RECORD OF DECISION

ATCHAFALAYA BASIN FLOODWAY SYSTEM, LOUISIANA

The Atchafalaya Basin Floodway Project was authorized for implementation by Public Law 99-88 in 1985, thus preempting the original decision document. The purpose of this document is to complete the procedural requirements of the National Environmental Policy Act to prepare a concise public record of the decision made.

The plan approved by the Chief of Engineers and authorized by PL 99-88 includes the following features:

o Continued operation of the Old River control complex and the new auxiliary structure to maintain an average annual latitude flow division at Old River, Louisiana, of 70 percent Mississippi River/30 percent Atchafalaya River;

o Modifications of existing features where required, to pass the project flood;

o Continued construction of bank stabilization measures, as required, along the Atchafalaya River main channel;

o Enlargement of the main channel by construction of training works along the Atchafalaya River to a height sufficient to confine average peak flows;

o Realinement of the four principal distributaries of the Atchafalaya River main channel;

o Construction of a rock weir and connecting levees above the head of Grand Lake to control the present distribution of low to normal floodway outlet flows to approximately 30 percent through the Wax Lake Outlet and 70 percent through the Lower Atchafalaya River with possible future restrictions to 20 percent through the Wax Lake Outlet;

o Enlargement of Wax Lake Outlet overbank by setting back the existing west Wax Lake Outlet Levee an average of about 3 miles and degrading the old levee to natural ground level and construction of a new West Calumet floodgate;

o Enlargement of the outlet channels by construction of training works below Morgan City on both the Wax Lake Outlet and Lower Atchafalaya River and closure of Bayou Shaffer;

o Construction of freshwater distribution structures for the Henderson Lake and Alabama Bayou areas in the lower floodway;

o Acquisition of additional real estate interests, excluding minerals, in the lower Atchafalaya Basin Floodway for:

Flood Control Purposes - Flowage easements on approximately 59,000 acres and developmental control easements on approximately 367,000 acres, excluding developed ridges;

Environmental Protection Purposes - In addition to developmental control rights, environmental protection rights will be included in a comprehensive multipurpose easement on the same 367,000 acres, excluding developed ridges;

Recreation Development Purposes - Fee simple title, excluding minerals, on 1,500 acres; and

Public Access - Participation with the State of Louisiana in the fee title purchase, excluding minerals, of approximately 50,000 acres of lands identified by the State as being available from "willing sellers." Federal cost participation will be limited to $32,000,000.

o Construction of recreational facilities to provide three destination-type campgrounds, seven primitive campgrounds, boat-launching ramps, and other facilities complementary to outdoor recreational activities;

o Construction initially of two "pilot" Management Units, with implementation of future units to be at the discretion of the Chief of Engineers after evaluation of the operational success of the pilot units;

o Construction of miscellaneous canal closures and water circulation improvements in the lower floodway;

Numerous alternatives were considered and are described in the Corps of Engineers Report in order to address the primary study goals of flood control and environmental protection. Separable plan features were considered to be responsive to individual problem areas, and certain features were combined to form an optimum comprehensive multipurpose plan. To this end, the study addressed management measures for the distribution of flows between the Mississippi and Atchafalaya Rivers; the safe conveyance of floodflows through, and reduction of sedimentation in the Lower Atchafalaya Basin Floodway; the safe conveyance of floodflows through the outlets to the Gulf of Mexico; the protection of the area east of the lower floodway from backwater flooding; and, the protection or enhancement of fish, wildlife, and recreation resources in the lower floodway and project-affected areas.

The authorized plan (Plan 9) differs only slightly from the environmentally preferable alternative (Plan 4) in that the former calls for a more publically acceptable public access plan and for engineering modification of the floodway outlets in a manner that would affect natural processes in the growing Atchafalaya delta.

Technical and economic criteria used in the formulation of alternative plans were those specified in the Water Resource Council's Principles and Standards. Applicable laws, executive orders, regulations, and local governmental plans were considered in evaluating alternatives and all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted.

FOR H. J. HATCH
Major General, U. S. Army
Director of Civil Works

3 Dec 86
Date

DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
WASHINGTON, D.C. 20314

REPLY TO
ATTENTION OF:

Proposed Report

DAEN-CWP-G

SUBJECT: Atchafalaya Basin Floodway System, Louisiana

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on the Atchafalaya Basin Floodway System. It is accompanied by the reports of the Mississippi River Commission and the reporting officer. These reports were developed in response to resolutions from the Committee on Public Works of the U. S. Senate dated 11 June 1968 and 23 March 1972 and to a resolution from the Committee on Public Works of the U. S. House of Representatives dated 14 June 1972.

2. The Atchafalaya Basin Floodway System report developed by the reporting officer contains recommendations for both authorized and unauthorized features. The authorized features are recommended in two feature groups: (1) those features that have already been approved by the Chief of Engineers and for which design and construction may continue and (2) those features which require approval by the Chief of Engineers. I concur with the recommendation of the Mississippi River Commission regarding these features as follows:

a. The following features of the Atchafalaya Basin, Louisiana, project are authorized, have been approved, and will continue to be implemented by the New Orleans District Commander.

(1) Continued operation of the Old River control complex and the new auxiliary structure to maintain an average annual latitude flow division at Old River, Louisiana, of 70 percent Mississippi River/30 percent Atchafalaya River;

(2) Modifications of existing features were required, to pass the project flood, including raising to grade the East and West Atchafalaya Basin Protection Levees and the levees west of Berwick; construction of service roads on levee crowns; modifying Bayou Sorrel, Bayou Boeuf, and Berwick locks; modifying the Charenton and East Calumet floodgates; modifying the Wax Lake East and Wax Lake West drainage structures; modifying culverts in the East and West Bayou Sale levees; and modifying the Upper Pointe Coupee, Centerville, Ellerslie, Franklin and Franklin Enlargement,

*This report contains the proposed recommendations of the Chief of Engineers. The recommendations are subject to change to reflect substantive comments received during the review period.

Gordy, Maryland, North Bend, Wax Lake East, Wax Lake West, Bayou Yokely and Bayou Yokely Enlargement, Morgan City, and Tiger Island pumping plants; and such other miscellaneous modifications as deemed appropriate; and

(3) Continued construction of bank stabilization measures, as required, along the Atchafalaya River main channel above river mile 55.0.

b. I am considering approval of implementation of the following features of the Atchafalaya Basin project under existing authorization.

(1) Enlargement of the main channel by construction of training works along the Atchafalaya River to a height sufficient to confine average annual peak flows, from river mile 116.0 to mile 90.0, and maintenance of existing channel banks from river mile 90.0 to mile 53.0 on the east side and mile 55.0 on the west side;

(2) Realinement of the four principal distributaries of the Atchafalaya River main channel; the Old Atchafalaya River, the East Freshwater Distribution Channel, the West Access Channel, and the East Access Channel to provide the optimum channel entrance angles for sediment control;

(3) Construction of a rock weir and connecting levees above the head of Grand Lake to control the present distribution of low to normal floodway outlet flows to approximately 30 percent through the Wax Lake Outlet and 70 percent through the Lower Atchafalaya River. For flows exceeding a 10-year frequency event, the low-level levees above Wax Lake Outlet would be overtopped. Operation of the outlet system will be monitored, and provided that the area's ecosystem responds favorably, then flow into Wax Lake Outlet may be further restricted by modification of the rock weir to limit low to normal flows entering the outlet to approach 20 percent;

(4) Enlargement of Wax Lake Outlet overbank by setting back the existing west Wax Lake Outlet an average of about 3 miles and degrading the old levee to natural ground level and construction of a new West Calumet floodgate;

(5) Enlargement of the outlet channels by construction of training work below Morgan City on both the Wax Lake Outlet and Lower Atchafalya River and closure of Bayou Shaffer. Training works will simulate the formation of natural levees along about 15 miles of existing channel length by placing dredged material to a height sufficient to confine average peak flows, in an irregular series of low mounds about 1 vertical on 40 horizontal, with gaps in between;

(6) Construction of freshwater distribution structures for the Henderson Lake and Alabama Bayou areas in the lower floodway. The Courtableau structure site will be relocated to a site in the vicinity of Bayou Graw near river mile 45.0 on the West Atchafalaya River levee, and the Sherbourne structure will be located in the east river levee at approximate river mile 43.0.

c. I am also considering the construction of further extensions of the East Atchafalaya Basin Protection Levee beyond the Avoca Island Cutoff channel and/or other structural and nonstructural measures, after completion of further studies of the engineering and biological parameters affecting the complex, dynamic and delicate ecosystem of the Atchafalaya Bay-Terrebonne Marsh backwater complex.

3. The reporting officer recommended improvements in the Basin for flood control and environmental preservation that require Congressional authorization. The Mississippi River Commission was unable to reach a majority view on the implementation of these features. After careful consideration of all issues, I conclude that the unauthorized features of the plan recommended by the reporting officer are in the public interest, are justifiable on the basis of combined economic and beneficial environmental effects, are responsive to the Congressional resolutions which requested a "... comprehensive plan for the management and preservation of the water and related land resources of the Atchafalaya River Basin...", and are therefore proper added increments of the Mississippi River and Tributaries Project. Therefore, I recommend that the Atchafalaya Basin Feature of the MR&T project, authorized by the Flood Control Act, approved 15 May 1928, as amended, be further modified and expanded to provide improvements as follows, with such modifications, substitutions, additions, or deletions as in the discretion of the Chief of Engineers may be advisable in the interest of flood control and environmental improvements.

a. Acquisition of additional real estate interest, excluding minerals, in the Lower Atchafalaya Basin Floodway for:

(1) Flood Control Purposes - Flowage easements on approximately 59,000 acres and developmental control easements on approximately 367,000 acres, excluding developed ridges.

(2) Environmental Protection Purposes - In addition to developmental control rights, environmental protection rights will be included in a comprehensive multipurpose easement on the same 367,000 acres, excluding developed ridges.

(3) Recreation Development Purposes - Fee simple title, excluding minerals, on 1,500 acres.

(4) Public Access - Participation with the State of Louisiana in the fee title purchase, excluding minerals, of approximately 50,000 acres of lands identified by the State as being available from "willing sellers". Federal cost participation will be limited to $32,000,000.00. (The State will provide additional public access within the lower floodway on 150,000 acres of existing State-owned lands and more than 30,000 acres of lands donated to the State by the Dow Chemical Company.);

b. Construction of recreation facilities to provide three destination-type campgrounds, seven primitive campgrounds, boat-launching ramps, and other facilities complementary to outdoor recreational activities;

c. Initial construction of two "pilot" Management Units, with implementation of future units to be at the discretion of the Chief of Engineers after evaluation of the operational success of the pilot units; and

d. Construction of miscellaneous canal closures and water circulation improvements in the lower floodway.

4. The authorized features of the plan for which construction may continue are estimated to cost $551,631,000. The features of the plan that are already authorized and which require my approval are estimated to cost $260,839,000. This includes $56,200,000 for the 14,000-foot interim extension of Avoca Island Levee recommended by the Mississippi River Commission, but which requires further study before approval and implementation. Features of the plan which require Congressional authorization are estimated to cost $180,527,000 (all costs in October 1981 prices). The flood control features of the plan are integral, inseparable features of the authorized comprehensive MR&T project. Separable benefit cost analyses are not computed for inseparable features of the project. The benefit-cost ratio for this comprehensive project is 16.5 to 1. Benefits and subsequent benefit/cost ratios were developed for the non-flood control portion of the plan. When all non-flood control features are jointly evaluated, the benefit cost ratio is 1.01 to 1. The recreation portion of the non-flood control features by far provides the majority of the benefits. The environmental features, do, however, provide many intangible benefits such as preservation of forest areas, lakes, swamps, and wetlands that enhance the value of recreational features.

5. The plan described in this report is a balanced approach to the water resource problems encountered in the Atchafalaya Basin area. The plan provides for the safe passage of the project design flood in an environmentally acceptable manner. The report is generally in accordance with all applicable rules and guidelines. Accordingly, I am considering approving those features described in paragraph 2b above, subject to cost sharing arrangements established by the 1928 FCA and subsequent modifying acts which authorized the MR&T Project and the Atchafalaya Floodway features. I recommend project features described in paragraph 3 above for authorization and implementation subject to cost sharing and financing arrangements which are satisfactory to the President and Congress.

J. K. BRATTON
Lieutenant General, USA
Chief of Engineers

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

ATCHAFALAYA BASIN
FLOODWAY SYSTEM, LOUISIANA

SYLLABUS

The purpose of the study was threefold: to review the Atchafalaya Basin Floodway feature of the Mississippi River and Tributaries (MR&T) project to develop an implementable plan for safely passing its share of the project flood; to review the operation of the Old River control structure to determine if changes in operation of that feature were warranted; and to develop a comprehensive plan for the management and protection of the water and related land resources of the Atchafalaya Basin. The US Army Corps of Engineers was assisted in the study by the active participation of the US Environmental Protection Agency, the US Fish and Wildlife Service, and the State of Louisiana.

The Federal flood control project, which drains some 41 percent of the continental United States, is currently incapable of passing the project flood. At the same time, there is the recognition both on a local and a national level that the Atchafalaya Basin is a unique ecosystem deserving of protection. This report serves as a survey report for those study features requiring congressional authorization, generally those relating to environmental preservation, and a Phase I general design memorandum for those features previously authorized by the Congress, generally the flood control features.

Numerous alternatives were considered in order to address the primary study goals of flood control and environmental protection. Separable plan features were considered to be responsive to individual problem areas, and certain features were combined to form an optimum comprehensive multipurpose plan. To this end, the study addressed management measures for the distribution of flows between the Mississippi and Atchafalaya Rivers; the safe conveyance of floodflows through, and reduction of sedimentation in, the Lower Atchafalaya Basin Floodway; the safe conveyance of floodflows through the outlets to the Gulf of Mexico; the protection of the area east of the lower floodway from backwater flooding; and, the protection or enhancement of fish, wildlife, and recreation resources in the lower floodway and project-affected areas.

The Recommended Plan provides for maintaining the existing Old River flow distribution of 70 percent down the Mississippi River and 30 percent down the Atchafalaya River; channel training for main channel and outlets development, sediment control measures and reestablishing, over time, the approved outlet distribution for passing the project flood through the Bayou Teche Ridge to the Gulf of Mexico; implementation of extension of the Avoca Island levee and/or other structural or nonstructural measures to provide protection to the backwater area east and northeast of Morgan City after completion of additional engineering and biological studies; establishing two management units initially, and possibly others in the future, to manage water levels for improvement of aquatic resources; and a

comprehensive real estate feature including, among other provisions, flowage and developmental control easements, environmental protection easements and additional state lands acquired through donation and purchase to optimize public access to the unique environmental features of the basin; and, recreational development features complementary to the added public access.

The total cost of the Recommended Plan, including remaining work to modify existing authorized features to pass the project flood, is $988,006,000. No cost benefit-cost ratio for this plan was developed since the flood control features are integral parts of the comprehensive MR&T project. The first cost of nonflood control features is estimated to be $220,113,000; the average annual cost $18,508,000; the average annual benefits $18,659,000; and the benefit-cost ratio 1.01. The average annual excess of benefits over costs is $151,000. It is recommended that first costs of $936,797,000 be borne by the Federal Government with non-Federal interests bearing a cost of $51,209,000, primarily for real estate features. It is further recommended that the environmental and recreational features be operated and maintained by the State of Louisiana. Operation and major maintenance of all flood control features would remain a responsibility of the US Army Corps of Engineers.

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MAIN REPORT AND FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 2

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APPENDIX B - FORMULATION, ASSESSMENT, AND EVALUATION OF DETAILED PLANS

APPENDIX C - ENGINEERING INVESTIGATIONS

APPENDIX D - ECONOMICS

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APPENDIX F - RECREATION RESOURCES

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

LMNPD-C

15 January 1982

SUBJECT: Atchafalaya Basin Floodway System, Louisiana

President
Mississippi River Commission

INTRODUCTION

The Atchafalaya Basin study combines pre-authorization studies of some project features with post-authorization studies of others. Thus, the study report is a combination Survey Report and General Design Memorandum (GDM), respectively. This distinction is necessary because the survey scope features of the Recommended Plan will require authorization by the US Congress prior to implementation, while the other features of the plan may be implemented under existing authorities.

The area encompassed by the study is located in south-central Louisiana, and extends from the vicinity of Monroe, Louisiana, southward to the Gulf of Mexico (see Figure 1). It includes the Red River backwater area, the Atchafalaya Basin Floodways, and the Atchafalaya Bay - west Terrebonne Parish marsh-backwater area complex. Plate 1 shows significant physical features of the floodway system as it presently exists. A familiarization with locations of the following key items on Plate 1 will aid the reader in better understanding the information presented in this report.

- Mississippi River
- Old River
- Red River
- Atchafalaya River (Main Channel)

- West Atchafalaya Floodway
- Morganza Floodway
- Lower Atchafalaya Basin Floodway
- Old River Control Complex
- Morganza Control Structure
- Interstate Highway 10 (I-10)
- East and West Atchafalaya Basin Protection Levees
- East and West Atchafalaya River Levees
- Krotz Springs, Louisiana
- Morgan City, Louisiana
- Wax Lake Outlet
- Lower Atchafalaya River Outlet
- Atchafalaya Bay
- Terrebonne Parish Marsh.

The primary study goal has been to develop an implementable multipurpose plan that will protect southeast Louisiana from Mississippi River floods by ensuring safe passage of one-half the project flood through the floodway system, while retaining and restoring the unique environmental values of the floodway and maintaining or enhancing the long-term productivity of the wetlands and woodlands. To this end, the study addressed management measures for the operation of the Old River control structure; the safe conveyance of floodflows through, and reduction of sedimentation in, the Lower Atchafalaya Basin Floodway; the safe conveyance of the floodflows through the outlets to the Gulf of Mexico; the protection of the area east of the lower floodway from backwater flooding; and the protection or enhancement of fish, wildlife, and recreation resources in the lower floodway and project-affected areas.

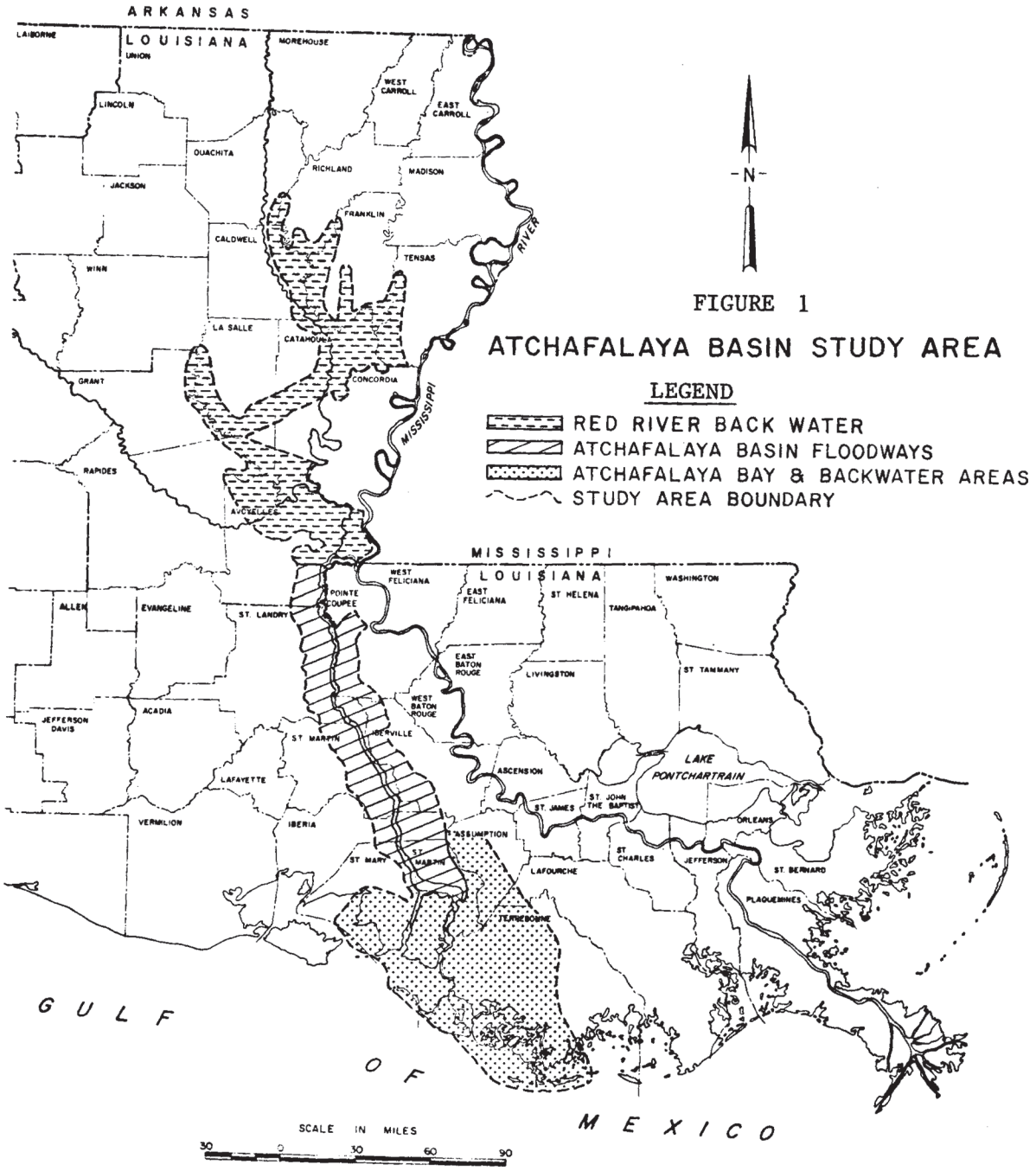


FIGURE 1

ATCHAFALAYA BASIN STUDY AREA

LEGEND

- RED RIVER BACK WATER
- ATCHAFALAYA BASIN FLOODWAYS
- ATCHAFALAYA BAY & BACKWATER AREAS
- STUDY AREA BOUNDARY

Study Background and Scope

The lower Mississippi Valley conveys the floodwaters originating in 41 percent of the continental United States to the Gulf of Mexico through the Mississippi River system. In 1927, a flood of unprecedented magnitude occurred on the Mississippi River, inundating some 16,500,000 acres in seven states and causing damages amounting to over one billion of today's dollars. An even greater loss was the 214 persons who perished in the flood. In response to this major disaster, the US Congress passed the Flood Control Act of 1928. That act directed the US Army Corps of Engineers to develop and implement a plan to prevent further damages and loss of life from floods on the Mississippi River system. Since that time, the US Army Corps of Engineers has developed the comprehensive Mississippi River and Tributaries (MR&T) project to provide flood protection in the alluvial valley of the Mississippi River from Cape Girardeau, Missouri, to Head of Passes, Louisiana.

The Atchafalaya Basin Floodway system, a prominent feature of the MR&T project, extends from the proximity of Old River, at the juncture of the Red and Mississippi Rivers, to the Gulf of Mexico.

The existing floodway system consists of three separate floodways: to the north are (1) the West Atchafalaya Floodway and (2) the Morganza Floodway with its control structure, both of which along with the Atchafalaya River, pass floodwaters into (3) the Lower Atchafalaya Basin Floodway (see Plate 1). These structural modifications have been made to the natural Atchafalaya Basin for the purpose of passing its share of a project design flood on the MR&T system. Translated to river flow rates, the design flood equals 3 million cubic feet per second (cfs) at the latitude of Old River, the head of the Atchafalaya River distributary and Atchafalaya Basin Floodway system. The floodway system must be capable of safely passing one-half, or 1.5 million cfs (see Figure 2), to the gulf in order to avert floods along the highly populated, industrialized corridor of the lower Mississippi River.

The principal features of the floodway system that have been developed to date are: protection levees forming the eastern and western boundaries to contain the floodwaters; an improved and partially leveed main channel to assist in transporting water and sediments more efficiently; and two outlets--the Lower Atchafalaya River and Wax Lake Outlet--to pass the floodwaters from the floodway to the gulf. The project also includes bank stabilization; navigation improvements; freshwater distribution channels; and numerous locks, floodgates, pumping stations, levees, and other features which provide improvement of local drainage affected by the project and local backwater protection. Currently, the Atchafalaya Basin Floodway

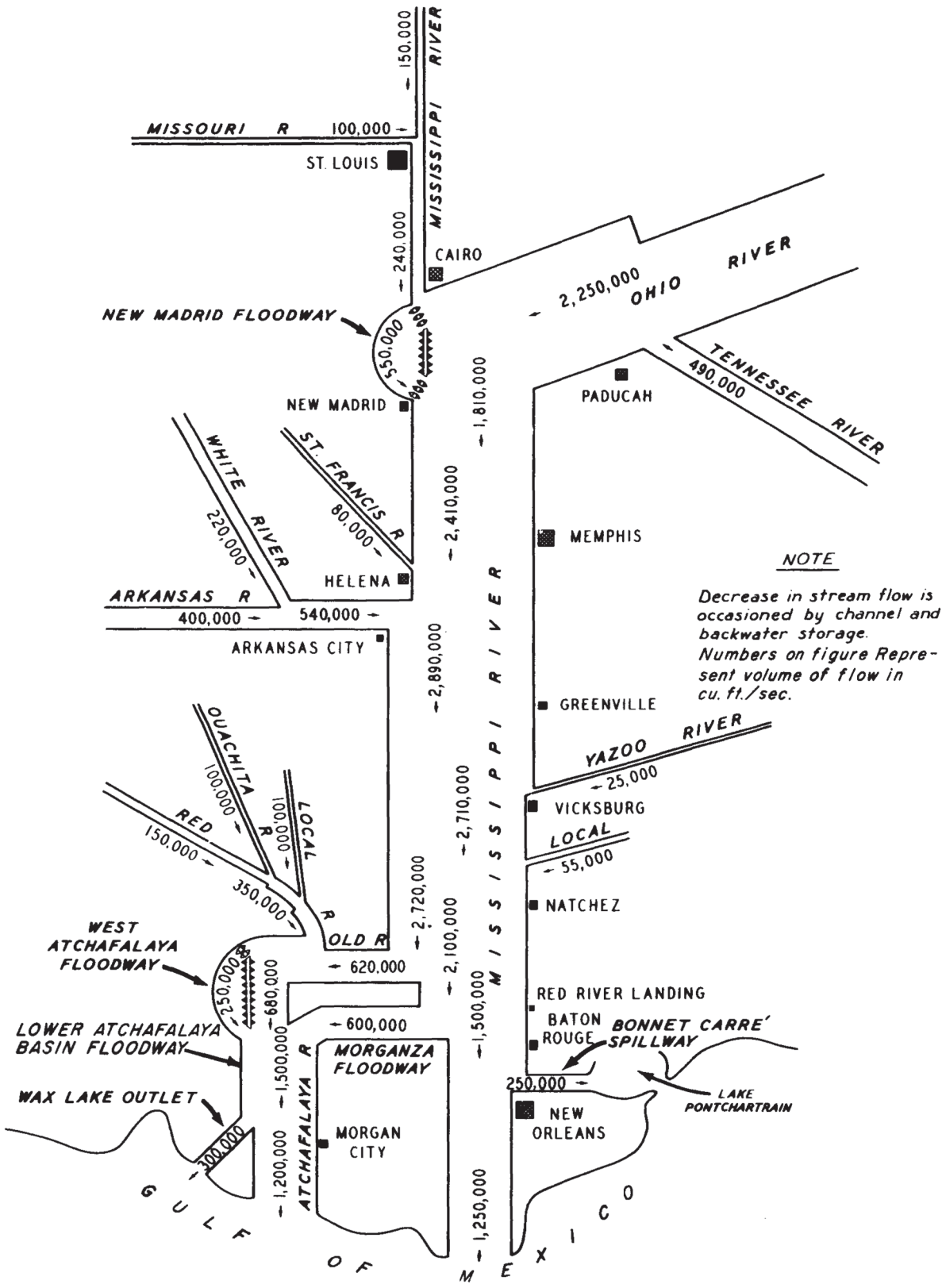


FIGURE 2 PROJECT DESIGN FLOOD

system can safely accommodate only about 60 percent of its assigned share of major floodflows. Until the flood control project is completed, much of south Louisiana remains vulnerable to flooding.

A history of the early natural formation and the later influences of man on the development of the Atchafalaya River and Basin is included in Appendix A of the report. The first significant structural changes by man consisted of levee building. By 1910, local interests had completed levees to confine the river as far south as Krotz Springs, Louisiana. After the Flood Control Act of 1928, a program for dredging the river south of the leveed segment was carried out between 1932 and 1940. Its purpose was to improve the flow capacity of the river by providing a single, centrally-located channel through the interlaced, meander bayous and streams of the lower basin. The Wax Lake Outlet channel was completed in 1941 to provide a second outlet for flow through the marshes to the south.

In 1954, a systematic program was begun to accelerate maturation of the Atchafalaya River main channel in reaching its estimated self-maintaining size of 100,000 square feet (sf) in cross-sectional area. The program involved the progressive confinement of normal river flows to the main channel by dredging to increase flow capacity, placing dredged material intermittently along the river's banks to aid confinement, and closing off some 22 distributary streams. These improvements in main channel capacity were directed at minimizing the need for increasing the heights of the East and West Atchafalaya Basin Protection Levees.

Studies undertaken shortly after World War II indicated that an ever increasing amount of Mississippi River flow was being diverted down its Atchafalaya River distributary, the shorter course to the gulf. If left to nature, complete rerouting of the Mississippi was projected to occur by about 1975, and would leave the lower Mississippi River a deep saltwater estuary of the gulf with no freshwater flows except during major floods. The impact of a course change would be catastrophic from an economic and social standpoint, since southeast Louisiana has been developed around the existence of the lower Mississippi in its present course. Studies by the Mississippi River Commission indicated that a diversion of flow, which would allow 70 percent of the total latitude flow at Old River to remain in the Mississippi River and 30 percent to go down the Atchafalaya, would promote stability of the system. The Old River control structure was completed in 1963 to provide for regulating flows to achieve this 70/30-percent flow division.

Dredging of the central or main channel was halted in 1968 because of limited funds. The next year, the National Environmental Policy Act was passed by the US Congress, requiring the preparation of an environmental impact statement (EIS) for such projects. By that time, the dredging of the main channel had become an environmentally

sensitive issue. Subsequently, an agreement was reached between the US Army Corps of Engineers and the National Wildlife Federation (NWF), whereby the US Army Corps of Engineers agreed to cease dredging work on the main channel until an EIS for the project was completed. The NWF agreed not to oppose the construction of the remaining features of the project and to assist the US Army Corps of Engineers in preparing the EIS. Thus, work has continued to raise the project levees, while the Atchafalaya River main channel has continued to develop and enlarge only by natural means.

Study Authority

Pre-authorization studies affecting the Atchafalaya Basin were first launched in June 1968, when the Committee on Public Works of the United States Senate, at the request of agricultural interests from the Red River backwater area, adopted a resolution authorizing the US Army Corps of Engineers to review the Old River control system and its operation to determine whether either or both should be modified. Four years later, in March 1972, the Senate Committee adopted another resolution at the request of interests from the lower floodway area, this time authorizing the US Army Corps of Engineers to develop a comprehensive plan for the management and preservation of the water and related land resources of the Atchafalaya River Basin. A companion resolution was adopted by the House Committee on Public Works in June of that year. Verbatim citations of these study authorities are contained in Appendix A.

The phase I GDM, or post-authorization study, was authorized in June 1976 under the discretionary authority of the Secretary of the Army acting through the Chief of Engineers. This provided for a study to address alternative plans for accomplishing the previously authorized purposes of the Atchafalaya Basin, Louisiana, project.

Because of interrelationships between the studies authorized by the US Congress and those authorized by the Chief of Engineers, they were combined into a single study to develop a comprehensive multipurpose plan for the Atchafalaya Basin Floodway system.

Study Participants and Coordination

As indicated earlier, prior to the study authorizing resolutions of 1972, the US Army Corps of Engineers was constructing, by dredging,

an enlargement of the Atchafalaya River main channel. This dredging was first halted in 1968 by a lack of funds and later by the lack of an EIS. In 1971, the Chief of Engineers reached an agreement with the Executive Director of the NWF to cease dredging of the main channel until an EIS for the project was filed with the Council on Environmental Quality. In turn, the NWF agreed not to contest work on other project features, such as levee raisings, while the EIS was being prepared. Further, the NWF agreed to assist in the preparation of the EIS to bring an "environmental awareness" to the effort.

Following that agreement, a multi-interest, interdisciplinary approach to the preparation of the EIS was begun. The Atchafalaya Basin Steering Group was formed to oversee the effort and functioned primarily as an advisory group, with the primary work being performed by the US Army Corps of Engineers. The Steering Group was chaired by the US Army Corps of Engineers, with membership including representatives of: the NWF; the Louisiana Department of Transportation and Development, Office of Public Works (OPW); the Louisiana Wildlife and Fisheries Commision; the US Department of the Interior, represented by the US Fish and Wildlife Service (US FWS); the US Environmental Protection Agency (US EPA); and the Louisiana State University, School of Environmental Design.

In December 1974, a preliminary draft EIS was completed. A public meeting was subsequently held (January 1975) to discuss the document. Following that meeting, the Steering Group developed a conceptual multipurpose plan for the Lower Atchafalaya Basin Floodway. No details were developed on how the plan would or could be implemented. The US Army Corps of Engineers began addressing the multipurpose plan under pre-authorization authorities while preparing the draft EIS for the Lower Atchafalaya Basin Floodway project in a separate effort. At this point, the studies were generally of reconnaissance scope.

In February 1976, the draft EIS was completed and forwarded to the Office of the Secretary of the Army. Prior to public release, the Assistant Secretary of the Army for Civil Works, after meeting with national and local interests primarily concerned with conservation and wildlife, decided not to release the draft document. As a result of that decision, the Director of Civil Works of the Office of the Chief of Engineers directed that studies be made to address both the authorized and unauthorized features of the floodway project for resource preservation and management. This directive, in effect, combined the pre-authorization studies with the phase I GDM studies. These combined studies have culminated in this report.

Since that time, the Steering Group has been inactive, and management of the current studies was conducted by an Agency Management Group headed by the District Engineer, New Orleans District, US Army Corps of Engineers and included representatives of

the US EPA, represented by both its Region VI office in Dallas, Texas, and the Environmental Monitoring and Support Laboratory in Las Vegas, Nevada; the US Department of the Interior, represented by the US FWS offices in Lafayette, Louisiana, and Jackson, Mississippi; and the State of Louisiana, represented by the Department of Transportation and Development, OPW, and the Office of the Governor. The US Army Corps of Engineers had the responsibility of coordinating the study, conducting engineering, socioeconomic, and environmental studies, consolidating information from other agencies and interested parties, and preparing the report. The US FWS conducted fish and wildlife studies, assisted in formulating alternative plans, and aided in assessment of the fish and wildlife impacts of the various alternatives in accordance with the Fish and Wildlife Coordination Act. The US EPA conducted a number of hydrologic and hydraulic studies, assisted in formulating plans, and aided in assessment of the impacts of the alternatives on water quality. The State of Louisiana participated in all facets of the study and assisted in plan formulation. Other interests, including landowner representatives, hunting clubs, the National Marine Fisheries Service, and the NWF, participated in the study in an advisory role.

Throughout the course of the study, many informal meetings and field investigations were conducted for the purpose of fully coordinating with all interests; determining problems, needs, and opportunities; and assessing the impacts of alternate plans. Agency Management Group representatives met often to discuss the various aspects of the study.

Public Involvement

In the early stages of planning, formal public meetings were held to determine the desires of local interests. At these meetings, local interests described the extent of development that had occurred as a result of protection from Mississippi River floods and requested that completion of authorized projects be expedited. Local organizations of sportsmen stated that their expressed purpose was not to oppose flood control but to protect and preserve fish, wildlife, and recreation resources. Meetings were held in Vidalia, Louisiana, on 21 November 1968; Lafayette, Louisiana, on 19 December 1968, New Orleans, Louisiana, on 19 December 1968; Morgan City, Louisiana, on 15 October 1971; and Lafayette, Louisiana, on 25 January 1975. The areas of concern voiced at the meeting in Lafayette in 1975 set the tone for the studies presented in this report. Those concerns were as follows:

- There was recognition of the reality of flood threat to the area and awareness of the urgency for dealing with it.

- There was widespread concern by both proponents and opponents of the plan over the adequacy of the protection afforded Morgan City, Berwick, and other communities located at the lower end of the floodway system.

- There was not an overall appreciation of the degree to which natural forces were operating to foreclose future options with respect to environmental management within the lower floodway.

- There was widespread acceptance of the view that not enough had been done in previous years to preserve the natural values within the lower floodway and that more needed to be done.

In January 1979, public meetings were held in five Louisiana cities (Baton Rouge, Jonesville, New Orleans, Lafayette, and Morgan City) to present 10 comprehensive plans, developed by the Agency Management Group from a large array of alternative features, for public comment. Attendance at these meetings was more than 5,000, and approximately 25,000 comments were received. The primary focus of those meetings was the issue of Federal acquisition of 443,000 acres of privately-owned lands in the Lower Atchafalaya Basin Floodway for the establishment of an "Atchafalaya Fish, Wildlife and Multi-Use Area," an independent proposal developed and publicized by the US FWS.

On 27-28 March 1980 and again on 17 November 1980, representatives of environmental organizations, hunting clubs, the oil and gas industry, the League of Women Voters, public hunting organizations, landowner associations, sport fishing clubs, commercial fishing interests, agricultural interests, timber interests, and minority groups were invited to attend formal Agency Management Group meetings for the purpose of keeping their respective constituencies informed about the status of Atchafalaya Basin study planning efforts.

National level interagency meetings were held in Washington, DC, in November 1979, April 1980, and November 1980, for the purpose of discussing the status of studies on the Atchafalaya Basin. These meetings were attended by representatives of all Federal agencies having an interest in the studies. National officers of several environmental organizations attended, as well as State of Louisiana officials.

Public meetings to review the Tentatively Selected Plan in the draft report and draft EIS for this study were conducted in July 1981 in the same five Louisiana cities as in the 1979 meetings.

Discussions relative to comments received on individual features of the Tentatively Selected Plan appear later in this report under descriptions of recommended plan features and in Appendix J. In general, public support was voiced for all major plan features as proposed, except for those concerning reduction of backwater flood

damages east of the lower floodway and the public access portion of the real estate plan. Substantial numbers of adverse comments were received on these two proposals.

Participation Acknowledgment

The US Army Corps of Engineers gratefully acknowledges the help and support of numerous agencies, groups, and individuals who provided information, comments, and assistance in this important water resource study. Particular note should be made of the contributions of the members of the Atchafalaya Basin Agency Management Group, the State of Louisiana, the US EPA, and the US FWS.

Implementation of the Recommended Plan presented in this report will satisfy the critical flood control needs of the southeast Louisiana area and optimize the protection of the Lower Atchafalaya Basin Floodway, the major objectives of this comprehensive multi-purpose plan.

Studies of Others

Because of the degree of interagency involvement in this investigation, particularly from an environmental standpoint, a number of studies have been undertaken by other Federal agencies. Studies by the US FWS, funded in part by the US Army Corps of Engineers, are listed in Appendix A. These studies involved a wide variety of the biologic resources of the basin. The US EPA has completed several hydraulic, water quality, and productivity studies in the basin, which are also itemized in Appendix A.

The Study Process and Report

THE STUDY PROCESS

Studies conducted by the US Army Corps of Engineers normally follow a three-stage process in which the four functional planning tasks of problem identification, formulation of alternatives, impact assessment, and evaluation occur within the framework of each stage.

Stage 1 studies are reconnaissance level, stage 2 involves development of intermediate plans, and stage 3 concludes the general investigation process with development of detailed plans.

In this study the planning process was modified to facilitate the integration of the extensive degree of interagency involvement and coordination and the unusual combination of pre-authorization scope studies with post-authorization studies. The four functional planning tasks were carried out in the intermediate and detailed planning levels with the coordination of the interagency Agency Management Group, whereas, reconnaissance scope studies were performed under the auspices of the interagency Steering Group.

The next step in the study process is the review of the final report and EIS by higher US Army Corps of Engineers authorities, including the Mississippi River Commission and the Office of the Chief of Engineers. Following this, the Chief of Engineers would then include funds in his budget requests for design and construction of those approved plan features that had been previously authorized. For those plan features not previously authorized, review and comment would be sought from the Governor of Louisiana and interested Federal agencies. At the same time, the final EIS would be filed with the US EPA.

After state and interagency review, the final report of the Chief of Engineers would be forwarded by the Secretary of the Army to the US Congress, subsequent to his seeking comments of the Office of Management and Budget regarding the relationship of the project to the programs of the President of the United States. Congressional authorization of the features not previously authorized would then be required.

If the features are authorized, the Chief of Engineers would include funds in his budget requests for design and construction of these features. The New Orleans District will seek expeditious review and approval of the nonauthorized features. However, action on features currently mandated by the US Congress will not be delayed while that authorization is pending.

Advance engineering and design studies would then be initiated, project formulation reviewed, and the plan reaffirmed or modified to meet conditions at that time.

Surveys, materials investigations, and preparation of design criteria, plans, specifications, and an engineering estimate of cost would next be accomplished by the District Engineer. Subsequently, bids for construction of project features would be received and contracts awarded for execution of the work.

THE REPORT

In the interest of clarity and ease of understanding, results of the study effort to date are summarized in this main report and detailed in its appendixes.

The main report is a nontechnical presentation of the overall study, including identification of the study area and its problems and needs, the formulation of plans to resolve the problems and to meet the needs, assessment and evaluation of those plans, and the study recommendations. As the primary document for review, the main report and the EIS are bound together.

Except for recommendations for plan implementation, the appendixes to this report generally contain the same information as the main report, but in significantly greater technical detail. Appendix A provides detailed information about area resources and economy, including the physical and biological resources that constitute the environmental setting, as well as the unique culture and characteristics of the people who inhabit the area. Information is also included on development occurring in the area; the existing plans and improvements; future without-project conditions; water and land resources problems, needs, and opportunities; planning constraints; and specific planning goals and objectives. Appendix B presents a discussion of the formulation of comprehensive multipurpose flood control and resource management plans, impact assessment, and evaluation. Appendix C contains the general criteria used in the design of project features, estimation of costs, analysis of performance, and a statement of specific engineering field and office studies performed. Appendix D presents study economics, including details of the economic benefits and costs of the alternatives accompanied by explanatory rationale. Appendix E presents the social components of the areas under study and their significance, as well as the area's cultural resources. Appendix F contains a detailed analysis of regional recreation, initial and future development needed to supplement existing facilities, and the corresponding administrative responsibilities. Fish and wildlife and related data are contained in Appendix G. Appendix H includes an assessment of endangered species. The Coordination Act report by the US FWS is contained in Appendix I. Appendix J, presents information on the public involvement program used in this study and displays pertinent correspondence with US Army Corps of Engineers response to comments, issues, points of information, and other considerations resulting from the review process, particularly those resulting from the public review of the draft report and EIS.

PROBLEM IDENTIFICATION

The following paragraphs present a discussion of the objectives of national economic development and environmental quality; define the geographic area involved; describe the existing water and land uses, as well as the area's environmental, cultural, social, and economic characteristics; project future conditions in the absence of Federal action; present problems, needs, and opportunities; and translate all of the above into specific objectives to be used as a guide for plan formulation.

National Objectives

The Water Resources Council "Principles and Standards for Planning Water and Related Land Resources" require that Federal and Federally-assisted water and related land planning be directed to achieve national economic development and environmental quality as equal national objectives. National economic development is achieved by increasing the value of the nation's output of goods and services and improving national economic efficiency. Environmental quality, on the other hand, is achieved by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems.

These national objectives are interpreted as being consistent with and reflective of the concept of total environment set forth in the National Environmental Policy Act of 1969. As a result, planning efforts in this study comprised a broad range of concerns, including those related to the natural, cultural, and human environments and were, simultaneously, responsive to the substantive requirements of NEPA. The national economic development and environmental quality objectives were kept in the forefront throughout the planning process.

Existing Conditions (Profile)

As previously indicated, the study area is comprised of three major interrelated areas: the Red River backwater area; the Atchafalaya Basin Floodway system; and the Atchafalaya Bay complex, including the Lower Atchafalaya River, the coastal marsh and bays, and the backwater area east and northeast of Morgan City.

The northernmost portion of the study area, the Red River backwater area, is located north of Old River and is subject to overflow some 40 miles westward by backwater. This area extends from the proximity of Old River, at the head of the Atchafalaya Basin Floodway system, northward to the vicinity of Monroe, Louisiana. The backwater area is now protected from headwater flooding by the west bank Mississippi River levee, the east bank Ouachita River levee and, to a minor extent, by the Red River levees below Moncla, Louisiana.

The Atchafalaya Basin comprises the central and southern portion of the study area. It is bounded by alluvial ridges that mark the positions of ancient meander belts of Mississippi River courses and extends from the latitude of Lower Old River and Bayou des Glaises to the Atchafalaya Bay and Gulf of Mexico. The basin contains the Atchafalaya Basin Floodway system, which is leveed to form the West Atchafalaya, Morganza, and Lower Atchafalaya Basin Floodways (Plate 1), and encompasses approximately 822,000 acres. Also, within the Atchafalaya Basin Floodway system, the Atchafalaya River is leveed from Simmesport to below Krotz Springs, Louisiana. Below the river levees, the floodway is a wetland of national significance. At the lower end of the Lower Atchafalaya Basin Floodway, waters pass to the gulf through the Lower Atchafalaya River and Wax Lake Outlet. The Atchafalaya Bay complex includes the Lower Atchafalaya River and the backwater area located along the east side of the Lower Atchafalaya Basin Floodway, extending from just below Baton Rouge to the gulf via the Terrebonne Parish marshes and Atchafalaya Bay.

EXISTING AND AUTHORIZED PROJECT FEATURES

Any discussion of the existing plans and improvements associated with the Atchafalaya Basin Floodway project must begin with the Flood Control Act of 1928, as amended. This act authorized the comprehensive MR&T flood control project to provide flood protection in the alluvial valley of the Mississippi River between Cape Girardeau, Missouri, and Head of Passes, Louisiana. Presently, the MR&T project includes a combination of features: levees along the main stem of the river and its tributaries in the alluvial plain to confine floodflows; reservoirs on the tributaries to store excess floodflows; floodways; and improvements to increase channel capacity, such as revetting, diking, and dredging. Other features include control structures, cutoffs, pumping plants, floodwalls, and floodgates. These features are designed to convey the project design flood discharges as was shown on Figure 1.

As was discussed in the Introduction, the principal role of the Atchafalaya Basin Floodway system in the MR&T design is to carry 1,500,000 cfs during a project design flood. An inventory of

currently authorized or existing features in the Atchafalaya Basin and a description of the features follows (see Plate 1).

Old River Complex. The Old River complex consists of a low sill structure which is operated to pass normal and floodflows into the floodways, an overbank structure to pass excess floodflows, and a lock to permit navigation from the Mississippi River to the Atchafalaya River. Present combined flood capacity at the complex is 850,000 cfs (design flows are 620,000 cfs). An auxiliary structure is being constructed to provide a backup system for the low sill structure, which has been damaged and is not capable of functioning as originally designed. Flows through the complex are managed to the extent possible so that 30 percent of the total latitude flow at Old River from the Mississippi River system and Red River system passes through the Atchafalaya Basin on an annual basis.

Morganza Floodway. The Morganza Floodway is the east side artificial intake for the Atchafalaya Basin Floodway, comprising an area of 68,000 acres. It is used only to pass floodflows and has been operated only once, in 1973. The design capacity of the Morganza control structure and floodway is 600,000 cfs.

Atchafalaya River. The Atchafalaya River is the largest distributary of the Mississippi River and is the only natural intake of the Lower Atchafalaya Basin Floodway. The Atchafalaya River extends 141 miles from its source at a junction with Old River to Atchafalaya Bay. The Lower Atchafalaya Floodway is comprised of an upper leveed section, a middle unleveed section, and a lower outlet section. The intake capacity of the Atchafalaya River presently exceeds 700,000 cfs. The design capacity of the combined outlets for the floodway is 1,500,000 cfs; however, their current total capacity is only about 850,000 cfs. Through approximately the upper half of the floodway, the Atchafalaya River is confined between levees. These levees protect the lands of the Morganza and West Atchafalaya Floodways when these floodways are not in operation. On the west bank, the towns of Simmesport, Melville, and Krotz Springs are protected on the floodway side of the perimeter levees by ring levees that tie to the river levees. Any improvements to the Atchafalaya River, including the outlet through the Lower Atchafalaya River or Wax Lake Outlet, necessary to pass design floodflows are considered to be authorized.

West Atchafalaya Floodway. The West Atchafalaya Floodway (the west side artificial intake for the Lower Atchafalaya Basin Floodway) comprises an area of about 170,000 acres. This intake is bounded on the north by the Bayou des Glaises fuseplug levee, on the west by the West Atchafalaya Basin Protection Levee, and on the east by the West Bank Atchafalaya River Levee. The lower limit of the West Atchafalaya Floodway is approximately at the latitude of Krotz Springs. The design capacity of the West Atchafalaya Floodway is 250,000 cfs above Bayou Current and 400,000 cfs below Bayou Current. This floodway is

used only for the passage of floodflows. To date, the floodway has never been operated.

Lower Atchafalaya Basin Floodway. The Lower Atchafalaya Basin Floodway extends from about the latitude of Krotz Springs to the approximate latitude of Morgan City. It is bounded on the east by the East Atchafalaya Basin Protection Levee and on the west by the West Atchafalaya Basin Protection Levee, an area averaging 14 miles wide by 65 miles long. The West Atchafalaya Basin Protection Levee originates near Hamburg, Louisiana, at a junction with the Bayou des Glaises fuseplug levee and proceeds in a southerly direction, terminating south of Berwick, Louisiana. The Morganza Floodway lower guide levee, which continues as the East Atchafalaya Basin Protection Levee, begins at Morganza and proceeds generally southward through Morgan City and along the Lower Atchafalaya River to Avoca Island Cutoff. Any improvements to the protection levees are considered to be authorized.

Flowage Easements. Any form of land-use controls in addition to those described as follows would require congressional approval.

- Below Krotz Springs. The Flood Control Act of 15 May 1928, as amended by the Flood Control Act of 28 June 1938, authorized the Chief of Engineers to purchase flowage easements over all lands below the latitude of Krotz Springs that were not considered subject to frequent overflow as of 1928. This has been established at approximately 68,000 acres. As determined by the Chief of Engineers, only those lands on which the title was clear (and the owner had presented a claim and was agreeable to the appraised value) were subject to the payment of flowage easements. Condemnation was not authorized. Due to the costliness of this process, acquisition of tracts in this category has been on a case-by-case basis. To date, easements have been purchased on approximately 9,000 acres.

- West Atchafalaya Floodway. Perpetual flowage easements on approximately 154,347 acres were acquired by the Government over all lands and improvements in the floodway down to the latitude of Krotz Springs. These easements provide for full use of the lands for flood control purposes. Owners retain the rights to farm, improve, build houses and inhabit the lands, and to harvest timber and minerals.

- Morganza Floodway. Comprehensive easements on approximately 71,577 acres of land within the floodway have been acquired for the passage of floodwaters into the Atchafalaya Basin. Construction for permanent habitation within the flooway is not permitted, but use of the land for farming, removal of timber and minerals, and other purposes not in conflict with flood control is permitted with prior approval.

- Upper Pointe Coupee Area. Inundation rights have been acquired on 12,801 acres of land above the Pointe Coupee drainage structure for storage of runoff when it becomes necessary to close the gates in the upper guide levee during operation of the Morganza Floodway.

- Morgan City Front. Flowage easements have been acquired on 18 acres in connection with the Morgan City front levee.

- Bayou des Glaises Loop. Flowage easements have been acquired on approximately 16,091 acres within the Bayou des Glaises loop.

- Bayou Chene. Flowage easements have been acquired on 692 acres.

NATURAL SETTING, RESOURCES, DEVELOPMENT AND ECONOMY

Prior discussion has described the authority for this study and the flood control aspects of the Atchafalaya Basin. However, the complexity of the problems facing the water resource planner cannot be appreciated without an understanding of the basin environs. As a major distributary of the Mississippi River in early geologic stages of development, the Atchafalaya River and the basin are in a dynamic state of change. In the upper reaches (primarily above I-10), the floodplain has already filled in with sediments and has succeeded to vegetation types that are normally found on infrequently flooded land. The higher ground within the floodway is being developed for intensified agricultural practices.

Contributing to this "drying out" of the upper basin is the fact that as overbank flows become more confined by natural levees formed by the sedimentation process, more scouring occurs in the main channel, thereby increasing cross-sectional area and reducing the river flowline. The lower part of the basin floodway is also changing from a primarily wet environment to a drier one. Lakes are filling in and vegetation changes are occurring. Sediment not deposited in the floodway is passed through either the Lower Atchafalaya River or Wax Lake Outlet and into Atchafalaya Bay where the delta is emerging and new marsh is being formed.

Although the basin is in a dynamic state of change, it remains one of the largest river overflow swamps in the continental United States and harbors a vast array of fish and wildlife resources. The high aquatic productivity of the lower floodway is directly attributable to the annual cycle of flooding and dewatering. Predominant habitat types are early and late successional bottomland hardwood forests, cypress-tupelo swamps, marshland, and cultivated farmland (see Plates 2-4). Marshes extending from the lower floodway

to the gulf grade from freshwater to brackish, to saline in character. Terrestrial and aquatic habitat types are summarized in Tables 1 and 2, respectively. All areas of the lower floodway and surrounding lands are used intensively for hunting, fishing (both commercial and recreational), camping, and general water and wilderness outdoor recreation. Organized hunting camps in the area prevent public access to most privately-owned land. Of the approximate 595,000 acres in the Lower Atchafalaya Basin Floodway, about 445,000 acres are in private ownership, with the other 150,000 acres owned by the State of Louisiana.

Timber harvesting, commercial fishing (including crawfishing), trapping, and oil and gas exploration are the predominant commercial activities in the area. In fact, 25 percent of the commercial forests and 51 percent of the bottomland hardwood forests of the state are located in this general area. The oil and gas industry in the area is thriving and accounts for a significant share of employment in the area, either directly or indirectly. Table 3 depicts value and pounds of fish and shellfish taken in recent years, while Figures 3 and 4 show relevancy of minerals and timber in the study area to statewide production.

The project-affected area has a distinctively rich folk and cultural heritage. Early settlers, the Europeans and French Acadian refugees who came to occupy the area, displaced the indigenous Indian tribes inhabiting the basin. The first white settlements were limited to the periphery of the swamp; however, with the expansion of the plantation system, the French-speaking Acadians soon abandoned agricultural pursuits, principally due to the disastrous effects of flooding and backwater on their crops. Instead, many of these Acadians turned to extractive pursuits of wild resources from the swamp, principally hunting, fishing, trapping, and removal of cypress for building materials and commerce. The basin culture did not develop in isolation, but adjusted through time to new technology and demands. At present, the heart of the swamps has largely been abandoned and most inhabitants have moved to the edges of the Lower Atchafalaya Basin Floodway. This abandonment was due to the loss of wetlands caused by levee construction and sedimentation, discovery of oil and gas in the basin, and the technological advances and conveniences of the 20th century. However, there remains today an abundance of folk behavior and tradition adapted to swamp utilization which comprises an "Atchafalaya Basin Culture." The rich cultural heritage of the project-affected area offers great scientific, educational, and interpretative potential.

TABLE 1

EXISTING TERRESTRIAL HABITAT

Habitat Type	1975 Acreage				1980 Acreage	
	Red River Backwater Area	West Atchafalaya Floodway	Simmesport, Melville, and Krotz Springs	Morganza Floodway	Lower Atchafalaya Basin Floodway [1]	Areas Outside the Floodway System [2]
Mid-to-Late Successional Bottomland Hardwood Forest	391,000	108,000		39,000	247,000	85,000
Cypress-Tupelo Swamp	29,000			1,000	176,000	275,000
Early Successional Bottomland Hardwood Forest					91,200	2,700
Early Successional Bottomland Hardwood Forest Mixed with Cypress-Tupelo					8,400	
Cleared Land	354,000	60,000		17,000	16,400	80,800
Fresh Marsh						323,000
Brackish Marsh						89,400
Saline Marsh						108,000
Urban	1,000		2,000			5,300
Active Delta						10,100
TOTAL	775,000	168,000	2,000	57,000	539,000	979,300

[1] Includes the area bounded by a line one-quarter mile west of the West Atchafalaya Basin Protection Levee north of Verdunville and a line one-quarter mile east of the East Atchafalaya Basin Protection Levee north of Bayou Sorrel.

[2] Includes all lands outside the protection levees south of Verdunville on the west side and the Lower Atchafalaya River backwater complex.

TABLE 2

EXISTING AQUATIC HABITAT

Habitat Type	1975 Acreage				1980 Acreage	
	Red River Backwater Area	West Atchafalaya Floodway	Simmesport, Melville, and Krotz Springs	Morganza Floodway	Lower Atchafalaya Basin Floodway [1]	Areas Outside the Floodway System [2]
Riverine, Distributary, or Open-Ended Canal	27,000				23,000	8,000
Freshwater Bayou or Slow-Flowing Canal	12,000	1,000			15,900	22,100
Headwater Lake					18,200	
Backwater Lake	36,000	1,000			13,800	28,200
Cropland Lake	6,000	500				
Fresh Marsh Pond and Lake						87,600
Fresh Bay						200,000
Brackish Marsh Pond and Lake						55,200
Brackish Bayou or Canal						6,200
Brackish Bay						58,900
Saline Marsh Pond or Lake						64,400
Saline Bayou or Canal						6,100
Saline Bay						53,800
Shallow Gulf						804,000
TOTAL	81,000	2,500			70,900	1,394,600

[1] Includes the area bounded by a line one-quarter mile west of the West Atchafalaya Basin Protection Levee north of Verdunville and a line one-quarter mile east of the East Atchafalaya Basin Protection Levee north of the Bayou Sorrel.

[2] Includes all lands outside the protection levees south of Verdunville on the west side and the Lower Atchafalaya River backwater complex.

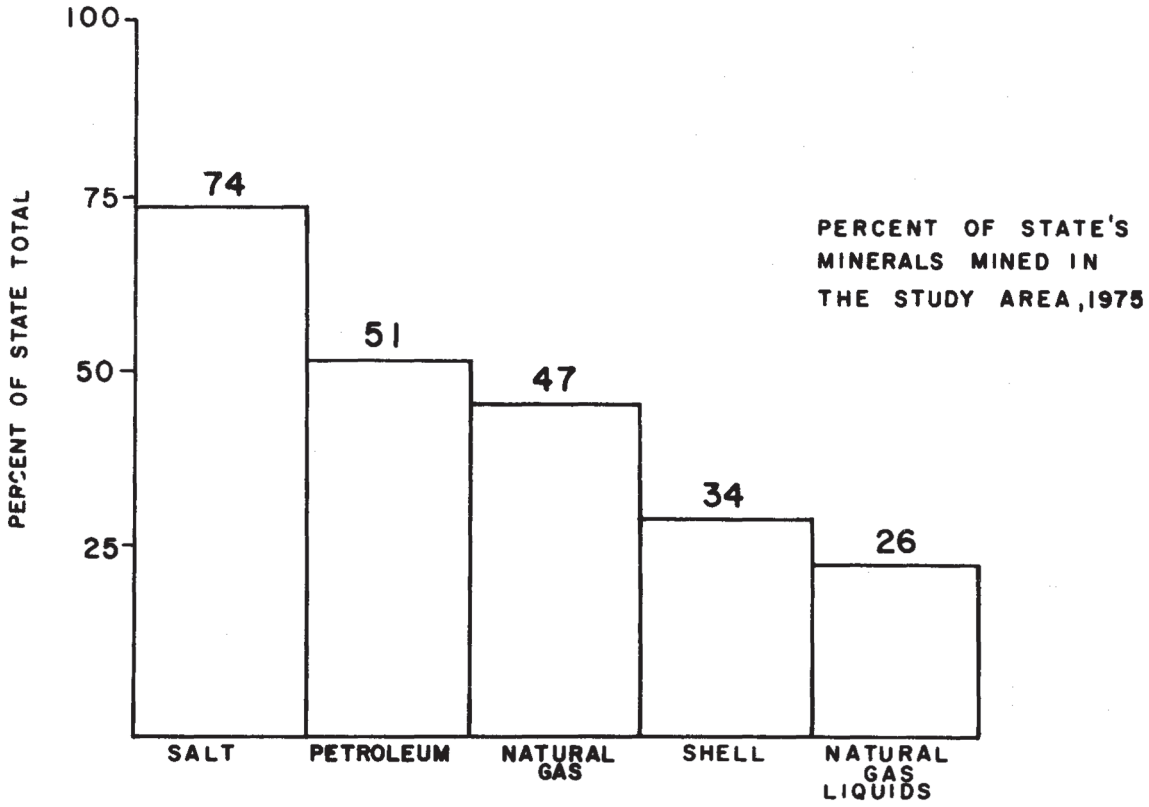
TABLE 3

POUNDS AND VALUE OF FISH AND SHELLFISH FOR THE ATCHAFALAYA BASIN [1/]

Species	1976		1977		1978		1979	
	Pounds	Value ($)	Pounds	Value ($)	Pounds	Value ($)	Pounds	Value ($)
Bowfin	13,200	945	11,500	1,014	3,700	356	13,600	1,406
Buffalo	726,900	108,587	836,200	129,733	1,365,700	231,959	2,055,400	353,113
Carp	105,100	4,272	59,800	2,959	61,500	3,235	131,800	10,128
Catfish	644,600	225,585	631,900	228,216	660,400	270,170	613,600	255,509
Garfish	75,900	11,029	93,700	15,996	130,500	25,375	158,500	34,280
Paddlefish	3,100	249	2,700	254	14,900	1,759	30,600	3,349
Gou	354,300	52,582	345,500	52,448	203,900	32,307	527,600	87,068
Shad	573,100	21,735	654,600	31,039	413,100	25,644	474,100	48,343
Crawfish	5,620,100	1,692,063	1,310,900	708,413	13,941,700	4,107,092	5,524,500	1,981,940
FW Turtle	9,100	4,013	6,900	3,247	13,400	5,016	29,900	16,249
Frog	25,000	19,075	21,000	19,969	33,500	47,492	15,400	15,166
River Shrimp	2,500	1,750	2,000	1,392	4,800	3,663	8,500	6,376
Total	8,150,650	2,141,885	3,976,700	1,194,680	16,847,100	4,769,988	9,583,500	2,812,927

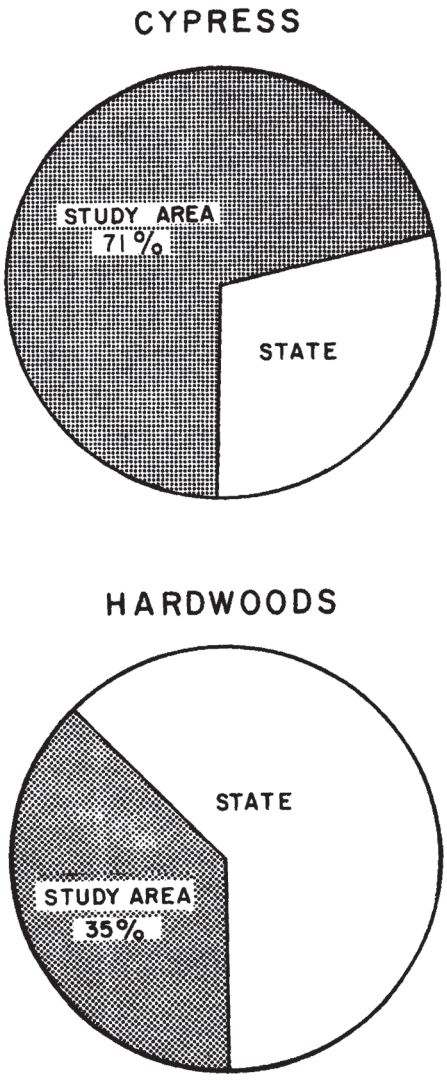
[1/] Preliminary, subject to revision.

Source: National Marine Fisheries Service as cited in "Commercial Fishing and Trapping: An Economic Analysis of the Atchafalaya Basin," F. W. Bell, 1980.



SOURCE : U.S. DEPT. OF THE INTERIOR, BUREAU OF MINES, "THE MINERAL INDUSTRY OF LOUISIANA 1975", AND UNPUBLISHED DATA.

FIGURE 3 MINERALS



SOURCE: LOUISIANA DEPT. OF NATURAL RESOURCES, OFFICE OF FORESTRY
"TIMBER AND PULPWOOD PRODUCTION IN LOUISIANA", APRIL 1978.

FIGURE 4 CYPRESS AND HARDWOODS

Conditions If No Federal Action Taken (Without Condition Profile)

Because of the devastating effects that would result from not controlling flows from the Mississippi River into the Atchafalaya Basin at the Old River control complex and from not providing flood overflow restraint with the basin protection levees, there is no true no-action alternative for this study. The future without-project conditions described below assume continuing a 70/30-percent distribution of flow below the Old River control structure, with 30 percent regulated to the Atchafalaya River, and the continued development and maintenance of the basin protection levees to project flood levels by local interests.

NATURAL SETTING, RESOURCES, DEVELOPMENT AND ECONOMY

The process of a river overflowing its banks and depositing sediments on adjacent land areas is a natural developing process of a young river like the Atchafalaya. Each year when the river conveys spring floods to the gulf, it overflows its banks and deposits sediments. These sediments build natural levees in the overbank areas that become flooded. As the natural levees along the water channels within the Lower Atchafalaya Basin Floodway build up to higher elevations from the yearly overflows, the quantity of water diverted to the overbank areas will gradually decrease; therefore, the quantity of sediments deposited or rate of sediment deposition on the overbank areas is expected to decrease accordingly. While significant amounts of deposition have already taken place throughout most areas of the floodway, additional sediment deposits of up to 9 feet deep could occur in some locations.

Sediment that passes through the Lower Atchafalaya Basin Floodway to the Atchafalaya Bay will continue to build the delta. It is expected that about 300 square miles of land will emerge as a result of this active deltaic process. If no actions are taken to control flows through the Lower Atchafalaya River and Wax Lake Outlet, the outlet will capture a larger share of the flow conveyed to the gulf. As the natural levees of the main channel in the Lower Atchafalaya Basin Floodway are built up, a larger percentage of the river flow will be confined to the channel, which will result in its continued natural enlargement between 1980 and 2030. The channel's cross-sectional area between mile 54.8 and 65.4 is projected to increase from 92,000 sf to about 110,000 sf. Between mile 65.4 and mile 100.8, the channel's cross section will increase from about 80,000 to 98,000 sf. Channel enlargement above river mile 55 is expected to be minimal, increasing from 118,000 sf in 1980 to only about 121,000 sf by the year 2030.

The shift in distribution of flows through the outlets toward a larger part of the total flow being conveyed by Wax Lake Outlet will have the net effect of a loss in total flow capacity of the outlets as existed in 1980. This, along with the projected overbank sediment deposition, will cause the project flood flowline to become higher than if some alternate action were taken. The no-action flowline is projected to be up to 1.5 feet higher than the 1973 refined flowline, the current project design flowline. This higher flowline effect would extend along the East Atchafalaya Basin Protection Levee, West Atchafalaya Basin Protection Levee, Morganza Floodway levees, and the Atchafalaya River levees.

While the average stage hydrographs for the no-action alternative would be lower than the present hydrographs, they would be higher than the hydrographs resulting from alternative actions. The differences in magnitude are generally between 1 and 2 feet higher for all areas of the lower floodway.

As deltaic development in the Atchafalaya Bay continues, the Atchafalaya River's mouth will continue to move gulfward, and stages at the end of the east protection levee at Avoca Island Cutoff for a given flow will continue to rise. It is the stage at the end of this levee that governs the amount of backwater flooding that reaches the area east and northeast of Morgan City. For this reason, the backwater flooding problem in this area will continue to worsen with the no-action plan. The water level or stage at Amelia, with an average return interval of 100 years, is expected to rise from 5.5 feet to 7.9 feet. Similar increases in stage heights are expected to occur throughout the backwater area.

The various land and water habitat types in the project area form a complex and ever-changing pattern. This pattern is the result of changes induced by varying water levels and length of time of flooding, sediment deposition in open water and overbank areas, and changes in salinity concentrations in the coastal reaches of the basin. The naturally occurring alluvial riverine processes are further altered by controlling the flow at Old River, clearing land for timber and agriculture, dredging canals, and building levees. The assumed non-Federal action of raising the existing levees, as previously mentioned, would result in environmental impacts. The habitat changes which would be associated with this levee raising are shown in the EIS, Table 6-1. Also, in the EIS, Table 6-7 shows in column 2 the expected acreages of habitat types in the Lower Atchafalaya Basin Floodway, backwater areas, and marsh complex during the next 50 years, if the Federal project is not implemented.

Early successional bottomland hardwood forests would decrease by approximately two-thirds due to the conversion of the existing acreage within the Henderson area to the mid-to-late successional bottomland hardwood category or to the clearing of this acreage

for agriculture. Mid-to-late successional bottomland hardwood forests would decrease by about 50 percent, primarily because of land clearing for agriculture. Cypress-tupelo swamps would decrease only slightly, most of which would be attributable to the conversion of this type to the bottomland hardwood mixed with cypress-tupelo category (see EIS, Table 6-7). This conversion would occur due to sedimentation and a lowering of water levels within the Lower Atchafalaya Basin Floodway. Another factor of far greater importance to the ecology of the basin is the potential harvest of the maturing cypress-tupelo timber. For a worst-case analysis, it was assumed that 50 percent of the acreage existing in 1980 could be cut-over by the year 2030. Additionally, the projected future rise of water levels in the backwater area northeast of Morgan City could have significant adverse impacts upon the forests. Open land acreage in the affected area would increase about three-fold by 2030, almost entirely as a result of the clearing of bottomland hardwood forests for conversion to agriculture and this change would have a profound effect on terrestrial wildlife resources.

Fishery resources changes would be dramatic within the Lower Atchafalaya Basin Floodway and adjacent marshes in the absence of a Federal project. The most significant changes would be caused by the projected conversion of annually flooded forestlands to agricultural lands. Other primary impacts would be a net loss of aquatic habitat due to sedimentation and the creation of new delta. The major significance of aquatic habitat losses would be a reduced harvest of freshwater fish and crawfish. The magnitude of these reductions in harvest of some common species is presented in the EIS, Table 6-10. This table also shows changes in the harvest rates of estuarine-dependent species. These data reflect the deterioration in the marsh-delta complex.

Timber resources would be greatly depleted by the conversion of forests to farmland and, in addition, the harvest of cypress-tupelo forest in some areas could become a permanent loss because altered flooding cycles could prevent regeneration of these trees. A general decline in overall water quality is expected to occur within the floodway during the next 50 years, a result of reduced water levels and decreased circulation in backwater areas. Decreased biological productivity would accompany the eventual shortage of nutrients and oxygen. Further physical modifications, including canal dredging and dredged material deposition by private interests, would reinforce these trends. The changing conditions would favor agricultural, industrial, and urban developments, along with their attendant pollution potentials. The continuing sedimentation and draining of the swamps would also adversely impact the swamp-dependent part of the economic base, and thus, the lifestyle of the people who live along the edges of the floodway.

The most significant agricultural development in the area during the next several decades under the future without-project condition

will be conversion of forestland to agricultural production. In the Lower Atchafalaya Basin Floodway, conversion of about 200,000 acres of forestland to agricultural land is expected to occur. Aside from the significant boost in agriculture-related goods and services that this land-use conversion would provide, the major impacts will be a reduction in both forestry activities and recreational opportunities on the converted land. No long term mineral projections specific to the Atchafalaya Basin are available. This area is important in the production of oil and natural gas and this is expected to continue in the future.

Problems, Needs, and Opportunities

The overriding factor in any analysis of the Atchafalaya Basin is the requirement of the basin to function properly and adequately during major flood events. All other aspects of plan formulation must be subservient to this goal. Other needs include protection or enhancement of environmental features, provision of public recreation opportunities and maximizing delta development. Environmental groups have promulgated the concept of a "wet and wild" Atchafalaya Basin. But it is not possible to halt the natural changes that are occurring in the basin. It is desirable, however, to manage these changes to provide the best possible environmental conditions.

As stated previously, the Atchafalaya Basin Floodway system must be capable of passing 1,500,000 cfs during a project design flood. The lower floodway cannot currently meet this criteria, primarily because of sediment deposition in the overbank areas. This capacity is being restored by raising the East and West Atchafalaya Basin Protection Levees. Also, the outlets are not capable of passing design flows. This problem is a result of reduced flow capacity of the Lower Atchafalaya River (Morgan City to the gulf) as a result of a natural delta-building process and the fact that the Wax Lake Outlet has been capturing more and more of the low to normal flows, generating a channel degradation problem on the Lower Atchafalaya River.

The low sill structure at Old River is not capable of withstanding design head differentials. This deficiency is a result of bed scouring during recent flood events which have undermined the structure. The design capability of this structure must be restored because as the Atchafalaya River develops, the head differentials at Old River will increase and because this structure is used to control flow into the area on a daily basis. It is imperative that a reliable method of controlling normal flows, as well as floodflows, be available.

Backwater flooding in the area east and northeast of Morgan City is increasing, both in frequency and intensity, because the delta development and decreasing channel capacity along the Lower Atchafalaya River are resulting in a rising flowline along the lower river.

The major threat to the natural environment of the area is land clearing for agricultural development. As sediment has been deposited in the basin (especially in the Lower Atchafalaya Basin Floodway above I-10) and as the main channel has degraded and lowered flowlines, some areas are now suitable for conversion from timberland to agriculture. Even with the threat of periodic flooding, agricultural practices return far more profit per acre than timber. The primary crop raised in the basin is soybeans. As the floodway in the area below I-10 becomes higher and drier, it will be subject to the same land-use conversion pressures as the lands above I-10.

A common cause of physical changes occurring in the lower floodway is sediment. If the introduction of sediment into the basin could be stopped, then changes in the area would be minimized. Of course, this is not possible. Practically speaking then, sediment management is the primary consideration for influencing physical changes in the basin. It must be realized, however, that no action can be taken which would impede the freshwater flows into the backswamp areas of the basin. These flows are vital to the entire ecosystem of the area. It is important to realize also, that a large portion of the total sedimentation in the basin is delivered during floods when the water is levee to levee. During these times, no sediment management measures can be effective. Thus, the need to influence sediment deposition can be realistically pursued only for low to normal flow conditions.

Land-use controls in the lower floodway for both flood control and environmental purposes need to be reevaluated. Concern has been expressed by some that public access needs to be expanded. Currently, that area of the floodway is intensively utilized for hunting, fishing, etc., but most of the area is privately-owned and leased by club organizations. Also, there is high potential for additional recreation facilities, such as campgrounds, boat-launching ramps, scenic areas, and hiking trails. The State of Louisiana is on record as supporting the need for additional public access. As parts of the floodway system become less susceptible to flooding, residential, agricultural and industrial development, if uncontrolled, can be expected to occur. If this is allowed, then some have speculated that there will be a reluctance to use the system for the passage of floodflows and a high degree of environmental degradation would occur. Also, if the floodway becomes developed, then substantial damages would be sustained with each usage.

Planning Goals and Objectives

Aside from the co-equal national objectives of environmental quality and national economic development, goals and objectives specific to the Atchafalaya Basin study were defined by the Agency Management Group. The primary goal is to develop, as soon as possible, an implementable, multipurpose plan to protect south Louisiana from MR&T floods while retaining and restoring the unique environmental features and long-term productivity of the natural environment of the basin.

Within this overall goal, specific objectives can be defined. Among these are:

- Flood Control - Implement a flood control system that will safely pass the project flood to the Gulf of Mexico in an environmentally sound manner. Reduce to the maximum extent practical the deposition of sediments that reduce the ability of the floodway to pass the project flood.

- Natural Environment - Retain and restore the unique environmental features of the floodways and maintain or enhance the long-range productivity of the wetlands and woodlands.

- Agricultural Activities and Mineral Development - Allow agricultural activities and mineral developments, provided such activities do not interfere with the goals relative to flood control or the natural environment.

- Delta Formation - Maximize natural delta formation in Atchafalaya Bay while providing for navigation and passage of the project flood.

- Public Accessibility - Maximize public opportunity to observe and utilize the fish and wildlife resources of the floodway.

PLAN FORMULATION

The planning process used in this study consisted of first developing groups of measures to address the individual functional and geographical areas of concern and then combining alternative features for those measures into comprehensive plans. Initially, eight groups of measures, which generated 45 separate alternative features, were defined. These alternative features were grouped into 10 plans for presentation at the formulation-stage public meetings held in Louisiana during January 1979. Subsequent to those meetings, many of the features were eliminated while a limited number of new alternatives were added. These remaining alternatives were then grouped into plans which, through a series of iterations, were reduced to the Recommended Plan (Appendix B should be consulted for a detailed description of the plan formulation process used to arrive at the Recommended Plan). Descriptions of those alternative features considered in developing the detailed plans follow.

Alternative Features

GROUP I - ALTERNATIVES FOR OPERATION OF OLD RIVER CONTROL STRUCTURE

Maintain a 70/30-percent annual distribution of total flows between the Mississippi and Atchafalaya Rivers below Old River, respectively (current operation). This alternative provides for operation of the Old River control structure to maintain the approximate 1950 distribution of flows between the Mississippi and Atchafalaya Rivers. This flow distribution is normally regulated on a daily basis. Various interest groups expressed a desire for this distribution to be modified slightly. For example, farmers in the Red River backwater area would benefit during some years in the months of May, June, and July from a reduction of flow into the Atchafalaya River so that stages would not interfere with crop planting. However, the US FWS would like flows increased during the same months in some drier years to benefit fishery resources in the lower floodway. Actually, these seemingly incompatible desires would not conflict during some years. Short term changes in flow distribution might be feasible when such changes could be accomplished without adversely impacting other resource uses. Operational procedures would be reviewed to determine the advisability of developing specific criteria for such changes.

GROUP II - ALTERNATIVES FOR ATCHAFALAYA BASIN MAIN CHANNEL DEVELOPMENT AND LEVEE RAISING

All alternative features for main channel development recognize that the East and West Atchafalaya Basin Protection Levees will continue to be raised, as necessary, in combination with the main channel development feature to safely pass the project flood. Also included in all structural plans is the installation of bank protection measures on the Atchafalaya River above river mile 55.0. Main channel features considered in detail follow.

- Channel training would be accomplished by dredging material from the main channel where necessary and depositing it within diked areas on the banks to a height sufficient to contain the average annual high water.

- The main channel would be dredged as necessary to attain a 100,000-sf cross-sectional area from the head of Whiskey Bay pilot channel to Wax Lake Outlet, and to an 80,000-sf cross-sectional area from Wax Lake Outlet to Stouts Pass. Gaps would be left in the dredged material. In a modification of this alternative feature, no gaps would be left in the dredged material.

GROUP III - ALTERNATIVES FOR SEDIMENT CONTROL

Entrance channels of principal main channel distributaries would be realigned so that flows would remain essentially as they are now but would be as sediment-free as possible.

GROUP IV - MANAGEMENT UNITS AND RELATED FEATURES

Natural processes and human actions have combined to produce distinct environmental and hydrological subdivisions within the Lower Atchafalaya Basin Floodway. These areas have been identified as management units for the purpose of formulating individual water management plans to retain or restore unique environmental values of an individual area (see Figure 5). Management units should be designed so that:

- Water regimes are restored as closely as practicable to historical overflow patterns.

- Proper water movement occurs through the units.

- Sediment movement and deposition in the units are restricted.

- Nutrients and organic matter are supplied to the estuarine area and the Gulf of Mexico.

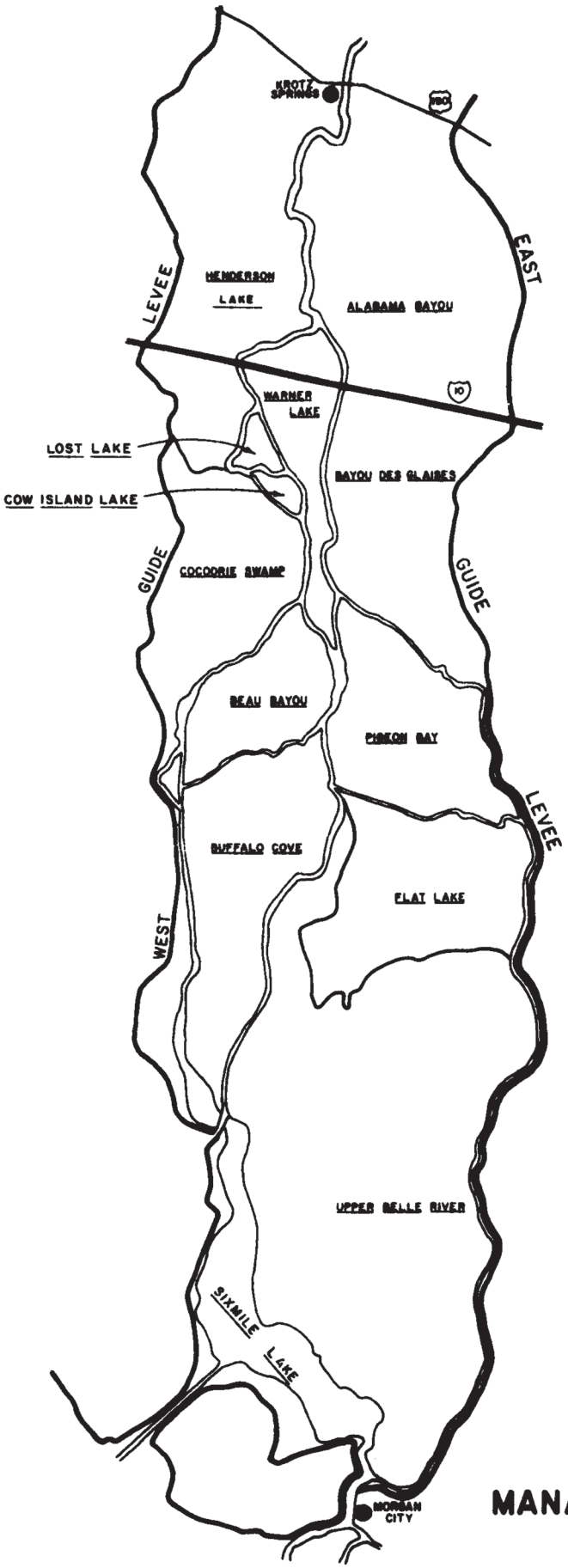


FIGURE 5

MANAGEMENT UNITS

Each management unit would be individually evaluated to determine its potential effectiveness for retaining or restoring desirable environmental values. Conceptually, improvements necessary to create management units consist of dredging entrance channels, constructing some low levees or dikes around prospective units, and installing weirs in the inlet and outlet channels to control flows.

In addition to management units, gated diversion structures would be provided for the Henderson Lake and Alabama Bayou area to introduce up to 3,000 cfs of freshwater through the Atchafalaya River levees. Other improvements could be achieved by selective closing of canals that allow sediment-laden waters to reach backswamp areas, and selective opening of dredged material banks to improve water flow patterns.

GROUP V - ALTERNATIVES FOR FLOODWAY LAND USE

The following proposed real estate interests were considered. In addition to the interests cited, several combinations of the individual features were considered.

- No Action. No additional real estate interests would be acquired.

- Fee Acquisition. The Federal Government would purchase all surface rights to all lands in private ownership in the Lower Atchafalaya Basin Floodway below the approximate latitude of Krotz Springs, Louisiana.

- Comprehensive Multipurpose Easement: Government Controls Timber and Access. This easement would allow the Federal Government to overflow lands in the Lower Atchafalaya Basin Floodway for any purpose for any length of time, either naturally or artificially; to construct recreational facilities; to regulate public access; to forbid construction of permanently habitable structures; to forbid or regulate the construction of other structures, including camps; to forbid removal of timber; to forbid the use of lands for agricultural purposes; and to regulate excavation and landfill operations. Landowners would retain mineral rights. These easements would be acquired over all lands in private ownership within the Lower Atchafalaya Basin Floodway below the approximate latitude of Krotz Springs.

- Comprehensive Easement: Landowner Controls Timber, Government Controls Access. This interest would be similar to the preceding alternative, except the landowner could pursue good commercial timber practice on a sustained yield basis.

- Comprehensive Easement: Landowner Controls Timber and Access. This would be similar to the preceding alternative, except the landowner would also control access.

- Comprehensive Easement: Landowner Controls Access, Government Controls Timber.

- Recreation Features. A concept of potential resource use and allocation was developed, which would minimize overall land acquisition and development yet increase public access within the Lower Atchafalaya Basin Floodway. Included in this conceptual plan were areas having the potential to be used for or classified as wildlife refuges, natural areas, public hunting areas, public fishing and crawfishing areas, nature hiking, canoe trail areas, developed and primitive camping areas, boat-launching areas, and areas having significant and unique resources. A detailed discussion of recreation resources is presented in Appendix F.

GROUP VI - ALTERNATIVES FOR FLOODWAY OUTLETS AND DELTA BUILDING

This group of alternative features was considered in detail to address the problem of conveying floodflows past Morgan City via the Lower Atchafalaya River and through Wax Lake Outlet to the gulf.

- Maintaining existing flow distribution, Lower Atchafalaya River 70 percent/Wax Lake Outlet 30 Percent.

- Maintaining same flow distribution, but with sediment redistribution.

- Reestablishing approved design flow distribution (Lower Atchafalaya River 80 percent/Wax Lake Outlet 20 percent).

- Closing Wax Lake Outlet to normal flows (Lower Atchafalaya River 100 percent/Wax Lake Outlet 0 percent).

- Implementing channel training in Lower Atchafalaya River and Wax Lake Outlet.

- Widening Wax Lake Outlet overbank area.

GROUP VII - ALTERNATIVES TO REDUCE BACKWATER FLOODING EAST OF THE FLOODWAY

Alternatives considered in detail for the backwater flooding problem east and northeast of Morgan City follow.

- Limited Structural Measures. These alternative features for protection of only the developed parts of the backwater area east of the floodway would consist of construction of ring levees and drainage pumping stations. One feature would use two ring levees to protect the Morgan City - Amelia and Bayou Black industrial areas. This option would utilize a navigation

structure in Bayou Chene just below Bayou Boeuf, on Bayou Boeuf just below Lake Palourde, and two on Bayou Black. These structures would be closed when water elevations begin flooding the areas. To provide for drainage of the runoff from the backwater area above Morgan City, a bypass east of and equivalent in size to Bayou Boeuf would be required. A second alternative feature would use 28 ring levees with pumping stations for interior drainage to protect the same industrial areas as well as various other populated areas within the backwater area. Such ring levees would provide protection within the ringed areas from backwater flooding as well as headwater and tidal flooding. However, the construction right-of-way for required ring levee alinements would require the relocation of about 1,900 existing residential, commercial, and public structures that are located along bayous or in other physically restricted areas. Further, all structures located outside the ring levees would require raising, flood-proofing, or removal for prevention of flood damages. Additionally, this alternative would not offer protection for roads nor most existing farmlands that are subject to backwater flooding.

• Extension of Avoca Island levee. With this alternative feature, Avoca Island levee would be incrementally extended to a total length of either 17.0 or 19.6 miles, depending upon the levee alinement selected (Plate 10). The existing Avoca Island levee was constructed to limit project flood stages east of Morgan City to generally the same stages that occurred in that area in the 1945 flood. The amount of flooding from backwater is related to the stage in the Lower Atchafalaya River at the end of the Avoca Island levee. Since the active development of the delta in Atchafalaya Bay will result in elongation of the river's course and thereby raise the stage at the end of the existing levee for a given discharge, flooding caused by backwater in the area east of the floodway will become more frequent and to greater depths as time progresses. Thus, this feature would provide phased implementation of additional levee reaches as necessary to maintain stages for each reach equivalent to the 1945 backwater conditions. Several alinements for the total levee extension were considered. An alinement totaling about 17.0 miles in length immediately adjacent to the east side of the Lower Atchafalaya River would be accompanied by extensions of the Avoca Island Cutoff channel around the end of each reach to provide for navigation. An alinement totaling about 20 miles in length following the marsh adjacent to the shoreline would require some type of navigation structure in the levee, since it would be infeasible to extend the cutoff channel around the end of the levee and across the bay to the Lower Atchafalaya River channel for each reach of the levee extension. Because the marsh in Terrebonne Parish east of the Avoca Island levee depends upon freshwater and sediment from the Lower Atchafalaya

River to prevent saltwater intrusion and help to compensate for marsh subsidence, a freshwater diversion structure or structures would be included in the levee extension to divert flow from the river to the marshes. The structure(s) would be designed to maintain the present distribution of flow, estimated to be 4,000 cfs, into the west Terrebonne Parish marsh and would be closed when the stage at Amelia, Louisiana, reaches 3.0 feet NGVD to provide protection from Lower Atchafalaya River backwater.

- Extension of Avoca Island Levee 14,000 Feet. The Avoca Island levee would be extended by 14,000 feet to continue backwater flooding protection in the area east of the floodway for a period of about 10 years. This would provide an interim period of protection to allow for completion of detailed studies of the Atchafalaya Bay - Terrebonne Parish marsh - backwater complex. A freshwater diversion structure, identical in both design and operation to that described under Extension of Avoca Island Levee, would also be provided for this interim protection feature.

GROUP VIII - MANAGEMENT ENTITY

- To insure the proper implementation and operation of the plan selected, a management entity would be established, composed of the US Army Corps of Engineers, US EPA, US FWS, and the State of Louisiana. Mechanisms would be included for public involvement. The management entity would not inhibit emergency flood control operations by the US Army Corps of Engineers.

- No management entity would be formed.

- Some combination or part of the above feature would be adopted.

Plans of Others

In October 1978, the US FWS published a brochure entitled, "The Atchafalaya, America's Greatest River Swamp." That brochure proposed that approximately 443,000 acres of floodway land between Krotz Springs and Morgan City, excluding developed ridge areas, be acquired by the US Army Corps of Engineers to establish the Atchafalaya Fish, Wildlife, and Multi-Use Area. Mineral rights would be retained by present owners, with exploration and extraction opportunity being essentially the same as now. Timber harvest would be for the primary purpose of optimizing fish and wildlife productivity and natural beauty. The result of this would be a minor reduction in sawtimber

yield as compared to industrial forestry practices. Camps within the floodway, along perimeter levees, would not be affected; however, public access points would be obtained. Other camps within the basin would be retained for life by present owners. Flood control would be under US Army Corps of Engineers jurisdiction; management for fish and wildlife conservation and public use would be the joint responsibility of the Louisiana Department of Wildlife and Fisheries and the US FWS. Commercial crawfishing, fishing, trapping, sport hunting, and general public use would be maximized.

During the planning process the US Army Corps of Engineers developed a real estate concept for the Lower Atchafalaya Basin Floodway based on a categorization of existing uses of the basin's environmental and recreational resources by the various concerned interest groups and the general public. This concept was presented to other Agency Management Group members, and resulted in subsequent real estate proposals by US EPA, US FWS, and the State of Louisiana. Details of the state proposal, which was adopted for the "public access" feature of the Tentatively Selected Plan, are contained in Appendix B.

Development of Detailed Plans

From the features considered in detail, 10 alternative structural plans were developed as shown in Table 4. In this table, alternative Plan 1 reflects present conditions, Plan 2 shows the future without-project conditions, and Plans 3 through 10 are alternative plans that could be implemented. Plans 7 through 10 have been further subdivided to show these plans both with and without management units. Some plans emphasize the environmental quality goal, some the national economic development goal, and some a combination of both co-equal goals. From these plans, the final three plans--National Economic Development, Environmental Quality, and Tentatively Selected--were chosen. Rationale for that selection process is detailed in Appendix B and summarized in subsequent paragraphs of this report.

TABLE 4

ALTERNATIVE STRUCTURAL PLANS

Feature	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	Plan 6	Plan 7 a / b	Plan 8 a / b	Plan 9 a / b	Plan 10 a / b
Old River Control Structure 70%/30% Mississippi/Atchafalaya	---	---	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Levee Raising	---	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main Channel:										
100,000 Square Feet Dredging (modified)	---	---	---	---	Yes	Yes	---	---	---	---
100,000 Square Feet Dredging	---	---	Yes	---	---	---	---	---	---	---
Channel Training	---	---	---	Yes	---	---	Yes	Yes	Yes	Yes
Sediment Control	---	---	---	Yes	Yes	---	Yes	Yes	Yes	Yes
Management Units	---	---	---	Yes	---	---	No/Yes	No/Yes	No/Yes	No/Yes
Outlets:										
Lower Atchafalaya River/Wax Lake Outlet										
70% / 30%	---	---	---	Yes	---	---	---	---	---	---
100% / 0%	---	---	---	---	Yes	Yes	---	---	---	---
70% / 30% → 80% / 20%	---	---	---	---	---	---	---	---	Yes	Yes
70% / 30% → 80% / 20% → 100% / 0%	---	---	---	---	---	---	Yes	Yes	---	---
80% / 20%	---	---	Yes	---	---	---	---	---	---	---
Increase Sediment to Wax Lake Outlet	---	---	---	Yes	---	---	---	---	---	---
Widen Wax Lake Outlet Overbank	---	---	---	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Channel Training Below Morgan City	---	---	---	---	Yes	Yes	Yes	Yes	Yes	Yes
Backwater Flooding:										
Extend Avoca Island Levee	---	---	Yes	Yes	Yes	Yes	Yes	---	Yes	---
Limited Structural Measures	---	---	---	---	---	---	---	Yes	---	Yes

Note: To develop complete multi-purpose plans, a real estate option and a management entity alternative should be added to each structural plan. All plans include bank stabilization on the Atchafalaya River above mile 55, recreational developments and minor project features.

ASSESSMENT AND EVALUATION OF FINAL PLANS

Detailed analyses of the alternative plans indicated that certain features were desirable from both an economic and an environmental standpoint or, as in the case of the Avoca Island levee extension, they were the only alternative that fully satisfied one of the project goals. Among those features were sediment control, channel training above Morgan City, and the Avoca Island levee (14,000-foot extension). Accordingly, plans that contained those features (Plans 4, 7, and 9) were considered in the final array while those that did not contain those features (Plans 3, 5, 6, 8, and 10) were eliminated. The three remaining plans were evaluated and from them, the Environmental Quality Plan (Plan 4), the National Economic Development Plan (Plan 7a), and the Tentatively Selected Plan (Plan 9b) were chosen.

Subsequent to the public meeting reviews of the draft plan/EIS in July 1981, the Recommended Plan has been developed from the Tentatively Selected Plan. Further, the National Economic Development and Environmental Quality Plans have been revised to reflect changes resulting from public comments and study data refinement since the public meetings. Draft versions of these plans may be found in Appendix B.

Descriptions of each of the three final revised plans are presented in the following paragraphs. In addition to plan descriptions, significant beneficial and adverse impacts, an evaluation and trade-off analysis, and mitigation requirements are presented. Responsibilities for implementation are also included, along with the apportionment of costs for each detailed plan.

Final Environmental Quality (EQ) Plan

PLAN DESCRIPTION

This plan is comprised of a combination of features that emphasize environmental quality while safely conveying the project flood through the Atchafalaya Basin to the gulf. Its features are as follows:

70/30-Percent Distribution of Flows at Old River. This is the present plan of operation for the Old River control structure, Louisiana, project and would not change. The Old River control structure would be operated so that approximately 30 percent of the combined flows of the Red and Mississippi Rivers above Old River are distributed to the Atchafalaya River, and 70 percent are distributed to the Mississippi River below Old River. (The New Orleans District initiated the

construction of an auxiliary control structure in July 1981. This control structure will serve to insure the integrity of the existing system. No changes in flow distribution or in stages would be effected by its installation.)

Modification of Existing Features, Where Required, to Pass the Project Flood. This includes the following: raising to grade the East and West Atchafalaya Basin Protection Levees and the levees west of Berwick (see Plate 5), and construction of approximately 429 miles of service roads on levee crowns; modifying Bayou Sorrel, Bayou Boeuf, and Berwick Locks; modifying the Charenton and East Calumet floodgates; modifying the Wax Lake East and Wax Lake West drainage structures; modifying culverts in the East and West Bayou Sale levees; and modifying the Upper Pointe Coupee, Centerville, Ellerslie, Franklin and Enlargement, Gordy, Maryland, North Bend, Wax Lake East, Wax Lake West, Bayou Yokely and Enlargement, Morgan City, and Tiger Island pumping plants. Since the EQ plan does not include channel training below Morgan City, the project flood flowline and levee grades would be somewhat higher than that achieved by implementing the other plans.

Bank Stabilization. Bank stabilization on the main channel above mile 55 would continue.

Training Works on the Atchafalaya Basin Main Channel Above Morgan City. This feature proposes the implementation of training works on the Atchafalaya Basin main channel to a height sufficient to confine average annual peak flows, approximately 450,000 cfs. This requires dredging approximately 29,000,000 cubic yards of material from 17.6 miles of channel, from mile 90.0 to mile 116.0, and placing it on the banks within diked areas to simulate development of natural ridges (Plate 6). The majority of the works would be below mile 94.0 and would be confining; that is, essentially no gaps would be left in the works to allow water to overflow the banks during low flows. Possible bank maintenance works may be required in the future along the main channel from mile 90.0 to mile 53.0 on the east bank and mile 55.0 on the west bank, but being very minor in nature, this was not included in cost estimates or impact assessments.

Sediment Control. The sediment control component of this plan includes realining the four principal distributaries of the Atchafalaya Basin main channel to reduce the entrance angle to between 30 and 45 degrees. These distributaries are the Old Atchafalaya River, the east freshwater distribution channel, west access channel, and east access channel (Plate 7).

70/30-Percent Distribution of Outlet Flows. This feature provides for maintaining the present flow distribution at the outlets by constructing a rock weir at the head of Grand Lake with connecting

levees to the West Atchafalaya Basin Protection Levee (Plate 8). The weir is designed to allow 30 percent of the low to normal flows to reach the gulf through Wax Lake Outlet, with the remaining 70 percent conveyed to the gulf via the Lower Atchafalaya River. For flows exceeding a 10-year frequency, the low connecting levees would be overtopped so that floodflows could be safely conveyed to the gulf via the Wax Lake Outlet.

Widening Wax Lake Outlet Overbank. This feature consists of setting back the west Wax Lake Outlet levee an average of about 3 miles as shown on Plate 9. The existing west Wax Lake Outlet levee would be degraded to natural ground and a new West Calumet floodgate would be constructed.

Extension of Avoca Island Levee. Further extension of the Avoca Island levee is the only alternative which would provide protection over the entire area of backwater influence east of the floodway. However, more precise engineering and biological parameters must be defined to provide a better understanding of the complex, dynamic, and delicate ecosystem of the Atchafalaya Bay-Terrebonne marsh complex before implementation of further extensions of the levee and other structural or nonstructural features associated with backwater protection. The needed studies would be completed by 1985. Further rationale for delaying implementation of this plan feature is included in the Recommended Plan description.

Recreational Development. This feature consists of three developed and seven primitive campgrounds, one interpretative facility, and 15 boat-launching ramps located throughout the Atchafalaya Basin on 1,500 acres of acquired fee land (owner retains mineral rights).

Management Units. Thirteen management units (Figure 6) were studied to determine their feasibility for restoring historical overflow conditions to benefit the aquatic ecosystem. The studies to date indicate that five units (Buffalo Cove, Henderson, Beau Bayou, Flat Lake, and Cocodrie Swamp) have the greatest potential for accomplishing that goal. For this reason, these five were specifically included in the plan evaluation and the costs, benefits, and impacts developed for detailed plan comparison purposes. The Buffalo Cove and Henderson units are proposed as pilot units for initial implementation according to plans developed in conjunction with representatives of US FWS, US EPA, and appropriate state agencies. Subsequent to construction, the operation of these units would be closely monitored and an evaluation of their performance made by representatives of the cooperating agencies, using criteria devised by that group, concerning the pilot units' effectiveness. Based on that group's evaluation and recommendations, requests for funding to implement other units would be made. Prior to that time, it is not possible to determine how many additional units are feasible for implementation. Development of management units would require the restriction of their natural

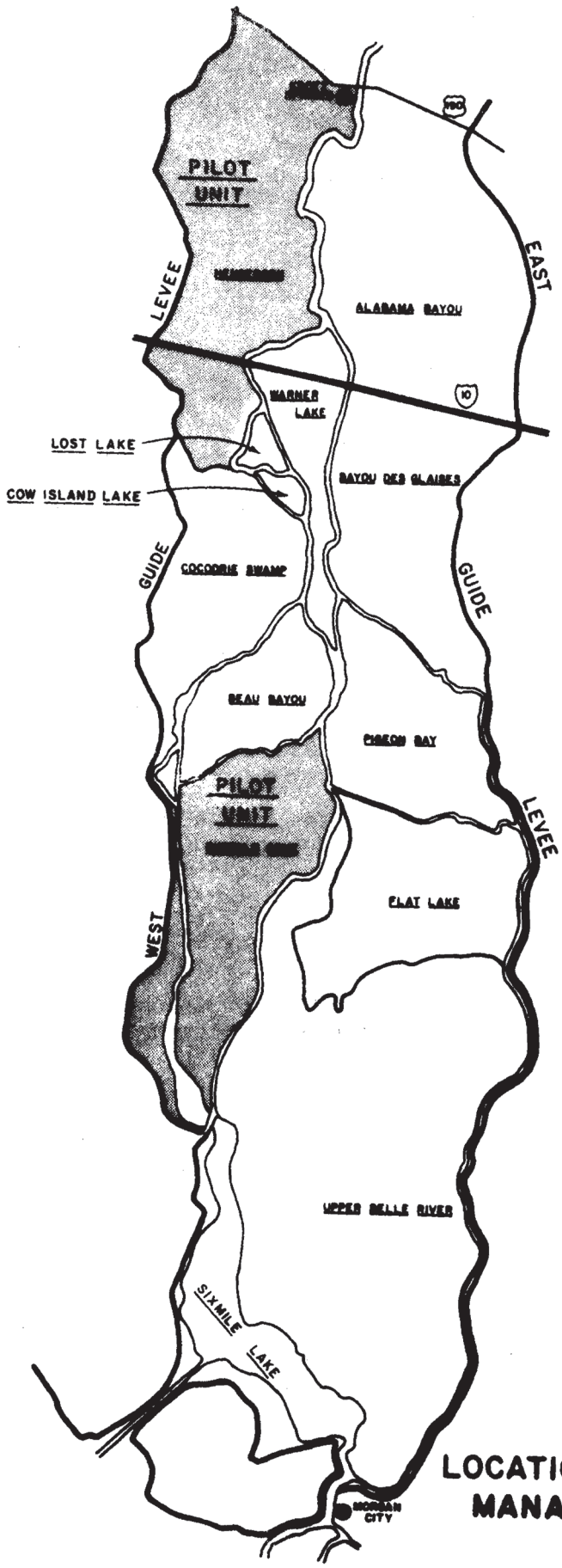


FIGURE 6
LOCATION OF PROPOSED MANAGEMENT UNITS

outlets by construction of weirs, and in some cases, low-level levees (see Plate 11). Construction of new inlets at the upper end of the management unit would also be necessary, as well as the closure of certain bayous and canals and the improvement of circulation within the unit. Rollovers to provide for small boat access would be installed at bayou and canal closures.

Freshwater Structures. This feature provides for implementation of the Henderson and Sherburne freshwater diversion structures to provide freshwater inflow from the Atchafalaya River to the Henderson Lake and Alabama Bayou areas, respectively. The Henderson structure would consist of a gated culvert designed to pass a maximum of 3,000 cfs into the upper region of the area. The exact location of this structure has not been determined as several feasible sites exist, but Bayou Graw in the vicinity of river mile 45.0 appears favorable. Studies to date, however, have ruled out the Bayou Courtableau and Indian Bayou sites. Studies during advanced planning and design would finalize a location for the structure. Plans would be developed to insure that diversion of the river water does not increase flooding on existing developed land or farmland in the vicinity of the structure nor cause a deterioration in the existing water quality in the presently impounded reach of lower Bayou Courtableau.

The Sherburne freshwater diversion structure, which also includes gated culverts of 3,000 cfs maximum capacity, would be located in the east Atchafalaya River levee at mile 43.0.

Real Estate Interests. The real estate feature of this plan provides for those interests needed to serve three basic functions: flood control, environmental protection, and public access. Real estate interests for both flood control and environmental purposes were developed in specific response to study objectives cited by the authorizing congressional resolutions. The public access function is ancillary to the proposed environmental features of the project, with the citizens of the State of Louisiana being the primary beneficiaries. The state expressed the view that public access in addition to the current state-owned lands (approximately 150,000 acres) was desirable. For this reason, the public access interests were developed in accordance with the November 1980 recommendations of the Governor.

The EQ plan provides a real estate feature which addresses both flood control and environmental protection purposes as follows:

- Flood Control. The Flood Control Act of 1936 authorized the US Army Corps of Engineers to acquire certain flowage rights in the Lower Atchafalaya Basin. The Act further specified: "That no flowage easements shall be paid for by the United States over properties subject to frequent overflow in the Atchafalaya Basin below the approximate latitude of Krotz Springs." It was

determined that about 68,000 acres in the Lower Atchafalaya Basin Floodway were subject to purchase of flowage easements under this Act. To date, those easements have been obtained on about 9,000 acres. The EQ plan includes the purchase of flowage rights on the remaining 59,000 acres. In addition, the right to prohibit the construction of new permanently habitable structures and to prohibit or regulate construction of other structures, including camps, would be acquired over all privately-owned land (approximately 445,000 acres) in the lower basin, except for the developed ridges. The need for developmental control is associated with operation of the floodway. This right would assure the lower floodway's readiness for operation on short notice, preclude the need for Corps of Engineers' emergency flood-fighting operations and associated Federal expenses within the basin, and insure no liability on the part of the Federal Government for the public health, safety, and welfare by controlling industrial development that could prove hazardous to the public during floodway operations. These developmental control rights would also serve to preserve the environmental values of the basin, but are considered essential elements of a flood control easement, which would provide for the continued unrestricted use of the lower floodway for project flood control purposes.

• Environmental Protection. Real estate interests for protection of environmental values in the lower basin were developed in response to general study goals of the authorizing congressional resolutions and specific study objectives as defined by the Agency Management Group, i.e., to "retain and restore the unique environmental features of the floodways and maintain or enhance the long-range productivity of the wetlands and woodlands." In addition to those rights needed for flood control, the EQ plan includes rights specifically for environmental protection. These rights are considered necessary for preservation of fish and wildlife habitat and maintaining the "wet and wild" environmental appeal of the lower floodway. Such rights would include control over all excavation and landfill operations and allow for extension of the time and duration of flooding by natural or artificial means. These rights would prevent or delay potential degradation of existing flowage patterns, prevent destruction of habitat, and provide for water level control under the management unit concept. Additional environmental rights would prohibit the conversion of land to other uses and provide control over the method of cutting timber. The land conversion control is directed at preventing destruction of fish and wildlife habitat, i.e., clearing of forests for the purpose of agricultural production of soybeans or other higher value economic pursuits. Control over timber is also aimed at preserving habitat, as well as maintaining the lower basin's environmental appeal by

controlling clearcutting and promoting sustained yield forestry practices. A comprehensive multipurpose easement, or higher interest if mutually agreed upon, containing the cited environmental interests would be acquired over the entire 445,000 acres of privately-owned land in the lower basin, except for the developed ridges.

• Public Access. The public access function was subdivided into two basic categories that relate to separate features of the proposed plan. The first, recreation development, was formulated in response to the study authorizing resolutions. The second, general public access, was developed in response to the Agency Management Group's objective to "maximize public opportunity to observe and utilize the fish and wildlife resources of the floodway" and is based on the November 1980 recommendations of the Governor of the State of Louisiana.

For the recreational development feature, a total of 1,500 acres would be acquired in fee title in the proximity of the lower floodway to provide for the development of campsites, boat-launching ramps, and other facilities complementary to destination-type outdoor recreational activities. Included would be a limited number of day-use or picnicking sites and 200 to 500 acres set aside for special and unique areas.

The general public access feature would be accomplished by the acquisition of such additional rights on 103,500 acres of the same 445,000 acres previously cited for environmental protection easements. The public access areas would include 30,000 acres of late successional bottomland hardwood forests, 50,000 acres of cypress-tupelo swamps, 23,000 acres of greenbelts along the edges of selected navigable public waterways as well as sites along the interior toe of the basin protection levees, and 500 acres of existing rookeries. Additional rights to prohibit timber harvest would be obtained on 73,500 of the same acres on which general public access easements are acquired. This would apply to the 30,000 acres of bottomland hardwoods, 20,000 acres of cypress-tupelo stands, 23,000 acres of greenbelts, and 500 acres of rookeries. These rights are associated with the environmental goal of maintaining or enhancing productivity of the habitat, i.e., allowing the management of timber for fish and wildlife habitat improvement, as well as preserving existing esthetic values to benefit the public access user.

For all real estate interests acquired for project purposes, mineral rights would be retained by the landowner. Other real estate interests would be acquired as necessary for implementation of other project features.

Increase Sediment Through Wax Lake Outlet. This feature proposes dredging a new entrance channel from the Atchafalaya River into Wax Lake Outlet at an angle that would optimize sediment transport to Atchafalaya Bay (Plate 12).

Canal Closures and Circulation Improvements. This feature proposes the closing of certain canals that permit sediment-laden waters to enter backswamp areas, as well as improving water circulation patterns throughout the lower floodway by the selective opening of dredged material banks and other features that presently impede circulation.

Management Entity. The District Engineer would be the sole jurisdictional authority to protect and oversee Federal interests in the Atchafalaya Basin Floodway system upon implementation of the proposed comprehensive multipurpose plan. Recreation and environmental features of the plan would be operated and maintained by the appropriate Louisiana State agencies under license and lease agreements administered by the US Army Corps of Engineers. The District Engineer would continue to coordinate with other Federal agencies on special studies and collateral interests as required by Federal law and Corps of Engineers' regulations.

COMPARISON OF DETAILED PLANS

Assessments of significant adverse and beneficial impacts for economic, social, cultural, and environmental values of the EQ plan are shown in detail in the Summary Comparison of Alternative Plans in Appendix B and are discussed in Sections 4 and 6 of the EIS.

When all nonflood control features are jointly evaluated, the EQ plan yields a 1.02 to 1 overall benefit-cost ratio for contributions to national economic development for nonflood control values. This is much lower than that of the NED plan and about equal to that for the Recommended Plan. The flood control aspects considered in detail for each plan are a part of the overall MR&T Project and thus, are not subject to incremental evaluation.

When the nonflood control features of the EQ plan are evaluated by separating the recreation development features from all other nonflood control features, the benefit-cost ratio for recreation development is 8.5 to 1 and the benefit-cost ratio for all other nonflood control features is 0.10 to 1. While the other nonflood features are primarily environmental, these features meet the national environmental quality objectives, and are justified by the many intangible benefits provided.

The EQ plan makes a highly positive contribution to each of the national environmental quality objectives, a net positive contribution to social well-being, but no net appreciable contribution to regional development objectives.

The EQ plan accomplishes the specific planning objective for flood control in a safe and environmentally sound manner. It exceeds other alternatives in accomplishing the objective of retaining and restoring unique environmental features of the floodways, and maintaining or enhancing the long-range productivity of the wetlands and woodlands. It also meets all obtainable objectives for reversible or controllable environmental conditions.

The objective of allowing agricultural and mineral development, provided that such activities do not interfere with flood control or the natural environment, is accomplished to the maximum practicable degree. The objective of maximizing natural delta formation while providing for navigation and passage of the project flood is accomplished by the plan. The objective of maximizing public opportunity for observing and utilizing fish and wildlife resources of the floodway is met through optimizing public access to aquatic resources by the implementation of recreation features and providing additional public access to the lower floodway's terrestrial resources.

The EQ plan's impacts evaluated under the associated evaluation criteria would likely be unacceptable to the majority of Atchafalaya Basin landowners and hunting clubs. It would, however, likely be acceptable to commercial fishermen and trappers, conservation groups, and general environmental interests. The completeness of the plan assumes a pre-authorization and post-authorization moratorium on land-clearing activities for success in achieving the environmental preservation goals associated with the defined real estate interests.

For contributions to national planning objectives/accounts, the EQ plan ranks second for the NED objectives, first for the EQ objectives, first for the social well-being objectives and second for the regional development objectives.

MITIGATION REQUIREMENTS

Mitigation requirements of the EQ plan would arise due to an estimated loss of 200 annualized habitat units (AHU's) of marsh habitat. However, since the implementation of this plan would result in a net gain of over 40,000 AHU's of bottomland hardwood/open land habitat and almost 3,000 AHU's of swamp habitat, it was assumed that these gains would offset the small loss of marsh habitat. Methods used in calculating mitigation needs are explained in Appendix G. Mitigation for any cultural resources losses would be as described for the NED plan.

IMPLEMENTATION RESPONSIBILITY

Cost allocation and cost apportionment by project purpose for the EQ plan are shown in Table 5. As noted in the table, costs are apportioned, using both the cost-sharing policy proposed by President Carter in his June 1978 water policy message to the Congress and the traditional cost-sharing policies. Under the President's cost-sharing policy, the non-Federal portion includes the costs of all lands, easements, rights-of-way, and relocations, and a cash contribution of $111,490,000 toward total construction costs. All estimated operation and maintenance costs would be borne by non-Federal interests.

Under traditional cost-sharing policy, all flood control costs are borne by the Federal Government (Section 2 and portions of Sections 3 and 4 of Public Law No. 391, 70th Congress). A non-Federal cash contribution of $2,201,000 toward construction costs of other features would be required in addition to a portion of lands, easements, rights-of-way, and relocations. The operation and maintenance costs attributed to recreation and enhancement of fish and wildlife would be borne by non-Federal interests.

For purposes of determining required Federal-state cost-sharing responsibilities, the Atchafalaya Basin is not a traditional water resources development project. Thus, the project should be considered exempt from the traditional policies, the President's cost-sharing policy, and provisions of PL 89-72, 89th Congress, S. 1229, 9 July 1965 under Section 6(e), which states in part that "cost-sharing and reimbursement provisions of the Act shall not apply to non-reservoir local flood control projects," beach erosion control projects, small boat harbor projects, hurricane protection projects, or "to project areas or facilities authorized by law for inclusion within a national recreation area or appropriate for administration by a Federal agency" as part of a national forest system, as part of the public lands classified for retention in Federal ownership, or "in connection with an authorized Federal program for the conservation and development of fish and wildlife." The pre-authorization study was authorized by both the House of Representatives and the Senate of the United States, as cited under Study Authority, i.e., "developing a comprehensive plan for the management and preservation of the water and related land resources of the Atchafalaya River Basin, Louisiana, which would include...improvements of the area for commercial and sport fishing..."

The Atchafalaya Basin Floodway is a non-reservoir flood control project, but goes far beyond the scope of a local project. The project areas or facilities may become authorized by law to satisfy the intent of the study authority resolution which directs management and preservation of the basin's natural resources, including improvements for public recreational purposes, i.e., sport fishing, as well as commercial fishing potential. The project or facilities are considered appropriate for administration by a Federal or state

TABLE 5

COST ALLOCATION AND COST APPORTIONMENT FOR THE FINAL ENVIRONMENTAL QUALITY PLAN

	President's Cost-Sharing Policy				Traditional Cost-Sharing Policy			
	FIRST COST[1]		ANNUAL O&M		FIRST COST[1]		ANNUAL O&M	
Purpose	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Flood Control	$596,528,000	$198,843,000	--	$14,439,000	$795,371,000	--	$14,439,000	--
Recreation	15,271,000	18,665,000	--	383,000[2]	16,968,000	$16,968,000	--	$383,000[2]
Enhancement of Commercial Fish	7,222,000	380,000	--	--	7,602,000	--	--	--
Enhancement of Fish and Wildlife	80,520,000	98,412,000	--	50,000	134,199,000	44,733,000	--	50,000
Mitigation	--	--	--	--	--	--	--	--
TOTALS	$699,541,000	$316,300,000	0	$14,872,000	$954,140,000	$61,701,000	$14,439,000	$433,000

[1] Interest during construction is not included in costs.

[2] Based on estimate included in Appendix F.

agency. In view of current administrative policy of placing more responsibility for the operation and maintenance of water resource projects in the hands of local authorities, it is intended that the State of Louisiana take responsibility for operation and maintenance of recreation developments and all other lands acquired for environmental management and general public access purposes, as included in this plan. Flood control features, and dredge and fill permits (Section 404 and Section 10) would remain under the control of the US Army Corps of Engineers. Federal real estate interests for recreational and environmental features of the plan would be administered through license and lease agreements with the state.

Lands of the Atchafalaya Basin are not part of a national forest system. However, further justification for exemption of the Atchafalaya Basin Floodway from cost-sharing requirements could be based on the basin's national environmental prominence as the largest forested wetland (river swamp) existing in the United States today that remains in a semi-natural state. The charge for preservation of this vast national resource, while maximizing public opportunity to observe and use its fish and wildlife resources, is clearly beyond the scope of traditional US Army Corps of Engineers' water resource development projects. The Governor of the State of Louisiana, in the state's Land Use Proposal, transmitted by letter 5 November 1980 to the District Engineer, recommended that "...management of non-flood control elements of the final Atchafalaya Basin plan should be through State of Louisiana agencies." This appears to more than satisfy previous legislative and executive intent for assuring local cooperation and participation in Federal flood control projects.

Under a cost-sharing arrangement, described in the preceding paragraphs, the Federal Government would bear a first cost of $999,903,000 and non-Federal interests a first cost of $15,938,000. Annual operation and maintenance costs of $14,439,000 associated with flood control would be borne by the Federal Government, while annual operation and maintenance costs of $433,000 for recreation and environmental protection and enhancement would be borne by non-Federal interests.

Final National Economic Development (NED) Plan

PLAN DESCRIPTION

This plan is comprised of a number of features which, when considered as a unit, provide for the lowest practicable project flood flowline. These features are discussed as follows:

70/30-Percent Distribution of Flows at Old River. This feature is identical to that described in the EQ plan description.

Modification of Existing Features, Where Required, to Pass the Project Flood. This component is similar to that described in the EQ plan, except that NED project features provide the lowest practicable project flowline and correspondingly lower grades for the East Atchafalaya Basin Protection Levee, the Atchafalaya River levees, the West Atchafalaya Basin Protection Levee, and the levees west of Berwick.

Bank Stabilization. Bank stabilization measures, such as articulated concrete mattresses and riprap placed above river mile 55.0 of the Atchafalaya River, would be required to control the meandering of the main channel to protect existing river levees (Plates 13-17).

Training Works on the Atchafalaya Basin Main Channel above Morgan City. This feature is identical to that described for the EQ plan.

Sediment Control. This feature is identical to that described for the EQ plan.

100/0-Percent Distribution of Outlet Flows. This feature provides for closing the Wax Lake Outlet to low and normal flows by constructing a rock weir at the head of Grand Lake, with connecting levees to the West Atchafalaya Basin Protection Levee. All low and normal flows would be conveyed to the gulf by the Lower Atchafalaya River. For flows exceeding a 10-year frequency, the low connecting levees would be overtopped so that floodflows could be safely conveyed to the gulf through Wax Lake Outlet.

Widening the Wax Lake Outlet Overbank. This component is identical to that described for the EQ plan.

Training Works Below Morgan City. This feature consists of training works below Morgan City on both Wax Lake Outlet and the Lower Atchafalaya River and closure of Bayou Shaffer. Implementation of the training works would require dredging about 15 miles of existing channel bottom areas and placing the dredged material in adjacent shallow water bottoms or on adjacent stream banks to simulate the formation of natural levees. Gaps would be left between disposal areas to allow for continued development of the overbank wetlands, for navigation access, and for pipelines (Plate 18).

Extension of Avoca Island Levee. This feature provides for a 14,000-foot extension of the Avoca Island levee for the purpose of continuing backwater flooding protection in the area east of the lower floodway. The length of time for which continuing protection is provided by this alternative is highly dependent upon the actual rate of development of the Atchafalaya delta. This extension would include

a structure or structures to divert sufficient freshwater to maintain the present distribution of nonfloodflows, estimated to be 4,000 cfs, to the marshes in west Terrebonne Parish. The structure(s) would necessarily be closed when the stage at Amelia, Louisiana, reached 3 feet to provide an acceptable level of damage reduction from Lower Atchafalaya River backwater flooding.

This solution provides an interim period of protection which would allow completion of studies of the Atchafalaya Bay-Terrebonne marsh-backwater complex. Following more detailed engineering and biologic studies, a decision would be made on implementing further extensions or other means to address flood problems in the backwater area.

Real Estate Interests. The real estate feature of the NED plan provides only for those interests needed for two basic functions: flood control and recreation development. Real estate interests for both flood control and recreation development were developed in specific response to study objectives cited by the authorizing congressional resolutions.

The NED plan provides a real estate feature that addresses only flood control and recreational development purposes, which are identical to these two purposes as described in the EQ plan.

For all real estate interests acquired for project purposes, mineral rights would be retained by the landowner. Other real estate interests would be acquired as necessary for implementation of other project features.

Recreational Development. This feature is identical to that described for the EQ plan.

Management Entity. The District Engineer would be the sole jurisdictional authority over flood control features of the plan, and recreational features would be operated and maintained by Louisiana State agencies under license agreements administered by the US Army Corps of Engineers. The District Engineer would continue to coordinate with other Federal agencies on collateral interests as required by Federal law and regulations.

COMPARISON OF DETAILED PLANS

Assessments of significant adverse and beneficial impacts for economic, social, cultural, and environmental values of the NED plan are shown in detail in Appendix B and in Sections 4 and 6 of the EIS.

The NED plan yields a 8.1 to 1 benefit-cost ratio for contributions to NED for nonflood control values, much higher than the

EQ and Recommended Plans. The flood control aspects of each plan considered in detail are a part of the overall MR&T Project and thus, are not subject to incremental evaluation.

This plan provides a negative contribution to all environmental quality national planning objectives but has only slight negative impacts on social well-being. It makes a positive contribution to regional development objectives.

The plan meets the specific planning objective to safely pass project floodflows, but because of the lower project flowline, it assumes that more environmental damages would occur than with the future without-project condition. It does not accomplish the natural environment objectives for retaining and restoring unique environmental features of the floodways or maintaining or enhancing productivity of existing natural resources.

Like the future without-project condition, this plan does not completely accomplish objectives for agricultural and mineral activities. Additionally, it does not accomplish the objective of maximizing delta formation. While the plan does not meet the specific goal of maximizing public access to the floodway, it does optimize public recreation facilities, thereby providing some additional opportunities for use of aquatic resources in the lower basin.

The NED plan's response to associated evaluation criteria would likely be unacceptable to environmental and commercial fishing interests, sport fishing clubs, and others who support habitat protection or enhancement in the floodway. It would, however, be more acceptable to agricultural and developmental interests in the lower floodway. The plan is complete and effective from the standpoint of project flood control protection.

For contributions to national planning objectives/accounts, this plan ranks first for the NED objectives and highest for the regional development objectives, but ranks lowest of the detailed plans considered for EQ and social well-being objectives.

MITIGATION REQUIREMENTS

Fish and Wildlife Habitat. Mitigation needs for the NED plan to replace loss of fish and wildlife habitat would arise due to the estimated loss of about 6,400 AHU's of bottomland hardwood and open land habitat, about 8,500 AHU's of flooded forest, about 3,000 AHU's of marshland habitat (If the entire Avoca Island levee extension was built, it would be necessary to replace 19,200 AHU's of marshland habitat.), and about 11,000 AHU's of swamp habitat.

The best method to mitigate for the loss of flooded forest habitat and about a third of the swamp habitat would be to build the Buffalo Cove management unit. (This assumes that building the unit would actually benefit aquatic resources.) This action would maintain the present water levels and thus, prevent clearing. At the present time, 23,910 acres of early successional bottomland hardwoods and 11,730 acres of cypress-tupelo are flooded yearly in Buffalo Cove. In the future with the NED plan, only 5,100 acres of early successional and 6,120 acres of cypress-tupelo forest would be flooded. Therefore, construction of the management unit would preserve flooding on 18,797 acres of early successional forest for a total of 5,075 AHU's preserved. Flooding would also be retained on 5,610 acres of cypress-tupelo forest for a total of 3,085 AHU's of flooded forest preserved. This flooding would also preserve about 4,000 AHU's of swamp habitat if it is assumed that a preservation credit of 1.0 for swampland could be saved by building the management unit. Thus, construction of the management unit would preserve a total of about 8,200 AHU's of flooded forest habitat and 4,000 AHU's of swamp habitat, which would mostly mitigate for the overall 8,500-AHU loss of flooded forest habitat. To mitigate for the remaining 7,100 AHU's of swamp habitat, it might be possible to build a water diversion structure that would direct sufficient Mississippi River water into existing swampland south of the river downstream from Donaldsonville, Louisiana, so that the habitat quality index of the swamps would be raised in a manner similar to that described for the future without-project plan. A structure similar to the one described below for marsh habitat mitigation would probably suffice. To mitigate for loss of 6,400 AHU's of bottomland forest/open land habitat it would be necessary to purchase and manage, as described for the future without-project condition, 16,800 acres of bottomland hardwood habitat. To mitigate for loss of 2,900 AHU's of marshland, it is proposed that management of marsh through freshwater introduction be carried out by diverting water from the Mississippi River into suitable areas adjacent to the river. Costs for these mitigation measures are shown in Table 6.

Cultural Resources. Responsibility to accomplish mitigation for losses of cultural resources is limited to National Register and Register-eligible properties subject to irreparable loss or destruction as the result of activities involving terrain alteration. The only existing project feature that has been subjected to an intensive cultural resources survey is the ongoing enlargement of the Atchafalaya Basin protection levees. Cultural resource mitigation requirements cannot be fully assessed until intensive cultural resource surveys of all features of the selected plans are completed. Mitigation requirements will then be determined for any cultural resources found eligible for inclusion in the National

TABLE 6

ESTIMATED MITIGATION COSTS FOR NED PLAN

Action	Total First Costs	Annual I&A[1/]	Annual O&M [2/]	Total Annual Costs
Purchase of 16,800 acres Bottomland Hardwood Forest	$13,144,000[3/]	$1,003,000	$25,000[4/]	$1,028,000
Freshwater Diversion (Swamp)	15,000,000	1,145,000	--	1,145,000
Freshwater Diversion (Marsh)	15,000,000[5/] (100,000,000)[6/]	1,145,000[5/] (7,630,000)[6/]	-- --	1,145,000[5/] (7,630,000)[6/]
Implement Buffalo Cove Management Unit	3,700,000[7/]	282,000	10,000	292,000
TOTAL	$46,844,000[5/] ($131,844,000)[6/]	$3,575,000[5/] ($10,060,000)[6/]	$35,000 ($35,000)	$3,610,000[5/] ($10,095,000)[6/]

[1/] Interest and Amortization - 7 5/8 percent for 100 years.

[2/] Operation and Maintenance.

[3/] Based on a unit land cost of $580 per acre, contingency cost of 25 percent, acquisition costs of $4,000 per tract for 110 tracts, development costs of $50 per acre, and total resettlement costs of $20,000.

[4/] Assumed to be $1.50 per acre.

[5/] Cost with first levee extension only.

[6/] Cost for entire levee extension.

[7/] Derived from data used in cost estimate preparation for the EQ plan.

Register that would be adversely affected by the project. Appendix E should be consulted for more information on this subject.

IMPLEMENTATION RESPONSIBILITY

Cost allocation and cost apportionment by project purpose for the NED plan are shown in Table 7. Under the President's cost-sharing policy, the non-Federal portion includes the costs of all lands, easements, rights-of-way, relocations, and a cash contribution of $98,747,000 toward total construction costs. All estimated operation and maintenance costs, except those attributed to mitigation, would be borne by non-Federal interests.

Under the traditional policy, non-Federal cash contribution of $8,991,000 toward construction costs of other features would be required, in addition to a portion of lands, easements, rights-of-way, and relocations. The operation and maintenance costs attributed to recreation would be borne non-Federal interests.

The study authority directs management and preservation of the basin's natural resources, including improvements for public recreational purposes, i.e., sport fishing, as well as commercial fishing potential. The users and those who benefit from such activities transcend state boundaries. As is the case of traditional cost-sharing for flood control, recreation costs should also be borne by the Federal Government. Thus, the Federal Government would be responsible for a total first cost of $936,006,000, with non-Federal cost of $1,875,000. Operation and maintenance costs for flood control of $14,673,000 would be borne by the Government while non-Federal interests would bear annual costs of $383,000 for recreation.

The Recommended Plan

PLAN DESCRIPTION

The Recommended Plan combines features of the Environmental Quality Plan with features of the National Economic Development Plan into a compatible mix that addresses both national economic development and environmental quality objectives. Rationale for differences between this plan and the Tentatively Selected Plan reviewed during the July 1981 public meetings is included under the descriptions of affected plan features for clarity. The Recommended Plan consists of the following:

70/30-Percent Distribution of Flows at Old River. The Old River control structure is presently operated so that approximately

TABLE 7

COST ALLOCATION AND COST APPORTIONMENT FOR THE FINAL NATIONAL ECONOMIC DEVELOPMENT PLAN

	President's Cost-Sharing Policy				Traditional Cost-Sharing Policy			
	FIRST COST[1/]		ANNUAL O&M		FIRST COST[1/]		ANNUAL O&M	
Purpose	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Flood Control	$653,011,000	$217,670,000	--	$14,638,000	$870,681,000	--	$14,638,000	--
Recreation	9,160,000	11,196,000	--	383,000[2/]	10,178,000	10,178,000	--	383,000[2/]
Enhancement of Commercial Fish	--	--	--	--	--	--	--	--
Enhancement of Fish and Wildlife	--	--	--	--	--	--	--	--
Mitigation	35,133,000	11,711,000	26,000	9,000	46,844,000	--	35,000	--
TOTALS	$697,304,000	$240,577,000	26,000	$15,030,000	$927,703,000	$10,178,000	$14,673,000	$383,000

[1/] Interest during construction is not included in costs; costs based on implementation of 14,000-foot extension of Avoca Island levee.

[2/] Based on estimate included in Appendix F.

30 percent of the combined flows of the Red and Mississippi Rivers above Old River, Louisiana, are distributed to the Atchafalaya River, and 70 percent are distributed to the Mississippi River below Old River. This flow distribution is maintained on an annual basis. Various interest groups expressed a desire for this distribution to be modified slightly during certain times of the year. For example, farmers in the Red River backwater area would be able to plant earlier during some years if flow into into the Atchafalaya River was reduced sooner in the months of May, June, and July so that stages would not rise above 45 feet at Acme, Louisiana. However, the US FWS would like flows increased during the same months in some drier years to benefit the fishery resources in the lower floodway.

Subsequent to the July 1981 public meetings, additional studies of a possible short term variation in the 70/30 flow division were completed. It was determined that even short term changes in the authorized flow division are unacceptable for both engineering and environmental reasons. The previous studies supporting authorization of Old River control structure as well as subsequent analyses of development of the Atchafalaya and Mississippi Rivers over the period from 1973 to the present have shown that it is necessary to maintain not less than 70 percent of the total annual volume of latitude flow in the Mississipi River channel below Old River. This is essential for insuring that the Mississippi does not change course to its Atchafalaya River distributary, the shorter route to the gulf. Day-to-day departures from the 70/30 distirbution are possible, but the margin for such operation is quite limited because it is impossible to predict for any given year the subsequent hydrograph of latitude flow in order to ascertain the ability to redress any volumetric imbalances created by such departures. From an engineering standpoint, flows through Old River control structure could be reduced earlier in some years during May, June, and July to maintain a stage of 45 feet at Acme, Louisiana, for agricultural interests in the Red River backwater area. However, it is not feasible to increase flows significantly into the Atchafalaya River in other years to benefit fishery interests in the lower floodway because this would promote instability of the Atchafalaya-Mississippi River system and enhance the possible capture of the Mississippi River by the Atchafalaya. Thus, if Atchafalaya River flows could not be substantially increased during some years to mitigate for the lower flows of previous years, then significant environmental losses would occur in both the Lower Atchafalaya Basin Floodway and in the Red River backwater area. Additionally, other environmental losses would be caused by holding 45 feet at Acme even if it were possible to increase flows to the Atchafalaya River during drier years. Losses from both sources, analyzed on a worst-case basis, are summarized as follows:

- Induced clearing of about 1,000 acres of bottomland hardwood forests in the backwater area.

• Pollution of aquatic habitats in the backwater area and lower floodway, corresponding to increased agricultural activity.

• Reduction by one-half or more in water exchange within existing aquatic habitat in the backwater area. This induced degradation of habitat would cause a corresponding reduction in economic benefits from commercial and sport fishing.

• Elimination by the year 2030, of overbank flooding in the lower floodway on about 77,000 acres of forest and swampland. Losses from resultant degradation of aquatic habitat under 2030 conditions, for a year when the 45-foot stage limitation would be in effect, are summarized as follows.

Species	Annual Pounds Lost
Buffalo	145,000
Catfish	280,000
Crawfish	2,100,000
Sunfish	38,000
Largemouth Bass	64,000

These losses to commercial fisheries would result in a net loss of income of about $810,000.

• Reduction in freshwater input to the Atchafalaya Bay-Terrebonne Parish marsh complex, decreasing the amount the nutrients and organic matter transported to the estuarine area. Corresponding reductions in economic benefits for commercial fishing (shrimp, oyster, and menhaden) would be expected to occur.

An analysis of economic benefits to be generated from increased agricultural production and associated damages prevented in the Red River backwater area by maintaining 45 feet at Acme in May, June, and July revealed benefits of about $1.4 million annually. (Detailed analyses of benefits and impacts are included in Appendix B.) However, about 50 percent of these benefits would come from lands within the backwater area where previously authorized ring levee systems are being planned--systems which would not cause environmental losses in the Lower Atchafalaya Basin Floodway.

In summary, measurable economic losses to resources in the lower floodway from short-term variations in operation of the Old River control structure would not equal estimated benefits to agricultural and related activities in the backwater area. However, it is readily apparent that total economic losses to all commercial fisheries, both freshwater and marine, the timber industry, and sport and recreational activities would be substantial. Moreover, mitigation measures needed to replace fishery losses would be highly significant. For these

reasons, and because of the engineering restraints concerning the variable operation of the Old River structure, no short term changes in the authorized operation of the structure are recommended. (The New Orleans District initiated the construction of an auxiliary control structure in July 1981. This control structure will serve to insure the integrity of the existing system. No changes in distribution of flows or in stages would be effected by its installation.)

Modification of Existing Features, Where Required, to Pass the Project Flood. The project flood flowline for the Recommended Plan would be somewhat higher than that achieved by implementing the National Economic Development Plan. Thus, the East Atchafalaya Basin Protection Levee, West Atchafalaya Basin Protection Levee, Atchafalaya River levees, and the levees west of Berwick would require raising to a higher grade. Other works would include: construction of service roads on levee crowns; modifying Bayou Sorrel, Bayou Boeuf and Berwick locks; modifying the Charenton and East Calumet floodgates; modifying the Wax Lake East and West drainage structures, modifying culverts in the East and West Bayou Sale levees; and modifying the Upper Pointe Coupee, Centerville, Ellerslie, Franklin and Enlargement, Gordy, Maryland, North Bend, Wax Lake East and West, Bayou Yokely and Enlargement, Morgan City and Tiger Island pumping plants; and such other miscellaneous modifications, as required, to pass the project flood.

Bank Stabilization. Bank stabilization measures, such as articulated concrete mattresses and riprap, would be required along the Atchafalaya River above river mile 55.0 to control the meandering of the main channel for protection of the river levees (Plates 13-17).

Training Works on the Atchafalaya Basin Main Channel Above Morgan City. For development of the main channel, training works would be implemented on the Atchafalaya River main channel to a height sufficient to confine average annual peak flows, approximately 450,000 cfs. This would require dredging approximately 29,000,000 cubic yards of material from 17.6 miles of channel, from river mile 116.0 to mile 90.0, and placing it on the banks within diked areas to simulate the development of natural ridges (Plate 6). The majority of the works would be below mile 94.0 and would be confining; that is, essentially no gaps would be left in the training works to allow overflow of the banks during low flows. Possible bank maintenance works may be required along the main channel in the future from mile 90.0 to mile 53.0 on the east bank and mile 55.0 on the west bank. However, because this work would be very minor in nature, it was not included in cost estimates or impact assessments.

Sediment Control. The sediment control component of the Recommended Plan would confine more sediment transport to the main channel by realining the four principal distributaries of the Atchafalaya River to provide optimum distributary channel entrance angles. These

distributaries are the Old Atchafalaya River, east freshwater distribution channel, the west access channel, and the east access channel (Plate 7).

70/30-Percent (with Possible Future Change to Approximately 80/20-Percent) Distribution of Outlet Flows. This feature would implement a control structure for initially maintaining the present distribution of low to normal flows at the outlets, with about 30 percent conveyed through Wax Lake Outlet, by constructing a rock weir and connecting levees at the head of Grand Lake. The outlet system would be monitored in the future and if the area's ecosystem responds favorably, then flow into Wax Lake Outlet may be further restricted by modification of the rock weir to limit the low to normal flows entering Wax Lake Outlet to approach 20 percent. In either case, for flows exceeding a 10-year frequency, the low-level levees above Wax Lake Outlet would be overtopped to allow for safe conveyance of floodflows to the gulf.

Widen Wax Lake Outlet Overbank. This feature would require the setting back of the west Wax Lake Outlet levee an average of approximately 3 miles to the location shown on Plate 9. The existing Wax Lake Outlet levee would be degraded to natural ground and a new West Calumet floodgate would be constructed.

Training Works Below Morgan City. This feature of the Recommended Plan would implement channel training works below Morgan City on both Wax Lake Outlet and the Lower Atchafalaya River and close Bayou Shaffer. The training works would require dredging about 15 miles of existing channel bottom areas and placing the dredged material on adjacent shallow water bottoms or banks. Gaps would be left between disposal sites to allow for continued development of the overbank wetlands, navigation access, and for pipelines (Plate 18). The pumped material would be allowed to spread freely to the angle of repose, estimated to be 1 vertical on 40 horizontal. The elevation of the placed material would be limited to a height sufficient to confine average annual peak flows, an approximate average depth of 3 feet. This would result in an irregular series of relatively low mounds of dredged material, roughly parallel to the channels, which would simulate the formation of natural levees.

Extension of Avoca Island Levee. For this plan feature, implementation of further extension of the Avoca Island levee and/or other structural and nonstsructural measures associated with reductions in backwater flooding east of the lower floodway would be delayed until completion of additional studies defining the engineering and biological impacts of the proposed flood control features of the project on the Atchafalaya Bay-Terrebonne marsh-backwater area complex.

At the time of public release of the draft report, the proposed extension of the Avoca Island levee was determined to be the only

viable alternative for maintaining an equivalent amount of flooding over the entire area of backwater influence east of the Lower Atchafalaya Basin Floodway to generally the level of flooding experienced in that area during the 1945 flood, the protection criterion that the existing levee was provided to meet. The amount of flooding from backwater is dependent on the volume of floodflows conveyed through the floodway system as influenced by the flood control features and the natural alluvial riverine processes at work in the basin. The level of flooding from backwater is directly related to the water level or stage in the Lower Atchafalaya River at the end of the Avoca Island levee. The further development of the delta in Atchafalaya Bay will result in elongation of the river's course and thereby raise the stage at the end of the existing levee for a given discharge. Thus, if the existing levee is not extended, flooding caused by backwater influences on the area east of the floodway will become more frequent and to greater depths in relation to the rate of delta development over time. For this reason, a 14,000-foot extension of the Avoca Island levee was proposed as the Tentatively Selected Plan in the draft report of 22 June 1981 as an interim measure. This extension was to provide continued protection of the backwater area.

Because of the dynamic state of development of the delta and the environmental vulnerability of the marsh in the vicinity of the Avoca Island levee, substantial public opposition to extending the levee was expressed during the recent public review of the draft report. Review comments underscored both the environmental values of the Terrebonne marsh to the east of the proposed levee extension and uncertainty concerning potential impacts of the proposed work.

Since the public meetings, the multiple effects of all other proposed flood control features of the plan, but excluding the extensions of Avoca Island levee, have been investigated. The plan feature for widening the Wax Lake Outlet overbank would redistribute flow through the outlets for floods with the probability of occurring less frequently than once in 10 years, and thereby provide for reductions of stages in the Atchafalaya River. Such reductions for the more severe floods serve to reduce backwater flooding in the area east of the floodway.

As described in the draft report, the Avoca Island levee extension is a time-phased construction with the need for adding subsequent extensions directly related to future rises in the project flood flowline. This, in turn, is dependent on conveyance capacity in the Lower Atchafalaya River and accompanying delta development in Atchafalaya Bay.

During the study period to date, a large base of hydraulic and hydrologic engineering data has been generated relative to the analysis and selection of alternatives for improving the conveyance

capacity and efficiency of the floodway proper without undue environmental degradation. However, this data base was developed within acceptable confidence limits at the expense of precisely defining all associated hydraulic, hydrologic, and biologic parameters in the Atchafalaya Basin outside of the floodway.

Present engineering studies are not of sufficient scope to accurately determine the length of levee extension required to protect the area east of the floodway with the proposed flood control features in place. Ongoing model studies of delta growth will provide a more reliable basis for making this determination. In addition, further studies are needed for determining changes in subsidence, flow patterns, salinity regimes, and sediment transport within the Terrebonne marshes for the proper assessment of biological and environmental impacts. These studies can be accomplished concurrently with the ongoing model studies.

In summary, further extension of the Avoca Island levee is the only alternative which would provide protection over the entire area of backwater influence east of the floodway. However, more precise engineering and biological parameters must be determined to provide a better understanding of the impacts the recommended flood control features would have on the complex, dynamic, and delicate ecosystem of the bay-marsh complex before implementation of further extensions of the levee and/or other structural or nonstructural features associated with backwater protection. The needed studies would be completed by 1985.

Recreational Development. This feature of the Recommended Plan consists of three developed and seven primitive campgrounds, one interpretative facility, boat-launching ramps, and other facilities complementary to outdoor recreational activities. These facilities would be located in the proximity of the Lower Atchafalaya Basin Floodway on a total of 1,500 acres to be acquired in fee title (owner retains mineral rights). Details of recreation needs and development proposed are contained in Appendix F.

Management Units. Thirteen management units (Figure 6) were studied to determine their feasibility for restoring historical overflow conditions to benefit the aquatic ecosystem. The studies to date indicate that five units--Buffalo Cove, Henderson, Beau Bayou, Flat Lake, and Cocodrie Swamp--have the greatest potential for accomplishing that goal. For this reason, these five were specifically included in evaluation of the Recommended Plan and the costs, benefits, and impacts were developed for detailed plan comparison purposes. The Buffalo Cove and Henderson units would be implemented as pilot units in accordance with plans developed in conjunction with representatives of the US FWS, US EPA, and appropriate state agencies. Subsequent to construction, the operation of these units would be closely monitored and an evaluation of their performance made by representatives of the

cooperating agencies, using criteria devised by that group, concerning the pilot units' effectiveness in enhancing the aquatic environment. Based on that group's evaluation and recommendations, requests for funding to implement other units would be made. Prior to that time, it is not possible to determine how many additional units are feasible for implementation from both an engineering and environmental standpoint. Development of management units would require the restriction of natural outlets by construction of weirs and, in some cases, low-level levees (see Plate 11). Construction of new inlets at the upper end of the units would also be necessary, as well as the closure of certain bayous and canals and the improvement of circulation within the units. Rollovers to provide for small boat access would be installed at certain bayou and canal closures.

Freshwater Structures. This feature proposes the implementation of the Courtableau and Sherburne freshwater diversion structures to provide water inflow from the Atchafalaya River to the Henderson Lake and Alabama Bayou areas, respectively. The Courtableau freshwater diversion structure would be relocated to the vicinity of Bayou Graw at river mile 45.0 to serve as an inlet for the Henderson Lake area. It would consist of gated box culverts designed to convey a maximum of 3,000 cfs through the west Atchafalaya River levee. The initially proposed Bayou Courtableau site was changed in response to comments received during public review of the draft report. Studies completed since August 1981 indicated than an alternate site near Bayou Graw is more feasible and the Bayou Courtableau and Indian Bayou sites were eliminated from further consideration. Advanced planning and design will determine the exact location of the structure and insure that the freshwater diversion does not increase flooding on existing developed land or farmland, nor cause a deterioration of water quality in the presently impounded reach of lower Bayou Courtableau.

The Sherburne freshwater diversion structure, which also includes gated culverts of 3,000 cfs capacity, would be located in the east Atchafalaya River levee at mile 43.

Real Estate Interests. The real estate feature of the Recommended Plan provides for those interests needed to serve three basic functions: flood control, environmental protection, and public access. Real estate interests for both flood control and environmental purposes were developed in specific response to study objectives cited by the authorizing congressional resolutions. The public access function is ancillary to the proposed environmental features of the project, with the citizens of the State of Louisiana being the primary beneficiaries. The state expressed the view that public access in addition to the current state-owned lands (approximately 150,000 acres) was desirable. For this reason, the public access interests proposed in the Tentatively Selected Plan of the draft report were developed in accordance with the recommendations of the Governor.

During the public meetings of July 1981, general opposition was expressed to the greenbelt portion of the plan by landowners and hunters, while the greenbelts were generally favored by environmental interests. Additionally, landowners voiced opposition to the public access easements and originated an alternate proposition whereby the state would be offered certain lands for acquisition on a "willing seller" basis. These lands plus those included in an impending donation to the state by the Dow Chemical Company were proposed as a substitute for the public access easements cited in the draft report. The comprehensive multipurpose easements proposed for flood control and environmental protection over the entire Lower Atchafalaya Basin Floodway were generally supported by both landowners and environmental groups and remained as part of the landowners' alternative proposal.

Subsequent to the July meetings, a compromise proposal for public access was developed through the cooperative efforts of major opposing interests. Prominent national and local environmental organizations worked with representatives of the landowners and the state toward this end. A key element of the new proposal which makes it acceptable to the environmental community is a recommended tightening of provisions of the comprehensive multipurpose easement to prohibit land-use conversion. A key issue resolved by the new proposal is the elimination of the "greenbelts" included under the prior public access proposal. The details of the new alternative for public access were announced by Governor David C. Treen during a press conference on 19 November 1981, as a substitute for the public access provisions he had recommended in November 1980 and which were adopted in the draft report.

The Recommended Plan provides a real estate feature which addresses both flood control and environmental protection purposes as follows:

- Flood Control. The Flood Control Act of 1936 authorized the US Army Corps of Engineers to acquire certain flowage rights in the Lower Atchafalaya Basin. The Act further specified: "That no flowage easements shall be paid for by the United States over properties subject to frequent overflow in the Atchafalaya Basin below the approximate latitude of Krotz Springs." It was determined that about 68,000 acres in the Lower Atchafalaya Basin Floodway were subject to purchase of flowage easements under this Act. To date, those easements have been obtained on about 9,000 acres. The Recommended Plan proposes the purchase of flowage rights on the remaining 59,000 acres. In addition, the right to prohibit the construction of new permanently habitable structures and to prohibit or regulate construction of other structures, including camps, would be acquired over privately-owned land (approximately 367,000 acres) in the lower basin, except for the developed ridges. The need for developmental

control is associated with operation of the floodway. This right would assure the lower floodway's readiness for operation on short notice, preclude the need for Corps of Engineers' emergency flood-fighting operations and associated Federal expenses within the basin, and insure no liability on the part of the Federal Government for the public health, safety and welfare by controlling industrial development that could prove hazardous to the public during floodway operations. These developmental control rights would also serve to preserve the environmental values of the basin, but are considered essential elements of a flood control easement which would provide for the continued unrestricted use of the lower floodway for flood control purposes.

• Environmental Protection. Real estate interests recommended for protection of environmental values in the lower basin were developed in response to general study goals of the authorizing congressional resolutions and specific study objectives as defined by the Agency Management Group, i.e., to "retain and restore the unique environmental features of the floodways and maintain or enhance the long-range productivity of the wetlands and woodlands." In addition to those rights needed for flood control, the Recomended Plan proposes other rights specifically for environmental protection. These rights are considered necessary for preservation of fish and wildlife habitat and maintaining the "wet and wild" environmental appeal of the lower floodway. Such rights would include control over all excavation and landfill operations and allow for extension of the time and duration of flooding by natural or artificial means. These rights would prevent or delay potential degradation of existing flowage patterns, prevent destruction of habitat, and provide for water level control under the proposed management unit concept. Additional environmental rights would prohibit the conversion of land to other uses and provide control over the method of cutting timber. The proposed land conversion control is directed at preventing destruction of fish and wildlife habitat, i.e., clearing of forests for the purpose of agricultural production of soybeans or other higher value economic pursuits, such as industrial development. Control over timber is also aimed at preserving habitat as well as maintaining the lower basin's environmental appeal by controlling clearcutting and promoting sustained yield forestry practices. A comprehensive multipurpose easement, or higher interest, if mutually agreed upon, containing the cited environmental interests would be acquired over 367,000 acres of privately-owned land in the lower basin, except for the developed ridges.

• Public Access. The public access function was subdivided into two basic categories that relate to separate features of the proposed plan. The first, recreation development, was

formulated in response to the study authorizing resolutions. The second, general public access, was developed in response to the Agency Management Group's objective to "maximize public opportunity to observe and utilize the fish and wildlife resources of the floodway" and is based on the substitute proposal of the Governor of the State of Louisiana, as announced in his press conference during November 1981.

For the recreational development feature, a total of 1,500 acres would be acquired in fee simple title in the proximity of the lower floodway to provide for the development of destination-type and primitive campsites, boat-launching ramps, and other facilities complementary to outdoor recreational activities. Included would be a limited number of day-use or picnicking sites and 200 to 500 acres set aside for special and unique areas, such as rookeries.

The general public access feature would be accomplished on the 150,000 acres of existing state-owned lands and by the following additional state-managed lands. At least 30,000 acres have been recently made available for public access within the Lower Atchafalaya Basin Floodway through a donation to the State by the Dow Chemical Company. The donation consisted of lands, located in or near the lower floodway, in excess of 40,000 acres. At least 48,000 additional acres would be made available for public access within the floodway by fee title acquisition of lands from owners identified by the state as "willing sellers." Federal cost participation with the State will be recommended for the fee lands yet to be procured, in an amount equivalent to that proposed in the draft plan for full Federal acquisition of public access and timber easement rights. These proposed public access lands are associated with the environmental goal of maintaining or enhancing productivity of the habitat, i.e., allowing the management of timber for fish and wildlife habitat improvement, as well as preserving existing esthetic values to benefit the public access user.

For all new real estate interests acquired for project purposes, mineral rights would be retained by the landowner. Other real estate interests would be acquired as necessary for implementation of project flood control features and are included in engineering cost estimates in Appendix C.

Canal Closures and Circulation Improvements. This feature proposes the closing of certain canals that permit sediment-laden waters to enter backswamp areas, as well as the selective opening of dredged material banks and other impediments to circulation for improving water circulation patterns throughout the lower floodway.

Management Entity. The District Engineer would be the sole jurisdictional authority to protect and oversee Federal interests in

the Atchafalaya Basin Floodway system upon implementation of the recommended comprehensive multipurpose plan. Recreation and environmental features of the plan would be operated and maintained by the appropriate Louisiana State agencies under license, lease, or other agreements administered by the US Army Corps of Engineers. The District Engineer would continue to coordinate with other Federal agencies on special studies and collateral interests as required by Federal law and US Army Corps of Engineers' regulations.

COMPARISON OF DETAILED PLANS

Assessments of significant adverse and beneficial impacts for economic, social, cultural, and environmental values of the Recommended Plan are shown in detail in Appendix B and in Sections 4 and 6 of the EIS.

When all nonflood control features are jointly evaluated, the Recommended Plan yields a 1.01 to 1 overall benefit-cost ratio for contributions to national economic development for nonflood control values, which is about equal to the Environmental Quality Plan but much lower than the National Economic Development Plan. The flood control aspects of the plan are not subject to incremental evaluation because they are part of the MR&T Project.

When the nonflood control features of the plan are evaluated by separating the recreation development features from all other nonflood control features, the benefit-cost ratio for recreation development is 8.5 to 1 and the benefit-cost ratio for all other nonflood control features is 0.13 to 1. Despite their excess in costs over tangible NED benefits, the other nonflood control features are considered to be justified and are included in the Recommended Plan because of the many intangible environmental benefits provided.

Because of alternative plan features selected, the plan makes a highly positive contribution to all national environmental quality objectives, a net positive contribution to social well-being, but no net appreciable contribution to regional development objectives.

For the specific planning objectives of safe flood control in an environmentally sound manner, and protection and enhancement of the natural environment, this plan accomplishes these objectives essentially the same as the Environmental Quality Plan. All other specific planning objectives are met in the same manner as was possible to accomplish by the Environmental Quality Plan.

The Recommended Plan's response to associated evaluation criteria will be the most acceptable to basin landowners, environmentalists, commercial fishing interests in Terrebonne Parish, and fishing clubs, commercial fishermen, hunters, and trappers in the floodway.

The geographic scope of this plan is national in nature, and it is reversible to a moderate degree, whereas the NED plan would be irreversible like the future without-project condition.

For contributions to national planning objectives/accounts, the Recommended Plan ranks third to the National Economic Development Plan for achieving national economic development objectives, second to the Environmental Quality Plan for environmental quality objectives, first for social well-being, and second for regional development objectives. This plan offers the best overall balance, of all detailed plans considered, toward meeting the national economic objectives and environmental quality accounts.

MITIGATION REQUIREMENTS

No mitigation would be required by implementing this plan. Mitigation needs for the Recommended Plan would arise because of the estimated loss of 200 AHU's of marsh habitat. However, since implementation of this plan would result in a net gain of over 40,000 AHU's of bottomland hardwood/open land habitat and almost 3,000 AHU's of swamp habitat, it was assumed that these gains would more than offset the small loss of marsh habitat.

Cultural Resources. Losses of cultural resources associated with the Recommended Plan would be mitigated in the same manner described in the National Economic Development Plan.

IMPLEMENTATION RESPONSIBILITY

Cost allocation and cost apportionment by project purpose for the Recommended Plan are shown in Table 8. Under the President's cost-sharing policy, the non-Federal portion includes the costs of all lands, easements, rights-of-way, and relocations, and a cash contribution of $100,999,000 toward total construction costs. All estimated operation and maintenance costs would be borne by non-Federal interests.

Under the traditional cost-sharing policy, all flood control costs are borne by the Federal Government. No non-Federal cash contribution toward construction costs of other features would be required, in addition to a portion of lands, easements, rights-of-way, and relocations. Operation and maintenance costs attributed to recreation and management and enhancement of environmental resources would be borne by non-Federal interests.

TABLE 8

COST ALLOCATION AND COST APPORTIONMENT FOR THE RECOMMENDED PLAN

Purpose	President's Cost-Sharing Policy				Traditional Cost-Sharing Policy			
	FIRST COST[1/]		ANNUAL O&M		FIRST COST[1/]		ANNUAL O&M	
	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal	Federal	Non-Federal
Flood Control	$575,920,000	$191,973,000	--	$15,606,000	$767,893,000	--	$15,606,000	--
Recreation	17,824,000	21,786,000	--	383,000[2/]	19,805,000	19,805,000	--	383,000[2/]
Enhancement of Commercial Fish	7,222,000	380,000	--	--	7,602,000	--	--	--
Enhancement of Fish and Wildlife	77,805,000	95,096,000	--	50,000	129,676,000	43,225,000	--	50,000
Mitigation	--	--	--	--	--	--	--	--
TOTALS	$678,771,000	$309,235,000	--	$16,039,000	$924,976,000	$63,030,000	$15,606,000	$433,000

[1/] Interest during construction is not included in costs.

[2/] Based on estimate included in Appendix F.

The rationale presented for the implementation responsibility for the Environmental Quality Plan is equally applicable to this plan, based on the selection of alternative features common to both plans. Because this project goes far beyond the scope of a local project in all aspects, particularly its national environmental prominence as the largest forested wetland (river swamp) existing in the United States in a semi-natural state, and the congressional mandate to develop "...a comprehensive plan for the management and preservation of water and related land resources of the Atchafalaya Basin, Louisiana...", the first cost of $936,797,000 for the project should be borne by the Federal Government with non-Federal interests bearing a cost of $51,209,000. Table 9 shows cost allocation of the nonstructural real estate feature of the Recommended Plan versus what was proposed in the Tentatively Selected Plan. It should be noted that total non-Federal costs increased from 9 percent to 27 percent, and even though the Recommended Plan total cost increased by over $19 million, the total Federal cost decreased by over $16 million. The annual Federal cost for operations and maintenance of flood control features would be $15,606,000, while non-Federal interests would be responsible for operations and maintenance of recreation facilities and management of environmental resources for fish and wildlife enhancement at an estimated annual cost of $433,000.

TABLE 9

COST ALLOCATION OF NONSTRUCTURAL REAL ESTATE FEATURE
(1 October 1981 Price Levels)

	Tentatively Selected Plan			Recommended Plan		
	Total	Federal	Non-Federal	Total	Federal	Non-Federal
Flood Control	$ 21,510,000	$ 19,635,000	$ 1,875,000[1/]	$19,732,000	$17,857,000	$ 1,875,000[1/]
Environmental	114,866,000	100,803,000	14,063,000[1/]	100,538,000	86,475,000	14,063,000[1/]
Public Access	31,422,000	31,422,000	--	66,693,000	31,422,000	35,271,000[2/]
Recreation	874,000	874,000	--	874,000	874,000	--
Total	$168,672,000	$152,734,000	$15,938,000	$187,837,000	$136,628,000	$51,209,000
Percent of Total	100	91	9	100	73	27

[1/] Credit for cost over 150,000 acres of state land.

[2/] Credit for Dow Chemical Company donation to State of 30,000 acres. = $19,153,000

Cost of "willing seller" fee purchase land of 48,000 acres ($47,540,000) in excess of TS plan public access cost ($31,422,000). = $16,118,000

$35,271,000

COMPARISON OF FINAL PLANS

Comparative information on the final plans and future without-project condition (FWO), along with the rationale for the final plans for environmental quality, national economic development, and the Recommended Plan, are presented in detail in Appendix B, in the table entitled Summary Comparison of Alternative Plans. That table provides a comparison of all significant beneficial and adverse impacts of the final alternative plans that were used for the purpose of trade-off analyses and decision making. The table also describes major features of each alternative plan, displays plan response to planning objectives, and presents each plan's performance against specified evaluation criteria, as was summarized for each final detailed plan in the previous section of this report.

Comparison of Final Plans

All of the final detailed plans are structural plans. Even the no-action or future without-project plan assumes the continuation of structural works in the form of the Atchafalaya Basin protection levees. This is necessary because of the floodway's prominence in safely passing the project flood via the Mississippi River and its floodway systems.

The detailed plans do not contribute to water conservation for the purpose of beneficial reductions in water uses or water losses. The plans considered in detail do not provide practicable opportunities for water conservation in this sense.

Flood control features were considered to fall under the overall MR&T project benefit-cost ratio and consequently were not incrementally evaluated. The nonflood control aspects, when jointly evaluated, were economically justified for all plans. Of the total nonflood control benefits, a minimum of 89 percent would accrue to the proposed construction of recreation facilities. The other environmental features, while providing only limited economic benefits, were considered justified on the basis of their intangible benefits and contributions to the study goal of environmental protection. A detailed comparison of overall versus incremental evaluation of nonflood control features is presented in Appendix B.

Rationale for Designation of Final EQ Plan

Contributions to environmental quality are favorable changes in the ecological, cultural, and esthetic attributes of natural and cultural resources that sustain and enrich human life (US Water Resources Council, 1980). Most features of the Environmental Quality Plan would contribute toward this definition of environmental quality, as well as meet the overriding criteria of safely passing the project flood through the Atchafalaya Basin to the Gulf of Mexico. Thus, it was designated the EQ plan. The following paragraphs explain how these contributions would occur for each of the plan features which yield a significant environmental quality contribution. Features that were included in the Recommended Plan are so noted.

SEDIMENT CONTROL BY DISTRIBUTARY REALINEMENTS

This feature would contribute to flood control, along with the preservation of both natural and cultural resources, by slowing the rate at which the Lower Atchafalaya Basin Floodway is filling with sediment. This process of sedimentation is destroying wetlands and open water bodies within the floodway, and this not only reduces aquatic productivity, but lowers esthetic values and compounds the loss of cultural resource sites. This feature was included in the Recommended Plan.

MANAGEMENT UNITS

This feature would contribute to preservation of aquatic natural resources by restoring, to the degree practicable, historical water conditions within the environmentally and hydrologically distinct areas of the lower floodway. Restoration of water levels in some areas would benefit local residents and recreationists that depend upon the aquatic productivity of these resources for their livelihood or enjoyment. This feature was included in the Recommended Plan.

FRESHWATER DIVERSION STRUCTURES

These structures would generally provide the same contribution toward environmental quality objectives as would management units, because they would help preserve and improve aquatic natural resources and productivity. This feature was included in the Recommended Plan.

CANAL CLOSURES AND CIRCULATION IMPROVEMENTS

These would contribute to improvements in the aquatic environment by helping to prevent introduction of sediment into productive wetland and open water areas and by alleviating water quality problems attributed to poor water circulation in swampland areas. These improvements would, in turn, benefit local residents and recreationists who depend upon aquatic productivity either for livelihood or enjoyment. This feature was included in the Recommended Plan.

REAL ESTATE INTERESTS

Comprehensive multipurpose easements would undoubtedly be the most valuable feature of the EQ plan in terms of contributing to environmental quality objectives. These easements, by prohibiting land conversion in the floodway, controlling the method of cutting timber, and controlling excavation and landfill operations, would preserve much of the ecological productivity of the area on which local residents and recreationists depend, as well as preserve many of the esthetic attributes that make the basin unique. Public access and timber easements would allow enhancement of habitat productivity, and increase opportunities for public use and enjoyment of the environmental values of the floodway. For the Recommended Plan, state-owned lands would be substituted for public access and timber easements. The developmental controls to be obtained for flood control purposes would serve to protect environmental values of the lower floodway for both the EQ and Recommended Plans.

RECREATIONAL DEVELOPMENT

These features would contribute to an enrichment of human life by increasing public accessibility to, opportunity for, and enjoyment of the natural and cultural resources of the lower floodway. This feature was included in the Recommended Plan.

DISTRIBUTION OF OUTLET FLOWS: 70/30 LOWER ATCHAFALAYA RIVER/WAX LAKE OUTLET

This feature, to retain present distribution of outlet flows, would contribute to environmental quality by helping maintain the existing ecological trends in the bays south of the project-affected area.

INCREASE SEDIMENT DIVERSION AT WAX LAKE OUTLET

This feature is intended to increase delta development at the mouth of Wax Lake Outlet, which would contribute to environmental quality by increasing the formation of undisturbed marshland in Atchafalaya Bay. Little marshland is presently forming at this location and marshland formation at the mouth of the Lower Atchafalaya River is hampered by the necessity to maintain a navigation channel through the developing delta.

WIDENING WAX LAKE OUTLET OVERBANK AREA

This feature would greatly improve the ecological conditions of the overbank area by restoring river overflows and tidal influence to swamps and marshes in the overbank area. This feature was included in the Recommended Plan.

ALTERNATIVES TO REDUCE BACKWATER FLOODING EAST OF THE FLOODWAY

For this plan feature, implementation of further extension of the Avoca Island levee and/or other structural and nonstructural measures associated with reductions in the backwater flooding east of the lower floodway would be delayed until completion of additional studies defining the engineering and biological impacts of the proposed flood control features of the project on the Atchafalaya Bay-Terrebonne marsh-backwater area complex.

Alternatives to the 14,000-foot extension of the Avoca Island levee proposed in the draft report for the EQ plan feature included: the phased extension of the levee to a total length of 19.6 miles along the bayshore alinement (Plate 10); and, the 28-ring levee plan to protect the larger industrial developments and residential areas, with residences outside the levees to be protected by flood-proofing measures. Further extension of the levee was selected for the Tentatively Selected Plan because it is the only alternative considered in detail that reduces flood damages for the entire area affected by backwater flooding, i.e., regional protection. Additionally, of the feasible alternatives, the levee extension had the lowest estimated annual costs, including operations and maintenance.

The amount of flooding from backwater is dependent on the volume of floodflows conveyed through the floodway system as influenced by the flood control features and the natural alluvial riverine processes at work in the basin. Backwater stages will continue to rise in the future because of the continuing delta development, and its

accompanying river elongation. Thus, the need for regional protection of the area from backwater influences will continue to become more acute. While the 28-ring levee plan would provide complete protection from headwater, tidal, and backwater influences within the selected leveed areas (see Plates 23-25), this plan would leave the majority of the area unprotected in the face of ever-worsening backwater conditions. This would result in substantial residual backwater damages in the future. Additionally, the construction rights-of-way for the proposed ring levee alinements would require the relocation of about 1,900 existing residential, commercial, and public structures located along bayous or in other physically restricted levee construction areas. Further, all structures located outside of the ring levees would require raising, flood-proofing, or removal for prevention of flood damages. Finally, evacuation and transportation routes, most existing farmland, and other facilities outside of the rings would be subjected to the ever-increasing backwater flood stages.

Because of the dynamic state of development of the delta and the environmental vulnerability of the marsh in the vicinity of the Avoca Island levee, substantial public opposition to extending the levee was expressed during the recent public review of the draft report. Review comments underscored both the environmental values of the Terrebonne marsh to the east of the proposed levee extension and uncertainty concerning potential impacts of the proposed work.

Since the public meetings, the multiple effects of all other proposed flood control features of the plan, but excluding the extensions of Avoca Island levee, have been investigated. The plan feature for widening the Wax Lake Outlet overbank would redistribute flow through the outlets for floods with the probability of occurring less frequently than once in 10 years, and thereby provide for reductions of stages in the Atchafalaya River. Such reductions for the more severe floods serve to reduce backwater flooding in the area east of the floodway.

As described in the draft report, the Avoca Island levee extension is a time-phased construction with the need for adding subsequent extensions directly related to future rises in the project flood flowline. This, in turn, is dependent on conveyance capacity in the Lower Atchafalaya River and accompanying delta development in Atchafalaya Bay.

During the study period to date, a large base of hydraulic and hydrologic engineering data has been generated relative to the analysis and selection of alternatives for improving the conveyance capacity and efficiency of the floodway proper without undue environmental degradation. However, this data base was developed within acceptable confidence limits at the expense of precisely defining all associated hydraulic, hydrologic, and biologic parameters in the Atchafalaya Basin outside the floodway.

Present engineering studies are not of sufficient scope to accurately determine the length of levee extension required to protect the area east of the floodway with the proposed flood control features in place. Ongoing model studies of delta growth will provide a more reliable basis for making this determination. In addition, further studies are needed for determining changes in subsidence, flow patterns, salinity regimes, and sediment transport within the Terrebonne marshes for the proper assessment of biological and environmental impacts. These studies can be accomplished concurrently with the ongoing model studies.

In summary, further extension of the Avoca Island levee is the only alternative which would provide protection over the entire area of backwater influence east of the floodway. However, more precise engineering and biological parameters must be determined to provide a better understanding of the impacts the recommended flood control features would have on the complex, dynamic, and delicate ecosystem of the bay-marsh complex before implementation of further extensions of the levee and/or other structural or nonstructural features associated with backwater protection. The needed studies would be completed by 1985.

This feature was included in the Recommended Plan.

Rationale for Designation of Final NED Plan

This plan, like the other detailed plans, was developed with the overriding criteria to safely pass the project flood through the Atchafalaya Basin to the Gulf of Mexico. In addition to meeting this criteria, the NED plan specifically attempted to maximize contributions to the NED account for recreation and fish and wildlife resource enhancement, as well as agricultural enhancement. As a result, the plan was comprised of features that would meet these objectives and yet be implementable in terms of the economic, political, social, and environmental systems operating in the area.

Contributions to NED are explained in the following paragraphs for those plan features having a significiant NED contribution. Features that were included in the Recommended Plan are so noted.

TRAINING WORKS BELOW MORGAN CITY

This feature would contribute to a lowering of the flowline in the Lower Atchafalaya Basin Floodway, thereby reducing overbank

sedimentation and construction costs of other flood control features. This feature was included in the Recommended Plan.

CHANNEL ALINEMENT OF THE AVOCA ISLAND LEVEE

Rationale presented under the EQ plan for the 14,000-foot extension is equally applicable to the NED plan. Additionally, extension of the Avoca Island levee would enhance agricultural potential in the backwater area east of the lower floodway by preventing future rises in backwater flood stages. Selection of the shorter river channel alinement of the Avoca Island levee for this plan was based on its substantially lower construction costs compared to the alternative alinement along the shoreline (Plate 10).

RECREATIONAL DEVELOPMENT

This feature was included because it would generate positive net benefits attributable to the NED account. This feature is common to both the EQ and Recommended Plans.

100/0-PERCENT DISTRIBUTION OF OUTLET FLOWS

The distribution of outlet flows with no flow through Wax Lake Outlet would increase the total flow capacity of the outlets, resulting in a lower project flood flowline and thus, lower construction costs for other flood control features.

REAL ESTATE INTERESTS

Acquisition of easements for purposes other than flood control would not be required, since they would not make positive contributions to the NED account. Acquisition of 1,500 acres of fee land would be required for development of proposed recreation facilities.

Rationale for the Recommended Plan

As with the other plans, this plan meets the overriding criteria of safely conveying the project flood to the gulf. In addition to meeting this criteria, the Recommended Plan offers balance with respect to contributions to both the national economic development and environmental quality accounts. Thus, it would contribute to NED and EQ while being implementable in terms of the economic, political, social, and environmental systems operating in the study area (Plate 19).

Rationale for changes in the individual plan features from those proposed in the draft plan was included in the plan description under Assessment and Evaluation of Final Plans. Contributions to the environmental quality and national economic development accounts are identical to the features of those plans which are common to the final Recommended Plan, and are so noted under rationale for individual plan features of the Environmental Quality and National Economic Development Plans.

Table 10 contains a summary of costs, authorization status, and purpose of major features of the Recommended Plan.

TABLE 10

COSTS, AUTHORIZATION STATUS, AND PURPOSE OF FEATURES

RECOMMENDED PLAN
ATCHAFALAYA BASIN STUDY

Feature	Cost	Requires Congressional Authorization		Purpose				Remarks
		Yes	No	Flood Control	Environmental Quality	Public Access	Recreation	
Old River Control Structure, maintain present operation	No additional		X	X				
Modification of features to pass the project flood	$446,681,000		X	X				
Bank stabilization	$104,950,000		X	X				
Main channel development[1/]	$64,100,000		X	X				
Sediment control	$31,100,000		X	X				
Management Units	$23,730,000	X			X			
Real Estate Interests								REAL ESTATE: The Recommended Plan includes comprehensive multipurpose easements over 367,000 acres in the Lower Atchafalaya Basin Floodway, excluding developed ridges. In addition, public access rights would be provided in the lower floodway by the State of Louisiana on: 150,000 acres of existing state lands; more than 30,000 acres donated to the state by Dow Chemical Company; and by the fee title purchase of approximately 50,000 acres of lands identified by the state, with Federal cost participation.
Flood Control								
Development Control	$13,781,000	X		X				
Overflow Rights	$5,951,000		X	X				
Environmental	$100,538,000	X			X			
Access	$66,693,000	X				X	X	
Fee (Recreation)	$874,000	X				X	X	
Wax Lake Outlet overbank enlargement (8,000 acres)	$90,500,000		X	X				COST ALLOCATION OF THE REAL ESTATE PLAN:
Outlet Works	$10,830,000		X	X				Flood Control $19,732,000 Environmental Protection 100,538,000 Public Access 66,693,000 Recreation (1,500 acres) 874,000 $187,837,000
Backwater Flooding East of Morgan City[2/]	—		X	X				
Recreational Development	$19,169,000	X					X	
Freshwater Structures	$8,109,000		X		X			
Canal Closures and Circulation Improvements	$1,000,000	X			X			
TOTAL[3/]	$988,006,000[4/]							

[1/] Includes channel training below Morgan City at $11,650,000.

[2/] Implementation after completing additional engineering and biological studies.

[3/] Does not include interest during construction.

[4/] Federal cost = $936,797,000; Non-Federal cost = $51,209,000 (see Table 9).

COMPARISON OF PROJECT COST ESTIMATES

Comparison of Estimates

Atchafalaya Basin, Louisiana, a feature of the main stem of the Mississippi River and Tributaries (MR&T) project, is based on the authorized comprehensive review of the MR&T project contained in House Document 308, 88th Congress, 2d Session, which is considered to be the base estimate for the main stem system. The current PB-3 is based on that estimate, escalated for general construction price level increases and subsequent General Design Memorandums, Real Estate DM's and Detail DM's. The Survey/Phase I GDM Recommended Plan estimate of $1,559,209,000 represents a net increase of $184,209,000 over the current PB-3 estimate, effective 1 October 1981, of $1,375,000,000. Table 11 shows a comparison of PB-3 and current cost estimates. A by-feature discussion of the differences follows:

ATCHAFALAYA RIVER NAVIGATION

Unchanged, feature complete.

LANDS AND DAMAGES (01)

The increase of $200,150,000 over the PB-3 estimate represents net increases of $31,093,000 for the flood control features (of which $29,218,000 is Federal and $1,875,000 is non-Federal) and $169,057,000 for the nonflood control (i.e., environmental) features (of which $119,723,000 is Federal and $49,334,0000 is non-Federal).

RELOCATIONS (02)

The increase of $42,034,000 over the PB-3 estimate represents a net increase of $41,989,000 for the flood control features and an increase of $45,000 for nonflood control features.

TABLE 11

COMPARISON OF ESTIMATES
(In Thousands of Dollars)

Feature	Description	Atch. Basin PB-3/1 Oct 81 Price Levels	Sur/PhI GDM 1 Oct 81 Price Levels	Net Change (+/-)
-	Atchafalaya River Navigation	304	304	--
01	Lands and Damages	17,107	217,257	+200,150
02	Relocations	42,839	84,873	+42,034
05	Locks	31,605	30,532	-1,073
06	Fish and Wildlife Facilities	5,952	6,020	+68
08	Roads, Railroads and Bridges	625	625	--
09	Channels and Canals	224,225	131,744	-92,481
11	Levees and Floodwalls	657,531	674,144	+16,613
13	Pumping Plants	21,676	22,661	+985
14	Recreation Facilities	5,525	15,333	+9,808
15	Floodway Control and Diversion Structures	15	15	--
16	Bank Stabilization	176,613	171,846	-4,767
18	Cultural Resources Preservation	103	103	--
19	Buildings, Grounds, and Utilities	14	14	--
30	Engineering and Design	95,388	109,322	+13,934
31	Supervision and Administration	95,478	94,416	-1,062
	Total Cost (Federal Cost and Non-Federal Contributions)	1,375,000	1,559,209	+184,209
	Required Non-Federal Contributions	3,000	51,209	+48,209
	Total Federal Cost	1,372,000	1,508,000	+136,000

LOCKS (05)

The decrease of $1,073,000 from the PB-3 estimate represents a net decrease for the flood control features.

FISH AND WILDLIFE FACILITIES (06)

The $68,000 increase over the PB-3 estimate is for nonflood control features.

ROADS, RAILROADS, AND BRIDGES (08)

Unchanged, feature complete.

CHANNELS AND CANALS (09)

The decrease of $92,481,000 from the PB-3 estimate represents a net decrease of $112,411,000 in the flood control features due to deletion of the main channel dredging feature and substitution of channel training and realinement features, partially offset by an increase of $19,930,000 in the nonflood control features.

LEVEES AND FLOODWALLS (11)

The increase of $16,613,000 over the PB-3 estimate represents a net increase of $15,278,000 in the flood control features due to addition of outlet control works, partially offset by a reduction in levee construction due to changes in the new flowline and an increase of $1,335,000 in nonflood control features.

PUMPING PLANTS (13)

The $985,000 increase over the PB-3 estimate is for flood control features.

RECREATION FACILITIES (14)

The increase of $9,808,000 over the PB-3 estimate includes addition of four sites and increased cost at the 22 previously authorized sites.

FLOODWAY CONTROL AND DIVERSION STRUCTURES (15)

Unchanged, feature complete.

BANK STABILIZATION (16)

The decrease of $4,767,000 from the PB-3 estimate represents a reduction of $19,167,000 for main channel bank protection, partially offset by an increase of $14,400,000 for channel realinement and training.

CULTURAL RESOURCES PRESERVATION (18)

Unchanged.

BUILDINGS, GROUNDS, AND UTILITIES (19)

Unchanged, feature complete.

ENGINEERING AND DESIGN (30)

The increase of $13,934,000 over the PB-3 estimate represents an increase of $9,963,000 for the flood control features and $3,971,000 for the nonflood control features.

SUPERVISION AND ADMINISTRATION (31)

The decrease of $1,062,000 from the PB-3 estimate represents a decrease of $5,187,000 in the flood control features, partially offset by an increase of $4,125,000 in the nonflood control features.

ATCHAFALAYA BASIN FLOODWAY SYSTEM, LA.

FINAL ENVIRONMENTAL IMPACT STATEMENT

PARISHES: CONCORDIA, AVOYELLES, POINTE COUPEE, ST. LANDRY, IBERVILLE, ST. MARTIN, IBERIA, ASSUMPTION, LAFOURCHE, TERREBONE, ST. MARY

LEAD AGENCY: U.S. ARMY CORPS OF ENGINEERS, NEW ORLEANS, LA.
COOPERATING AGENCIES: U.S. FISH AND WILDLIFE SERVICE
U.S. ENVIRONMENTAL PROTECTION AGENCY
STATE OF LOUISIANA

ABSTRACT: The Atchafalaya Basin Floodway system in south-central Louisiana is a safety valve for the floodwaters of the Mississippi River. The project area includes the Red River backwater area, the floodway system proper, the backwater area east and northeast of Morgan City, and the coastal marshes of south-central Louisiana. The New Orleans District and cooperating agencies have investigated passage of the project flood through the Lower Atchafalaya Basin Floodway (LABF), flood protection in the Morgan City backwater area, and protection of natural resources within the project area. Three plans were investigated in detail and have been updated as a result of public review during July 1981. All plans would maintain the present 70/30 distribution of flow between the Mississippi and Atchafalaya Rivers. Plan 4, the Environmental Quality (EQ) Plan, consists of levee raising, channel training, and bank stabilization of the Atchafalaya River; realinement of major distributaries for sediment control; water level management in the LABF; comprehensive multipurpose easements over the entire 445,000 acres in the LABF that are privately owned (excluding developed ridges); public access rights over 103,500 acres and timber rights over 73,500 acres of that same area; and fee purchase of 1,500 acres for recreational development and protection of environmentally unique areas; implementation of a solution for backwater flooding but only after completion of additional detailed studies; widening of Wax Lake Outlet (WLO) overbank; and diversion of sediment down WLO. This would provide for safe passage of the project flood and would protect environmental values. Plan 7, the National Economic Development (NED) Plan, consists of levee raising, channel training, and bank stabilization; distributary realinements; WLO overbank widening; extension of the Avoca levee by 14,000 feet; phased increase of the proportion of flow out of the Lower Atchafalaya River (LAR) until WLO is closed to normal flows; easements for developmental control over the entire LABF; and purchase of 1,500 acres for recreation. The NED plan provides flood protection similar to the EQ plan but would require extensive mitigation to replace environmental losses. Plan 9, the Recommended Plan, is similar to the EQ plan but includes channel training of the LAR and WLO; potential future change in flow distribution between the LAR and WLO from 70/30 to 80/20; implementation of a solution for backwater flooding after completion of additional detailed studies; and no diversion of sediment out of the WLO. In lieu of easements for public access, this plan incorporates donation and fee acquisition of about 78,000 acres of land. This plan also prohibits land-use conversion, maximizes project flood passage, and provides for protection of environmental values.

DATE: _____

Send your comments to OCE, ATTN: (DAEN-CWP) by the date stamped above. For further information on this statement, contact Dr. Tom Pullen, Jr., US Army Engineer District, New Orleans, LA. 70160. Commercial telephone (504) 838-2525; FTS: 687-2525.

NOTE: Information, displays, maps, etc. discussed in the Main Report and Appendixes are incorporated by reference in the EIS.

1. SUMMARY

Major Conclusions and Findings

1.1 In the 1930's, the Atchafalaya River in south-central Louisiana became the central channel of a 15-mile wide leveed floodway system passing through the center of the Atchafalaya Basin. The purpose of the floodway system was to convey up to half the annual floodwaters of the Mississippi River and its tributaries to the Gulf of Mexico. This final Environmental Impact Statement (EIS) is mainly concerned with proposed work that would affect the lower portion of the floodway system which consists of the Lower Atchafalaya Basin Floodway and adjacent coastal marshes. Project-induced effects in the backwater area northeast of Morgan City, Louisiana, are also addressed.

1.2 In addition to serving as a passage for floodwaters, the lower floodway is one of the largest remaining river overflow swamps in the continental United States and harbors a vast array of fish and wildlife resources. It produces an average of 15 million pounds of crawfish a year and serves as a recreational area for numerous hunters, fishermen, canoeists, and others who enjoy the out-of-doors. The northern portion of the lower floodway contains extensive bottomland hardwood forests, while the southern portion is a vast cypress-tupelo swamp with early successional bottomland hardwood forests developing as large lakes become filled with sediment. As the Atchafalaya River enters the estuarine area, it deposits sediment and is building a major delta.

1.3 The floodway has been slowly losing its capability to pass floodwaters due to continuing sedimentation problems. As the lower floodway fills with sediment, it loses flood-carrying capacity and can no longer safely carry the maximum (project) flood. In addition, the Atchafalaya is a geologically young, growing river and as it naturally enlarges its main channel, water levels in adjacent lakes and swamps drop. Thus, as a result of continuing sedimentation and falling water levels, lakes, bayous, and seasonally flooded forests are becoming dryer and will eventually cease to support the rich aquatic resources they support today. As the forests dry, it becomes highly profitable to clear them for agriculture. It is estimated that by the year 2030, over half the existing 332,000 acres of bottomland hardwood forest would be cleared if no preventative actions were taken. As the delta develops, it will increasingly reduce water and sediment flows to the western Terrebonne Parish marshes and the rate of deterioration of those marshes will increase. The enlargement of the delta is causing water levels to rise in the backwater area east and northeast of

Morgan City. If flood protection of some sort is not provided, this phenomenon would eventually force homes, businesses, and industries to relocate and the prolonged flooding could slow forest growth and regeneration. About 10,000 acres of existing farmland could also be adversely affected (about 3,000 acres of this would probably eventually receive protection in the form of currently proposed local interest ring levee systems).

RATIONALE FOR THE ENVIRONMENTAL QUALITY (EQ) PLAN

1.4 The individual features of Plan 4 (EQ) were chosen to preserve or to maximize favorable changes in ecological, cultural, and esthetic resources or to insure that a minimal irretrievable commitment of resources would be made if this plan were implemented. Since one of the overriding goals of the project is the safe passage of the project flood, some features of the EQ plan were chosen to meet this necessity and not specifically for their EQ contribution. A 70/30 distribution of flows at Old River, Louisiana, was chosen, so that 70 percent of the flow continuing down the Mississippi River and 30 percent down the Atchafalaya River would preserve present conditions with regard to total annual water flow. Raising of the subsiding East and West Atchafalaya Basin Protection Levees, the Atchafalaya River levees and levees west of Berwick, Louisiana, is necessary for flood control. Channel training of the main channel of the Atchafalaya River, in lieu of other measures to increase flood-carrying capacity, was chosen for the EQ plan because it would cause a sizable reduction in the amount of sediment entering swamps and lakes. The feature that would make the largest contribution to the EQ account is the provision for easements that would prohibit development and clearing for agriculture in the entire lower basin and allow public access on 105,000 acres, including 23,000 acres of greenbelts along navigable streams and the inside toe of perimeter guide levees. By preventing the loss of forests, these easements would preserve ecological productivity as well as many of the attributes which make the basin unique. The 1980 State of Louisiana proposal for public access is retained in this plan because it provides protection for far more acres of cypress-tupelo than the recommended substitute public access plan. Recreational development would allow millions of people to enjoy the semiwilderness experience of the basin. Realinement of distributary channels would help preserve both natural and cultural resources by slowing the rate at which the lower basin is filling with sediment, a process which results in loss of aquatic productivity and in burying of archeological sites. Construction of management units, hydrologically distinct areas in which existing water levels would be maintained to the degree possible, would contribute significantly to aquatic productivity and benefit recreationists and commercial fishermen. However, construction of those units might inconvenience the oil and gas industry and would reduce terrestrial productivity somewhat compared to what would

occur under future without-project conditions. The two freshwater diversion structures near Krotz Springs would also help preserve the aquatic system. Closure of selected canals would reduce sedimentation in wetlands and open water areas. Circulation improvement features would help lessen water quality problems caused by poor water movement. Preserving the present distribution of flows at Wax Lake and the Lower Atchafalaya River Outlets would help maintain existing ecological trends in coastal bays and marshes. By increasing the amount of sediment diverted out Wax Lake Outlet, the amount of undisturbed deltaic marsh in Atchafalaya Bay would be increased. The widening of the Wax Lake Outlet overbank area would be of great benefit to the aquatic system by restoring about 7,800 acres of swamp and marsh to the river and tidal system. The EQ plan contains no provisions to immediately solve the backwater flooding problems in the area northeast of Morgan City. Other features of the plan, such as the widening of the Wax Lake overbank area, would help reduce the magnitude of this problem in the near future for the more severe floods. In the meantime, additional detailed studies of the dynamic and delicate bay-marsh ecosystem would be completed by 1985 to gather data which would be used to help determine if extension of the Avoca Island levee, or other structural or nonstructural alternatives, would be an acceptable solution, from both a flood control and an environmental standpoint.

RATIONALE FOR THE NATIONAL ECONOMIC DEVELOPMENT (NED) PLAN

1.5 In choosing features of Plan 7 (NED), specific attempts were made to maximize contributions to the NED account for agricultural enhancement and fish and wildlife preservation. This plan was developed with the major goal of safely passing the project flood in the most economical manner. Training works along the Lower Atchafalaya River and Wax Lake Outlet and along the main channel would produce a lower flowline than with any other plan investigated. The closure of Wax Lake Outlet to all but floodflows would also lower the flowline. Thus, the east and west protection levees would be lower and less costly than with any other alternative. Extension of the Avoca Island levee for 14,000 feet would continue to reduce economic damages in the backwater area east and northeast of Morgan City for an interim period. Acquisition of occasional flowage easements that allow flooding due to operation of the project and prevent structures for human habitation and other uses or structures, as well as control excavations and fill, would make a contribution to the NED account as would development of recreational features. Construction of the Buffalo Cove management unit, purchase of 16,800 acres of bottomland hardwood forest for a wildlife management area, and marsh and swamp management by freshwater diversion would mitigate for the environmental losses caused by this plan.

RATIONALE FOR THE RECOMMENDED (R) PLAN

1.6 As with other plans, Plan 9 (R) was developed with the overriding criterion of safely passing the project flood. It was selected as the Recommended Plan because of the balance it offers with respect to contributions to the NED and EQ accounts as well as because it proposes a substitute public access plan which appeals to a wide spectrum of special interest groups. Sediment control and channel training above and below Morgan City, and works which could eventually regulate the outlets to an 80/20 distribution would result in a lower flowline than with the EQ plan and thus, lower and less costly protection levees. The combination of flowage and environmental easements would preserve environmental values. Construction of management units, freshwater diversion structures, canal closures, and circulation improvements would collectively produce significant benefits to the aquatic ecosystem. Widening the Wax Lake Outlet overbank would aid in flood control while improving aquatic productivity within the overbank area. This plan, like Plan 4, contains the provision to implement an alternative to solve the backwater flooding problems in the area northeast of Morgan City only after completion of additional studies. Until this decision is made, some relief from these problems would be provided by implementation of other plan features. The Recommended Plan includes the proposed acquisition of easements on 367,000 acres which would, among other things, prohibit conversion of wetlands and woodlands to other habitat types and provide for the operation of management units. Public access to an additional 78,000 acres of floodway lands and 10,000 acres of lands near the floodway made available by donation or acquisition from willing sellers is also included. Acquisition of and recreational development on 1,500 acres in the lower floodway would provide substantial new public recreation opportunities. While it is recognized that some losses to environmental values would occur due to construction of various project features, it is considered that these losses would be mitigated by the overall positive environmental contribution of the nonstructural real estate features of the plan.

SECTION 404 FINDINGS

1.7 The provisions of Section 404 of the Clean Water Act for all project features except levees, floodwalls and bank stabilization will be met via the Section 404(r) process by the submission of this EIS, including a Section 404(b)(1) Evaluation, to Congress for appropriation and/or authorization action. The levees, floodwalls, and bank stabilization features will meet Section 404 provisions by preparation of a Section 404(b)(1) Evaluation. A Public Notice will be prepared and a Water Quality Certificate will be requested from the State of Louisiana for these three features. This course is necessary because items of these three authorized features are scheduled for

construction in the near future and the Section 404(r) exemption process is too lengthy to complete prior to construction on these items. Certain other features are also authorized. If it is deemed necessary to construct any of these features prior to completion of the Section 404(r) process, the Public Notice/State Water Quality Certification process will be utilized.

1.8 The nine project features comprising the Recommended Plan have been 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. These evaluations are included in Appendix G of this report. The potential for environmental impact of each disposal activity was estimated on the basis of currently available engineering design data, and the pertinent physical, chemical, and biological information that had been compiled as a result of this and other studies and investigations. Efforts were made to identify the least environmentally damaging practicable alternative for each disposal site, wherever such alternatives were available.

1.9 No particular violations of applicable State of Louisiana water quality standards, other than for turbidity during construction operations, were found. No potential violations of the Toxic Effluent Standards of Section 307 of the Clean Water Act as a result of dredging operations were determined where practicable alternative sites are available. Although some of the selected disposal activities would destroy minor portions of the habitat of certain endangered or threatened species, those effects would be mitigated by the proposed environmental easements.

1.10 It was found that the proposed material discharges would not cause or contribute to significant adverse effects on: human health; the life stages of organisms within the aquatic ecosystem; or ecosystem diversity, productivity, and stability. Nor were there any significant adverse impacts identified on recreational, esthetic, or economic values. Some of these evaluations will be refined and updated when more site-specific water, sediment, and disposal area physical and/or chemical data become available. In the interim, the proposed dredged material disposal sites are found to be in compliance with the current Section 404 guidelines.

FINDINGS ON EXECUTIVE ORDER 11988

1.11 The proposed action would occur within a flood plain. A large number of practicable alternatives have been identified and are discussed and evaluated in Section 4. No nonflood plain alternatives exist. Section 6 describes the beneficial and adverse impacts of each alternative and describes any expected losses of natural flood

plain benefits. Views of the general public have been obtained at several public meetings. Plan 9 (R) and Plan 4 (EQ) recognize the significant value of the Atchafalaya River flood plain and include comprehensive easements to preserve forestland and prevent permanent human habitation in the floodway portion of the flood plain. Plan 7 (NED) contains similar easements to control development and prevent human habitation. In conclusion, the Recommended Plan is the most responsive to the planning objectives established for the study and is consistent with the requirements of Executive Order 11988.

FINDINGS ON EXECUTIVE ORDER 11990, PROTECTION OF WETLANDS

1.12 Since extensive wetlands are present in the study area, one of the project planning objectives was to maintain or enhance the long range productivity of wetlands and woodlands. There were no practicable alternatives to locating some project features in wetlands. The Avoca Island levee and ring levees around population and industrial centers were considered, but were eliminated from final consideration in the Recommended Plan due to uncertainty over which would be the most desirable solution to backwater flooding problems and to the fact that widening the Wax Lake overbank area would help reduce flood damages in this area until more data can be collected with which to determine the most acceptable solution to this problem. Channel training above Morgan City and levee raising work would involve destruction of wetlands, but there is no practicable nonwetland alternative to these measures so they were included in all plans. During plan formulation, wetland protection measures to minimize unavoidable adverse impacts were included in each plan. Environmental easements and management units in the floodway are part of Plans 4 (EQ) and 9 (R) and nondevelopment easements are a part of Plan 7 (NED). Freshwater diversion through the Avoca Island levee extension is part of Plan 7 (NED) even though only Reach 1 (14,000 feet) is proposed for construction. Adverse impacts to wetlands are discussed in Section 6 of this EIS. In conclusion, Plan 9 (R) is the one most responsive to planning objectives and evaluation criteria.

Areas of Controversy

1.13 Throughout the course of the study, there have been a number of major interagency controversial issues, most of which have been resolved. These are discussed in the subsequent paragraphs.

1.14 Most Probable Future. This issue concerned the use of most probable future (MPF) as the basis on which to compare alternatives or

the use of present conditions or MPF conditions based on a base year prior to man's alteration of the natural environment. The US Fish and Wildlife Service maintains that the true future without-project condition has not been defined. It argues that the future without-project condition described in this report is based upon an environmental profile which developed as a partial result of past flood control activities which have accelerated environmental losses. This issue has not been totally resolved. However, the established legal requirements of Principles and Standards (Water Resources Council, 1980) have been used in formulating the MPF condition profile.

1.15 Need for Additional Easements for Flood Control in the Lower Atchafalaya Basin Floodway. Environmental interests contended that additional easements for flood control were needed in the Lower Atchafalaya Basin Floodway. The US Army Corps of Engineers' past position has been that no additional real estate interest was needed for flood control. In this study, the District Engineer is recommending a more comprehensive easement, principally to control developments in the basin which would affect its use for flood control.

1.16 Recreation User-Day Values. The US Fish and Wildlife Service suggested using a set of values for recreation user-days based largely on the "time-value" or "income foregone" methodology. The US Army Corps of Engineers suggested use of values from Principles and Standards (Water Resources Council, 1979). Because of the uniqueness of the study area, the selection of user-day values actually used was based on a US Fish and Wildlife Service/US Army Corps of Engineers site-specific analysis contracted to Professor Fred Bell of Florida State University in 1979-1980 (Bell, 1981a).

1.17 Fee Acquisition of the Lower Atchafalaya Basin Floodway. The single most controversial issue in the course of the study has been the proposal recommending acquisition in fee of most privately-owned lands in the Lower Atchafalaya Basin Floodway (exclusive of mineral rights). Public meetings in January 1979 polarized around this particular issue. The Recommended Plan presented in this EIS includes a wide array of real estate interests varying from flowage easements to fee acquisition of 1,500 acres for recreational features and additional state fee acquisition of approximately 48,000 acres of land from willing sellers, with Federal participation.

1.18 Number of Management Units. The US Environmental Protection Agency and US Fish and Wildlife Service desire construction of all management units. US Army Corps of Engineers studies to date indicate that five of the units have the greatest potential for restoring historical conditions to benefit the aquatic ecosystem. Thus, costs, benefits, and impacts of these units were developed for plan evaluation purposes. The Buffalo Cove and Henderson units are proposed as pilot units for initial implementation according to plans developed in

conjunction with representatives of the US Fish and Wildlife Service, US Environmental Protection Agency, and appropriate state agencies. After construction, the pilot units would be monitored and an evaluation of their performance made by representatives of the cooperating agencies, using criteria devised by that group. Based on the group's evaluation and recommendations, requests for funding to implement other units would be made. At this time, it is not possible to determine how many additional units are feasible for implementation.

1.19 Public Access Features. One of the most recent controversies involved the proposed 1980 State of Louisiana public access proposal included in the draft plan. Public access was proposed over 23,000 acres of "greenbelts" in selected areas adjacent to lower basin navigable waterways and along the inside toe of perimeter guide levees. Hunting clubs were adamantly opposed to any such easements on their leases. The State of Louisiana proposed that the Federal Government relieve the landowners from liability for any accidents that might occur on lands upon which easements would be procured. Under law, the Federal Government cannot assume such liability. This issue has been resolved by the 1981 substitute real estate proposal which involves lands donated to the state and fee purchase from willing sellers.

Unresolved Issues

1.20 Although most of the controversial issues have been resolved to the extent necessary to allow preparation of this EIS, others remain unresolved. Four of these involve a difference in the respective agency policies and are discussed below.

1.21 Flood Protection for the Backwater Area Northeast of Morgan City. The method of protecting this area from backwater flooding has been an object of controversy. The US Environmental Protection Agency, US Fish and Wildlife Service, US National Marine Fisheries Service, and environmental groups feel that extension of the Avoca Island levee would cause severe environmental damage. The extent of such damage cannot, however, be quantified using the available data. This controversy has not been totally resolved by the recommendation to conduct additional detailed studies prior to implementing the best method for providing a solution to the backwater flooding problem.

1.22 Mitigation for Past Construction. Environmental interests and agencies argued early in the study for mitigation of damages resulting from past construction activities. US Army Corps of Engineers policy generally does not allow such mitigation. The plans presented in this EIS do not include mitigation for past construction in the Atchafalaya Basin.

1.23 Evaluation of Separable Project Features. Early in the study, there was concern among environmental groups that, via evaluation policy, the US Army Corps of Engineers was trying to circumvent fish and wildlife features of a multipurpose plan. Environmental groups felt that because a multipurpose plan would be tied to the Mississippi River and Tributaries (MR&T) project, any features of that plan should share in the benefit-to-cost ratio for the overall MR&T project. US Army Corps of Engineers policy dealing with the economic analysis of projects, however, dictates that each separable feature of a project must be evaluated independently, or in other words "stand on its own," based on monetary (tangible) and nonmonetary (intangible) benefits. Separable features, in this case, are those dealing primarily with nonflood control measures.

1.24 Implementation of a Single Multipurpose Plan. Throughout the study, there has been a concern among environmental groups that the previously authorized features of the final Recommended Plan would be implemented first and that new features, needing congressional authorization, might never be implemented due to their not being authorized or funded. This report recommends that all nonauthorized plan features be given an expeditious review so that completion of all previously authorized and newly authorized features will be carried out jointly to the maximum extent practicable. However, construction of those features previously mandated by the Congress will not be delayed pending authorization of additional features.

Relationship of Plan to Environmental Requirements

1.25 Table 1-1 indicates the relationship of each plan to Federal and state environmental protection statutes and other environmental requirements. A plan is listed as being in full compliance if at this stage of project planning, all necessary steps have been taken to comply with the statute in question.

TABLE 1-1

RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
ATCHAFALAYA BASIN FLOODWAY, LOUISIANA

	Plan 4 EQ	Plan 7 NED	Plan 9 R
FEDERAL STATUTES			
1. Preservation of Historical Archeological Data Act of 1974. Compliance requires Corps to undertake recovery, protection, and preservation of significant cultural resources whenever its activities may cause irreparable loss or destruction of such resources. Coordination with Advisory Council and others required. Coordination of DEIS brought project into partial compliance.	PC	PC	PC
2. Clean Air Act, as Amended. Compliance requires coordination with the US Environmental Protection Agency. Coordination of DEIS brought project into full compliance.	FC	FC	FC
3. Clean Water Act of 1977. Compliance requires preparation of 404(b)(1) Evaluation and submission of such to Congress with FEIS or procurement of a State Water Quality Certificate. The latter course will be taken for certain authorized features.	FC	FC	FC
4. Coastal Zone Management Act of 1972, as Amended. Compliance requires coordination with the Louisiana Department of Natural Resources to insure consistency with provisions of the Act. A draft Consistency Determination was sent to the State with the DEIS and no comment was received. A final Consistency Determination will be provided to the State at the time the FEIS is provided.	FC	FC	FC
5. Endangered Species Act of 1973, as Amended. Compliance requires coordination with the US Fish and Wildlife Service and the National Marine Fisheries Service to determine if any endangered or threatened species or their critical habitat would be impacted by the project. See Appendix H for results.	FC	FC	FC
6. Estuary Protection Act. Compliance requires review and comment by Department of the Interior. Washington level review of FEIS will bring project into full compliance.	FC	FC	FC
7. Federal Water Project Recreation Act. Compliance requires review by Department of the Interior. Washington level review of FEIS will bring project in full compliance.	FC	FC	FC
8. Fish and Wildlife Coordination Act. Compliance requires coordination with the US Fish and Wildlife Service (FWS), National Marine Fisheries Service, and Louisiana Department of Wildlife and Fisheries. Agency recommendations are discussed in Section 8 of the FEIS and the Coordination Act Report of the FWS is part of Appendix I.	FC	FC	FC

TABLE 1-1 (Continued)

RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
ATCHAFALAYA BASIN FLOODWAY, LOUISIANA

	Plan 4 EQ	Plan 7 NED	Plan 9 R
9. Land and Water Conservation Fund Act. Requirements similar to 7 above.	FC	FC	FC
10. Marine Protection Research and Sanctuaries Act of 1972, as Amended. Compliance requires evaluation of need for transport of dredged material for purposes of dumping it in ocean waters. No such action is anticipated in the project.	N/A	N/A	N/A
11. National Historic Preservation Act. Compliance requires Corps to take into account the impacts of project on any property included in or eligible for inclusion in the National Register of Historic Places.	PC	PC	PC
12. National Environmental Policy Act. Compliance requires preparation of this document. Completion of FEIS and signing of Record of Decision will bring project into full compliance.	FC	FC	FC
13. River and Harbor Act. No requirements for Corps projects authorized by Congress.	N/A	N/A	N/A
14. Watershed Protection and Flood Prevention Act. No requirements for Corps projects.	N/A	N/A	N/A
15. Wild and Scenic River Act. Compliance requires coordination with Department of the Interior to determine if any designated or potential wild, scenic, or recreational rivers are affected by project. Coordination has been accomplished and there are no such rivers in the project area.	FC	FC	FC
EXECUTIVE ORDERS			
1. Executive Order 11988, Floodplain Management. Compliance requires an assessment and evaluation together with the other general implementation procedures to be incorporated into the Main Report and noted in the DEIS.	FC	FC	FC
2. Executive Order 11990, Protection of Wetlands. Compliance requires results of analysis and findings related to wetlands be incorporated into Main Report and DEIS.	FC	FC	FC
3. Executive Order 12114, Environmental Effects Abroad of Major Federal Action. No requirements for Corps projects in US.	N/A	N/A	N/A

TABLE 1-1 (Continued)

RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
ATCHAFALAYA BASIN FLOODWAY, LOUISIANA

	Plan 4 EQ	Plan 7 NED	Plan 9 R
4. Executive Memorandum, Analysis of Impacts on Prime and Unique Farmlands in EIS. Compliance requires inclusion in DEIS of effects of proposed action on prime and unique farmlands.	FC	FC	FC
5. Executive Order 11593, Protection and Enhancement of the Cultural Environment. Compliance requires Corps to administer cultural properties under their control in stewardship for future generations; preserve, restore or maintain such for benefit of the people; and to assure that its plans contribute to preservation and enhancement of non-Federally owned sites.	FC	FC	FC
STATE AND LOCAL POLICIES			
1. Air Control Law. Compliance requires consistency with the State of Louisiana Implementation Plan with the Federal Clean Air Act, as amended.	FC	FC	FC
2. Archaeological Treasure Act. Compliance requires a contract from the Louisiana Archaeological Survey and Antiquities Commission for excavation or removal of cultural resources which are located on state land.	FC	FC	FC
3. Historic Preservation District Act. This act does not apply to Federal agencies.	N/A	N/A	N/A
4. Louisiana Scenic Streams Act. Compliance requires coordination with Louisiana Department of Wildlife and Fisheries if action would adversely affect a Louisiana scenic stream. This project would not do so.	FC	FC	FC
5. Protection of Cypress Trees (EO 1980-3). Compliance requires protection of cypress growing in state-controlled waterways. Cutting is prohibited unless necessary to remove real or potential threats to human life or health or to protect public interest.	FC	FC	FC
6. Water Control Law. Compliance requires consistency with Water Quality Standards established by the State of Louisiana.	FC	FC	FC
7. Development of Atchafalaya River Basin Act (Act No. 612)[1] Compliance requires that consideration be given to acquisition of 50,000 acres in the Atchafalaya Basin Floodway as partial mitigation for recreation losses and damages to fish and wildlife habitat and resources.	FC	WNC	FC
8. Senate Concurrent Resolution No. 8 (1976)[1] Compliance requires that the Federal Government not expropriate privately-owned land within the Lower Atchafalaya Basin for environmental, esthetic, or recreational purposes.	WNC	WNC	WNC

TABLE 1-1 (Continued)

RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION
STATUTES OR OTHER ENVIRONMENTAL REQUIREMENTS
ATCHAFALAYA BASIN FLOODWAY, LOUISIANA

	Plan 4 EQ	Plan 7 NED	Plan 9 R
LAND USE PLANS			
1. Louisiana Coastal Zone Management Plan. Compliance requires that any Federal development project in the coastal zone of a state shall be conducted in a manner which is, to the maximum extent practicable, consistent with the approved state coastal zone management program. See Appendix G.	FC	FC	FC
2. Regional and Metropolitan Clearinghouses (OMB CIRCULAR A-95) Compliance requires coordination with all clearinghouses whose jurisdiction exists within the project area.	FC	FC	FC
REQUIRED FEDERAL ENTITLEMENTS			
None are required.			

FC = Full compliance - All requirements of regulations at this stage of planning have been met.
PC = Partial compliance.
WNC = Would not comply.
N/A = Not applicable.
DEIS = Draft Environmental Impact Statement.
FEIS = Final Environmental Impact Statement.

[1]Please note that the current State position with regard to real estate acquisition within the Atchafalaya Basin is reflected in the proposed state plan discussed elsewhere in this report.

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ATCHAFALAYA BASIN FLOODWAY SYSTEM, LOUISIANA

3. NEED FOR AND OBJECTIVES OF ACTION

Study Authority

3.1 This study resulted from three congressional authorities: an 11 June 1968 resolution by the Committee on Public Works of the US Senate for a study of the operation of the Old River project, and resolutions by both the US Senate and House Committees on Public Works, 23 March 1972 and 14 June 1972, respectively, to develop a comprehensive plan for the preservation and management of the water and land resources of the Atchafalaya Basin. (A quotation of these authorities may be found in Appendix A, Section 1). By letter dated 18 June 1976, the Director of Civil Works of the Office of the Chief of Engineers directed the President of the Mississippi River Commission to address both the previously authorized features of the Atchafalaya Basin Floodway project and potential features for resource preservation and management, effectively combining studies of the Atchafalaya Basin Floodway project with those previously mandated by Congress.

Public Concerns

3.2 Throughout the course of the study, informal and formal interchange between the participating agencies and the public has provided an insight into the area's water and related land resource problems and needs as perceived by the public. In all cases, concern was expressed regarding the inability of the floodway to pass the project flood to the gulf while protecting life and property adjacent to the floodway system, and it was urged that actions to accomplish this be completed with haste. The inability to pass the project flood developed because of a loss of flood-carrying capacity of the floodway due to subsidence (sinking) of the east and west protection levees, sediment deposition within the floodway proper, and the inadequacy of the present outlets to safely pass the volume of water necessary. Concern over protecting life and property adjacent to the floodway system arose because natural alluvial riverine processes active in the floodway and the development of the Atchafalaya delta south of Morgan City have caused a rise in water levels in the backwater area northeast of Morgan City that will continue into the future. This continuing rise in water levels subjects the inhabitants of this area to an increased flood hazard, and it could eventually lead to forced abandonment of existing homes, business enterprises, and farmland as well as have a harmful impact upon the timber resources of the area. The public also voiced concern regarding the state of environmental

resources within the study area and the potential for further widespread degradation. Various interest groups expressed a desire to alter the existing flow regulation at Old River. Some favored a preference for less flow down the Atchafalaya to enhance agriculture while others favored a preference for more flow to preserve, and possibly enhance, environmental values. A desire was also expressed that delta development in Atchafalaya Bay be maximized. Early in the study the potential for nonconsumptive recreation, as well as for hunting and fishing by the general public, was recognized by local, state, and national interest groups who expressed a desire for more public access to the basin's swamps and forests. All of these concerns were considered in identifying the water and related land resource management needs of the study.

Planning Goals and Objectives

3.3 These goals and objectives were developed by the Agency Management Group, consisting of the Corps, the US Environmental Protection Agency, the US Fish and Wildlife Service, and the State of Louisiana (represented by the Office of Public Works).

GOALS

3.4 Protect south Louisiana from Mississippi River and Tributaries floods.

3.5 Retain and restore the unique environmental features and long-term productivity of the natural environment of the basin.

OBJECTIVES

3.6 Flood Control - Implement a flood control system that will safely pass the project flood to the Gulf of Mexico in an environmentally sound manner. Reduce to the maximum extent practical the deposition of sediments that reduce the ability of the floodway to pass the project flood.

3.7 Natural Environment - Retain and restore the unique environmental features of the floodways and maintain or enhance the long-range productivity of the wetlands and woodlands.

3.8 Agricultural Activities and Mineral Development - Allow agricultural activities and mineral development, provided such activity does not interfere with the goals relative to flood control or the natural environment.

3.9 Delta Formation - Maximize natural delta formation in Atchafalaya Bay while providing for navigation and passage of the project flood.

3.10 Public Accessibility - Maximize public opportunity to observe and utilize the fish and wildlife resources of the floodway.

4. ALTERNATIVES

4.1 The Atchafalaya Basin Floodway system, the backwater area east and northeast of Morgan City, and the coastal marshes form an exceedingly complex system. Because of this complexity, simple solutions to the problems of flood control and environmental preservation do not exist. To develop a multipurpose plan for this large and diverse area, existing project features and management options were separated into groups that addressed individual problems and opportunities. Then, alternative solutions or features were developed within each group, and subsequently, one or more features from each group were combined to form an individual plan. For purposes of illustration at the January 1979 public meetings, 10 comprehensive plans were presented to show the combinations that could be developed to emphasize different study goals. (Prior to these meetings, the US Fish and Wildlife Service proposed Federal purchase of 443,000 acres of land in the Lower Atchafalaya Basin Floodway so it could be used as a "Fish, Wildlife, and Multi-use Area.") As a result of comments at the meetings and subsequent studies, many features were eliminated while others were considered in detail. From the features considered in detail, the National Economic Development (NED), Environmental Quality (EQ), and the Recommended (R) Plans were chosen.

Description of Completed Features

4.2 Since the Atchafalaya Basin Floodway system is a partially completed project, it is necessary now and would be necessary in the future to operate and maintain the completed plan features as well as the new features proposed in the subsequent paragraphs. A brief description of the existing features of the system follows. For a more detailed description see Appendix A (major existing features are shown in Plate 1).

4.3 The Atchafalaya Basin Floodway system was constructed to safely convey floodwaters in excess of the capacity of the leveed Mississippi River to the Gulf of Mexico. For the project flood of 3,000,000 cubic feet per second (cfs), the floodway system would receive 620,000 cfs from the Mississippi River via the Old River control structure complex and 350,000 cfs from the Red River. The Morganza Floodway, with a gated control structure at its head, is 20 miles long and 5.5 miles wide and is located on the east side of the Atchafalaya River from Morganza to Krotz Springs. This floodway is designed to carry 600,000 cfs of the project flood entering from the Mississippi River. The West Atchafalaya Floodway, 35 miles long

and 7 miles wide, extends from Simmesport to Krotz Springs, and is designed to take 250,000 cfs of the 970,000 cfs that would pass into the Atchafalaya River above Simmesport. The Lower Atchafalaya Basin Floodway, extending from below Krotz Springs to Morgan City, is approximately 14 miles wide and 65 miles long, and is designed to handle the approximately 1,500,000 cfs of the project flood that would enter via the Atchafalaya River, and the Morganza and West Atchafalaya Floodways. The floodway system is presently capable of safely conveying only about 60 percent of a project design flood. Perpetual flowage easements were acquired on all lands within the West Atchafalaya and Morganza Floodways. These easements provide for full use of lands for flood control purposes. Owners retain the rights to farm and to harvest timber and minerals. Easements over the Morganza Floodway also prohibit human habitation. In the Lower Atchafalaya Basin Floodway, flowage easements have been acquired only where the owner made a claim upon the Government. The floodway system includes 449 miles of levees and floodwalls, and numerous control structures, culverts, channels, and pumping stations to improve both intercepted and interior drainage (Tables 4-1 and 4-2 and Plate 5). Barge and crew boat navigation is maintained in the main channel of the Atchafalaya River and along the Morgan City to Port Allen Alternate Route of the Gulf Intracoastal Waterway as well as along the landside Alternate Route. Four locks are part of this navigation system (Table 4-3). Small boat navigation is maintained along the east and west access and freshwater distribution channels.

4.4 The Old River control structure complex is normally operated to pass 30 percent of the combined flow of the Red and Mississippi Rivers down the Atchafalaya River on a daily basis. During floodflows, operation is as described in paragraph 4.3 above. On three occasions in the past, accidents have occurred in which runaway barges lodged in the structure and reduction of flows down the Atchafalaya River was required. In order to avoid such occurrences, a picket boat is continually stationed just upstream. This boat is in communication with all river traffic and would intercept any possible loose barges. A radar system is in the process of being placed into operation to keep even better track of any objects that might endanger the low sill structure. This structure was damaged by high water flows in 1973. Emergency repairs and rehabilitation work have restored a substantial degree of confidence in the structure; however, there is grave concern about its ability to handle abnormal or emergency conditions. An auxiliary structure is under construction and it will restore the ability of the Old River complex to safely handle emergency conditions.

4.5 Operation of the Morganza Floodway would inundate 70,000 acres of land. Frequency of operation is estimated to be once every 20 years on the average. The only use to date was in 1973. Operation of the West Atchafalaya Floodway is estimated to occur less frequently than once every 100 years on the average. Waters would enter this

TABLE 4-1

EXISTING PROJECT FEATURES
FEATURES TO RESTORE INTERCEPTED DRAINAGE

NAME	DESCRIPTION	DATE COMPLETED	MAINTENANCE RESPONSIBILITY	MAINTENANCE ACTIONS
Bayou des Glaises Diversion Channel and Improvement of State Canal and Bayou Roseau	5 miles of channel	1943	Local interests	Inspection and removal of debris, shoals, and sediment.
Bayou des Glaises Culvert	72-inch corrugated pipe culvert with flapgate and stilling basin	1939	Local interests	Inspection and removal of debris, erosion repair.
Bayou Darbonne Drainage Structure	Reinforced concrete box culvert 10 x 10 x 265 feet	1941	Corps of Engineers	Inspection, minor repairs, erosion repair.
Bayou Courtableau Drainage Structure and Channels	Reinforced concrete box culvert, 5 barrel with 5 mechanically-operated lift gates. 220 feet long. Inlet channel 1,800 feet long and oulet channel 23,500 feet long.	1956	Corps of Engineers	Periodic trial operation of gates. Removal trash and drift. Inspection and repair of structure or erosion.
Courtableau Diversion Channel and Control Structure	Reinforced concrete weirs of 482 feet and 517 feet with outlet channels.	1942	Corps of Engineers	Inspection and removal of trash and erosion repair.
Bayou Berard Drainage Canal	7-mile channel	1940	Local interests	Inspection and removal of debris and shoals. Erosion repair.
Channel Improvement Cypremort to Dauterive	14.3-mile channel	1941	Local interests	Inspection and removal of debris and shoals. Erosion repair.
Charenton Drainage Canal	7-mile channel	1948	Corps of Engineers	Inspection and removal of debris and shoals. Erosion repair.

TABLE 4-1 (Continued)

EXISTING PROJECT FEATURES
FEATURES TO RESTORE INTERCEPTED DRAINAGE

NAME	DESCRIPTION	DATE COMPLETED	MAINTENANCE RESPONSIBILITY	MAINTENANCE ACTIONS
Borrow pit enlargement Hamburg to Courtableau	35-mile channel	1939	-	None required.
Coulee Des Grues Culvert	8 x 8-foot barrel-gated structure	1954	Red River, Atchafalaya Bayou Boeuf Levee District	Debris removal, erosion repair, structure repair.
Lottie to Maringouin Borrow Pit Enlargement	20-mile channel	1940	-	None required.
Bayou Boeuf - Bayou Long Drainage Canal and Enlargement of Bayou Chene (Landside Route)	35-mile channel	1947	Corps of Engineers	Debris and shoal removal, erosion repair.
Interior Drainage West of Berwick	38 miles of canals, 3 drainage structures, 20 gated culverts, 1 inverted siphon and 10 pumping stations.	mid-1970's	Local interests	Inspection, minor repairs, removal of trash and drift. Painting, oiling, and greasing.

TABLE 4-2

EXISTING PROJECT FEATURES
OTHER CONTROL STRUCTURES

NAME	DESCRIPTION	DATE COMPLETED	MAINTENANCE RESPONSIBILITY	MAINTENANCE ACTIONS
Low Sill Control Structure	Reinforced concrete, 11 gate bars, 566 feet between abutments, vertical steel lift gates operated by gantry cranes. Inflow and outflow channels.	1960	Corps of Engineers	Bank erosion prevention in channels with riprap and articulated concrete mattress. Filling of possible scour holes. Ground maintenance consists of mowing of grass and trash removal, inspection of structures and any necessary repair. Painting, oiling, and greasing.
Overbank Control Structure	Reinforced concrete, 75 bays 3,356 feet between abutments. Flow only occurs during floods.	1959	Corps of Engineers	Prevention of bank erosion. Ground maintenance, inspection and necessary repair and painting, oiling, and greasing.
Morganza Combined Control Structure	Reinforced concrete, 125 gated openings, steel lift gates operated by gantry crane.	1954	Corps of Engineers	Inspection and necessary repair. Painting, oiling, and greasing. Ground maintenance.
Pointe Coupee Drainage Structure	Reinforced concrete, 2 manually operated steel lift gates.	1942	Corps of Engineers	Inspection and necessary repair. Painting, oiling, and greasing. Ground maintenance.
Charenton Floodgate	Reinforced concrete, 2 electrically operated steel sector gates.	1948	Corps of Engineers	Inspection and necessary repair. Painting, oiling, and greasing. Ground maintenance.
East and West Calumet Floodgates	Reinforced concrete, each 161 feet long, and 45 feet clear width with steel sector gates, motor driven.	1950	Corps of Engineers	Inspection and necessary repair. Painting, oiling, and greasing. Ground maintenance.

TABLE 4-3

EXISTING PROJECT FEATURES
LOCKS

NAME	DESCRIPTION	DATE COMPLETED	MAINTENANCE RESPONSIBILITY	MAINTENANCE ACTIONS
Old River Navigation Lock	75 feet x 1,200 feet	1962	Corps of Engineers	Routine painting, oiling, and greasing. Minor repairs yearly. Dewatered every 10-15 years for major repairs. Ground maintenance consists of mowing and trash removal.
Bayou Sorrel Lock	56 feet x 797 feet	1952	Corps of Engineers	Same as above.
Berwick Lock	45 feet x 300 feet	1941	Corps of Engineers	Same as above.
Bayou Boeuf Lock	75 feet x 1,156 feet	1955	Corps of Engineers	Same as above.

floodway by natural and artificial crevassing of the fuseplug levee at its head. Operation would inundate all or portions of 154,000 acres of land. Flows from the Morganza and West Atchafalaya Floodways ultimately pass through the Lower Atchafalaya Basin Floodway and to the Gulf of Mexico by the Lower Atchafalaya River and Wax Lake Outlet, a 16-mile channel built by the US Army Corps of Engineers in 1942.

4.6 Operation of features to restore intercepted drainage generally serve to convey the waters to the landside borrow pit and other channels. The operable structures in this system such as the Courtableau Structure, the Charenton and East and West Calumet Floodgates, and all locks are operated to pass water into the floodway during high water periods on the landside, and to pass waters from the floodway to the landside for low flow augmentation. Drainage facilities are operated to maintain pre-project conditions within the leveed area west of Berwick and in Morgan City.

4.7 Maintenance requirements for the Atchafalaya Basin Floodway system are as varied as the features which comprise the project. Maintenance dredging requirements are indicated in Table 4-4, which lists dredging frequency, average annual cubic yardage, and disposal areas. It can be seen that over 2,200,000 cubic yards (cy) are dredged annually. Maintenance actions are shown in Tables 4-1, 4-2, and 4-3. Grounds maintenance is conducted on 6,593 acres. Levee maintenance consists of grass mowing and removal of trash and debris over 24,780 acres of levee.

4.8 The remainder of this section describes the features eliminated from further study and the rationale for doing so; the conditions that are expected to occur in the absence of any Federal action to address the planning objectives; features considered in detail; and the plans formulated from features considered in detail, including implementation responsibilities and mitigation requirements. Table 4-7 shows the impacts of each detailed plan and the future without-project conditions on each significant resource of the project-affected area.

Features Eliminated from Study

4.9 The eliminated features are listed by group and are briefly described, and the rationale for elimination is presented. These features are described in more detail in Appendix B.

TABLE 4-4

MAINTENANCE DREDGING

Location	Dredging Frequency	Average Annual Yardage (C.Y.)	Location of Spoil Disposl Areas	Acreage and Habitat Type of Disposal Areas
Old River Lock Tailbay	Once every 10 years	7,000	Confined on north bank of channel	160 BLHW
Three Rivers (Mile 0 Atchafalaya River)	Annually	150,000	In deep water in Atchafalaya River	
McCrea Landing (Mile 12 Atchafalaya River)	Once every 15 years	23,000	Disposed in shallow water in Atchafalaya River along either side of dredged channel	
East Freshwater Distribution Channel	Once every 10 years	160,000	Confined on bank adjacent to waterway	300 CT 670 BLHW
East and West Access Channels	Once every 10 years	610,000	Confined on bank adjacent to waterway	470 ES 1700 BLHW
Below Bayou Sorrel (Alternate Route GIWW)	Annually	170,000	Confined on bank adjacent to waterway	400 CT
Sixmile Lake	Once every 5 years	480,000	Disposed in deep water in Atchafalaya River and contained sites on north bank	2500 ES
Berwick Bay Harbor	Annually	500,000	Disposed in deep water in Atchafalaya River	
Berwick Lock Forebay	Once every 2 years	70,000	In deep water on Atchafalaya River and adjacent to river bank below the forebay	60 ES

ES = Early successional bottomland hardwood
BLHW = Mid to late successional bottomland hardwood
CT = Cypress-tupelo

GROUP 1 - ALTERNATIVES FOR OPERATION OF THE OLD RIVER CONTROL STRUCTURE

Maintain 60/40 percent distribution of total flows between the Mississippi and Atchafalaya Rivers below Old River, respectively.

4.10 This feature was proposed as an environmental enhancement measure, but engineering studies indicated that such a distribution could not be stabilized. This feature could result in the Mississippi River changing its course, resulting in severe economic, environmental, and social consequences.

Operate the Old River control structure to keep water levels from rising above 35 feet National Geodetic Vertical Datum (NGVD)[1/] on the Black River at Acme, Louisiana, in the Red River backwater area, with head constraints.

4.11 This feature was proposed to enhance agricultural production in the Red River backwater area, but studies indicated that it could cause extensive environmental damage due to loss of wetlands and forestlands in both the Red River backwater area and in the Atchafalaya Basin Floodway. In addition, it would cause increased safety problems for Mississippi River navigation during high water.

Maintain 35 feet NGVD at Acme with no head constraints.

4.12 This feature was discarded for the reasons cited above, as well as for economic reasons because it would entail construction of a new control structure at Old River (in addition to the Auxiliary Structure).

GROUP II - ATCHAFALAYA BASIN MAIN CHANNEL DEVELOPMENT AND LEVEE RAISING ALTERNATIVES

Confined 100,000-square foot (sf) channel from head of Whiskey Bay Pilot Channel to Wax Lake Outlet, 80,000-sf to Stouts Pass.

4.13 Studies indicated that channel dredging to such a cross-sectional area and disposal of dredged material would adversely affect in excess of 20,000 acres of woodlands and wetlands. Other alternatives would result in fewer adverse impacts for comparative costs.

1/ Unless noted otherwise, all elevations are referenced to National Geodetic Vertical Datum of 1929 (NGVD), formerly mean sea level.

Confined 80,000-sf channel from head of Whiskey Bay Pilot Channel to Stouts Pass.

4.14 A preliminary study furnished by the US Environmental Protection Agency indicated that an 80,000-sf channel might be the largest that would develop naturally. Subsequent studies have shown that the channel would enlarge naturally, over time, to 100,000 sf.

GROUP III - SEDIMENT CONTROL ALTERNATIVES

No action alternative.

4.15 This alternative was eliminated because it made no contribution to either flood control or environmental goals.

Enlargement of major distributary channels at their heads, to act as sediment traps.

4.16 Studies indicated that maintenance would require disposal of dredged material on 3,000 acres of forestland. Since such maintenance would be an annual event and since sediment traps would remove only sand which would mostly be deposited along existing natural levees and not in backswamp areas, it was felt that permanent loss of this land would outweigh the benefits to be gained.

GROUP IV - MANAGEMENT UNITS AND RELATED FEATURES

Introduction.

4.17 Natural processes and human actions have combined to produce 13 areas in the Lower Atchafalaya Basin Floodway that are hydrologically distinct (Figure 4-1). Conceptually the units would be designed so that: water regimes would mimic historical water overflow patterns; water movement would occur through the units; sediment movement and deposition in the units might be restricted; and nutrients and organic matter would be supplied to the estuarine areas downstream.

No action alternative.

4.18 This alternative was eliminated because studies indicated that construction of some management units could significantly enhance the aquatic environment.

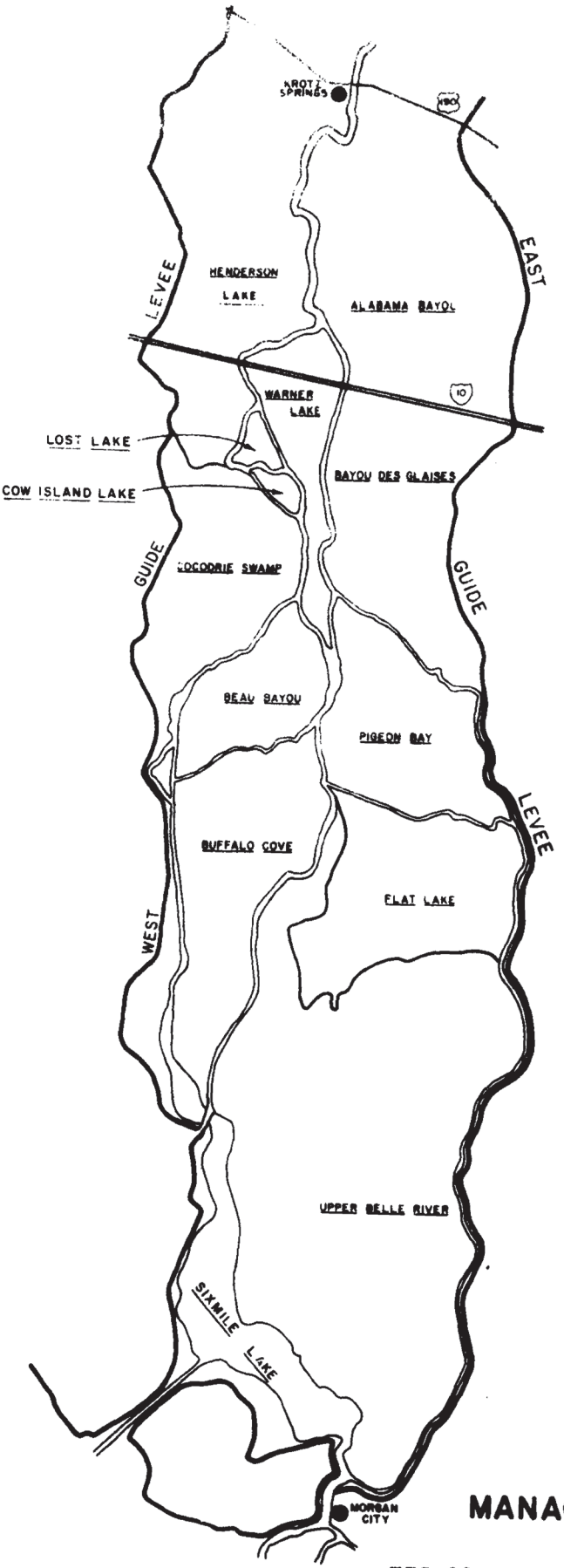

FIGURE 4-1

MANAGEMENT UNITS

Implementation of all 13 management units.

4.19 After evaluating the management unit concept, it was decided that a recommendation to implement all management units should not be made at this time since further studies are needed to determine exactly which units should be built to enhance environmental values.

GROUP V - ALTERNATIVE LAND-USE PLANS

4.20 No land-use plan alternatives were eliminated.

GROUP VI - ALTERNATIVES FOR FLOODWAY OUTLETS AND DELTA BUILDING

No action alternative.

4.21 This feature was eliminated because if nothing is done, the combined capacity of the outlets would continue to decrease; therefore, the project flood could not safely pass through the Teche Ridge.

Redistribute most flows to Wax Lake Outlet (Lower Atchafalaya River 0 percent/Wax Lake Outlet 100 percent).

4.22 Studies indicated that this feature would require two major navigation structures and, thus, would be inordinately costly. The long-term beneficial effects of such a redistribution on delta formation would not be of the order of magnitude to justify such costs and could disrupt existing environmental conditions to the east and west of Atchafalaya Bay.

GROUP VII - ALTERNATIVES TO REDUCE BACKWATER FLOODING EAST OF THE FLOODWAY

No action alternative.

4.23 This feature was eliminated because it would not protect the area from backwater flooding.

GROUP VIII - MANAGEMENT ENTITY

Introduction.

4.24 To insure proper implementation and operation of the plan selected, a management entity would be established. Mechanisms would

be included for public involvement. The management entity would not inhibit emergency flood control operations.

No action alternative.

4.25 Since the need for and makeup of a management entity could not be determined until a plan was selected, the no-action option was discarded.

Without-Project Conditions

4.26 If no Federal action were taken to address the planning objectives, the Atchafalaya River would persist in widening and deepening its channel, the Lower Atchafalaya Basin Floodway would continue to fill with sediment, clearing for agriculture and other development would rapidly accelerate, the Terrebonne Parish marshes would continue to deteriorate at an alarming rate, and water levels would continue to rise near Morgan City, in the Terrebonne marshes, and in the backwater area to the east and northeast. As the delta built in Atchafalaya Bay, the percent of flow between the outlets would stabilize at approximately 50 percent. Under future conditions, environmental quality would be drastically degraded and the threat of a severe flood affecting the urban and industrial areas south of Old River would be profoundly increased. In view of this latter fact, and because the basin is first and foremost a floodway, it was assumed that local interests would continue to raise the levees to preserve the flood-carrying capacity of the basin in the absence of any Federal action. (Future without-project conditions are more specifically described as they relate to each significant resource considered in Section 5 of this EIS, and are discussed in detail in Section 6 of Appendix A.)

4.27 Completion of levee raising by a non-Federal interest would cause forest, wetland, and aquatic habitat destruction and other environmental losses. (These losses are described in detail in Section 6 of the EIS and Section 6 of Appendix A.) In order to meet the legal requirements for identifying mitigation measures necessary to replace these losses, various habitat-based evaluation methods were utilized (these are described in Appendix G). These methods revealed the following losses in annualized habitat units: flooded forest, 3,016; bottomland forest - open land, 4,450; and cypress-tupelo swamp, 1,550. To mitigate for losses of flooded forest and cypress-tupelo swamp it would be possible to open the Wax Lake Outlet overbank area to allow the overflow flooding of 7,800 acres of hardwoods and swamp that is presently flooded only by local rainfall. To mitigate for loss of bottomland forest and open land, it would be possible to

purchase and manage about 12,000 acres of bottomland hardwood forest within the floodway.

Features Considered in Detail

4.28 Features carried forth into the final array of alternatives are described subsequently by group. For those features which were not made a part of the final three plans, a rationale for this elimination is provided. Additional information regarding final plan formulation may be seen in Appendix B.

GROUP I - ALTERNATIVES FOR OPERATION OF THE OLD RIVER CONTROL STRUCTURE

Maintain 70/30 percent distribution annually of total flows between the Mississippi and Atchafalaya Rivers below Old River, respectively with possible short-term variation of flow.

4.29 Various interest groups have expressed a desire to vary the present 70/30 daily distribution slightly during May, June, and July. Farmers in the Red River backwater area would benefit some years from a reduction in flow into the Atchafalaya River so that stages would not rise above 45 feet at Acme. However, the US Fish and Wildlife Service would like to see flows increased in some drier years to benefit fishery resources in the lower floodway. This alternative was eliminated because the economic gains that would be achieved in the backwater area by reducing flows into the Atchafalaya River would be far outweighed by environmental and economic losses sustained in the backwater area and the lower basin. Additionally, engineering studies have shown that increasing flows into the Atchafalaya River could lead to the capture of the Mississippi by the Atchafalaya.

Maintain 70/30 percent distribution of total flows between the Mississippi and Atchafalaya Rivers below Old River, respectively on an annual basis.

4.30 This is the present operational scheme and it would be maintained in the future.

GROUP II - ATCHAFALAYA RIVER MAIN CHANNEL DEVELOPMENT AND LEVEE RAISING ALTERNATIVES

Raising of the East and West Atchafalaya Basin Protection Levees, Atchafalaya River Levees, and levees West of Berwick.

4.31 Levee raising has been a continuing process since 1972. These levees would need to be raised approximately 6 feet in the southern portion and approximately 4 feet in the northern portion (Plate 5). Maintenance would consist of grass mowing, road repairs and other minor actions. Certain existing locks, floodgates, drainage structures, culverts, pumping plants, and service roads would also need to be modified to pass the project flood. These are listed in detail in the main report.

Channel training alternative.

4.32 Reduction of sediment deposition in overbank areas would be accomplished by dredging 29,000,000 cy of material from the river and depositing it on the banks to confine flows and sediment. These new banks would initially cover approximately 6,000 acres from river mile 90 to mile 116 (Plate 6). Low back levees would prevent runoff of sediment into adjacent areas. There would be no gaps in the banks, and they would be built to a height that would be overtopped during 50 percent of the years of project life. Future bank maintenance from mile 53 to mile 90 could become necessary if severe bank erosion occurred in this reach and repairs were needed to confine the river. Maintenance of training works would be minimal and would be limited to repair of any crevasses which might occur during major floods.

Modified channel development.

4.33 Approximately 32,800,000 cy would be dredged from the main channel between mile 101 and mile 114 and the dredged material placed upon the adjacent banks. No gaps would be left in the banks and approximately 7,000 acres would be covered by dredged materials. Maintenance would consist of repair of crevasses. This alternative was eventually dropped due to its cost and because it would be no more effective in reducing overbank sedimentation than the channel training alternative described above.

100,000-sf channel from head of Whiskey Bay Pilot Channel to Wax Lake Outlet, 80,000-sf to Stouts Pass, with gaps.

4.34 The river would be dredged and the dredged material would be placed on approximately 20,000 acres of adjacent banks and forests with gaps left to allow flow into the swamps, bayous, and lakes. This alternative was dropped because of its adverse environmental impact and high cost.

Bank Stabilization.

4.35 The banks of the Red and the Atchafalaya Rivers would be stabilized where necessary by placement of riprap or articulated concrete mattresses from the Old River outflow channel to the head of Whiskey Bay Pilot Channel (Plates 13-17). A 1.4-mile revetment would be built at Morgan City. (Approximately 41 miles of revetments are already constructed and nearly 24 miles remain to be built.) Maintenance would consist of repair of any damages that might occur.

GROUP III - SEDIMENT CONTROL ALTERNATIVES

Distributary channel realinements.

4.36 The major distributary channels of the Atchafalaya Basin main channel (Old Atchafalaya River, east and west access and east freshwater distribution channels) would be realined to reduce the entrance angle to between 30 and 45 degrees to reduce the volume of sediments being carried by these channels into swamp areas. This would be accomplished by blocking the distributary near the main channel, while at the same time dredging and placing necessary revetments for a new entrance channel (Plate 7). Maintenance would consist of regular inspection and repair of eroded areas which might be formed.

GROUP IV - MANAGEMENT UNITS AND RELATED FEATURES

Phased implementation.

4.37 This feature would provide for the implementation of two pilot management units and, based on detailed studies of the results of their operation, the development of others. Development of management units would require restriction of their natural outlets by constructing weirs and, in some cases, low-level levees (Plate 11). Construction of new inlets at the upper end of management units would probably be necessary, as well as the closure of certain bayous and canals, and the improvement of water circulation within the units. Rollovers for small boat access would be installed at some bayou and canal closures. Maintenance would consist of trash and debris removal from inlets and outlets, any necessary levee repairs, and boat rollover maintenance.

4.38 Studies to date indicate that five units--Buffalo Cove, Henderson, Beau Bayou, Flat Lake, and Cocodrie Swamp--have the greatest potential for accomplishing the goal of restoring historical overflow conditions to benefit the aquatic ecosystem. These five were specifically included in the plan and the costs, benefits, and impacts

developed for plan evaluation purposes (Figure 4-2). The Buffalo Cove and Henderson units are proposed for initial implementation as pilot units. Subsequent to their construction, they would be monitored by representatives of the cooperating agencies, using criteria developed by that group, and an evaluation of their performance would be made. Based on that group's evaluation, and recommendations, requests for funding of other units would be made. At this time, it is not possible to determine, with any precision, exactly how many additional units could be recommended for implementation.

Freshwater structures.

4.39 A freshwater diversion structure near Krotz Springs would serve as an inlet for the Henderson Management Unit. This structure would be a gated culvert designed to pass a maximum of about 3,000 cfs into the upper regions of the Henderson area. The exact location of this structure has not yet been determined, as several feasible sites exist. Studies to date, however, have ruled out the use of Indian Bayou and Bayou Courtableau where they meet the Atchafalaya River. The most likely site presently seems to be Big Bayou Graw near river mile 45. Future studies, during advanced stages of planning, would finalize the location of the structure. Plans would also be developed to insure that diversion of river water does not increase flooding on existing developed land or farmland in the vicinity of the structure nor cause a deterioration in the existing water quality of the presently impounded reach of lower Bayou Courtableau.

4.40 The* Sherburne Freshwater Diversion Structure at river mile 43 would provide freshwater to the Alabama Bayou area. This gated culvert would pass a maximum of about 3,000 cfs into Big Alabama Bayou.

4.41 Maintenance of both structures would consist of periodic inspection, removal of accumulated debris, and any repairs needed.

Canal closures and circulation improvements.

4.42 This feature would consist of closing certain canals that permit sediment-laden waters to enter backswamp areas, and of improving water circulation throughout the lower floodway by selective opening of dredged material banks and other features which presently impede circulation.

GROUP V - ALTERNATIVE LAND USE PLANS

Introduction.

4.43 The real estate features of the plans provide for those interests needed to serve three basic functions: flood control,

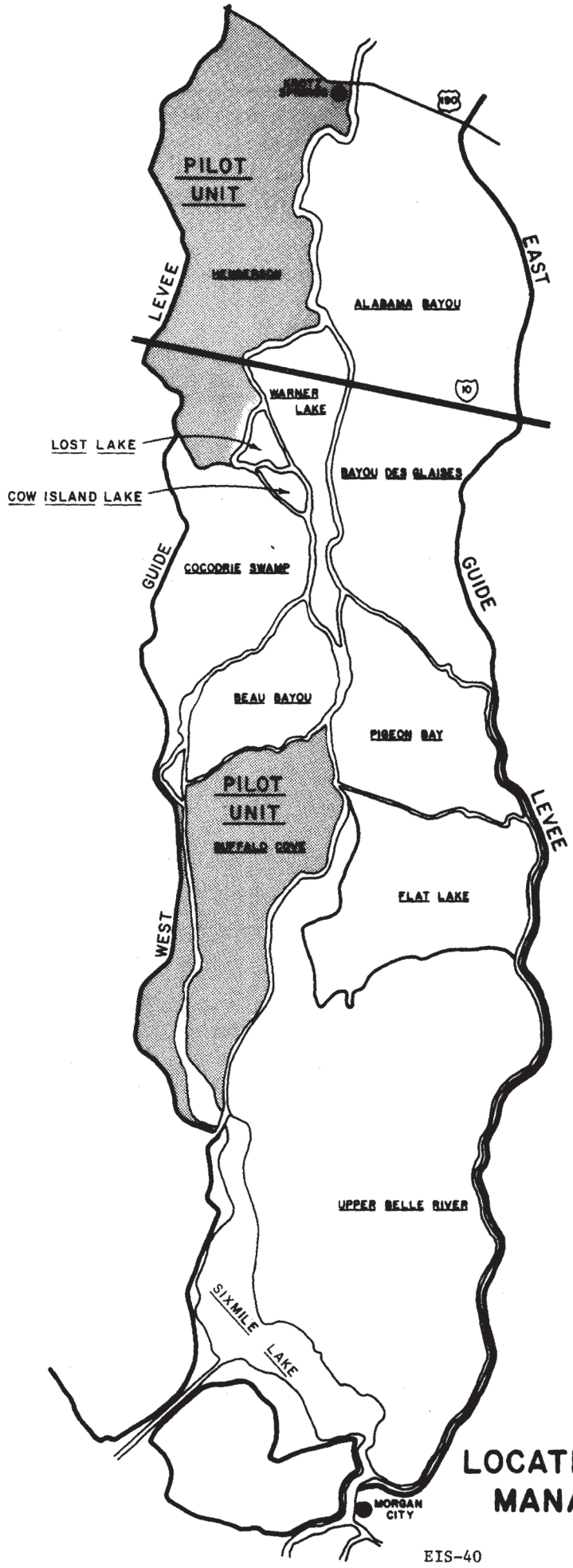

FIGURE 4-2
LOCATION OF PROPOSED
MANAGEMENT UNITS

environmental protection, and public access. Real estate features for both flood control and environmental purposes were developed in specific response to study objectives cited by the authorizing congressional resolutions. The public access function is ancillary to the proposed environmental features of the project. The state expressed the view that public access in addition to the current state-owned lands was desirable. Both of the proposed public access interests were developed in accordance with the recommendations of the Governor. For all new real estate interests acquired for project purposes, mineral rights would be retained by the landowner.

Flood control.

4.44 The Flood Control Act of 1936 specified: "That no flowage easements shall be paid for by the United States over properties subject to frequent overflow in the Atchafalaya Basin below the approximate latitude of Krotz Springs." It was determined that about 68,000 acres were subject to purchase of such flowage easements. To date, those easements have been obtained on about 9,000 acres. Flowage rights are proposed to be purchased on the remaining 59,000 acres. In addition, the right to prohibit the construction of new permanently habitable structures and to prohibit or regulate construction of other structures, including camps, would be acquired over all privately-owned land in the lower basin, except for developed ridges. Equivalent interests would be obtained from the State of Louisiana on all state-owned lands. The need for developmental control is associated with operation of the floodway. This right would assure the lower floodway's readiness for operation on short notice, preclude the need for US Army Corps of Engineers emergency flood-fighting operations and associated Federal expenses within the basin, and insure no liability on the part of the Federal Government for the public health, safety, and welfare by controlling industrial development that could prove hazardous to the public during floodway operations.

Environmental protection.

4.45 Certain rights are considered necessary for preservation of fish and wildlife habitat and maintaining the "wet and wild" environmental appeal of the lower floodway. Such rights would include control over all excavation and landfill operations, and provisions to allow for extension of the time and duration of flooding by natural or artificial means. Land conversion control would prohibit clearing of forests for the purpose of agricultural production or other pursuits such as industrial development. Control over timber would preserve habitat by requiring sustained yield forestry practices. A comprehensive multipurpose easement, or higher interest if mutually agreed upon, containing the cited environmental interests would be acquired over all privately-owned land in the lower basin except for the developed ridges. Equivalent interests would be obtained from the State of Louisiana on all state-owned lands.

Public Access.

1980 State of Louisiana proposal.

4.46 The public access function proposed at the July 1981 public meetings was subdivided into two basic categories: recreational development and general public access. For the recreational development feature, a total of 1,500 acres would be acquired in fee title in the proximity of the lower floodway to provide for the development of destination and primitive campsites, boat-launching ramps and other facilities complementary to destination-type outdoor recreational activities. The general public access feature would be accomplished by the acquisition of such additional rights on 103,500 acres of the same acreage previously cited for environmental protection easements. The public access areas would include 30,000 acres of late successional bottomland hardwood forests, 50,000 acres of cypress-tupelo swamps, 23,000 acres of greenbelts along the edges of selected navigable public waterways and sites along the interior toe of the basin protection levees, and 500 acres of existing rookeries. Additional rights to prohibit harvest of timber would be obtained on 73,500 of the same acres over which general public access easements were acquired; only 30,000 acres of cypress-tupelo would be excepted.

Development of substitute proposal.

4.47 During the public meetings of July 1981, general opposition was expressed to the greenbelt portion of the plan by landowners and hunters, while the greenbelts were generally favored by environmental interests. Additionally, landowners voiced opposition to the public access easements and originated an alternate proposition whereby the state would be offered certain lands for acquisition on a "willing seller" basis. These lands, plus those included in a recent donation to the state by the Dow Chemical Company, were proposed as a substitute for the public access easements cited above. The comprehensive multipurpose easement proposed for flood control and environmental protection over the entire Lower Atchafalaya Basin Floodway was generally supported by landowners and environmental groups and remained as part of the landowners' alternative proposal.

4.48 Subsequent to the July meetings, a compromise proposal for public access was developed through the cooperative efforts of major opposing interests. Prominent national and local environmental organizations worked with representatives of the landowners and the state toward this end. A key element of the new proposal which makes it acceptable to the environmental community is a recommended tightening of provisions of the comprehensive multipurpose easement to prohibit land-use conversion. A key issue resolved by the new proposal is the elimination of the "greenbelts" included under the prior public access proposal. The details of the new alternative for public access were announced by Governor David C. Treen during a press

conference on 19 November 1981, as a substitute for the public access provisions he had recommended in November 1980.

Recommended substitute proposal.

4.49 Recreational development would be as described in the 1980 proposal with the exception that some of the 200-500 acres specified in that proposal as special and unique areas would be set aside for rookeries. The general public access feature would be accomplished by the following described state-managed lands. At least 30,000 acres have been made available in the Lower Atchafalaya Basin Floodway through a donation of lands to the state made by the Dow Chemical Company. (An additional 10,000 acres near the floodway were also donated.) The state would provide additional public access on the 150,000 acres existing state-owned land and approximately 50,000 additional acres in the floodway would be made available by fee title acquisition from landowners identified by the state as willing sellers. Federal cost-sharing with the state would be recommended for the lands to be procured in an amount equivalent to that proposed in the draft plan for Federal acquisition of public access easement rights.

4.50 The exact habitat type composition of these lands is not known; however, for purposes of impact assessment it is assumed that 48,000 acres are mid-to-late successional bottomland hardwoods, 18,000 acres are early successional bottomland hardwoods, and 12,000 acres are cypress-tupelo.

Operation and maintenance of real estate features.

4.51 Operation and maintenance would consist of policing easements for unauthorized uses and managing lands for recreation, commercial fishing, wetland conservation, and oil and gas exploration.

No action.

4.52 This alternative was eventually dropped when it became obvious that real estate interests were needed for flood control, environmental protection, and public access.

GROUP VI - ALTERNATIVE FOR FLOODWAY OUTLETS AND DELTA BUILDING

Maintain existing flow distribution (Lower Atchafalaya River 70 Percent/Wax Lake Outlet 30 percent).

4.53 A weir and low-level levee would be constructed upstream of Wax Lake Outlet to maintain the existing distribution of outlet flows (Plate 8). Maintenance would consist of levee and weir repairs and mowing of grass.

Maintain 70/30 flow distribution with possible future change to approximately 20/80 percent distribution of outlet flows.

4.54 At first, present flows (70/30) would be maintained by a weir and low-level levee upstream of Wax Lake Outlet. If the estuarine and marsh ecosystem responded favorably, flows into Wax Lake Outlet would be further restricted by modification of the weir to limit the low to normal flows to 20 percent. Maintenance would be as described for the 70/30 alternative.

Close Wax Lake Outlet to normal flows (Lower Atchafalaya River 100 percent/Wax Lake Outlet 0 percent).

4.55 A low-level levee would be constructed at the head of Grand Lake. This levee would be overtopped by floodflows occurring on the average of once every 2 years. Maintenance would be as described for the 70/30 alternative.

Widen Wax Lake Outlet Overbank.

4.56 A new levee would be built west of the existing levee along the west side of Wax Lake Outlet to form a new overbank outlet. Existing levees within the widened overbank area would be degraded to ground level and a new West Calumet floodgate would be built (Plate 9). Maintenance would consist of routine levee repair and mowing of grass.

Training works below Morgan City.

4.57 This feature would provide for training works below Morgan City on both the Wax Lake Outlet and the Lower Atchafalaya River and a closure of Bayou Shaffer. Construction of the training works would require the dredging of approximately 15 miles of existing channel bottom areas and placing the dredged material in adjacent shallow water bottoms or on adjacent stream banks to confine average annual peak flows, leaving gaps between disposal areas to allow for continued development of the overbank marshes, for navigation access, and for pipelines (Plate 18).

Increase sediment through Wax Lake Outlet.

4.58 This feature would consist of dredging a new entrance channel to Wax Lake Outlet from the Atchafalaya River at an angle that would optimize sediment transport to the Wax Lake Outlet (Plate 12). Maintenance would consist of periodic inspection and repair of eroded channel areas. For engineering reasons, this feature could be built only if a 70/30 flow distribution were maintained at the outlets.

GROUP VII - ALTERNATIVES TO REDUCE BACKWATER FLOOD DAMAGES EAST OF THE FLOODWAY

Limited structural measures.

4.59 This feature would include building ring levees around Morgan City and other developed areas (Plates 23, 24, and 25), or a low-lying levee to the southwest of Houma. Providing additional pumping capacity, flood-proofing some structures, relocating some residences and businesses, and purchase of easements to prevent future development in the unprotected flood plain would also be accomplished. Maintenance would consist of periodic inspection and levee repair, mowing of grass, and trash removal. This feature was eliminated because of uncertainty over just what would be the best solution to the problem of backwater flooding and because of a need to accomplish more detailed studies before making a final decision.

Extension of the Avoca Island levee.

4.60 Approximately 14,000 feet of levee extension would be proposed for construction. (Impacts, costs, and benefits have been estimated for an entire levee extension only as a basis for equally comparing the detailed plans.) One proposed alinement would parallel the eastern shore of Atchafalaya Bay while the other proposed alinement would pass through the center of the bay (Plate 10). The bayshore alinement would include a navigation structure to connect the Avoca Island Cutoff to the Lower Atchafalaya River. Both alinements would also include water diversion structure(s) to be operated to maintain the present nonflood season distribution of water into the Terrebonne Parish marshes (Plate 10). During construction of the 14,000-foot first reach, detailed studies would be conducted to determine if construction of the remaining reaches is justified, or if some other alternative to solve flooding problems in the backwater area would be preferable. Any needed mitigation measures to compensate for environmental losses caused by these remaining reaches would also be clearly identified. Maintenance would be as described for the limited structural measures.

Delayed Action.

4.61 A decision on a recommendation for reducing backwater flood damages east of the floodway would be postponed until 1985. Recent refinement of hydraulic data has shown that implementation of other proposed project features common to all plans would help reduce flood damages for major floods with an expected frequency of occurrence of less than once in 10 years. Detailed studies would be conducted in the next few years to further evaluate extension of the Avoca Island levee and other structural and nonstructural features associated with means of reducing flooding problems in this area. Once these studies

were completed, a decision would be made as to which alternative would be implemented and a supplemental EIS would be prepared.

GROUP VIII - MANAGEMENT ENTITY

4.62 The management entity would depend on the features contained in the specific plan being considered.

Final Array of Plans

4.63 The EQ plan, the NED plan, and the Recommended Plan were formulated from the previously discussed features considered in detail. Table 4-5 lists the features of each of these plans, as well as the future without-project condition. The features of the Recommended Plan are shown on Plate 19.

MITIGATION NEEDS OF PLANS CONSIDERED IN DETAIL

4.64 No mitigation needs would exist with the EQ plan because implementation would result in a net gain of over 40,000 annualized habitat units (AHU's) of bottomland hardwood-open land habitat and almost 3,000 AHU's of swamp habitat. These gains would offset the small loss of 200 AHU's of marsh habitat this plan would cause.

4.65 Mitigation needs of the NED plan would require the replacement of about 6,400 AHU's of bottomland hardwood-open land habitat, about 3,000 AHU's of marshland habitat (19,200 units if the entire Avoca Island levee were built), about 8,500 AHU's of flooded forest and 11,100 AHU's of swamp habitat. To mitigate for loss of bottomland hardwood-open land habitat, it is proposed that about 16,800 acres of bottomland hardwood habitat would be acquired in fee and transferred to the Louisiana Department of Wildlife and Fisheries for use as a wildlife management area. It is assumed that such lands would be acquired within the Atchafalaya Basin Floodway and that they would be managed to increase their productivity for wildlife. To mitigate the loss of flooded forest and swamp it is assumed that management units would benefit aquatic productivity, and it is proposed that the Buffalo Cove Management Unit would be implemented to partially mitigate such a loss by preserving 8,200 AHU's of flooded forest and 4,000 AHU's of swamp. To mitigate for the remaining swamp losses, it is proposed that a water diversion structure would be built which would divert Mississippi River water into existing swampland in

TABLE 4-5
FEATURES OF FINAL ARRAY OF PLANS AND
THE FUTURE WITHOUT-PROJECT CONDITION [1/]

	FWO[2/]	EQ[3/]	NED[4/]	R[5/]
*70/30 flow at Old River	X	X	X	X
*Levee raising	X	X	X	X
*Bank stabilization		X	X	X
**Channel training		X	X	X
*Minor project features		X	X	X
**Sediment control (realinement)		X	X	X
Management units		X		X
**Freshwater structures		X		X
Canal closures and circulation improvements		X	X	X
Flood control easements[6/]		X	X	X
Environmental easements		X		X
Recreational development[7/]		X	X	X
1980 State of Louisiana public access		X		
Substitute proposal for public access				X
**LAR 100/WLO 0[8/]			X	
**LAR 70/WLO 30 to LAR 80/WLO 20				X
**LAR 70/WLO 30		X		
**Widen WLO Overbank		X	X	X
**Channel training below Morgan City			X	X
Increase sediment out WLO		X		
**Avoca Island levee 14,000-foot extension (channel)			X	
**Backwater flooding solution (delay in implementation)		X		X
Management entity		X	X	X
Swamp management via freshwater diversion			X	
Marsh management via freshwater diversion			X	
Land acquisition and management for mitigation	X		X	

1/ Features requiring congressional authorization have no asterisk.
*Features currently authorized by Congress and approved by the Chief of Engineers.
**Features for which approval of the Chief of Engineers would be needed
2/ Future without-project condition.
3/ Environmental Quality.
4/ National Economic Development.
5/ Recommended Plan.
6/ Acquisition of overflow rights to limited areas is authorized.
7/ Boat-launching facilities are authorized.
8/ LAR-Lower Atchafalaya River, WLO-Wax Lake Outlet.

the upper Barataria Basin. To mitigate for marsh losses, marsh management by freshwater introduction over 15,000 acres would replace losses caused by the first extension of the Avoca Island levee. Replacement of losses due to the entire levee would require management of over 100,000 acres.

4.66 The Recommended Plan includes the acquisition of real estate interests on 367,000 acres for the purposes of, among other things, preventing land clearing, preventing conversion of wetlands and woodlands to agriculture, and providing for the operation of management units. Public access to and ownership of the timber resources on 78,000 acres are also included. While it is recognized that some losses to environmental values would occur due to construction of various project features, it is considered that the need to mitigate these losses, in kind, would be negated by the overall positive environmental contribution of the real estate features of this plan.

4.67 Mitigation of losses to cultural resources cannot be determined until intensive cultural resource surveys on all features of the Recommended Plan are completed.

IMPLEMENTATION RESPONSIBILITY

4.68 Cost apportionment is shown in Table 4-6. As noted in the table, costs are apportioned using three cost-sharing policies: that proposed by President Carter in his June 1978 Water Policy Message to Congress; the Water Resources Council's traditional cost-sharing; and the policy proposed by the New Orleans District for this project.

4.69 Since it is an integral part of a project that provides drainage for one-third of the continental United States, the Atchafalaya Basin Floodway is a flood control project that goes far beyond local scope. The basin has national prominence as one of the largest river swamps in the nation remaining in a semi-natural state. Facilities may become authorized to satisfy the intent of the study authority, which directs preservation of the basin's natural resources, including improvements for sport and commercial fishing. It is proposed that the State of Louisiana take full responsibility for operation and maintenance of the management units, recreational developments, and lands acquired for public access. Flood control features, dredge and fill permits, and real estate management programs would remain under control of the New Orleans District.

TABLE 4-6

IMPLEMENTATION RESPONSIBILITY COST APPORTIONMENT

	PLAN		
	EQ	NED[1/]	R
	($)	($)	($)
PRESIDENT'S POLICY			
Federal first cost	699,541,000	697,304,000	678,771,000
Non-Federal first cost	316,300,000	240,577,000	309,235,000
Federal annual O&M	0	26,000	0
Non-Federal annual O&M	14,872,000	15,030,000	16,039,000
TRADITIONAL POLICY			
Federal first cost	954,140,000	927,703,000	924,976,000
Non-Federal first cost	61,701,000	10,178,000	63,030,000
Federal annual O&M	14,439,000	14,673,000	15,606,000
Non-Federal annual O&M	433,000	383,000	438,000
PROPOSED POLICY			
Federal first cost	999,903,000	936,006,000	936,797,000
Non-Federal first cost	15,938,000	1,875,000	51,209,000
Federal annual O&M	14,439,000	14,673,000	15,606,000
Non-Federal annual O&M	433,000	383,000	433,000

[1/] Based on construction of an additional 14,000 feet of the Avoca Island levee.

Comparative Impacts of Alternatives

4.70 Table 4-7 compares the base and without-project conditions and lists the impacts of each detailed plan on the significant resources of the project-affected area. Plan economic characteristics are also compared. The significant resources are individually described in Section 5 of this EIS, and the impacts of each plan on each significant resource are detailed in Section 6.

4.71 The impacts in this table are based on the assumption that in the NED plan alone the entire Avoca Island levee would eventually be built. Thus, all beneficial and adverse impacts of the entire levee are discussed. It is also assumed where appropriate that five management units would be built. No impacts of possible measures which might eventually be recommended to solve backwater flooding problems in the area northeast of Morgan City are discussed for the EQ and Recommended Plans. These impacts would eventually be discussed in a future supplemental EIS.

4.72 Definitions of the abbreviations that appear in the table are as follows:

DO	= Dissolved oxygen
EQ	= Environmental Quality Plan
FWO	= Future without-project condition
LABF	= Lower Atchafalaya Basin Floodway
LAR	= Lower Atchafalaya River
MSY	= Maximum sustainable yield
MU	= Management units
NED	= National Economic Development Plan
R	= Recommended Plan
WLO	= Wax Lake Outlet

TABLE 4-7

COMPARATIVE IMPACTS OF ALTERNATIVES

	EARLY SUCCESSIONAL BOTTOMLAND HARDWOODS	LATE SUCCESSIONAL BOTTOMLAND HARDWOODS
Base	93,900 acres	332,000 acres
FWO	35,200 acres in 2030 Bulk of 58,700-acre loss due to clearing for agriculture.	186,100 acres 145,900-acre loss mostly due to land clearing for agriculture.
Plan 4 EQ	58,500 acres in 2030 35,400-acre loss from base mostly due to plant succession. 23,300-acre gain over FWO.	339,300 acres in 2030 153,200-acre gain over FWO due to environmental easements.
Plan 7 NED	42,100 acres in 2030 51,800-acre loss from base mostly due to land clearing. 6,900-acre gain over FWO.	177,700 acres in 2030 154,000-acre loss from base mostly due to land clearing. 8,400-acre loss from FWO due to land clearing.
Plan 9 R	60,400 acres in 2030 33,500-acre loss from base mostly due to plant succession. 25,200-acre gain over FWO.	339,500 acres in 2030 Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	CYPRESS TUPELO SWAMPS	AGRICULTURAL LAND
Base	451,000 acres	97,200 acres
FWO	415,000 acres in 2030 36,000-acre loss mostly due to land clearing.	283,800 acres in 2030 186,600-acre gain mostly due to land clearing.
Plan 4 EQ	408,200 acres in 2030 42,800-acre loss from base mostly due to plant succession. 6,800-acre loss from FWO mostly due to plant succession.	100,100 acres in 2030 2,900-acre gain over base due mostly to levee construction. 183,700-acre loss from FWO.
Plan 7 NED	364,100 acres in 2030 87,900-acre loss from base due to land clearing and plant succession. 50,900-acre loss from FWO mostly due to land clearing and plant succession.	326,500 acres in 2030 229,300-acre gain over base due mostly to land clearing. 42,700-acre gain over FWO.
Plan 9 R	407,700 acres in 2030 Impacts similar to those of Plan 4.	100,300 acres in 2030 Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	FRESH MARSH	BRACKISH MARSH	SALINE MARSH
Base	321,300 acres	89,000 acres	107,300 acres
FWO	243,100 acres in 2030 78,200-acre loss due mostly to existing marsh deterioration trends.	64,400 acres in 2030 24,600-acre loss due to marsh deterioration.	69,300 acres in 2030 38,000-acre loss due to marsh deterioration.
Plan 4 EQ	242,900 acres in 2030 78,500-acre loss from base. 300-acre loss from FWO due to direct construction impacts.	64,400 acres in 2030 24,600-acre loss over base due to marsh deterioration. No change from FWO.	69,300 acres in 2030 38,000-acre loss from base due to marsh deterioration. No change from FWO.
Plan 7 NED	238,500 acres in 2030 82,800-acre loss from base. 46,000-acre loss from FWO, mostly due to accelerated marsh loss caused by Avoca Island levee.	63,200 acres in 2030 25,800-acre loss over base. 1,200-acre loss over FWO, Avoca Island levee causes accelerated marsh loss.	69,200 acres in 2030 38,100-acre loss from base. 100-acre loss from FWO due to accelerated marsh loss caused by Avoca Island levee.
Plan 9 R	242,100 acres in 2030 79,200-acre loss from base. 1,000-acre loss from FWO, mostly due to direct construction impacts of channel training below Morgan City.	64,400 acres in 2030 Impacts similar to Plan 4.	69,300 acres in 2030 Impacts similar to Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	DELTA	RIVER, MAJOR DISTRIBUTARY, AND MAIN STEM LAKES	FRESH BAYOUS, CANALS, AND BORROW PITS
Base	10,100 acres	31,100 acres	38,000 acres
FWO	135,000 acres in 2030 125,000-acre gain due to delta development in Atchafalaya Bay.	32,100 acres in 2030 1,000-acre gain over base due to erosion of Atchafalaya River.	50,900 acres in 2030 13,000-acre gain due mostly to levee raising and some to marsh deterioration.
Plan 4 EQ	130,700 acres in 2030 124,600-acre gain over base. Same as FWO.	33,100 acres in 2030 2,000-acre gain over base due to construction and erosion. 1,000-acre gain over FWO due to construction.	50,900 acres in 2030 13,000-acre gain over base mostly due to levee raising and some to marsh deterioration. 100-acre gain over FWO due to construction impacts.
Plan 7 NED	130,700 acres in 2030 120,600-acre gain over base. 4,300-acre loss from FWO due to Avoca Island levee. Between 2030 and 2080 an additional 17,000 acres of delta would deteriorate due to the Avoca Island levee.	32,100 acres in 2030 1,000-acre gain from base due to erosion. Same as FWO.	52,100 acres in 2030 14,100-acre gain over base due mostly to levee raising and some to marsh deterioration. 1,200-acre gain over FWO due to construction impacts of the Avoca Island levee extension.
Plan 9 R	135,000 acres in 2030 Impacts similar to Plan 4.	32,300 acres in 2030 1,000-acre gain from base due to erosion. 200-acre gain from FWO due to construction.	50,400 acres in 2030 12,400-acre gain over base due mostly to levee raising and some to marsh deterioration. 500-acre loss over FWO due to fewer construction impacts.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	HEADWATER LAKES	BACKWATER LAKES	CROPLAND LAKES
Base	18,200 acres	42,000 acres	30 acres
FWO	1,900 acres in 2030 16,300-acre loss due mostly to sedimentation and lowering of water levels.	34,000 acres in 2030 8,000-acre loss due mostly to sedimentation and falling water levels and 3,900 acres reclassified as cropland lakes due to clearing.	4,100 acres 4,070-acre gain due to land clearing.
Plan 4 EQ	2,200 acres in 2030 16,000-acre loss from base due to sedimentation and falling water levels. 300-acre gain over FWO.	38,300 acres in 2030 3,700-acre loss from base due to sedimentation and falling water levels. 4,300-acre gain over FWO due mostly to environmental easements.	30 acres in 2030 Retains present conditions.
Plan 7 NED	1,800 acres in 2030 16,400-acre loss from base due to sedimentation and falling water levels. 100-acre loss from FWO.	33,400 acres in 2030 8,600-acre loss from base due to sedimentation and falling water levels and about 4,600 acres reclassified as cropland lakes due to clearing.	4,900 acres in 2030 4,870-acre gain over base due to land clearing. 800-acre gain over FWO due to land clearing.
Plan 9 R	2,200 acres in 2030 Impacts similar to Plan 4.	38,300 acres in 2030 Impacts similar to Plan 4.	30 acres in 2030 Impacts similar to Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	BRACKISH AND SALINE MARSH BAYOUS, CANALS, AND BORROW PITS	MARSH PONDS AND LAKES
Base	Brackish bayous 6,200 acres. Saline bayous 6,100 acres.	Fresh 87,600 acres. Brackish 55,200 acres. Saline 64,400 acres.
FWO	Brackish 8,100 acres by 2030. Saline 7,400 acres by 2030. Increase due to erosion of brackish and saline marsh.	Fresh 141,600 acres in 2030. Brackish 75,300 acres in 2030. Saline 99,000 acres in 2030. 54,000-acre gain of fresh, 20,100-acre gain of brackish, 34,600-acre gain of saline due to "natural" deterioration of marsh.
Plan 4 EQ	Brackish 8,100 acres by 2030. Saline 7,400 acres by 2030. Same as FWO.	Same as FWO.
Plan 7 NED	Brackish 8,300 acres by 2030. Saline 7,400 acres by 2030. Saline same as FWO, additional brackish marsh deterioration caused by Avoca Island levee extension would lead to increase of 200 acres of brackish bayous.	Fresh 142,400 acres in 2030. Brackish 76,300 acres in 2030. Saline 99,100 acres in 2030. Gains slightly larger than FWO. Construction of Avoca Island levee would increase formation of ponds.
Plan 9 R	Brackish 8,100 acres by 2030. Saline 7,400 acres by 2030. Same as FWO.	Same as FWO.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	BAYS AND OPEN GULF	FLOOD-CARRYING CAPACITY	NATURAL AND SCENIC STREAMS
Base	Fresh bays 200,000 acres. Brackish bays 58,900 acres. Saline bays 53,800 acres. Shallow gulf 804,000 acres.	The floodway system is inadequate at present. It can pass only 850,000 cfs of its assigned capacity of 1.5 million cfs.	Bayou Penchant
FWO	Fresh bays 75,100 acres in 2030. Others same as base. Loss of 124,900 acres of fresh bays due to growth of delta in Atchafalaya Bay.	Carrying capacity would increase to 1.5 million cfs by raising the levees. This would be a long and expensive process.	Scenic quality could decrease or change as water levels rise due to rising Atchafalaya River flowline.
Plan 4 EQ	75,100 acres of fresh bays in 2030. Others same as base. Loss of 124,900 acres of fresh bays due to growth of delta in Atchafalaya Bay.	This plan would pass 1.5 million cfs to the gulf, but due to its higher flowline and increased costs, it would take the longest of any plan to achieve the desired capacity.	Same as FWO.
Plan 7 NED	75,400 acres of fresh bays in 2030. Others same as base. Loss of 120,600 acres of fresh bays due to growth of delta in Atchafalaya Bay.	This plan would safely carry the 1.5 million cfs to the gulf.	Avoca Island levee would prevent rising water levels and possibly help preserve existing scenic quality.
Plan 9 R	75,100 acres fresh bays in 2030. Others same as base. Impacts similar to Plan 4.	Impacts similar to Plan 7.	Same as FWO.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	WATER QUALITY	NAVIGABLE WATERWAYS
Base	River water is high in suspended sediments, DO and nutrients. Overbank areas experience low DO levels during much of the year. Nutrients are sufficiently available within the Lower Floodway for complete bacterial metabolism of organic matter. Areas outside of Floodway have higher DO and more phytoplankton.	Many navigable waterways present, with good access to most areas.
FWO	Water quality in overbank areas would deteriorate as average levels and circulation decrease. Further sedimentation would cause even lower DO. Increases in agriculture and industry would lead to potential problems of pesticide and heavy metal concentrations.	Present conditions would be maintained.
Plan 4 EQ	MU's would maintain desirable water levels and flow patterns. Sedimentation would be reduced by distributary realinement. Environmental easements would prevent water quality problems associated with agricultural and industrial development.	Adverse impacts would occur due to MU's, channel training in the Atchafalaya River, and restriction of WLO.
Plan 7 NED	Channel training and outlet flow concentration through LAR would lower flowline. Absence of MU's, together with other features, would reduce overbank water supplies. Avoca Island levee extension would limit freshwater input to Terrebonne marshes, but diversion structure(s) could compensate for this effect.	Adverse impacts would occur due to channel training in Atchafalaya River and LAR, extension of Avoca Island levee and closure of WLO.
Plan 9 R	Impacts similar to Plan 4. Possible flow distribution between WLO and LAR, along with channel training, would result in lessened overbank flow into adjacent marshes.	Adverse impacts would occur due to MU's, channel training of the Atchafalaya River and LAR, and restriction of WLO.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	FISHERIES
Base	The overflow system of the LABF supports a fishery rich in numbers and species. Crawfish harvest averages 15 million pounds yearly. Marshes support an important estuarine fishery. Annual average harvest of shrimp, 47.8 million pounds; menhaden, 173 million pounds.
FWO	Fisheries productivity would decline from present due to loss of aquatic habitat because of sedimentation, lowering of water levels and marsh deterioration. Agriculture would increase sediments and pesticides in the aquatic system. Crawfish MSY would drop 39 percent from present.
Plan 4 EQ	Overall fishery productivity would be less than present, but more than under FWO project or Plan 7 conditions. MU's would increase fishery productivity by flooding more land deeper and longer than under FWO condition, and by preserving permanent aquatic habitat at low water. Crawfish MSY would drop 28 percent from present. Estuarine fishery resources would decrease slightly from the present and future without-project conditions. Widening Wax Lake Outlet overbank would benefit fisheries by reconnecting 7,800 acres of cypress-tupelo to the river and tidal system. 12,090 acres of borrow pits would be created which would enhance fisheries.
Plan 7 NED	Overall fishery productivity would be lowest with this plan. Sedimentation would destroy thousands of acres of aquatic habitat in the LABF and severe water quality problems would occur. Additional agriculture would increase pesticides and sediments, which would reduce fisheries. Crawfish MSY would drop 48 percent from present. Avoca Island levee alinement would cause greatest loss of estuarine fisheries of any plan. Widening of Wax Lake Outlet and construction of 13,220 acres of borrow pits would have benefits described in Plan 4.
Plan 9 R	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	WILDLIFE	ROOKERIES
Base	A great variety of wildlife exists throughout the project area.	Numerous rookeries occur in the project-affected area.
FWO	A highly significant decrease in wildlife would occur due to destruction and degradation of forests, marshes, and aquatic habitats due to clearing for agriculture, sedimentation, and levee raising.	A number would disappear due to decline in feeding habitat for birds that use them.
Plan 4 EQ	A slight decrease in wildlife would occur due to marsh deterioration, and direct construction impacts. However, there would be a gain in wildlife over future without-project conditions.	500 acres of rookeries would be protected by special easements. Environmental easements and management units would preserve feeding habitat for birds. Recreation features would increase public use, causing increased harrassment of birds during nesting.
Plan 7 NED	A highly significant decrease in wildlife would occur due to loss of forestland in the LABF and backwater area, marsh deterioration, and direct construction impacts.	No protection by easements. Least feeding habitat of any plan would be preserved. Recreational impacts same as those of Plan 4. Clearing would cause increased pesticide pollution in aquatic areas which would adversely impact birds. Channel training of the LAR could disrupt several sites.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4 but channel training of the LAR could disrupt several sites.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	AUDUBON SOCIETY BLUE LIST SPECIES	ENDANGERED AND THREATENED SPECIES	RECREATION
Base	Range of 50 species includes project area.	16 endangered or threatened species occur or might be expected to occur in project area.	269,000 annual user-days of supply valued at $7,469,000.
FWO	Species living in forests or marshes would decline in numbers as their habitat declines.	Six species would be affected adversely.	250,800 average annual equivalent user-days of supply valued at $6,892,000.
Plan 4 EQ	Plan would benefit forest species.	Two species would be benefited and two species adversely affected.	$1,537,000 average annual equivalent user-days of supply valued at $25,230,000. Real estate features preserve forest and provide access which enhances recreation. Fee acquisition of 1,500 acres provides a large amount of this recreation.
Plan 7 NED	Plan would be greatly detrimental to most species--especially those inhabiting forests and marshes. Increased pollution caused by agriculture would also have adverse impacts.	Same as FWO	1,273,000 average annual equivalent user-days of supply valued at $23,354,000. Clearing for agriculture and construction impacts, and loss of delta caused by Avoca Island levee would reduce recreation when compared to Plans 4 or 9. Major source of recreation in this plan is fee acquisition of 1,500 acres.
Plan 9 R	Impacts similar to those of Plan 4.	Same as Plan 4.	1,320,900 average annual equivalent user-days of supply valued at $24,944,000. Conditions very similar to Plan 4. Recreational development features are idential to that of Plan 7.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	WILDLIFE REFUGES AND MANAGEMENT AREAS	TIMBER	OIL, GAS, AND MINERALS
Base	One national refuge and 11 state management areas in project area. Two in project-affected area.	Commercial forests comprise 40 percent study area. $5,960,000 average annual net income.	Extensive oil, gas, and mineral activities in project-affected area.
FWO	The two management areas in the project-affected area would increase in size and terrestrial habitat quality due to sedimentation and plant succession. Aquatic habitat quality would decrease due to pollution.	Resource would decrease significantly as land clearing continues and harvest of existing cypress forest progresses. $4,362,000 annual net income by 2030.	No impacts, but oil and gas extraction would become much less important as reserves are depleted.
Plan 4 EQ	Public use would be increased in the two areas in project-affected area.	Resource would decrease slightly from present due to construction impacts. However, resource would be significantly greater than under FWO. $5,458,000 annual net income by 2030.	Channel training above Morgan City and closure to Wax Lake Outlet could have adverse impacts on access for exploration and production of oil and gas. Management units could also cause minor inconveniences.
Plan 7 NED	Public use would be increased as in Plan 4. Channel alinement of Avoca Island levee could destroy 4,000 acres of newly developed delta in Atchafalaya Delta Management Area by 2030 and an additional 17,000 acres by 2080.	By 2030, about one-fourth of the timber resources in the area would be lost due to clearing in the floodway and the backwater area. $4,148,000 annual net income by 2030.	Impacts similar to those of Plan 4 with additional impacts due to the Avoca Island levee extension and channel training below Morgan City, which could limit access for exploration and production of oil and gas.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4. $5,477,000 annual net income by 2030.	Impacts similar to those of Plan 4, except channel training below Morgan City could limit access.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	CULTURE OF THE BASIN	NATIONAL TRUST PROPERTIES
Base	A unique folk culture, based upon utilization of swamp resources, developed in the basin in the mid-1800's. Although the heart of the swamps has largely been abandoned and the inhabitants have moved to the edges of floodway, folk traditions, lifestyles and skills remain.	There are no National Trust properties in the project-affected area.
FWO	The continuing sedimentation and drainage of the swamps would adversely impact the extractive economy base, and thus, the life-style of those who live on the edges of the floodway. This would have far-reaching effects upon folk culture.	
Plan 4 EQ	This plan would slow the deterioration of the natural conditions upon which the folk culture of the basin is based. However, increased recreational use of the basin would conflict with established commercial use patterns.	
Plan 7 NED	This plan would be the most detrimental as it would accelerate deterioration of swamp production and thus, undercut the economic base of the basin's folk culture. Increased recreational use would cause competition between recreationists and commercial fishermen over the dwindling resource base.	
Plan 9 R	Impacts similar to those of Plan 4.	

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	NATIONAL REGISTER PROPERTIES	ARCHEOLOGICAL RESOURCES
Base	Two archeological sites have been determined eligible for the National Register of Historic Places. Ten additional significant cultural resources possibly eligible for inclusion in the National Register also exist.	Over 252 prehistoric and historic archeological sites are recorded. However, these sites represent an incomplete sample of the resources expected to exist.
FWO	The ongoing levee enlargement would possibly impact one of the National Register-eligible properties, and six of the 10 cultural re-resources identified possibly eligible for the National Register.	Archeological resources would be adversely affected as the burial of sites by sedimentation, unregulated development in the basin, the widening and deepening of the Atchafalaya River, and ongoing levee enlargement would continue.
Plan 4 EQ	Same as FWO except that other project features would possibly impact additional cultural resources identified by future investigations as eligible for the National Register.	By regulating land development and maintaining natural conditions through management units, this plan would lessen the processes that adversely impact archeological resources. However, construction related to project features would affect archeological sites and increased public access would increase vandalism and pothunting.
Plan 7 NED	Impacts similar to those of Plan 4.	This plan would be the most detrimental to the resource base as it would accelerate the processes that adversely impact archeological resources. Construction related to project features and increased public access would adversely affect archeological resources.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	NATIONAL REGISTRY OF NATURAL LANDMARKS	OPEN SPACE	AIR QUALITY
Base	Basin being evaluated as natural landmark.	Largest contiguous, roadless semiwilderness in Louisiana.	Quality is generally good, except near industrial facilities.
FWO	Only moderate amount of land in LABF would be preserved in natural state, thus little land would be available for inclusion in landmark.	Amount and quality of open space in LABF would decrease while need for such spaces grew. Rising water levels would preserve open space in backwater area. Continued oil development would decrease quality.	Quality would decrease as development and agriculture expansion spread.
Plan 4 EQ	Would preserve large amounts of habitat in natural state and allow greatest flexibility in choosing landmark lands.	Open space preserved in LABF and backwater area.	Existing quality would be preserved.
Plan 7 NED	Would preserve least land in natural state of any plan. Thus amount of land available for consideration would be less.	Greatest amount of open space, both in LABF and backwater area, would be lost.	Quality would deteriorate throughout the area even more than under FWO conditions.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	ESTHETIC VALUES	UNDEVELOPED LAND	PROPERTY OWNERSHIP
Base	Value high due to semiwilderness nature of area despite oil and gas activities.	Several hundred thousand acres of marsh and forest.	In LABF approximately 60 percent of privately-owned land is vested in 13 major property owners. The remaining 175,000 acres are controlled by some 3,200 owners.
FWO	Quality would continue to deteriorate as sedimentation continues to fill in open water areas and as oil and gas activity expands and logging accelerates.	Much of the existing undeveloped forest land would be developed for agriculture, industry, or residential development. Forests in backwater would not be cleared due to rising water levels.	Impacts would occur to the extent of land requirements for levee raising.
Plan 4 EQ	Values would decline from present as sedimentation, and oil, and gas activities continue and logging accelerates. Decline would be far less than under FWO. Real estate features would preserve forests in LABF. Overall, plan would benefit esthetic values.	Environmental easements would prevent clearing in LABF.	In addition to land requirements for plan construction, there would be impacts due to nondevelopment easements, flowage easements, environmental easements, and fee acquisitions in the lower floodway.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	ESTHETIC VALUES	UNDEVELOPED LAND	PROPERTY OWNERSHIP
Plan 7 NED	Even greater degradation of esthetic values in LABF and Atchafalaya Bay would occur than under FWO. Construction of Avoca Island levee through center of developing delta would degrade esthetics.	Greatest development would occur with this plan, both in the LABF and in the backwater area with consequent loss of undeveloped land.	Impacts due to and requirements for construction would be greater than those of Plan 4, but much less for real estate features, since this plan includes only fee acquisitions and nondevelopment and flowage easements.
Plan 9 R	Impacts similar to those of Plan 4, but channel training along the Lower Atchafalaya River Lake Outlet would degrade esthetics.	Impact similar to those of Plan 4.	Impacts similar to those of Plan 4, except fee purchases from willing sellers for public access would replace public access and timber ownership easements.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	NOISE	DISPLACEMENT OF PEOPLE	COMMUNITY COHESION
Base	Area is relatively noise free compared to other areas. Most existing noise due to boat traffic.	-	Unique cultural heritage and lifestyles of the Atchafalaya Basin dependent on swamp resource utilization have created strong community cohesion.
FWO	Noise levels would increase as agricultural and oil and gas development multiplied. Noise associated with recreation and and commercial fishing would decrease.	Displacements would occur as a result of levee raising. Rising water levels in backwater area could cause displacement of residents.	The LABF would become drier and with the conversion of forest to cropland it would become increasingly more difficult to preserve traditional lifestyles and communities.
Plan 4 EQ	In southern portion of the area, plan would preserve aquatic habitat and boating would increase noise levels over FWO. In northern portion, environmental easement would keep area quieter than under FWO.	Similar to FWO, but widening Wax Lake overbank would cause additional displacements.	Preservation of swamp habitat would help to maintain traditional lifestyles. However, there might be adverse impacts resulting from increased public access and from rising water levels in the backwater area.
Plan 7 NED	Permanent noise would be greatest with this plan due to agricultural development and recreational usage.	Impacts similar to those of Plan 4, but with no displacement of residents in backwater area.	Impacts essentially the same as FWO except for a beneficial impact due to the Avoca Island levee preventing rising water levels and an adverse impact resulting from increased public access.
Plan 9 R	Noise levels would be similar to those of Plan 4.	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	COMMUNITY GROWTH	LOCAL GOVERNMENT FINANCE, TAX REVENUES, AND PROPERTY VALUES	PUBLIC FACILITIES AND SERVICES
Base	-	-	-
FWO	The most significant influence on community growth would be the negative effects resulting from rising backwater area water levels.	The conversion of forestland to cropland could cause the converted acres to be assessed and taxed at a higher rate, increasing the tax base and contributing favorably to tax income. However, rising backwater area stages would tend to reduce the tax base.	No impacts.
Plan 4 EQ	This plan would restrict growth through easements and due to rising backwater area stages.	Threat to tax base in backwater area would be less than with FWO. Also some small increases in sales tax revenue by increased expenditures of recreationists.	Increased visitations in the lower floodway resulting from the recreation development plan might necessitate a greater level of public services, e.g., sanitation and law enforcement.
Plan 7 NED	This plan would remove the hindrance to growth in the backwater area, and would not restrict agricultural development in the floodway.	Same as FWO but to a larger degree, with respect to forestland conversion. Effects on sales tax revenue would be the the same as EQ.	Impacts similar to those of Plan 4.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	BUSINESS AND INDUSTRIAL ACTIVITY AND REGIONAL GROWTH	EMPLOYMENT	DISPLACEMENT OF FARMS
Base	The industrial complex located in and around Morgan City holds the greatest potential for spurring regional growth.		
FWO	Rising stages in the backwater area would pose a significant hindrance to the growth potential of the Morgan City industrial complex.	Minor employment opportunities would be provided by levee raising and conversion of forest to cropland. Destruction of fisheries habitat would reduce employment opportunities. Rising stages in the backwater area would reduce employment opportunities in business and industry.	Approximately 7,000 acres of agricultural land in the backwater area could be lost due to rising water levels.
Plan 4 EQ	Similar to FWO, but to a lesser degree.	Minor employment opportunities would be provided by construction of plan features. Employment decline in fishing would be greatly reduced as fisheries habitat is preserved. Rising stages in backwater area would have less effect than under FWO.	Same as FWO.
Plan 7 NED	By extending the Avoca Island levee, the impediment to industrial expansion and regional growth would be lessened.	Essentially the same as FWO except employment opportunities in business and industry would not be lost due to rising stages in the backwater area.	No displacement of agricultural land would occur.
Plan 9 R	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.	Impacts similar to those of Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	VECTORS
Base	Numerous mosquito vectors occur throughout the project area.
FWO	Same as base.
Plan 4 EQ	Certain project features would temporarily increase vector population.
Plan 7 NED	Same as Plan 4.
Plan 9 R	Same as Plan 4.

TABLE 4-7 (Continued)

COMPARATIVE IMPACTS OF ALTERNATIVES

	TOTAL FIRST COST[1/]	NET BENEFITS (nonflood control)[2/]	BENEFIT/COST RATIO (nonflood control)[2/]
Base	-	-	-
FWO	$669,000,000[3/]	No contribution.	
Plan 4 EQ	$1,032,652,000	$445,000 average annual	1.02 to 1
Plan 7 NED	$939,433,000	$14,496,000 average annual	8.1 to 1
Plan 9 R	$1,004,790,000	$151,000 average annual	1.01 to 1

1/ Includes construction and mitigation costs for the first reach of the Avoca Island levee extension (in plan 7). With full extension, total first costs would be $1,239,901,000.

2/ The estimates presented here are for the nonflood control values applicable to each plan. The flood control aspects are considered a part of the overall MR&T project and as such are not subject to incremental evaluation.

3/ These costs include levee raising only, and do not provide for protection of the area northeast of Morgan City from backwater flooding, nor do they provide for preservation of the basin's fish and wildlife resources, nor do they provide for any recreational development.

5. AFFECTED ENVIRONMENT

Environmental Conditions

5.1 The project area, consisting of the Red River backwater area, the Atchafalaya Basin Floodway system, the backwater area northeast of Morgan City and coastal marshes, is a vast lowland region confined by major meander belts of the Lower Mississippi and Red Rivers. The Atchafalaya River formed along the axis of this area about 500 years ago and today exists as the major distributary of the Mississippi River. The Atchafalaya Basin system conveys about 30 percent of the combined flows of the Red and Mississippi Rivers southward to the Gulf of Mexico through a system consisting of the Old River control structure, the river proper, and many interconnected channels, swamps, lakes, and marshes. The Atchafalaya River is bounded on the east and west by artificial levees, built in the 1930's and located at an average distance of about 7 miles from the main river channel. Within this area, impacts due to the proposed implementation of the plans evaluated in this EIS would occur primarily in the area south of US Highway 190. Within this project-affected area (Figure 5-1), the predominant habitat types are bottomland hardwood forest, cypress-tupelo swamps, marshland, and cultivated farmland. Much of the project-affected area is subject to occasional overbank flooding from the Atchafalaya River. In the leveed floodway portion south of Interstate Highway 10 (I-10) overbank flooding is usually an annual event. This annual overbank flooding is the driving force behind a system in which decaying vegetation (called detritus) is formed within the swamps and forests, as waters rise in the spring. This detritus and its attendant bacteria become food for invertebrate animals, and nutrients released by decay of detritus nourish microscopic floating plants which, in turn, serve as food for microscopic animals. The rising river waters carry some types of microscopic plants and animals into flooded forests and pick up others from lakes and introduce them throughout the system. Bottom-dwelling animals are similarly dispersed. The project-affected area serves as highly valuable habitat for a variety of fish and wildlife species, as well as being one of the largest and most important semi-natural areas remaining in the United States. This area is heavily used for commercial fishing and for fish- and wildlife-oriented recreational purposes. The human population of the project-affected area is primarily rural and highly dependent upon the natural resources of soil, minerals, timber, fish, and wildlife for livelihood. A large part of this population is descended from French-speaking Acadian exiles who began coming to Louisiana in the 1770's. North of I-10 and along the Mississippi and Lafourche Ridges, farming activities are highly important. Considerable acreage here is devoted to the growth of soybeans. South of I-10, agriculture is less important and the economy is based on commercial fishing and trapping, outdoor recreation, and the extraction of oil and gas.

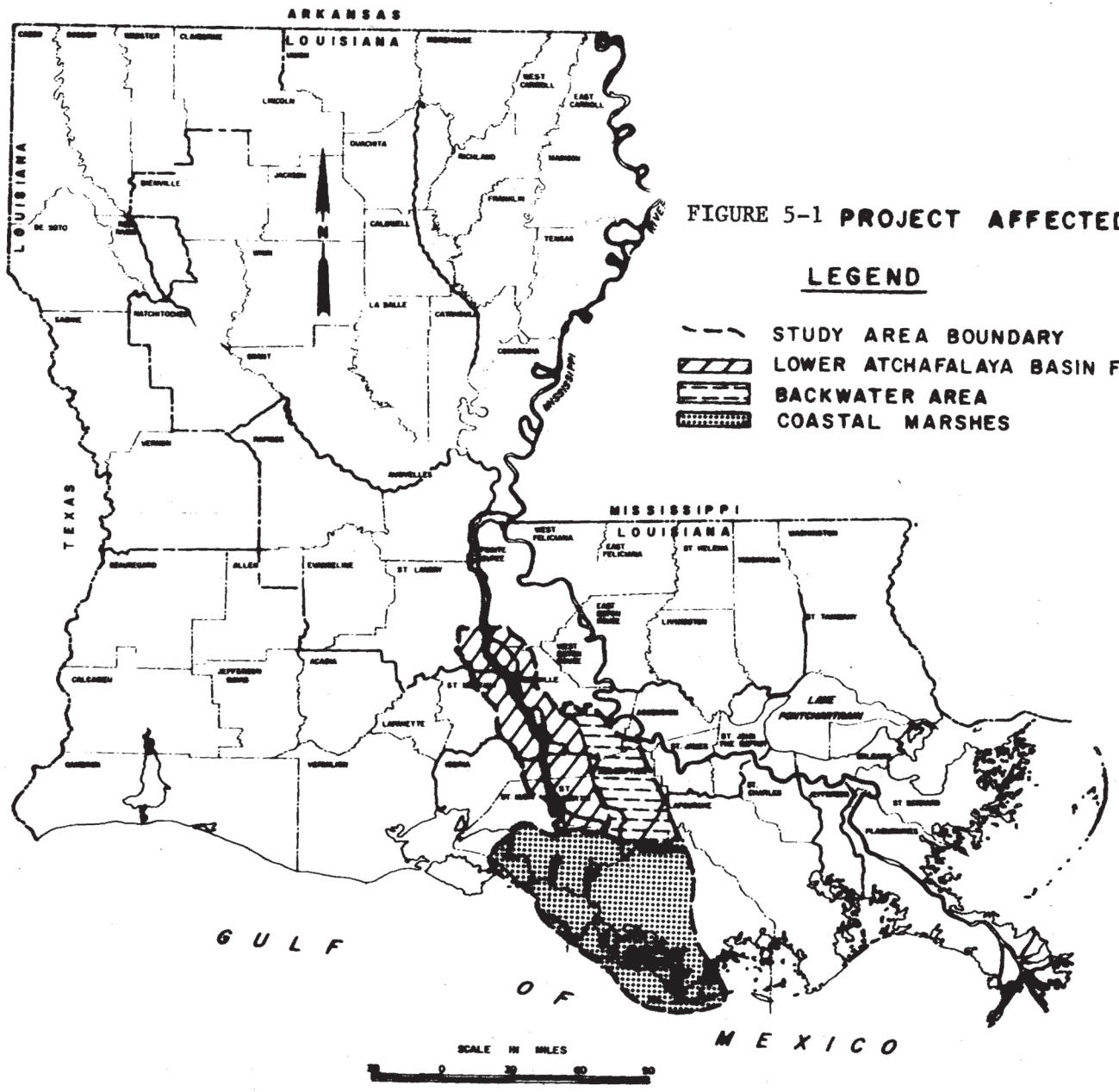

FIGURE 5-1 **PROJECT AFFECTED AREA**

5.2 Under future without-project conditions, the project-affected area would undergo profound changes. Due to the maturation of the Atchafalaya River main channel, average water levels within the floodway would decrease, leading to an expansion of land clearing and agricultural activity. Future sedimentation within the floodway would also contribute to this agricultural expansion due to a raising of land elevation. These changes would lead to a highly significant decrease in the productivity of the area for fish and wildlife and to a decline in recreational potential. In the backwater area northeast of Morgan City, rising water levels would occur due to the growth of the Atchafalaya River delta. These rising water levels could have detrimental effects upon the forests of this area as well as to existing agricultural lands, residential or industrial developments, and cultural resources. Additional details of all these changes can be found in the remaining parts of Section 5, and in Section 6, which deals with the environmental effects of the various plans.

Significant Resources

EARLY SUCCESSIONAL STAGE BOTTOMLAND HARDWOOD FORESTS

5.3 Approximately 94,000 acres of this pioneer forest occur within the project-affected area, primarily south of I-10 (Plates 2 through 4). This forest type is most widespread on the newly accreted lands that have been formed in and around Grand and Sixmile Lakes. Species composition of these forests varies with the age of the accreted lands, with pure stands of willow predominant on younger areas and mixed stands of cottonwood, willow, and sycamore occurring on older areas (a list of scientific names of plant species mentioned in this report can be found in Appendix G). Other species, such as ash, maple, and cypress, may be found growing in association with the three dominant species. Common understory and groundstory species found in these forests are waxmyrtle, false nettle, lizard's tail, blackberry, shield fern, and smartweed. These forests are valuable as wildlife habitat for species such as deer, swamp rabbits, and songbirds and will eventually develop into highly productive, late successional stage bottomland hardwood forests. Approximately 73,000 acres of early successional forest are flooded for a few days to a few months during an average spring. These flooded acres provide habitat for fish and crawfish and the detritus they produce furnishes food to various aquatic animals. Under future without-project conditions, the acreage of early successional forest would decrease by about two-thirds due to plant succession and land clearing. Approximately 2,700 acres of this decrease would be due to raising the protection levees surrounding the lower floodway.

LATE SUCCESSIONAL STAGE BOTTOMLAND HARDWOOD FORESTS

5.4 Approximately 332,000 acres of late successional stage, mixed bottomland hardwood forests are found within the project-affected area, primarily north of I-10 and in the backwater area northeast of Morgan City (Plates 2 through 4). Tree species composition of these forests varies according to the wetness of the site. Water oak, willow oak, sweetgum, and American elm are common species in the drier areas and Nuttall oak, overcup oak, bitter pecan, ash, and Drummond red maple are common on wetter sites. Live oak is a common species on dry sites in the southern one-third of the area. Common understory and ground story species present are swamp privet, water elm, poison ivy, greenbrier, rattan vine, shield fern, false nettle, and butterweed.

5.5 These forests are highly productive in terms of wildlife and commercial forest products and also act as aquatic habitat when waters rise in the spring. About 128,000 acres are flooded during an average year. White-tailed deer, gray and fox squirrels, swamp rabbits, and woodcock are common game species found throughout this forest type. These forests also serve as habitat for an abundance of songbirds, reptiles, amphibians, and small animals. Commercial forest products derived from these areas include lumber, pulpwood, and veneer.

5.6 Forests of this type are rapidly disappearing from the lower Mississippi Valley due to agricultural expansion, and the forests of the project-affected area represent one of the largest expanses remaining intact anywhere in the nation. Under future without-project conditions, the acreage of this habitat type would decrease by about 50 percent due to clearing of land for agriculture and to a loss of about 9,200 acres due to raising the protection levees around the lower floodway.

CYPRESS-TUPELO SWAMPS

5.7 Approximately 451,000 acres of cypress-tupelo swamps may be found within the project-affected area (Plates 2 through 4). Dominant trees in these swamps include cypress, tupelo, swamp red maple, and pumpkin ash. Common understory plants include snowbell, buttonbush, Virginia willow, swamp privet, and water elm. Typical ground cover includes water hyacinth, lizard's tail, pickerelweed, and smartweed. Water from a few inches to several feet in depth covers the swamp floor much of the year; but during low water river stages, the areas may become dry. These swamps are less productive in terms of wildlife than are bottomland hardwood forests, but serve as high quality aquatic areas when flooded due to the large amount of habitat they provide and the input of detritus they add to the system. The most productive crawfish habitat of the study area occurs in these swamps,

which are also of high value to wading birds and other waterfowl, as well as to furbearing mammals such as the mink and otter. These swamps also serve as important habitat for the American alligator. Many of the esthetic qualities that make the study area valuable for recreational usage can be found in these swamps. Under future without-project conditions, the total acreage of this habitat type would decrease only slightly, although logging activity coupled with changes in hydrological conditions could cause drastic changes in the nature of these forests. By 2030, it is estimated that half of the cypress-tupelo areas would have been logged, and approximately 2,400 acres of swamp would have been destroyed due to raising the protection levees around the lower floodway.

AGRICULTURAL LANDS

5.8 High-quality agricultural lands occur throughout the project-affected area whenever soil moisture conditions during the growing season are low enough to permit growth of cultivated crops. These farmlands generally are on the higher elevations, with major farming activity concentrated along the Teche Ridge in the south, and the Lafourche Ridge to the east. The primary crops produced on these lands are soybeans in the north and sugarcane in the south. Some land is also used for rice, corn, cotton, and hay crops; and small amounts of pastureland occur. Much of this land is eligible for classification as prime and unique farmland (Plates 20 through 22). The Atchafalaya Basin Floodway contains little land of high value for agriculture due to the excessive flooding that occurs over much of the area.

5.9 The agricultural lands of the project area are of major significance to both the economy and as a source of high quality protein that may be eaten by both humans and domestic animals. Under future without-project conditions, agricultural lands would nearly triple in acreage by 2030.

FRESH MARSH

5.10 At the present time, there are approximately 321,000 acres of fresh marsh in the project area (Plates 2 through 4). The marshes near the Lower Atchafalaya River and Wax Lake Outlet are generally decreasing in acreage at a slow rate while those removed from river overflow are rapidly decreasing in acreage. Under future without-project conditions, there would be an estimated 243,000 acres of fresh marsh in the area in 2030. This reduction would be expected to continue from 2030 to 2080. These marshes contain a variety of plants, the most common being maidencane and bulltongue. Salinities range

from 0.06 parts per thousand (ppt) to 6.7 ppt and average 1.5 ppt. Fresh marshes provide prime habitat for nutria and also attract large numbers of wading birds, red-winged blackbirds, and wintering ducks and geese. Several kinds of reptiles and amphibians are present, including the American alligator. As they flood, these marshes act as habitat for numerous fish. These marshes provide numerous user-days of hunting and sport fishing. Detritus from marshes is a vital part of the food base of the aquatic system. However, because tidal fluctuation is low, much of the dead material builds up as peat deposits. The fresh marshes near Morgan City provide feeding habitat for the largest concentration of Southern bald eagles in the south-central United States. Overall, the project area marshes are the largest contiguous tract of fresh marsh in the state and are, therefore, a national resource of great tangible and intangible value.

BRACKISH MARSH

5.11 There are approximately 89,000 acres of brackish marsh in the project-affected area (Plates 2 through 4). Under future without-project conditions, there would be a decrease of about 25,000 acres by 2030. This trend would be expected to continue through 2080. Plant diversity in brackish marsh is less than in fresh marsh, with wiregrass being the dominant plant. Salinities generally range from 6 to 18 ppt with a mean of 8 ppt. Brackish marshes, excellent muskrat habitat, also attract wintering waterfowl in moderate numbers. Wading birds, sea birds, and shore birds are also common. Numbers and kinds of reptiles and amphibians are less than in fresh marsh. Brackish marshes provide valuable nursery habitat for several species of fish and shellfish, especially for white shrimp and menhaden; and the detritus they furnish is vital to the aquatic system. Brackish marshes sustain less hunting and trapping than fresh marshes.

SALINE MARSH

5.12 Approximately 107,000 acres of saline marsh border the gulf in the Terrebonne Parish portion of the project-affected area (Plates 2 through 4). Under future without-project conditions, this area would be reduced to 69,000 acres by 2030 as saline marshes deteriorated into ponds or were converted into brackish marsh. This reduction would be expected to continue through 2080. Salinities within these marshes can range from 1 to 52 ppt with a mean of 16 ppt. Oystergrass is the dominant plant present. There are few mammals, reptiles, or amphibians present. Gulls, terns, and other shore birds are common because of the extensive mudflats uncovered by tidal fluctuations. The saline marshes provide vital nursery habitat for young fish and shellfish such as seatrout, shrimp, and blue

crabs. The detritus produced by this marsh is flushed into the bays and gulf by the tides, and this detritus nourishes the entire system. Hunting and trapping are not important pursuits in this marsh type; yet, sport fishing is common. These marshes form the initial barrier protecting inland areas from destructive effects of storms such as hurricanes.

ATCHAFALAYA DELTA

5.13 Before 1950, the mainstem lakes within the Atchafalaya Basin were receiving most of the sediments of the Atchafalaya River and a lake delta was filling them. By 1960, the lakes were mostly filled and silt was being carried into Atchafalaya Bay where it was building shoals at the mouths of the Lower Atchafalaya River and Wax Lake Outlet. With the flood of 1973, enough sediment was deposited to cause the land to finally become visible. Major floods followed in 1974 and 1975, and at the present time, there are approximately 10,100 acres of new land in the bay (Plate 1). Since it is impossible to predict the amount of marsh, natural levee, dredged material disposal areas, ponds and bayous that would appear in this newly emergent land, the whole mass has been simply classified as delta.

5.14 A major navigation channel passes through the delta. This channel may be retarding westerly growth of the delta and shunting sediment into the slightly deeper waters offshore instead of into the bay. This delta is of major significance because Louisiana may be losing approximately 39 square miles of marsh per year (Wicker et al., 1980). Predictions show that without the project, there would be 135,000 acres of delta by 2030, an average growth rate of 4.2 square miles per year. The delta marsh is extremely productive in terms of biological resources. It contributes to hunting, trapping, sport and commercial fishing, and other wildlife-oriented activities. The entire area is a wildlife management area. The area is significant from a purely scholarly standpoint because it is one of the few developing deltas in the United States. Scientific investigations are today being conducted to expand understanding of the geological and ecological processes that occur in such areas.

RIVER, MAJOR DISTRIBUTARY, AND MAIN STREAM LAKES

5.15 At the present time, there are 23,000 acres of this habitat in the Lower Atchafalaya Basin Floodway and 8,100 acres in the backwater area. These water bodies are turbid and have moderate to fast currents, lower temperatures, and higher dissolved oxygen than other waters. Riverine waters are the main source of nitrogen and phosphorus to fuel the primary production in the lower floodway (Bryan

et al., 1974, 1975, 1976). These swift, turbid waters contain few plants or bottom-dwelling animals. However, these waters serve to transport microscopic plants and animals into all parts of the basin during flooding. Depths in the river and major distributaries usually range from 10 to 20 feet. Main stream lakes are shallow except where the river channel passes through them. During the next 50 years, under future without-project conditions, surface acreage of riverine habitat within the lower floodway would be expected to increase slightly because of erosion. In the period between 2030 and 2080, this trend would probably continue.

FRESH BAYOUS, CANALS, AND BORROW PITS

5.16 This habitat type covers 38,000 acres of the project-affected area at the present time, including 15,900 acres in the Lower Atchafalaya Basin Floodway. Approximately 4,340 acres are borrow pits built between 1972 and 1980 during levee construction for this project. These waterways are slow-moving except during flood season and depths are usually less than 6 feet. Dissolved oxygen levels in basin bayous are consistently slightly lower than in other habitat types. Rooted aquatic plants are common in these waters. Bayous, generally having numerous bottom-dwelling animals, serve as avenues for fish to move between riverine waters and the lakes and swamps. During the summer when waters recede from swamps and forests, fish congregate in bayous. They often seek refuge here during hot weather when temperatures get very high in shallow lakes. Under future without-project conditions, there would be 50,900 acres of bayous and canals by 2030. This increase of 12,900 acres would be due primarily to the construction of borrow pits to raise various levees. As sedimentation continues and the flowline drops, most bayous would become more shallow, and some that contain permanent water now would have water only during high river stages. During the 2030 to 2080 period, it is probable that the acreage of bayous in the basin would decrease due to sedimentation and falling water levels while the acreage of bayous in the marshes would increase due to erosion.

HEADWATER LAKES

5.17 The 17,000 acres of headwater lakes in the project-affected area lie mostly in the Lower Atchafalaya Basin Floodway. These lakes receive a complete flushing by flowing water during the year. They are very valuable aquatic habitat because of the addition of nutrients during overbank flooding, their relatively high levels of dissolved oxygen, and their favorable temperatures. Most such lakes are fairly clear in the summer and have a heavy growth of rooted aquatic plants and a thriving population of plankton. Many kinds of bottom-dwelling

animals inhabit these lakes. The red swamp crawfish is abundant in the spring and fish are common through the year. Shallow water bodies such as these also contain a great diversity of reptiles and amphibians. Under future without-project conditions, there would only be an estimated 1,900 acres of such lakes remaining in the area in 2030 because of the heavy sediment loadings and falling water levels. Other lakes would remain, but would be reclassified as cropland lakes due to the agricultural fields surrounding them. Water quality of headwater lakes would be reduced because of turbidity and pesticides due to farming. By 2080, it is probable that all such lakes in the lower floodway would be eliminated. It is possible that, as the swamp develops below Morgan City, some of the existing lakes would be reclassified as headwater lakes.

BACKWATER LAKES

5.18 These lakes rarely receive a thorough flushing from the river. Most of the time the water enters them from downstream. There are 42,000 acres of such lakes in the project-affected area; 13,300 of these are in the Lower Atchafalaya Basin Floodway, and the remainder in the backwater area. Less is known about this type lake than the other types; but, in general, they are less productive than headwater lakes because dissolved oxygen and nutrients are usually present in lower amounts. Under future without-project conditions there would be an estimated 34,000 acres of backwater lakes in the project-affected area by 2030. The entire loss of 8,000 acres would be in the lower floodway and would be due to sedimentation, the lowered flowline, and agricultural expansion, which would result in some lakes being reclassified as cropland lakes. Water quality would deteriorate in the remaining backwater lakes. By 2080, it is probable that very little habitat of this type would remain.

CROPLAND LAKES

5.19 A cropland lake is one that is entirely surrounded by agricultural lands. At the present time, there are only 27 acres of this habitat in the project-affected area. These lakes are moderately deep and excessively rich in nutrients due to fertilizer runoff from fields. They are usually high in pesticides, which are detrimental to fish life. By 2030, it is estimated that there would be 4,100 acres of such lakes in the area. By 2080, the acreage would increase even more as clearing for agriculture continued below I-10.

BRACKISH AND SALINE MARSH BAYOUS, CANALS, AND BORROW PITS

5.20 At the present time, there are approximately 6,200 acres of brackish bayous and canals, and 6,100 acres of saline bayous and canals in the marsh area. These bayous and canals have fairly low suspended solid concentrations and dissolved oxygen conditions are usually adequate for aquatic life. Salinities vary with the marsh type with which they are associated. Temperature ranges are usually less than in adjacent ponds and these bayous serve as a refuge during times of extreme temperature. They also serve as a passageway between ponds and bays. By 2030, under future without-project conditions, the acreage of brackish bayous would increase by 1,900 acres and that of saline bayous by 1,300 acres. This change would occur as brackish and saline marsh deteriorated. The same trend would probably continue from 2030 to 2080.

MARSH PONDS AND LAKES

5.21 Acreage of this habitat type in 1980 was as follows: fresh, 87,600; brackish, 55,200; and saline, 64,400. Fresh ponds and lakes provide valuable habitat for wintering waterfowl and both freshwater and estuarine fish. Attached aquatic plants often attain luxurient growth here during periods of clear water. Plankton and bottom-dwelling animals are also abundant.

5.22 Brackish ponds and lakes are less valuable for waterfowl and freshwater fish, but do provide nursery areas for numerous species of estuarine fish. There are a moderate number of attached aquatic plants in these water bodies. Plankton and bottom-dwelling animals are also numerous and diverse.

5.23 In saline ponds there are generally few attached plants and plankton, but bottom-dwelling animals are abundant. Numerous estuarine sport fish utilize these ponds. Under future without-project conditions, the acreage of these ponds would increase to the following by 2030: fresh, 141,600; brackish, 73,500; and saline, 99,000.

5.24 In summary, marsh ponds and lakes would increase markedly under future without-project conditions. All these increases would occur as the marsh adjacent to the ponds deteriorated. It must be remembered that the base of the estuarine food web is detritus, produced mainly in the marsh. Turner (1979) has shown that the Louisiana commercial inshore shrimp catch is proportional to the amount of intertidal wetlands and not to the amount of estuarine waters. Productivity studies show that a square meter of pond will produce 600 grams of phytoplankton per year (Day et al., 1973), while a square meter of marsh will produce 2,200 grams of marsh grass per year (Gosselink et al., 1979). Thus, as marsh disappears into ponds,

a vital part of the system is lost. Trends toward pond increase would be expected to continue from 2030 to 2080.

BAYS AND OPEN GULF

5.25 These habitat types presently form a large portion of the total acreage of the project-affected area: fresh bays cover 200,000 acres; brackish bays, 58,900 acres; saline bays, 53,800 acres; and open gulf, 804,000 acres. These bays are a major component of the dynamic estuarine complex that stretches from Morgan City to the gulf. Freshwater and estuarine forms use these bays in a constantly changing variety as salinities and temperatures change. The major change that would occur under future without-project conditions is the loss of 124,300 acres of fresh bay as the delta emerges in Atchafalaya Bay. The acreage of brackish and saline bays would be similar to 1980 conditions. As the delta grows, salinities in the western bays, portions of which are brackish now, would gradually decrease as more river water moves westward. Salinities in the Four League Bay area have been decreasing and the trend would be expected to continue for some time, but would eventually reverse and salinities in all of Terrebonne Parish would increase. It is difficult to predict changes in the system past 2030, but it is possible that the acreage of brackish and saline bays would stay the same and the amount of open gulf would decrease as the delta builds its way southward.

FLOOD-CARRYING CAPACITY

5.26 In 1927, a huge flood devasted much of the lower Mississippi River Valley. As a result, Congress passed the Flood Control Act of 1928, authorizing the Mississippi River and Tributaries project to provide for the safe passage of a project flood of 3 million cfs at the latitude of Old River. Because of its early history as a natural floodway, the Atchafalaya Basin became an integral feature of that project with its natural features supplemented by manmade levees, a channel to assist in obtaining the floodway's assigned flood-carrying capacity of 1.5 million cfs, and two outlets for passing the flood-waters out of the floodway system to the Gulf of Mexico. At present, the Atchafalaya Basin Floodway system is inadequate and can safely pass only 850,000 cfs, about 60 percent of its assigned capacity. It was assumed that under future without-project conditions, flood-carrying capacity would be maintained by the non-Federal action of raising the east and west protection levee. This could be done only at considerable social, environmental, and economic cost.

WATER QUALITY

5.27 The project-affected area can be divided into two main parts: the Atchafalaya Basin Floodway, that portion totally encompassed by a system of levees; and the areas outside of the levee system. Significant water resources in the Lower Atchafalaya Basin Floodway are affected by the annual stage variations of the Atchafalaya River, climate, biological activity, suspended sediments and siltation, water levels, circulation and distribution in backwater areas, land-use patterns, and physical modifications due to construction of borrow pits, canals, and other features. The State of Louisiana has designated the Atchafalaya River along its entire length for primary and secondary contact recreation and propagation of fish and wildlife, and as a domestic water supply above Bayou Boeuf. River water entering the floodway is turbid, high in suspended solids, high in dissolved oxygen, and rich in nitrogen and phosphorus. Much of the Atchafalaya River discharge remains intact and well aerated as it passes through the floodway.

5.28 Dissolved oxygen concentrations are one of the most important gauges of the project area's water quality and its ability to support a well-balanced aquatic fauna. Two separate phenomena create conditions under which reduced dissolved oxygen levels exist within the levee system: (a) rapid decomposition of newly inundated forest litter and herbaceous vegetation associated with periods of flooding and draining of overflow areas during high water levels and; (b) increased biological activity associated with warm summer temperatures, reduced flows, and receding water levels. The more severe dissolved oxygen reductions are closely associated with the peak flows of the spring season. Most of the extremely low dissolved oxygen concentrations during high water conditions in the floodway occur in backwater areas shielded from extensive wind action or with little or no water circulation due to manmade or natural obstructions.

5.29 Waters in the Lower Atchafalaya Basin Floodway are extremely rich in nutrients as compared to lakes outside the levees. However, light limitation due to mineral-induced turbidity may limit phytoplankton production within the levees. Areas outside the levee system which do not experience overbank flooding support higher standing crops of phytoplankton and have higher dissolved oxygen concentrations than areas within the levees which experience overbank flooding. Levels of chlorophyll *a* increase considerably within the levees during the warmer summer months. During this period, there is also a marked increase in ammonia-nitrogen values due to increased bacterial action primarily associated with bottom sediments.

5.30 The area within the levees exports a large quantity of nutrients (phosphorus and nitrogen) and fixed energy (in the form of dissolved organic carbon) via the Atchafalaya River and Wax Lake Outlets to the estuarine and marine waters. This export is important

in maintaining their productivity. The key to the high productivity of the Atchafalaya Basin Floodway is the short, efficient, bacteria-detritus food chain. Prolonged overbank flooding, with the inundation during rising stages of additional land areas containing herbaceous materials and forest litter, renews the carbon resources needed to drive the bacteria-detritus system.

5.31 Areas within the Lower Atchafalaya Basin Floodway are relatively free of heavy metals and organochlorine compounds in the water column, bottom sediments and biota. Pesticides are more widely present in the water column, sediments and/or biota in areas outside the levee system, or in areas within the levee system in the proximity of agricultural activity or subject to drainage from agricultural areas. Toxicants are also associated with industrial development in the Morgan City area.

5.32 Many factors would affect future water quality in the floodway. Reduction of water levels and water level fluctuations, and decreased inundation of backwater areas would result in a drying trend. This would affect the bacterial-detritus production and fixed carbon export. The introduction of sediment bearing waters into backwater areas in the floodway would cause further sediment deposition and loss of water area and depth. Physical modifications due to canal dredging and disposal of dredged material (spoil) would be expected to continue in the future irrespective of the implementation of any project features or management plans. Their effects would include stagnation, higher temperatures, and increased dissolved oxygen problems. Lower water levels in the floodway would likely allow for encroachment and expansion of residential and agricultural activities. These would further degrade water quality through loss of natural purificiation processes of the wetlands, residential discharges and runoff, runoff of sediments and nutrients from agricultural areas, and the permeation of agricultural pesticides into the abiotic compartment of the ecosystem and accompanying effects on biota.

NATURAL AND SCENIC STREAMS

5.33 The State of Louisiana has designated Bayou Penchant in Terrebonne Parish as "natural and scenic" (Louisiana Wildlife and Fisheries Commission, 1976). Bayou Penchant lies wholly within the privately-owned freshwater marshes and cypress-tupelo forests southeast of Morgan City between Bayou Chene and Lake Penchant (Plate 1). This bayou is protected by law from such actions as channelization, clearing and snagging, channel realinement, and reservoir construction. Water levels in the Bayou Penchant area have been slowly rising over the last several years as the flowline of the Atchafalaya River rises. Some trees along the bayou appear to be dying due to this flooding. Water levels would be expected to continue to rise under

future without-project conditions and this condition, coupled with the prevailing rate of land subsidence in the area, could adversely affect even more trees, thereby degrading the scenic qualities of the area.

NAVIGABLE WATERWAYS

5.34 The project-affected area abounds with navigable waterways. The Atchafalaya River and associated channels provide a water route extending the length of the basin. The shallow-draft Gulf Intracoastal Waterway traverses the area, intercepting rivers and bayous and crossing bays and lakes. Included in this waterway system are landside and floodside alternate routes to the Gulf Intracoastal Waterway that extend from Morgan City to Port Allen, Louisiana. This vital link for the towboat industry provides a shorter and faster route from the Morgan City area to and from the barge-fleeting areas on the Mississippi River. Within the Lower Atchafalaya Basin Floodway, navigation channels are maintained from the Atchafalaya River to the east and west protection levees' borrow pits. These allow access for crew boats, pleasure boats, and commercial fishermen. Other natural and manmade channels provide water access to practically all sections of the economic area. No extension of the network of major waterways is anticipated in the future.

FISHERIES

5.35 A good fisheries data base exists for the Lower Atchafalaya Basin Floodway, but somewhat less is known about the fisheries of the backwater area northeast of Morgan City. The estuarine dependent fisheries of the marshes are fairly well understood.

5.36 The Lower Atchafalaya Basin Floodway supports a diverse fishery. Annual overflow is the life blood of this complex. As the river water spreads over the lower basin each year, it picks up detritus and nutrients from the forest and these serve as the food source for numerous plankton, bottom-dwelling organisms, crawfish, and fish. These organisms are highly dependent upon the 347,000 acres of annually flooded forests as feeding, spawning, and living areas. Headwater and backwater lakes are also of vital importance to fishery productivity. More than 85 species of fish occur in the leveed floodway and they can be present in amounts exceeding 1,000 pounds per acre (Sabins, 1977). Crawfish, also abundant, are a primary food for many fish as well as other animals. A large recreational fishery exists, having an annual harvest of 2.9 million fish (mostly bass, crappie, and other sunfish) and 1.6 million pounds of crawfish reported for the 1971-1974 period (Soileau et al., 1975).

5.37 Commercial fishing activities are also important. Crawfish, buffalo, and catfish comprise over 90 percent of the value of the catch, which was worth 2.8 million dollars in 1979. During the period 1965 to 1979, the average annual harvests were as follows: crawfish, 13.6 million pounds; catfish, 2.2 million pounds; and buffalo, 1.1 million pounds. Crawfish are consumed locally and internationally and demand continues to increase. Many people living within 50 miles of the project area engage in full- or part-time commercial fishing and this work, plus processing and wholesaling of fish, crawfish, and prepared products, provides employment for thousands of people.

5.38 Fish sampling studies (US Department of Agriculture, 1978) in the backwater area northeast of Morgan City indicated that bayous averaged 165 pounds of fish per acre with few sport fish and large populations of shad and carp. Lake Verret averaged slightly over 160 pounds per acre and supported large numbers of sport fish with a fair population of commercial fish. Lake Verret is occasionally opened to commercial fishing and catches are on the order of 200,000 pounds annually. Some crawfishing occurs in the swamps in the spring. The probable reason that the backwater area is far less productive than the leveed floodway is that it does not receive any river overflow with its nourishing and flushing actions. The existing swamps in the backwater area furnish vital nutrients to the aquatic system.

5.39 The marsh complex supports an extensive sport and commercial fishery. The most valuable commercial species are shrimp and menhaden. In the 1963 to 1978 period (1963-73 for Hydrologic Units 6 and 7), the average annual harvest attributed to the project-affected area was 47.8 million pounds of shrimp worth 46.45 million in 1978 dollars; 173.2 million pounds of menhaden worth 7.5 million in 1978 dollars; and 2.2 million pounds of oysters worth 2.8 million in 1978 dollars. Seatrout are the most sought-after estuarine sport fish with nearly 6,500,000 being caught in Louisiana waters during 1979. Red drum are the second most sought-after; 1,450,000 were caught in 1979. Atlantic croaker are harvested in large numbers (6,000,000 in 1979) and southern flounder and sheepshead are also popular. The total estimated number of participants per year in the Louisiana estuarine recreational fishing is 500,000 (US Department of Commerce, 1980). Sport shrimping is also a popular pastime. Juneau and Pollard (1981) showed a recreational shrimp catch in 1978 of nearly 250,000 pounds of white shrimp and nearly 200,000 pounds of brown shrimp. Both the sport and recreational fishing provide significant financial benefits to the local and national economy. The marsh complex acts as a nursery area for all the above-mentioned fish and shellfish as well as for blue crabs and numerous smaller fish.

5.40 The fishery resources in the Lower Atchafalaya Basin Floodway under future without-project conditions would be drastically reduced due to decreases in aquatic habitat caused by sedimentation and lowering of water levels (Table 6-11). The amount of forest flooded