WEST SHORE-LAKE PONTCHARTRAIN, LOUISIANA

PROJECT STUDY PLAN

This plan has been prepared in accordance with the following guidance:

a. ER 5-7-1 (FR), Project Management
b. ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies.
c. ER 1105-2-xxx, Preparation and Use of Initial Project Management Plans
d. EC 1105-2-208, Preparation and Use of Project Study Plans

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13 Jan 98
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WEST SHORE-LAKE PONTCHARTRAIN, LOUISIANA
HURRICANE PROTECTION PROJECT
PROJECT STUDY PLAN

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WEST SHORE-LAKE PONTCHARTRAIN, LOUISIANA
HURRICANE PROTECTION PROJECT
PROJECT STUDY PLAN

SEPTEMBER 1997

1. INTRODUCTION

The project study plan (PSP) is a plan of study which is used to define and manage the development and conduct of a feasibility study. This PSP documents the assumptions, work tasks, products, and the level of detail that will be necessary during the feasibility study to determine existing and future without project conditions; formulate a range of alternatives; assess their effects; and present a clear rationale for the selection of a hurricane protection plan. The PSP also provides district management a mechanism for cost and schedule control, establishes the basis for changes, promotes internal communications, and minimizes potential review problems of the feasibility study.

The PSP includes all of the requirements to complete a hurricane protection feasibility study for the West Shore-Lake Pontchartrain, Louisiana study area. The feasibility study will describe the problems and opportunities of the study area relative to hurricane protection, and will evaluate alternatives which meet Federal, environmental, and economic criteria. The alternatives will be evaluated at a level to determine the maximum net economic development benefits and assess the environmental and social effects of the selected plan.

The information provided in the reconnaissance report and the PSP was developed through meetings with the Pontchartrain Levee District, Louisiana Department of Transportation and Development (LADOTD), U.S. Fish and Wildlife Service, and other Federal, state, and local agencies.

2. STUDY AUTHORITY

This study was authorized by two resolutions, the first of which was adopted on July 29, 1971, by the Committee on Public Works of the U.S. House of Representatives at the request of Congressmen Speedy O. Long and Patrick T. Caffery. The resolution reads as follows:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, that the board of Engineer's for Rivers and Harbors is hereby requested to review the report

of the Chief of Engineers on Lake Pontchartrain and Vicinity, Louisiana, published as House Document No. 231, 89th Congress, First Session, and other pertinent reports, with a view to determining whether modifications to the recommendations contained therein are advisable at this time, with particular reference to providing additional levees for hurricane protection and flood control in St. John the Baptist Parish and that part of St. Charles Parish west of the Bonnet Carre' Spillway."

The second resolution dated September 20, 1974, was adopted by the Committee on Public Works of the U.S. Senate at the request of Senators Russell B. Long and J. Bennett Johnston, and reads as follows:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, that the Board for Rivers and Harbors is hereby requested to review the report of the Chief of Engineers on Lake Pontchartrain and Vicinity, Louisiana, published as House Document No. 231, 89th Congress, First Session, and other pertinent reports, with a view to determining whether modifications to the recommendations contained therein are advisable at this time, for hurricane protection and flood control in St. James Parish."

The Fiscal Year 1996 Energy and Water Appropriations Act allocated $500,000 to initiate a General Investigations reconnaissance study specifically for the West Shore-Lake Pontchartrain, Louisiana.

3. GENERAL DESCRIPTION OF THE STUDY AREA

The study area is located in southeast Louisiana approximately 25 miles west of New Orleans, Louisiana. The boundaries of the study area are the Bonnet Carre Spillway to the east, the Mississippi River to the south, Lakes Pontchartrain and Maurepas to the north, and the St. James/Ascension Parish line to the west. The study area includes portions of St. Charles, St. John the Baptist, and St. James Parishes. The initial development within the study area occurred primarily along the banks and natural ridges of the Mississippi River. As development continued to expand away from the river and into the lower more vulnerable areas, the needs for levees, drainage canals, and pumping stations became apparent.

There are currently no Federal hurricane protection projects in the study area protecting against a hurricane surge coming from Lakes Pontchartrain and Maurepas. Interstate 10, which is located on a raised earthen embankment for approximately 4.5 miles between the U.S. Hwy. 51 interchange and the Belle Terre Boulevard interchange, provides only a very limited degree of

protection. In order to allow for rainfall to drain into the surrounding marshes, a number of large culverts were included in the initial construction of this reach of I-10. There are approximately 35 drainage culverts, ranging in size from 54 inch to 96 inch diameter, which pass under I-10. These culverts do not provide a means of positive cutoff and are unable to prevent the flow of water into the study area during high tides. As a result, I-10 provides the study area only a very limited amount of protection against tidal flooding. A major hurricane could also produce a tidal surge capable of overtopping the interstate embankment.

Hurricane Juan demonstrated a recognizable potential for the occurrence of hurricane flooding events that could cause catastrophic loss of life and property damage in the study area. Hurricane Juan began as a tropical depression on October 26, 1985 and grew into a category 1 hurricane by October 27th. The storm remained along the Louisiana coast for 2 days before moving east and making landfall between Alabama and the Florida panhandle. Torrential rain for several days, coupled with tides as high as 8 feet above normal, caused extensive flooding in coastal Louisiana. Several subdivisions within the study area, including Laplace Park, Homewood Place, River Forest, and New ERA, were heavily damaged due to flooding from Hurricane Juan. As a result of the extensive flooding, St. John the Baptist Parish was declared a Federal disaster area. Hurricane Juan caused an estimated $1 billion in damages throughout southern Louisiana. The lack of adequate hurricane protection within the study area also caused local officials to issue evacuation orders during Hurricane Andrew (1992). A tornado touched down in Laplace during Hurricane Andrew, killing two people and destroying 52 homes. As the population and development in the area increases, the potential for loss of life and property damage from a hurricane will escalate.

The vulnerability of the study area to hurricane surge can be demonstrated by the fact that there are an estimated 1,398 residential structures vulnerable to flooding from the 25-year storm, 3,991 residential structures vulnerable to the flooding from the 100-year storm, and 4,021 residential structures vulnerable to flooding from the 500-year storm. The equivalent annual damages for the without-project conditions are estimated at $9.4 million.

4. ALTERNATIVE PLAN DEVELOPMENT, SCREENING, AND EVALUATION

In the development of plans for addressing the problems and needs of the study area relative to hurricane flooding, structural and non-structural alternatives were considered. Due to the extent and types of existing development, limitations on the times for advance flood forecasting, and

limitations on the capacities of hurricane evacuation routes, the development of strictly non-structural measures would not be responsive to the problems and needs of the area relative to hurricane flooding. Structural alternatives for addressing the problems and needs of the study area were limited to barriers to hurricane surges, such as levees, floodwalls, floodgates, and pumping stations.

The majority of residential growth which has occurred in the study area since 1960 has been concentrated on lower, more vulnerable land located between U.S. Hwy. 61 and I-10 in the Laplace area. Natural ground elevations in this area vary from around 10 ft NGVD near U.S. Hwy. 61 to around 4 ft NGVD near I-10. The developed areas west of Laplace (Garyville, Gramercy, & Lutcher) are generally located on higher ground between U.S. Hwy. 61 and the Mississippi River, and are less susceptible to flooding. During the reconnaissance study, we concentrated our efforts on the Laplace area due to the large number of residential structures located in areas vulnerable to hurricane flooding.

Two alternative alignments for providing hurricane protection to the Laplace area were evaluated during the reconnaissance study. Both alignments would provide protection to essentially the same residential and commercial areas and would produce similar levels of benefits. The two alignments are identical except for the portion located west of Belle Terre Blvd. Both alignments (Plan 1 and Plan 2) begin at the west guide levee of the Bonnet Carre Spillway approximately 2 miles south of Lake Pontchartrain and both alignments end at U.S. Hwy. 61 in the vicinity of the Reserve Relief Canal. The alignment for Plan 1 more closely follows the existing limits of development and encloses less wooded swamps and bottomland hardwoods within the protection. The alignment for Plan 2 parallels I-10 for an additional 1.2 miles west of the Belle Terre Blvd. interchange before turning to the southwest and heading back towards U.S. Hwy. 61. This results in an estimated 1,345 acres of additional undeveloped land being enclosed within the protection. This area would be used as a sump to pond rainfall during extreme events.

The alternative plans for providing hurricane protection to the study area were evaluated at the 100-year and the standard project hurricane (SPH) levels of protection. Lower levels of protection would not be acceptable to local residents and parish officials given the study areas vulnerability to storm surge, the authorized level of protection for residents living east of the Bonnet Carre Spillway, and the potential loss of life if the protection were to be overtopped. The costs and benefits for each plan were evaluated using a traditional analysis to determine the plan which provides the greater net annual benefits. The plans were also evaluated based on their

environmental impacts.

4.1. ALTERNATIVE PLANS

4.1.1 PLAN 1

Plan 1 would provide for the construction of an earthen levee beginning at the west guide levee for the Bonnet Carre Spillway and following the Louisiana Power & Light clearing located approximately 2 miles south of Lake Pontchartrain. The levee would extend in a northwesterly direction for approximately 2.4 miles. Geotextile would be placed in the base of the levee to improve the overall stability, reduce the footprint of the section, minimize environmental impacts, and reduce potential settlement problems. The protection would then turn to the north and cross under the elevated portion of I-10 in the vicinity of the I-10/I-55 interchange. A T-wall would be constructed under the interstate to avoid impacting the existing support columns. Transitions from earthen levee to T-wall and back to earthen levee would be accomplished with I-walls. Once north of I-10, the protection would turn to the west and cross U.S. Hwy. 51. The U.S. Hwy. 51 crossing would require two 50 ft rollergates, two T-wall storage monoliths, and a T-wall across the median. I-walls would again be used to transition from earthen levee to T-wall and back to earthen levee. Large culverts would be placed at approximately 4 locations along the alignment between the Bonnet Carre Spillway and U.S. Hwy. 51 to maintain gravity drainage to the area. The culverts would be located at existing drainage canals to minimize impacts to existing drainage patterns.

The protection west of the I-10/U.S. Hwy. 51 interchange would run parallel to I-10 to just beyond the Belle Terre Blvd. interchange, a distance of approximately 4.5 miles. Two alternative methods of construction were considered for providing the protection in this area. Interstate 10 between the U.S. Hwy. 51 interchange and the Belle Terre Blvd. interchange is located at ground level. In order to minimize flooding to I-10 during periods of high tide, a large embankment was created upon which to construct the interstate. The existing embankment, currently at a elevation of approximately 6.0 feet NGVD, extends roughly 100 feet north of the shoulder of the westbound lanes. A levee/floodwall combination (Plan 1A) was developed in an effort to maximize the use of the existing embankment. A small earthen levee would initially be constructed just north of the existing west bound lanes of the interstate. Sheetpiling would then be driven into the embankment and capped with concrete. The location of the floodwall would be approximately 50 feet north of the existing shoulder of the interstate to avoid creating a hazard to vehicular traffic. Consideration was also given to the construction of a full earthen levee section (Plan 1B).

The existing interstate embankment was incorporated into the design of the levee to reduce costs and minimize environmental impacts. The centerline of the levee would be located approximately 65 feet north of the existing shoulder of the west bound lanes. Geotextile would be used to improve stability and minimize the base width of the levee section. Based on Louisiana Department of Transportation and Development drawings, there are eight locations where existing drainage culverts pass under the interstate. Floodwalls would be constructed at these locations for both Plan 1A and Plan 1B alternatives. Gravity drainage to the area would be maintained by extending the existing culverts through the floodwall. Sluice gates would be added to the culverts to provide positive cutoff during hurricane events.

The interstate becomes elevated approximately 0.5 miles west of the Belle Terre Blvd. interchange. At this point, the protection for both Plan 1A and Plan 1B would turn to the southwest and cross under the interstate. A T-wall would be constructed under I-10 to avoid impacting the existing support columns for the interstate. I-walls would be used to transition from levee to T-wall and back to levee. South of the interstate, the protection would consist of an all earthen levee. The levee would continue in a southwesterly direction for approximately 2.5 miles, incorporating an existing local levee into the protection. The protection would then turn to the south and continue for approximately 0.85 miles before tying into high ground at U.S. Hwy. 61. Geotextile would be placed in the base of the levee to improve the overall stability, reduce the footprint of the section, minimize environmental impacts, and reduce potential settlement problems. The borrow material for all levee construction would be truck hauled from the Bonnet Carre Spillway. Using adjacent cast material was ruled out because of the adverse environmental impacts and the availability of borrow material for a truck-hauling operation within close proximity to the project site.

To maintain gravity drainage to the area, culverts would be placed at approximately six locations between Belle Terre Blvd. and the tie-in at U.S. Hwy. 61. The gravity drainage structures would be located at existing drainage canals to minimize impacts to the adjacent wetlands. During hurricane events or periods of unusually high tides, the gravity drainage structures would be closed preventing rainfall from draining from the developed areas into the surrounding wooded swamps and bottomland hardwoods. Plan 1 alternatives would require the construction of two pumping stations to ensure that interior stages would not exceed the without-project conditions during periods when the gravity drainage structures were closed. A 100 cfs pumping station would be located along the alignment approximately 2 miles northwest of the west guide levee for the

Bonnet Carre Spillway. The other pumping station would be located approximately 0.5 miles southwest of the I-10/Belle Terre Blvd. interchange. This pumping station would be constructed with a capacity of approximately 1,000 cfs. The pumping stations would be located at existing drainage canals to minimize impacts to the existing wetlands. Existing drainage canals within the protection would serve as feeder canals. Collector canals, running parallel to the protection, would be provided as necessary to connect the existing canals to the gravity drainage structures and pumping stations.

4.1.2 PLAN 2

Plan 2 was considered to determine if increasing the size of the sump area in the western portion of the study area (west of Belle Terre Blvd.) would reduce the required capacities of the pumping stations and reduce the estimated project cost. The large sump area would be used to store rainfall when conditions warrant closing the interior drainage structures. Plan 2 is identical to Plan 1 except for the portion of the alignment west of the I-10/Belle Terre Blvd. interchange. Instead of turning to the southwest as soon as I-10 becomes elevated, Plan 2 would follow the interstate for approximately 1.2 miles beyond the Belle Terre Blvd. interchange. At the point where I-10 crosses an existing pipeline canal, the protection would turn to the southwest and parallel the pipeline canal until intersecting the Reserve Relief Canal (a distance of approximately 1.5 miles). The protection would then turn to the south and follow the Reserve Relief Canal for approximately 1.8 miles before intersecting high ground at U.S. Hwy. 61. The alignment for Plan 2 encloses an additional 1,345 acres of wooded swamp and bottomland hardwoods west of Belle Terre Blvd. within the protection.

As described for Plan 1, an earthen levee would be constructed from the west guide levee for the Bonnet Carre Spillway to the vicinity of the I-10/U.S. Hwy. 51 interchange. A T-wall would be used to cross under I-10 to avoid impacting the existing support columns for the interstate. Once north of I-10, the protection would turn to the west and parallel the interstate. Rollergates would be used to cross U.S. Hwy. 51. Two alternative methods of construction were considered for the protection which runs parallel to I-10. A levee/floodwall combination (Plan 2A) and an all earthen levee (Plan 2B) were the alternatives evaluated. The levee/floodwall combination can be located entirely within the existing embankment which was created during the initial construction of I-10. A small earthen embankment would initially be constructed approximately 50 feet north of the shoulder of the west bound lanes of the interstate. Sheetpiling would be driven into the embankment and capped with concrete. The centerline of the protection for the earthen levee alternative would be located approximately 65

feet north of the shoulder of the west bound lanes of I-10. Geotextile would be used to improve stability and minimize the base width of the levee. At the locations where drainage culverts pass under the interstate, floodwalls would be constructed for both Plans 2A and 2B. The culverts would be extended, passed through floodwalls, and fitted with sluice gates to provide positive cutoff during hurricane events.

The protection west of Belle Terre Blvd. would be located primarily in low lying wooded swamps. A sand base would be required in order to provide a suitable foundation upon which to construct the levee. The sand base would be constructed to an elevation of 3 ft NGVD using sand truck-hauled from the Bonnet Carre Spillway. A layer of geotextile would be placed on top of the sand base to improve the overall stability of the levee, reduce the footprint of the section, minimize environmental impacts, and reduce potential settlement problems. The full levee section, including floodside and protected side stability berms, would be constructed on top of the sand base using borrow material truck-hauled from the Bonnet Carre Spillway.

Interior drainage to the area would be maintained by constructing gravity drainage structures at several locations along the alignment. There would be a total of four gravity drainage structures east of U.S. Hwy. 51 and another eight west of Belle Terre Blvd. The gravity drainage structures would be located at existing drainage canals to minimize impacts to the existing wetlands.

The large track of undeveloped land located west of Belle Terre Blvd. would serve as a sump to pond rainwater during times when the gravity drainage structures were closed. Providing a sump to pond the rainwater reduces the pumping requirements for the western portion of the study area. The 1,000 cfs pumping station described for Plan 1 would be reduced to a 100 cfs pumping station for Plan 2 alternatives. As described for Plan 1 alternatives, Plan 2 would also require a 100 cfs pumping station in the eastern portion of the study area. Existing drainage canals within the protection would serve as feeder canals. Collector canals, running parallel to the protection, would be provided as necessary to connect the existing canals to the gravity drainage structures and pumping stations.

4.2 SUMMARY OF ECONOMIC ANALYSIS

The alternative plans were evaluated from an economic standpoint by comparing estimated equivalent annual benefits with estimated average annual costs. Average annual costs for the alternatives were determined using a Federal discount rate of $7^3/_8$ percent and a period of analysis of 50 years. Each of the plans fulfill the primary objective by providing hurricane

protection to the study area. Practical non-structural measures, such as zoning and building regulations, flood-forecasting and warning, and flood fighting and evacuation plans are currently in place in the study area and will remain in use as features of any plan, including the no action plan.

Each of the alternatives considered would provide positive equivalent annual net benefits and would result in benefit-to-cost ratios (BCR's) of greater than unity. Plan 1B, providing a 100-year level of protection, produces the greatest amount of equivalent annual net benefits, $5,341,000, followed by Plan 1B with SPH protection, $5,114,000; Plan 2B with 100-yr protection, $5,088,000; and Plan 2B with SPH protection, $4,749,000. The Plan 1A and Plan 2A alternatives provide approximately $1 million less in equivalent annual net benefits and were eliminated from further consideration. Plan 1B with a 100-year level of protection has a BCR of 2.3. The BCR changes to 2.1 for Plan 1B, SPH protection; 2.1 for Plan 2B, 100-yr protection; and 2.0 for Plan 2B, SPH protection.

5. PROPOSED ACTION

The West Shore-Lake Pontchartrain, Louisiana reconnaissance study considered several alternative plans for reducing hurricane flooding in the Laplace area. All of the plans considered were determined to be economically justified. As a result, the District Engineer recommended that a feasibility study be initiated. The Pontchartrain Levee District has expressed an interest in participating in the feasibility study.

The Plan 1 alternatives enclose less undeveloped land within the protection and result in lower levels of adverse environmental impacts than the Plan 2 alternatives. The Plan 1 alternatives also result in greater levels of net benefits. The feasibility study will further investigate alternatives for providing hurricane protection to the Laplace area. The Plan 1 alignment will be the basis for developing the alternatives. Variations on the Plan 1 alignment will be considered. These variations will include deviations to enclose less undeveloped lands within the protection. Deviations to enclose more residential and commercial structures within the protection may also be considered.

In the feasibility phase, the level of protection provided by the project will be optimized according to an economic analysis of the costs and benefits. Borings and cross-sections will be taken along the proposed alignment to better define the existing soil conditions and ground elevations, and to prepare detailed designs of the protection. A hydraulic analysis of the interior drainage conditions will also be performed to

determine the required capacity of the gravity drainage structures and pumping stations.

Design features will be fully evaluated with respect to the latest economic and environmental regulations for acceptability under current Federal laws and regulations. Any adverse effects of the plan that require modifications to the project will be identified and appropriate mitigation measures will be included in the plan.

5.1 ENVIRONMENTAL IMPACT STATEMENT

An Environmental Impact Statement (EIS) is scheduled to be conducted at this time. This assumption is based upon information generated during the reconnaissance phase. The impacts will be determined once pertinent hydraulics and design information is generated during the feasibility study. An EIS is deemed necessary given the potential for indirect impacts associated with enclosing large tracks of undeveloped land within the protection.

6. SCOPE OF WORK

The feasibility study activities presented in this PSP will be completed to determine the feasibility of providing hurricane protection to the area generally bounded by the Bonnet Carre Spillway to the east, the Mississippi River to the south, Lakes Pontchartrain and Maurepas to the north, and the St.James/Ascension Parish line to the west. The description of tasks and associated costs provided in the following sections reflect the required efforts to complete feasibility scope designs and costs.

This PSP was developed generally in accordance with the following guidelines:

a. Engineering Regulation (ER) 1105-2-100: "Guidance for Conducting Civil Works Planning Studies"' dated 28 December 1990,

b. ER 5-7-1: "Project Management", dated 30 September 1992,

c. ER 1110-2-1150: "Engineering and Design for Civil Works Projects",

d. ER 405-1-12: Draft Chapter 12, Real Estate handbook,

e. ER 1105-2-208: "Preparation and Use of Project Study Plans", dated 23 December 1994,

f. ER1105-2-101: "Risk-Based Analysis for Evaluation of Hydrology/Hydraulics, Geotechnical Stability, and Economics in

Flood Damage Reduction Studies".

7. SPECIFIC WORK SCOPE

A specific work scope for the activities required to accomplish the West Shore-Lake Pontchartrain, Louisiana Feasibility Study is presented in Appendix A. Activities are grouped generally according to the organization responsible for performing the task. A general description of **what**, **why**, **who**, **when**, **how**, **manpower/cost**, and **duration** required to accomplish each task are presented.

8. WORK BREAKDOWN STRUCTURE

A Work Breakdown Structure (WBS) outlining the component products and sub-products for the feasibility study are listed in a hierarchy of levels in Appendix B. Each activity and product in the WBS can be cross referenced with the Responsibility Assignment Matrix (RAM) in Appendix D.

9. ORGANIZATIONAL BREAKDOWN STRUCTURE

Appendix C contains a list of the various offices within the New Orleans District Corps of Engineers and other agencies that will be involved in the feasibility study efforts.

10. RESPONSIBILITY ASSIGNMENT MATRIX (RAM)

A presentation of the organizational responsibility for the products shown in the WBS is shown in Appendix D. This report generally defines the organization(s) required to perform the specific activities associated with production of the feasibility report and other associated products of the feasibility study effort. The organizations responsible for each product and activity can be cross-referenced with the organizational breakdown structure in Appendix C.

11. BUDGET AND COST ESTIMATES

The baseline cost estimate is shown in Appendix E. The incremental feasibility study cost estimate shown is $2,610,000. Revisions to the PSP will be required if significant changes are made to the proposed action, scope of work, and associated specific work scope.

12. SCHEDULE

A Critical Path Method (CPM) network schedule showing the logical progression of all the activities required for the feasibility study is presented in Appendix G. This schedule is based on the assumptions presented in the scope of work and APPENDIX A, SPECIFIC WORK SCOPE. The current schedule assumes that the New Orleans District will receive approval to initiate the feasibility phase in November 1997.

The schedule of major tasks and study milestones are listed below:

MILESTONE	ACTION
01 APR 98	Initiate feasibility study.
15 APR 98	Initiate Hydraulics Design of Alternative.
06 APR 00	Hold Alternative Formulation Briefing.
06 NOV 00	Submit draft feasibility report and draft environmental impact statement.
10 JAN 01	Feasibility Review Conference (FRC), if required.
15 JUN 01	Submit final feasibility report and final environmental impact statement.
16 JUL 01	Division Engineer's Notice

13. CURRENT BENEFITS PLAN

Project benefits for the plan will be developed and will reflect an effective date corresponding to submission of the draft feasibility report. The feasibility report and the Project Management Plan (PMP) will present a plan for updating project benefits for the plan every year.

14. RESOURCE ALLOCATION PLAN

The Open Plan report in Appendix F has the information required for a Resource Allocation Plan. As recommended in ER 5-7-1, this report includes activity identification and description, duration of each activity, the resource code and description, cost, and the start/finish dates for each activity.

15. LOCAL COOPERATION PLAN

The cash requirements of the local sponsor, presented in Appendix E, Baseline Cost Estimate, will be made available as follows: for each fiscal year of the study, the Government shall, no later than 60 days prior to the beginning of the fiscal year, notify the local sponsor of the sponsor's cash requirement for the upcoming fiscal year. No later than 30 calendar days after the beginning of the fiscal year, the local sponsor shall verify to the satisfaction of the Government that it has deposited the requisite amount in an escrow account acceptable to the Government, with interest accruing to the local sponsor. As the study progresses, the Government will adjust the cash amounts required to be provided by the local sponsor such sums as the Government deems necessary to cover contractual and in-house fiscal obligations attributable to the study as they are incurred.

A copy of the escrow agreement to be executed between the Government, the local sponsor, and the financial institution is provided as Appendix H.

16. ACQUISITION PLAN

The Federal Acquisition Regulations (FAR) and the Engineer Federal Acquisition Regulations (EFAR) require the preparation of an acquisition plan. The acquisition plan will provide a comprehensive and concise picture of what is being procured, how the proposed acquisition will take place, and to document why the type or manner of procurement was most appropriate for the acquisition planned. The acquisition plan will be a coordinated product of the appropriate functional elements, contracting, and the Small and Disadvantaged Business Utilization Office (SADBU). The acquisition plan will be developed during the feature design memorandum phase of project development for construction contracts.

17. REAL ESTATE PLAN

Real Estate Division, New Orleans District, will prepare a Real Estate Plan (REP), which will include a Baseline Cost Estimate (Chart of Accounts) for the alternative plan, as well as milestones and other pertinent real estate information. Cost estimates for lands and damages associated with the alternatives will be prepared and included in the cost estimates used to determine the feasibility of each alternative plan. The baseline cost estimate for real estate required for the tentatively selected plan will include a gross appraisal, which will be reviewed and approved according to current delegated authority.

The Sponsor will acquire all necessary rights-of-entry for the accomplishment of field investigations such as: surveys; soil borings; cultural resource investigations; environmental assessments; hazardous, toxic and radioactive waste determinations; and other exploratory activities, including the right of ingress and egress to perform these activities, as deemed necessary for completion of the study.

18. QUALITY CONTROL PLAN

The quality control plan (QCP) for the West Shore-Lake Pontchartrain, Louisiana feasibility study provides a technical review mechanism insuring that quality products are developed during the course of the study by the New Orleans District (NOD). Technical review will consist of a single level study review and will be performed at NOD throughout the course of the study. The Mississippi Valley Division (MVD) will be responsible for verifying that NOD's products meet the needs and expectations of the customer, and that competent technical resources are utilized throughout the design and review process. One level of policy review for the West Shore-Lake Pontchartrain, Louisiana study will be performed at the Headquarters of the United States Army Corps of Engineers (HQUSACE), and will insure that all applicable statutes have been applied with respect to cost sharing, project purpose, and budget criteria. All processes, quality control, quality assurance, and policy review, should complement each other producing a seamless review process which identifies and resolves technical and policy issues during the course of the study and not during the final study stages.

The QCP has been formulated to provide for a sound technical review process at the NOD level which focuses on several objectives. Primarily, quality technical products will be produced through an effective and comprehensive single level technical review process throughout product development while verifying that functional, legal, safety, health and environmental requirements are satisfied. This review process will insure that a cost effective solution, while maintaining product requirements, is developed. Technical review will also act as a mechanism to avoid startovers and redesign efforts, and will assure accountability for the technical quality of the product. Each technical review objective in the QCP will be satisfied through a seamless review process performed by NOD (technical review), MVD (quality assurance of technical products), and HQUSACE (policy review). The scope of the West Shore-Lake Pontchartrain, Louisiana quality control plan is based upon applicable guidance from higher authority including the Report of the Task Force on Technical Review, dated December 1994, and CELMV-ET memorandum of 23 September 1995, subject: Lower Mississippi Valley Division, Directorate of

Engineering and Technical Services, Quality Control and Quality Assurance Guidance.

18.1. TECHNICAL REVIEW

Based upon cost, technical expertise, and current and projected work load, the technical review for the West Shore-Lake Pontchartrain, Louisiana feasibility study will be conducted by in-house resources. The local sponsor, and the U. S. Fish and Wildlife Service will also be involved in the review process by participating in Interdisciplinary Planning Team (IPT) meetings. These agencies will also be invited to have a representative on the Technical Review Team. In-house technical review is expected to result in a lower project and review cost when compared to non-Corps contractual services, thereby adding value to the project and yielding the most cost effective method for technical review. In terms of technical expertise, NOD has a vast amount of experience and capability in order to produce a quality product for the West Shore-Lake Pontchartrain, Louisiana feasibility study given the similarity to numerous other hurricane protection and flood control projects constructed throughout the New Orleans metropolitan area.

Based upon the current and projected work load of NOD, the project study plan indicates that the study will be completed in approximately 38 months. This duration is well within the acceptable time frame for a hurricane protection feasibility study.

18.2. TECHNICAL REVIEW TEAM (TRT)

The TRT for both Planning and Engineering Divisions will be responsible for performing an independent technical review of the West Shore-Lake Pontchartrain, Louisiana feasibility study. The TRT will be established at the initial stages of the study and will be maintained to the maximum extent possible during the life of the study. At the initial study stages, the TRT will consist of one or more reviewers from each functional area within each division, and will consist of existing senior staff who perform other technical work but are not involved in the technical products under review. The TRT will be comprised of the same disciplines on the IPT, and will have experience in the type of analyses in which they are responsible for reviewing. Each TRT member will be senior or equal in experience to the analyst or production person. The TRT will be responsible for verifying; 1) assumptions, 2) methods, procedures, and material used in analyses based on the level of analyses, 3) alternative evaluated is reasonable, 4) appropriateness of data used, and level of data obtained, 5)

reasonableness of results, and 6) products meet customer needs and are consistent with law and existing policy. The makeup of the TRT may be modified as the study progresses to match the review requirements. The changes to the TRT may result in out-of-house resources.

18.2.1. PLANNING DIVISION TECHNICAL REVIEW MEMBERS

Technical Review Members will be from the functional areas within Planning Division which include Plan Formulation Branch, Economics and Social Analysis Branch, and Environmental Analysis Branch. Each functional area will be represented by one or more reviewers on the TRT from the various disciplines. Thus, a minimum of three members from Planning Division will reside on the TRT for the West Shore-Lake Pontchartrain, Louisiana feasibility study.

18.2.2. ENGINEERING DIVISION TECHNICAL REVIEW MEMBERS

The Technical Review Members will be selected from the various design offices. The members may change as the project progresses and specific project features are better defined. The TRT will consist of a Technical Review Manager (TRM) and representatives from the various design offices. The design offices include Civil Branch, Cost Engineering Branch, Design Services Branch, General Engineering Branch, Geotechnical Branch, Hydraulics & Hydrologic Branch, and Structures Branch. Each branch will be represented by one or more reviewers on the TRT from the various disciplines. There will be a minimum of seven Engineering Division members on the TRT for the West Shore-Lake Pontchartrain, Louisiana feasibility study.

The West Shore-Lake Pontchartrain, Louisiana Hurricane Protection feasibility study Technical Review Team comprised of Planning, Engineering, Operations and Maintenance, Real Estate, and Programs and Project Management Divisions will consist, as a minimum, of the following disciplines:

West Shore-Lake Pontchartrain, Louisiana Feasibility Study
Technical Review Team Members

DISCIPLINE	DIVISION	BRANCH	SECTION
Economist	Planning	Economic and Social Analysis	General Water Resources
Environmentalist	Planning	Environmental Analysis	Environmental Studies

Cultural Resource Specialist	Planning	Environmental Analysis	Natural/Cultural Resource Analysis
Recreational Resource Specialist	Planning	Environmental Analysis	Natural/Cultural Resource Analysis
Civil Engineer	Planning	Plan Formulation	Basin Special Planning
Hydraulic Engineer	Engineering	Hydraulics & Hydrologic	Hydraulic Design
Civil Engineer	Engineering	Cost Engineering	
Geotechnical Engineer	Engineering	Geotechnical	Dams, Levees & Channel Slopes
Civil Engineer	Engineering	Civil	Levees
Civil Engineer	Engineering	Structures	Flood Control Structure
Mechanical Engineer	Engineering	General Engineering	General & Env. Design
Civil Engineer	Engineering	Design Services	Projects Engineering
Civil Engineer	Operations	Readiness	
Realty Specialist	Real Estate	Acquisition	
Appraiser	Real Estate	Appraisal	
Attorney	Real Estate	Legal Support	
Civil Engineer	Program and Project Management	Program and Project Management	

18.3. TECHNICAL REVIEW MEETINGS AND CRITICAL CHECKPOINTS

The quality control process recognizes that the appropriate place to perform one-on-one verification for both Planning Division and Engineering Division products will vary among the functional areas. However, the verifications will occur prior to the release of data and/or final products to another office/division, but may include reviewers and IPT members from other functional areas. The one-on-one verifications for both divisions will occur numerous times throughout the current 38 month schedule. The one-on-one technical review verifications for both divisions are shown as a hammock on the Open Plan diagram. Each one-on-one verification meeting will be documented and become part of the quality control records used

in the quality assurance process by MVD.

In addition to the one-on-one verification process, there are also points within the study process where it is appropriate for the TRT and IPT to perform the verification process as a team. This feature of the quality control process allows the flexibility to optimize the one-on-one verification process within the functional area while maintaining the team concept during the Technical Review Meetings. Each meeting will be documented and become part of the quality control records used in the quality assurance process by MVD. These points in the study process would typically occur during: scoping and plan formulation, defining of existing conditions, alternative screening, plan selection, report review, and the preparation of the project management plan.

18.4. QUALITY CONTROL RECORDS

Quality control records for both Planning and Engineering Division products will be maintained in a technical review package prepared by the IPT leader and included in the West Shore-Lake Pontchartrain, Louisiana feasibility report. The package will consist of review comments, and a certification checklist. The review comments will summarize the major issues/comments from the independent technical review along with the response or resolution to each comment. The Planning Division technical review checklist will also be included within the report as a means of documenting the independent technical review. Both the Planning and Engineering Division checklists will assure that the major elements of the quality control plan have been followed. Planning Division reviewers will sign the checklist, certifying that, for their particular subject area, the document conforms to pertinent regulations, guidance, and sound professional practices. Prior to the submittal of the draft report to HQUSACE the checklist will be completed by the Planning Division functional chief, reviewed by the Chief of Planning Division, and signed by the District Commander as part of the required report documentation. Engineering Division's quality control records, comments and resolutions, will accompany the design document. The design checklists will serve as a tool for the TRT and will become part of the district's files.

19. VALUE-ENGINEERING PLAN

During the feasibility study, the Value Engineer will review the project and appropriate action, if any, will be taken. A Value-Engineering Plan will be developed for the plan and detailed in the Project Management Plan. This plan will discuss the need for a cost effectiveness review.

20. SAFETY PLAN

Field investigations will be conducted following current safety regulations. The local sponsor will assist the study team in identifying hospitals and emergency facilities throughout the project area.

21. SECURITY PLAN

This element has been evaluated and is not applicable to the study.

22. CULTURAL AND RECREATIONAL RESOURCE PLAN

This work activity requires an in-house evaluation of project design features. Effort will focus on designing and implementing cultural resources investigations, monitoring project development, and coordinating efforts with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP).

Contractor assistance will be required to conduct a cultural resources survey of the project area. The contractor will be responsible for conducting investigations using appropriate professional methods and techniques to identify cultural resources within the project area, and assessing them for National Register (NR) of Historic Places eligibility according to established criteria. The contractor will complete any NR forms, if appropriate, and prepare a written report of findings. The report will provide recommendations for the protection and preservation of significant cultural resources and include a discussion on the potential for sites in the unsurveyed portions of the project area.

23. ENVIRONMENTAL PLAN

The New Orleans District will conduct the necessary investigations to assure that no unmitigated adverse impacts to significant resources would be caused by the implementation of the plan. This will be done using the following:

a. Environmental planning. Project features will be designed to avoid environmental impacts and minimize unavoidable impacts in the immediate area of construction. Environmental design will include recommendations of the U.S. Fish and Wildlife Service and various State and local agencies. Cultural and aesthetic resources will be assessed and impacts considered in plan formulation, design, and mitigation planning.

b. Environmental Impact Statement. An Environmental Impact statement will be prepared and coordinated with appropriate Federal, State, and local agencies as required for National Environmental Protection Act (NEPA) compliance. Compliance documents for Coastal Zone consistency, Section 404 (b) 1 guidelines, and Water Quality certification will be prepared as required.

c. Mitigation plan. A mitigation plan will be prepared to compensate for any unavoidable environmental or cultural resource losses caused by construction, operation, and maintenance activities.

24. OPERATION AND MAINTENANCE

Operations Division, New Orleans District, will coordinate with Engineering Division to review the alternative design features, determine the operation and maintenance requirements, recommend typical standard operating procedures, and estimate the operation, maintenance, replacement, and rehabilitation costs. This information will be coordinated with and approved by the non-Federal sponsor.

25. MANAGEMENT CONTROL PLAN

Management of this study will be in accordance with ER 5-7-1 and ER 1105-2-100. Cost, schedule, and technical performance will be monitored by the project manager and the planning functional manager utilizing standard procedures outlined in the regulations referenced above.

The Feasibility Cost Sharing Agreement (FCSA) shall formalize an Executive Committee and its responsibilities. The committee will be comprised of the district engineer, his chief planner, a person of commensurate decision making authority for the non-Federal sponsor and his primary technical advisor. The district engineer and his local sponsor counterpart will co-chair the committee. During the feasibility phase, the Committee will participate in the Issue Resolution Conference and participate in decisions and recommendations made by the Study Management Team. The Executive Committee will also be responsible for resolving any disputes that may arise during the feasibility phase and determining appropriate solutions and study direction, including termination or suspension.

In accordance with EC 1105-2-208, changes that significantly alter the scale and scope of the study as originally agreed to in the PSP, the New Orleans District will notify HQUSACE so that all levels can reach a new agreement on the conduct of the study.

26. REPORTING REQUIREMENTS

Reporting of study progress and expenditures will be made utilizing the guidelines given in ER 1105-2-100 and ER 5-7-1.

27. CHANGE CONTROL PLAN

If a change in activity cost or schedule is identified during preparation of Management Control Reports or other study activities, the identifying team member will submit a Schedule and Cost Change Report (SACCR).

The project manager, in consultation with the study manager, sponsor, and appropriate technical managers, will determine whether a Technical Review Conference or a reduced variation thereof is necessary to redetermine project scope. After the revised scope is agreed upon, the affected team members will submit SACCR's.

Submission and approval of SACCR's are not a correction for poor planning, poor execution, or efforts/expenditures outside the scope of the PSP. Necessary efforts/expenditures outside the scope of the PSP will be reviewed and approved by the project manager, study manager, and sponsor prior to being undertaken.

28. SCREENING AND SCOPE REVISIONS

During the study process, the alternative will be screened to determine the potential of Federal participation in the next phase, Preconstruction Engineering and Design (PED). Federal participation is primarily based upon the benefit to cost ratio and environmental acceptability. Currently, the benefit to cost ratio must exceed 1.0 for Federal participation. If during the course of the study, significant plan modifications, additional plans, or other study modifications are required, the total study cost will be adjusted and the PSP revised accordingly.

29. RISK-BASED ANALYSIS FOR HYDROLOGY/HYDRAULICS AND ECONOMICS

The total effect of risk and uncertainty on project design and economic feasibility can be expressed through explicit tradeoffs between risks and costs. Project sponsors have the opportunity to examine these tradeoffs and make a more informed decision in selecting among project alternatives that reflect unique risk preferences.

In order to account for such uncertainties, risk-based analysis

will be completed for both the H&H analysis and economic analysis for the West Shore-Lake Pontchartrain, Louisiana feasibility study. Risk-based analysis is defined as an approach to evaluation and decision making that explicitly, and to the extent practical, analytically incorporates considerations of risk and uncertainty. It is recognized that the "true" values of key planning and design variables and parameters are frequently not known with certainty and can take on a range of values. One can describe, however, the likelihood of a parameter taking on a particular value by a probability distribution. The probability distribution may be described by its own parameters, such as, mean and variance for a normal distribution, or minimum and maximum, and most likely for a triangular distribution. The approach combines the underlying risk and uncertainty information so that the engineering and economic performance and associated reliability of a project can be expressed in terms of probability distributions.

30. UNCERTAINTIES IN SCOPE OF WORK

The scope of work in this PSP defines the tasks required to complete the West Shore-Lake Pontchartrain, Louisiana feasibility study as currently scoped. The required tasks are based upon evaluating Plan 1B recommended for further analysis in the West Shore-Lake Pontchartrain, Louisiana reconnaissance report. These required tasks and related costs, are subject to change during the course of the study if plan modifications, additional plans, or other study modifications are warranted. If changes in the scope of work are required, the total cost of the study will be adjusted to reflect such changes.