shallow open water located outside of the levee, which are of value to commercial and recreational fishing interests. Approximately 3,000 acres of such habitat would be permanently altered to become levee or borrow pit.

6.2.15.3. I-Wall

Impacts would be similar to the SCHC Plan without the loss of wetlands.

6.2.16. **Property Value**

6.2.16.1 Future Without-Project

The limited flood protection afforded in lower Plaquemines Parish probably would cause continuing depressed property values. Current building restrictions due to flood threats would be extended.

6.2.16.2 SCHC

As the potential for damage from tidal overflows would be materially diminished, the additional protection offered by this plan would improve the stability of property values and increase the dollar value of land within the project area. While the immediate effect of this plan could have a negative impact on adjacent wetlands by reducing their economic value in the short term, mitigation measures are designed to replace damaged wetland losses.

6.2.16.3. I-Wall

Impacts would be similar to those of the SCHC Plan except that losses to wetlands would not be incurred.

6.2.17. **Minerals & Energy**

6.2.17.1. Future Without-Project

The high demand for the minerals produced in the Plaquemines Parish area would probably result in their continued production, declining over time as these resources are depleted. Production of energy-related resources would continue, interrupted occasionally by periodic storm surges.

6.2.17.2. SCHC

Production would be similar to that for future without-project conditions. Improved flood protection would reduce problems and costs associated with maintaining a convenient and efficient base of operations.

6.2.17.3. I-Wall

Impacts would be similar to those of the SCHC plan.

6.2.18. **Business and Industrial Activity**

6.2.18.1. Future Without-Project

The industrial and business activity in the project area would probably follow the trends of resource production in the region, mainly minerals and commercial fishery resources. As supply and demand of these resources fluctuates, either from natural depletion or from problems caused by high river stages and storm surges, commercial and industrial activities would also be subject to fluctuations.

6.2.18.2. SCHC

The disruption caused by storm surges would be significantly reduced, enhancing further economic development and stability. Operational efficiencies would result for those firms active in the area.

6.2.18.3. I-Wall

Impacts would be similar to the SCHC plan.

6.2.19. **Employment**

6.2.19.1. Future Without-Project

Employment trends in the area would probably follow business and industrial growth trends, continuing as the availability of natural resources continues. Employment in some industries could be seriously impaired, however, by the occurrence of periodic flooding.

6.2.19.2. SCHC

Construction activities associated with the project would generate temporary employment in Plaquemines Parish and the greater New Orleans area. Induced developments and changes in land use resulting from the project would also result in increased employment opportunities over the long term.

6.2.19.3. I-Wall

Impacts would be similar to those of the SCHC plan. Differences in design could result in somewhat greater employment during construction with this plan.

6.2.20. **Public Facilities and Services**

6.2.20.1. Future Without-Project

Current conditions would probably continue, gradually following economic development and area population trends. The cost of maintaining these facilities and services would be excessive if the area's pattern of severe flood damage continues.

6.2.20.2. SCHC

The additional flood protection offered by the project could substantially reduce flood damages to these facilities and aid in maintaining existing services. Public costs would be drastically reduced during storm periods.

6.2.20.3. I-Wall

Impacts would be similar to those of the SCHC Plan.

6.2.21. **Tax Revenues**

6.2.21.1. Future Without-Project

Revenues are expectd to slowly increase as a result of additional developments and greater business activity in the area. This would depend, to a large extent, on the price of oil and future activity levels of the oil industry in this region.

6.2.21.2. SCHC

As greater flood protection is afforded, induced commercial and industrial developments as, well as increased residential construction activity, would spur larger tax revenues and a more stable tax base.

6.2.21.3. I-Wall

Impacts would be similar to those of the SCHC plan.

6.2.22. **Community and Regional Growth**

6.2.22.1. Future Without-Project

The limited amount of land available for development and the continued potential for flood and hurricane damage would continue to restrict growth in the area.

6.2.22.2. SCHC

The proposed plan would encourage growth in local communities; the plan would not, however, encourage significant regional growth. Improved protection of primary manufacturing industries in Plaquemines Parish, as well as the unusually large volume of mineral production in the parish, could have an indirect beneficial impact on the stability of adjacent parishes including the New Orleans metropolitan area.

6.2.22.3. I-Wall

Impacts would be similar to those of the SCHC plan.

6.2.23. **Noise**

6.2.23.1. Future Without-Project

Current trends would probably continue, fluctuating with changes in commercial and industrial activity. Adverse noise impacts would be minor.

6.2.23.2. SCHC

Socioeconomic activity stimulated by improved flood protection would create additional noise; however, no increases to

highly objectionable or dangerous levels are anticipated. Noise levels would be temporarily increased at construction sites.

6.2.23.3. I-Wall

Impacts would be similar to those of the SCHC plan.

6.2.24. **Population**

6.2.24.1 Future Without-Project

The potential for population displacements on the west bank of the Mississippi River in Plaquemines Parish resulting from hurricanes and tidal overflows was dramatized by the effects of Hurricane Camille in 1969. An estimated 17,800 residents of the entire parish were required to seek refuge in advance of the storms. Below Port Sulphur, an estimated 2,450 houses and 1,000 mobile homes were in the overflow area. Some 1,800 houses and 400 mobile homes were totally destroyed. About 11,000 persons were left homeless. While the flooding effects of Hurricane Camille were not typical, they indicate the potential for population displacements in the area.

6.2.24.2. SCHC

The additional flood protection would reduce the potential for damage to businesses, industries, and residences reducing the threat of population displacements to the local communities. The improved protection against flooding within the project area would induce additional economic development and employment, thus stimulating minor population growth in the area.

6.2.24.3. I-Wall

Impacts would be similar to the SCHC Plan.

6.2.25. **Esthetic Values**

6.2.25.1. Future Without-Project

The natural environment, which is the primary esthetic quality of the area, probably would continue to decline as urban-type development expands. Periodic flood damages would also cause negative impacts on the esthetics of the urban area.

6.2.25.2 SCHC

Further economic expansion would result in some degradation of the esthetic values of the natural environment; however, improved flood protection could prevent damage and destruction to man-made developments.

6.2.25.3. I-Wall

Impacts would be similar to the SCHC plan. This plan would limit adverse impacts on the marshes.

6.2.26. **Community Cohesion**

6.2.26.1. Future Without-Project

Local interests probably would continue their support for improved flood protection along the west bank. Community spirit could be adversely discouraged and thereby impacted if present plans for additional flood protection are not implemented.

6.2.26.2. SCHC

No adverse impacts on the structure of local communication are anticipated. Increased growth potential and improved life-styles would intensify community cohesion. The project's planning process

includes coordination with local authorities and opportunities for comment by the community at large.

6.2.26.3. I-Wall

Impacts would be similar to the SCHC plan. Local interests are less inclined to support this alternative due to its additional cost and operating requirements. Under threat of a hurricane, evacuation procedures would require closure of the gates along the wall.

7. LIST OF PREPARERS

The following people were primarily responsible for preparing this Environmental Impact Statement:

NAME	DISCIPLINE/ EXPERTISE	EXPERIENCE	ROLE IN PREPARING EIS
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Mrs. Suzanne R. Hawes	Botany/Fisheries Biology/Marsh Ecology	11 years, EIS studies, New Orleans District	Review
Mr. Everett K. Johnson	Economics	12 years, Chief Economics, New Orleans District; 30 years Federal Government Service	Review
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Mr. Peter C. Womack	Economist/Base Studies	4 years, Economic Studies, Corps of Engineers, New Orleans District	Economic Data and Projections

8. PUBLIC INVOLEMENT

8.1. PUBLIC INVOLVEMENT PROGRAM

A public meeting was held on 13 March 1956 in New Orleans, Louisiana, to discuss the views of local interests concerning hurricane flooding and protection. Coordination was maintained throughout the study with other agencies and interested parties. These include the U. S. Fish and Wildlife Service, the U. S. Environmental Protection Agency, the National Marine Fisheries Service, and the Louisiana Department of Wildlife and Fisheries. Coordination was also maintained through correspondence and informal meetings with local interests.

8.2. REQUIRED COORDINATION

Circulation of this draft EIS will accomplish the required coordination with the appropriate Federal, state, and local agencies, organizations, and individuals.

8.3. STATEMENT RECIPIENTS

The agencies or persons listed below have received copies of the Draft EIS.

Honorable Russell B. Long
Honorable Corinne C. Boggs
Honorable Robert L. Livingston
Honorable Gillis W. Long
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ENVIRONMENTAL

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