



Integrated Ecosystem Restoration and Hurricane Protection: Louisiana's Comprehensive Master Plan for a Sustainable Coast

Appendix I: Measures Appraised: Alternative Plans 1 and 2 (May 2006)

**Coastal Protection and Restoration Authority
of Louisiana**

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Table of Contents

1.0	INTRODUCTION	1
1.1	SUMMARY OF ALTERNATIVE PLAN FORMULATION PROCESS	1
2.0	PLANNING UNIT 1- EAST OF THE MISSISSIPPI RIVER	3
2.1	ALTERNATIVE 1	3
2.2	ALTERNATIVE 2	10
3.0	PLANNING UNIT 2 – MISSISSIPPI RIVER TO BAYOU LAFOURCHE	18
3.1	ALTERNATIVE 1	18
3.2	ALTERNATIVE 2	23
4.0	PLANNING UNIT 3A - BAYOU LAFOURCHE TO BAYOU DE WEST	30
4.1	ALTERNATIVE 1	30
4.2	ALTERNATIVE 2	34
5.0	PLANNING UNIT 3B – BAYOU DE WEST TO FRESHWATER BAYOU	41
5.1	ALTERNATIVE 1	41
5.2	ALTERNATIVE 2	44
6.0	PLANNING UNIT 4 – FRESHWATER BAYOU TO SABINE RIVER	48
6.1	ALTERNATIVE 1	48
6.2	ALTERNATIVE 2	54
7.0	TABLES	59

List of Tables

Table C.1	Planning Unit 1 - List of Proposed Measures	59
Table C.2	Planning Unit 2 - List of Proposed Measures	62
Table C.3	Planning Unit 3a - List of Proposed Measures	65
Table C.4	Planning Unit 3b - List of Proposed Measures	67
Table C.5	Planning Unit 4- List of Proposed Measures	68
Table C.6	Alternative One and Two Measures- Planning Unit 1	70
Table C.7	Alternative One and Two Measures- Planning Unit 2	72
Table C.8	Alternative One and Two Measures- Planning Unit 3a	74
Table C.9	Alternative One and Two Measures- Planning Unit 3b	76
Table C.10	Alternative One and Two Measures - Planning Unit 4	77
Table C.11	- Planning Unit 1- Additional Projects Proposed by Stakeholders	79
Table C.12	- Planning Unit 2 - Additional Measures Proposed by Stakeholders	79
Table C.13	- Planning Unit 3a - Additional Measures Proposed by Stakeholders	80
Table C.14	- Planning Unit 3b - Additional Measures Proposed by Stakeholders	80
Table C.15	- Planning Unit 4 - Additional Measures Proposed by Stakeholders	80



1.0 Introduction

This appendix presents the full suite of protection and restoration measures appraised in two full alternative plans as part of the development of the November 2006 Preliminary Draft Master Plan. Appendix H presents the process through which these alternative plans were defined.

The appendix contains two sets of listings of measures. Tables C.1 to C.5 present all the potential measures identified during the Plan Formulation Process, divided into the five Planning Units (PU1, PU2, PU3a, PU3b & PU4). The subsequent sections then present a brief description of the measures taken forward for appraisal in the two alternative plans.

1.1 Summary of Alternative Plan Formulation Process

The current and likely future levels of risk to the human environment and the existing disruptions to processes for the natural environment were used to project the natural landscape in order to identify long-term issues for coastal Louisiana. These risks to human and natural assets were used as the basis for defining specific planning unit objectives. These objectives address the specific future risks and impacts identified (see Appendix B).

A full list of known proposed measures was compiled, using existing knowledge and published reports, to provide a list of potential options for future management of the coast to achieve the planning unit objectives. The sources of these measures include, but are not limited to CWPPRA, LCA, BTNEP, LDNR, FEMA ESF 14, Conservation Plans, Feasibility Studies, USACE, and USFWS. Tables C.1 to C.5 consist of all proposed measures considered in the Plan Formulation process for the five planning units.

The proposed measures were then reviewed with regard to their potential for achieving the planning unit objectives. Those measures considered potentially viable for achieving an objective were given a positive score against that objective (see Appendix H, Measures vs. Objectives tables).

Two plan formulation rationales were then developed to provide the basis for defining complete alternative plans for appraisal. These rationales were set up to represent potential alternative approaches to managing the protection and restoration issues facing coastal Louisiana in the long-term, and capture the trade-offs necessary in defining the long-term plan.

In the first rationale, the strategy for selection of measures is summarized as follows:

“Provides for maximum structural protection, without constraints by local asset benefit/costs. Landscape features will be created and sustained using mechanical means. Long-term O&M costs are not a constraint at this stage of plan formulation.”

In the second rationale, the strategy for selection of measures is summarized as follows:

“Provides for variable levels of structural protection with non-structural alternatives for protection (e.g. coastal restoration, evacuation planning, raising or relocating assets). Measures will reflect benefit/cost constraints and include self-sustaining environmental options. Long-term O&M costs will be minimized.”



Based on the plan formulation rationales, selected measures were classified under two alternatives, simply titled “Alternative One” and “Alternative Two”. Table C.6 through C.10 lists all measures under Alternatives One and Two, which were selected from Tables C.1 to C.5. In addition to measures that were selected from the original list of measures presented in Tables C.1 to C.5, measures have also been nominated by stakeholders during the ongoing process of stakeholder engagement (see Appendix B). These lists of measures, found in Tables C.11 to C.15, were also considered as the November 2006 Preliminary Draft Master Plan was being developed.

Through the appraisal of these two alternative plans (see Appendices E, F and G) and application of the decision making process (see Appendix B) the November 2006 Preliminary Draft Master Plan was defined. This is presented in the Main Report, and in more detail in Appendix B.

The following sections summarize the measures appraised as part of Alternative One or Two for each Planning Unit in the development of the Master Plan.



2.0 Planning Unit 1- East of the Mississippi River

Eighty-one measures were considered for planning unit one. Thirty-three measures were selected to represent the two alternatives, and are described briefly by alternative below. The analysis and model runs on these alternative measures resulted in twenty-four measures to represent preferred plan.

2.1 Alternative 1

1-1. Levee Alignment No. 1 from Pearl River to Caernarvon (30-ft Storm Surge at Coastline) and Hurricane Protection from Caernarvon to Pointe a la Hache (20-ft Storm Surge at Coastline)

The USACE LaCPR Levee Alignment No. 1 includes a barrier levee from Caernarvon to the Pearl River at Interstate 59. It also includes a ring levees on the east bank of the Mississippi River from Caernarvon to Belair and Phoenix to Bohemia.

The Levee Alignment No.1 would provide increased surge protection, 40-ft levee, to communities, industries, and other assets located in New Orleans metropolitan area, St. Bernard, and to areas along the shoreline of Lake Pontchartrain; and also provide increased protection to major highways and evacuation routes. In addition, levee Alignment No. 1 would provide increased surge protection, 24 ft from Caernarvon to Belair and 21.5 ft from Phoenix to Pointe a la Hache.

1-2. West Shore Lake Pontchartrain Study Levee Alignment

The proposed levee alignment provides hurricane protection along Lake Pontchartrain and extends the Lake Pontchartrain and Vicinity Project to include St. Charles, St. John the Baptist and St. James Parishes. This measure encloses a population of approximately 40,000 people and includes the communities of LaPlace, Reserve, and Garyville.

The design concept includes the construction of the levee utilizing the adjacent borrow construction method and will provide for detention pond storage outside of developed areas. It would also provide a continuous conveyance channel to pump stations and provide a wet type pumping system. The design accommodates future Southeast Louisiana (SELA) Projects and parish drainage improvements and reduces operation and maintenance costs to existing parish drainage infrastructure.

The ongoing Feasibility Study (USACE & Pontchartrain Levee District) currently projects an initial first lift levee elevation of 17.0 ft and final lift levee elevations at 14.0 ft for the Montz Area, 14.5 ft for the I-10/I-55 area, and 10.5 ft for the Reserve area. The crown of the levee is designed with a width of 8 ft and with a slope of 1:4.

1-3. Reevaluate Levee Protection at South Shore of Lake Pontchartrain (30-ft Storm Surge at Coastline) and Hurricane Protection from Caernarvon to Pointe-a-la-Hache (20 ft Storm Surge at Coastline)

The levee alignment location is along the south shore of Lake Pontchartrain from Kenner to Highway 11. In case the Levee Alignment No. 1 is not implemented as a first line of defense, this protection system needs to be reevaluated. The concept of second-line levees and internal protection systems are vital to restoration of confidence in the flood protection system and to the concept of lowering risk in highly developed urban areas.

1-4. Resolve/Close Mississippi River Gulf Outlet (MRGO) to Deep Draft Navigation

The MRGO begins at the confluence of the Gulf Intracoastal Waterway (GIWW) and the Inner Harbor Navigation Canal (IHNC) and extends southeastward approximately 35 miles, emptying into the Breton/Chandeleur Sound area.



This measure will resolve/close the MRGO to deep draft navigation. Alternative 1 will include a 110-ft by -14-ft by 30-ft floodgate at Bayou Dupre. A restriction to GIWW dimensions (approximately 110 ft) at the Bayou LaLoutre Ridge would supplement this measure.

1-5. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

1-5a. Mississippi River Gulf Outlet (MRGO) Environmental Restoration Features

The MRGO begins at the confluence of the Gulf Intracoastal Waterway (GIWW) and the Inner Harbor Navigation Canal (IHNC) and extends eastward approximately 35 miles, emptying into the Breton/Chandeleur Sound area. The environmental restoration features involve construction of shoreline protection measures, such as rock breakwaters along the north bank of the MRGO, and along important segments of the southern shoreline of Lake Borgne. New bankline stabilization along Lake Borgne is proposed in measure 1-17. Stabilization along the MRGO will start approximately 0.5 mile south of Bayou LaLoutre and extends to the corner of the GIWW and Michoud Canal (approx. 25.6 miles). Because in some places some rock stabilization is already in place, 23 miles were assumed to be in need of new rock stabilization.

1-5b. Small Diversion at Hope Canal

The Hope Canal is located in the Upper Basin (south of Lake Maurepas) on the north bank of the Mississippi River between Gramercy and Garyville. A small diversion (1,000 cfs to 5,000 cfs) from the Mississippi River and through a new structure at Hope Canal would increase freshwater and sediment introduction to the Maurepas swamps. The project would result in increased organic deposition and improved biological productivity.

1-5c. Small Diversion at Convent/Blind River

The Convent/Blind River is located in the upper basin (20 miles south of Lake Maurepas) on the north bank of the Mississippi River between Gramercy and Burnside. A small (1,000 cfs to 5,000 cfs) diversion from the Mississippi River and through a new structure at Convent/Blind would increase freshwater and sediment introduction to the Maurepas swamp. The measure would result in increased organic deposition and improved biological productivity. This measure is intended to work in conjunction with the Hope Canal diversion to facilitate organic and mineral deposition in the swamp.

1-5d. Increase Amite River Diversion Canal Influence by Gapping Banks

The Amite River is located southwest of Lake Maurepas and east of I-10. The proposed measure involves the construction of eight (8) 40-ft-wide gaps in the existing dredged material banks of the Amite River Diversion Canal, each diverting an average of 250 cfs. The objective of this measure is to allow floodwaters to introduce additional fresh water, nutrients, and sediment into the western Maurepas swamp. The exchange of flow would occur during flood events on the river and from runoff of localized rainfall events, and would in turn providing nutrients and sediment to facilitate organic sediment deposition in the swamp, some fluctuation of water levels, improve biological productivity, and prevent further swamp deterioration.

1-5e. Medium Diversion at White Ditch

The White Ditch is located on the east bank of the Mississippi River north of Carlisle. The measure involves implementing a medium sized diversion (5,000 cfs to 15,000 cfs) from the Mississippi River through a new control structure at White Ditch. This feature is located in the vicinity of a historic



crevasse. Follow-up feasibility-level analysis will determine the ultimate size of the diversion. The area requires additional fresh water and sediment to facilitate organic sediment deposition, improve biological productivity, and prevent further deterioration of the marshes.

1-5f. Modification at Caernarvon Diversion

The diversion structure is located on the east bank of the Mississippi River about 15 miles downstream from New Orleans, near the city of Caernarvon, near the Breton Sound marshes close to the St. Bernard-Plaquemines Parish line. Modified operation of this structure would allow an increase in the freshwater introduction rate, probably 5,000 cfs on average, to accommodate the wetland building function of the system. This measure would identify operation changes that would increase restoration outputs. The additional input of fresh water would facilitate organic sediment deposition, improve biological productivity, and prevent further deterioration of the marshes. This structure is located in the vicinity of a historic crevasse.

1-5g. Louisiana/Mississippi Hydrodynamic Study

The proposed study area would encompass the estuaries and near shore water associated with Lake Borgne Basin, Chandeleur and Breton Sound, Mississippi Sound and Mobile Bay. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly development of new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration projects. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing or planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features and to evaluate adaptive management and adjustments to restoration features.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-5h. Mississippi River Hydrodynamic Study

The proposed study area would encompass the existing Mississippi and Atchafalaya River systems necessary to properly assess the operation and parameters of the system with respect to water and sediment transport, flood control, and navigation. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration projects. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing or planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features and to evaluate adaptive management and adjustments to restoration features.

This measure was labeled as being “not tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-5i. Mississippi River Delta Management Study

The Mississippi River Delta Study includes the delta region below Pointe a la Hache. The study would analyze two types of projects including large diversions (approximately 50,000 cfs) from the Mississippi



River, and alternative navigation channel alignments. The large scale river diversions could potentially maximize the river's sediment and freshwater resources available for ecosystem maintenance. Diversion sites, capacities, and outfall management measures would also be assessed to help optimize diversion plans. Such massive diversions, however, may cause adverse impacts to the existing navigation channel; so alternative scenarios must be investigated to accommodate navigation needs. Alternate navigation scenarios include new channels to the east or west of the current river while providing navigation either in the new channel or by maintaining the existing channel as a slack-water channel by the construction and operation of a lock system. In addition, the study would evaluate potential impacts of natural and man-made factors on the environment and economy.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-6. Restore the Chandeleur Islands

The Chandeleur Islands are a barrier island chain located in easternmost St. Bernard and Plaquemines Parishes, approximately 70 miles east of New Orleans, Louisiana. This barrier island chain separates the Chandeleur and Breton Sounds from the Gulf of Mexico. The curve of the Chandeleur Islands connects the Mississippi gulf coast to the delta of the Mississippi River. Like all barrier islands, the Chandeleur Islands form a protective boundary between the Gulf of Mexico and the estuaries and the coastal communities. The islands are impacted by the strongest waves and act to reduce the wave energy, sheltering the mainland during storm events.

This measure will enhance flood protection and restore island habitat. Dredged material from offshore borrow areas is needed to rebuild the islands to an elevation of 6 ft above MSL. Restoration of the barrier islands will reduce wave height and wave energy that enter Chandeleur Sound (fair weather and storm generated), and reduce storm surge elevations east of the barrier islands that impact the Biloxi Marsh. Habitat restoration includes re-vegetation, which will be implemented simultaneously with beach nourishment activity in the barrier island dune and lagoon habitats. This measure will support the preservation and enhancement of saline marshes, bird rookery, recreational and commercial fishing, and maintain benefits of the National Wildlife Refuge.

1-7. Maintain and Restore the Biloxi Land Bridge and Barrier Reefs- South

The Biloxi Land Bridge South is a brackish marsh/oyster reef system that is situated in a southwest-to-northeast alignment, extending from easternmost St. Bernard Parish and north to Pelican Point. Drum Bay and the Chandeleur Sound are east of the Biloxi Land Bridge South, and Bay Boudreau is located along the west side.

This measure includes the marsh restoration of a 33,000 acres Biloxi Marsh area, which includes the placement of 5ft of dredged material and the creation of a 21 mile long and 400 ft wide ridge. Vegetative planting in the marsh area is part of this measure and black mangrove and matrimony vines will be placed on the crown of the ridge. Smooth hard grass will be planted on the water sides of the ridge and the containment berm. Offshore borrow material will be used in this effort.

1-8. Restore Bayou LaLoutre Ridge

The Bayou LaLoutre Ridge is a natural ridge that extends from the east bank of the Mississippi River Gulf Outlet (MRGO) south of Old Shell Beach eastward along the south boundary of the Biloxi Wildlife Management Area.

To restore the Bayou LaLoutre Ridge, a constriction (rock) of the MRGO to GIWW dimensions is required at the ridge, along with a rebuilding and reforesting of the natural ridge using dredged material, and the plantings of hardwoods is needed. Restoration of the Bayou LaLoutre Ridge will in the long-term assist in sustaining the



Biloxi Land Bridge South, and in reducing wave/wake, and storm surge impacts to the entire area encompassing the ridge and land bridge. Habitat restoration will provide refuge for indigenous ridge species.

1-9. Construct Jefferson Parish Fringe Marsh Buffer

The Jefferson Fringe Marsh area is located on the south shore of Lake Pontchartrain (north Jefferson Parish shoreline) between the Causeway Bridge and west to the New Orleans Airport. This measure includes an approximately 9-mile-long foreshore dike (rock) and marsh restoration between the dike and the shore, to reduce shoreline and berm erosion lakeward of the Hurricane Protection Levee. The dike is on average 300 ft away from the shoreline. Restoration of intermediate and fringe marshes must be integral to shoreline protection to provide sustainable shoreline. Marsh restoration provides critical marsh nursery, recreational fishing, birding, and other outdoor activities.

1-10. Maintain MRGO – Lake Borgne Land Bridge

The Lake Borgne Land Bridge is the area along the Lake Borgne shoreline between Doulluts Canal and Jahnckes Ditch and along the north bank of the Mississippi River Gulf Outlet (MRGO) between Doulluts Canal and Lena Lagoon in St. Bernard Parish, Louisiana. To maintain the land bridge, the marsh between Lake Borgne and the MRGO must be protected and maintained to prevent further shoreline erosion. This measure includes marsh restoration of the deteriorated land bridge between Lake Borgne and the MRGO, which includes approximately 14,000 acres. Bankline stabilization along the north bank of the MRGO is incorporated in measure 1-5a and bankline stabilization along the Lake Borgne shoreline is incorporated in measure 1-17, therefore, no additional shoreline protection is included in this measure.

1-11. Sediment Delivery by Pipeline at American/California Bay

The American/California Bay is located off the east bank of the Mississippi River, east of Sulphur, Louisiana. The objective of this measure is to restore wetlands in the American/California Bay by pipeline conveyance (1,000 cfs). The moderately deep (6 to 10 ft) open water in the bay system requires a large volume of sediment in order to bring back lost land and marsh and a containment dike to keep the sediments in place. Sediment to the bay will be provided via pipeline through programmatic sediment mining from the Mississippi River

1-12. Sediment Delivery by Pipeline at Central Wetlands

The Central Wetlands are located between the east bank of the Mississippi River, the south bank of the Gulf Intracoastal Waterway (GIWW), and west of the Mississippi River Gulf Outlet (MRGO). This measure includes restoration of wetlands in the Central Wetlands by pipeline conveyance (1,000 cfs). The objective of this measure is to counteract marsh breakup by providing sediment and nutrients to renourish the area by pipeline conveyance. Sediments will be mined from the Mississippi River into the Central Wetlands, adjacent to the MRGO and Violet Canal, via pipeline. Sediment would be placed in shallow open water zones of the marshes.

1-13. Sediment Delivery by Pipeline at Golden Triangle

The Golden Triangle area is located between the west lobe of Lake Borgne, the north bank of the Mississippi River Gulf Outlet (MRGO), and the south bank of the Gulf Intracoastal Waterway (GIWW). This measure includes restoration of wetlands in the Golden Triangle by pipeline conveyance (1,000 cfs). The objective of this measure is to counteract marsh breakup and restore wetlands by providing sediment and nutrients to renourish the area. Sediments will be mined from the Mississippi River into the Golden Triangle, and placed at the confluence of the MRGO and GIWW, via pipeline. Sediment would be placed in shallow open water zones of the eroding marshes. Increasing the area and improving the function of these marshes would facilitate biological productivity of the marshes and will reduce wetland loss.



1-14. Sediment Delivery by Pipeline at La Branche

The La Branche area is located along the southwest shoreline of Lake Pontchartrain between the Bonnet Carre Spillway and the west boundary of Jefferson Parish. This measure includes restoration of wetlands in the La Branche wetlands by pipeline conveyance (1,000 cfs). The objective of this measure is to counteract marsh breakup and restore wetlands by providing sediment and nutrients to renourish the area. Sediments will be mined from the Mississippi River into the La Branche Wetlands and placed in shallow open water zones of the marshes, via pipeline.

1-15. Benneys Bay Sediment Diversion

The Benneys Bay diversion site is located on the east bank of the Mississippi River, in Plaquemines Parish, Louisiana, 7.5 miles above Head of Passes. This measure will divert Mississippi River water and sediments into Benneys Bay. The objective is to restore vegetated wetlands in an area that is currently shallow open water. The project will divert sediments in an effort to restore, nourish, and maintain approximately 5,828 acres of fresh to intermediate marsh in the Benneys Bay. The project consists of a conveyance channel for the large scale diversion of water and sediments from the river. The conveyance channel would be constructed in two phases: (1) construction of an initial channel with an average discharge of 20,000 cfs; (2) after a period of intensive monitoring, enlargement of the channel to a 50,000-cfs discharge. Material from the construction of the channel would be used to restore wetlands in the diversion outfall area

The diversion would induce shoaling in the main navigation channel of the Mississippi River. Dredging of the channel is accomplished under the U.S. Army Corps of Engineers' ongoing Operations and Maintenance Program for the river. The Pilottown anchorage area is not maintained under the Operations and Maintenance Program. The additional dredging of the induced shoaling in the navigation channel and anchorage area would be an added feature and cost of the project. The dredged material removed from these areas would be used to restore wetlands where possible.

1-16. Restore Main Pass Ridge with Dredge Material

Main Pass Ridge extends approximately 10 miles northeast from the east bank of the Lower Mississippi River (near Pilottown). This measure will restore the Main Pass Ridge (400 feet wide and 5 feet high) with dredged material from the Mississippi River or from other beneficial uses of dredged material and be armored with rock for bankline protection and vegetated for resilience. Restoration of the ridge in conjunction with sediment diversions to the north (Benneys Bay Sediment Diversion) would serve to strengthen the ridge and marsh system in the area

1-17. Add New Bankline Stabilization (Shoreline of Lake Borgne from Alligator Point to Lake Shore Bayou)

The Lake Borgne bankline stabilization is located along the south shoreline of Lake Borgne from Alligator Point (Orleans Landbridge), along the Golden Triangle and the MRGO to Lake Shore Bayou. This measure includes shoreline protection by structural means (riprap) along the south shoreline of Lake Borgne from Alligator Point to Lake Shore Bayou.

1-18. Goose Point / Pointe Platte Marsh Creation

The measure is located on the north shore of Lake Pontchartrain between Fontainebleau State Park and Louisiana Highway 11 and within the Big Branch Marsh National Wildlife Refuge in St. Tammany Parish, Louisiana. The measure area at Goose Point also includes a portion of the St. Tammany Wildlife Management Area.



This measure includes marsh restoration of approximately 330 acres. The goal of this measure is to restore marsh habitat in the open water behind the shoreline. This marsh will maintain the lake-rim function along this section of the north shore of Lake Pontchartrain by preventing the formation of breaches into the interior marsh. Sediment will be dredged from Lake Pontchartrain, contained in cells within the interior ponds, and planted with vegetation. Marsh will be restored to widen the shoreline so that the ponds will not be breached during the course of normal shoreline retreat.

1-19. Adaptive Management through Maintenance of Existing Crevasses and Construction of New Crevasses

This measure applies to the Lower Mississippi River and Delta area. This measure includes the implementation of four crevasses in the first year. Each crevasse is assumed to have a flow of 2,500 cfs and allows for delta building processes. In the second year, four different crevasses will be opened and the four crevasses from the previous year are assumed to silt in during this period. This procedure will continue throughout the next 100 years

1-20. Maximize Beneficial Use of Dredged Material

The areas within Planning Unit 1 where beneficial uses of dredged material could be placed from river and other sediment sources include Biloxi Marsh area, Breton Sound area, and all marsh areas that have eroded away in the vicinity of the MRGO on the east side of the Mississippi River, as well as the Chandeleurs, a national wildlife refuge. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial use of dredged material.

Increasing and maximizing the beneficial uses of dredged material will provide stronger foundations for marsh-building processes, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 1 and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-21. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans

This measure applies to all areas of the Planning Unit that are identified as being at risk from storm surge inundation at the 1% annual probability storm event (1 in 100-year event) that are not protected by a current and/or proposed hurricane levee or levees.

It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or, where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-22. Maintain and Restore the Breton Land Bridge with Marsh Creation

The Breton Land Bridge is located between the east bank of the Mississippi River and the south bank of the Mississippi River Gulf Outlet (MRGO), from Burbridge to Pointe a la Hache on the Mississippi River, and from



Yscloskey to south of Hopedale on the MRGO. This measure includes marsh restoration to maintain the Breton Land Bridge and marshes. Dedicated dredging and marsh restoration are components of this measure. Approximately 156,000 acres will be restored, excluding 60-percent of total acreage to account for open bays, channels, passes, uplands, and infrastructure. A Mississippi River diversion at Caernarvon would supply the needed fresh water and sediments to the Breton Land Bridge area.

2.2 Alternative 2

1-1. Levee Alignment No. 2 from Pearl River to Caernarvon (30-ft Storm Surge at Coastline) and Hurricane Protection from Caernarvon to Pointe a la Hache (20-ft Storm Surge at Coastline)

The USACE LaCPR Levee Alignment No. 2 includes a barrier levee from Caernarvon to the Pearl River at Interstate 59. It also includes a ring levees on the east bank of the Mississippi River from Caernarvon to Belair and Phoenix to Bohemia.

The Levee Alignment No.1 would provide increased surge protection, 40-ft levee, to communities, industries, and other assets located in New Orleans metropolitan area, St. Bernard, and to areas along the shoreline of Lake Pontchartrain; and also provide increased protection to major highways and evacuation routes. In addition, levee Alignment No. 1 would provide increased surge protection, 24 ft from Caernarvon to Belair and 21.5 ft from Phoenix to Pointe a la Hache.

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The proposed levee alignment provides hurricane protection along Lake Pontchartrain and extends the Lake Pontchartrain and Vicinity Project to include St. Charles, St. John the Baptist and St. James Parishes. This measure encloses a population of approximately 40,000 people and includes the communities of LaPlace, Reserve, and Garyville.

The design concept includes the construction of the levee utilizing the opposite borrow construction method and will provide for detention pond storage outside of developed areas. It would also provide a continuous conveyance channel to pump stations and provide a wet type pumping system. The design accommodates future Southeast Louisiana (SELA) Projects and parish drainage improvements and reduces operation and maintenance costs to existing parish drainage infrastructure.

The ongoing Feasibility Study (USACE & Pontchartrain Levee District) currently projects an initial first lift levee elevation of 17.0 ft and final lift levee elevations at 14.0 ft for the Montz Area, 14.5 ft for the I-10/I-55 area, and 10.5 ft for the Reserve area. The crown of the levee is designed in this Feasibility Study with a width of 8 ft and with a slope of 1:4.

1-3. Reevaluate Levee Protection at South Shore of Lake Pontchartrain (30-ft Storm Surge at Coastline) and Hurricane Protection from Caernarvon to Pointe-a-la-Hache (20 ft Storm Surge at Coastline)

The levee alignment location is along the south shore of Lake Pontchartrain from Kenner to Highway 11. In case the Levee Alignment No. 1 is not implemented as a first line of defense, this protection system needs to be reevaluated. The concept of second-line levees and internal protection systems are vital to restoration of confidence in the flood protection system and to the concept of lowering risk in highly developed urban areas.



1-4. Resolve/Close Mississippi River Gulf Outlet (MRGO) to Deep Draft Navigation

The MRGO begins at the confluence of the Gulf Intracoastal Waterway (GIWW) and the Inner Harbor Navigation Canal (IHNC) and extends southeastward approximately 35 miles, emptying into the Breton/Chandeleur Sound area. This measure will resolve/close the MRGO to deep draft navigation. Alternative 1 will include a 110-ft by 14-ft by 30-ft floodgate at Bayou Dupre. A restriction to GIWW dimensions (approximately 110 ft) at the Bayou LaLoutre Ridge would supplement this measure.

1-5. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

1-5a. Mississippi River Gulf Outlet (MRGO) Environmental Restoration Features

The MRGO begins at the confluence of the Gulf Intracoastal Waterway (GIWW) and the Inner Harbor Navigation Canal (IHNC) and extends eastward approximately 35 miles, emptying into the Breton/Chandeleur Sound area.

The environmental restoration features involve construction of shoreline protection measures, such as rock breakwaters along the north bank of the MRGO, and along important segments of the southern shoreline of Lake Borgne. New bankline stabilization along Lake Borgne is proposed in measure 1-17 and therefore excluded from this measure. Stabilization along the MRGO will start approximately 0.5 mile south of Bayou LaLoutre and extends to the corner of the GIWW and Michoud Canal (approx. 25.6 miles). Because in some places some rock stabilization is already in place 23 miles where assumed to be in need of new rock stabilization.

1-5b. Small Diversion at Hope Canal

The Hope Canal is located in the Upper Basin (south of Lake Maurepas) on the north bank of the Mississippi River between Gramercy and Garyville. A small diversion (1,000 cfs to 5,000 cfs) from the Mississippi River and through a new structure at Hope Canal would increase freshwater and sediment introduction to the Maurepas swamps. The measure would result in increased organic and mineral deposition and improved biological productivity.

1-5c. Small Diversion at Convent/Blind River

The Convent/Blind River is located in the Upper Basin (20 miles south of Lake Maurepas) on the north bank of the Mississippi River between Gramercy and Burnside. A small (1,000 cfs to 5,000 cfs) diversion from the Mississippi River and through a new structure at Convent/Blind would increase freshwater and sediment introduction to the Maurepas swamp. The measure would result in increased organic deposition and improved biological productivity. This measure is intended to work in conjunction with the Hope Canal diversion to facilitate organic deposition in the swamp.

1-5d. Increase Amite River Diversion Canal Influence by Gapping Bank

The Amite River is located southwest of Lake Maurepas and east of I-10. The proposed measure involves the construction of eight (8) 40-ft-wide gaps in the existing dredged material banks of the Amite River Diversion Canal, each diverting an average of 250 cfs. The objective of this measure is to allow floodwaters to introduce additional fresh water, nutrients, and sediment into the western Maurepas swamp. The exchange of flow would occur during flood events on the river and from runoff of localized rainfall events, and would in turn providing nutrients and sediment to facilitate organic sediment



deposition in the swamp, some fluctuation of water levels, improve biological productivity, and prevent further swamp deterioration.

1-5e. Medium Diversion at White Ditch

The White Ditch is located on the east bank of the Mississippi River north of Carlisle. The project involves implementing a medium sized diversion (5,000 cfs to 15,000 cfs) from the Mississippi River through a new control structure at White Ditch. This feature is located in the vicinity of a historic crevasse. Follow-up feasibility-level analysis will determine the ultimate size of the diversion. The area requires additional fresh water and sediment to facilitate organic sediment deposition, improve biological productivity, and prevent further deterioration of the marshes.

1-5f. Modification at Caernarvon Diversion

The diversion structure is located on the east bank of the Mississippi River about 15 miles downstream from New Orleans, near the city of Caernarvon, near the Breton Sound marshes close to the St. Bernard-Plaquemines Parish line. Modified operation of this structure would allow an increase in the freshwater introduction rate, probably 5,000 cfs on average, to accommodate the wetland building function of the system. This measure would identify operation changes that would increase restoration outputs. The additional input of fresh water would facilitate organic sediment deposition, improve biological productivity, and prevent further deterioration of the marshes. This structure is located in the vicinity of a historic crevasse.

1-5g. Louisiana/Mississippi Hydrodynamic Study

The proposed study area would encompass the estuaries and nearshore water associated with Lake Borgne Basin, Chandeleur and Breton Sound, Mississippi Sound and Mobile Bay. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly development of new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration measures/projects. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing or planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features and to evaluate adaptive management and adjustments to restoration features.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-5h. Mississippi River Hydrodynamic Study

The proposed study area would encompass the existing Mississippi and Atchafalaya River systems necessary to properly assess the operation and parameters of the system with respect to water and sediment transport, flood control, and navigation. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration projects/measures. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing or planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features and to evaluate adaptive management and adjustments to restoration features.



This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-5i. Mississippi River Delta Management Study

The Mississippi River Delta Study includes the delta region below Pointe a la Hache. The study would analyze two types of measures including large diversions (greater than 50,000 cfs) from the Mississippi River, and alternative navigation channel alignments. The large scale river diversions could potentially maximize the river’s sediment and freshwater resources available for ecosystem maintenance. Diversion sites, capacities, and outfall management measures would also be assessed to help optimize diversion plans. Such massive diversions, however, may cause adverse impacts to the existing navigation channel; so alternative scenarios must be investigated to accommodate navigation needs. Alternate navigation scenarios include new channels to the east or west of the current river while providing navigation either in the new channel or by maintaining the existing channel as a slack-water channel by the construction and operation of a lock system. In addition, the study would evaluate potential impacts of natural and man-made factors on the environment and economy.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-6. Restore the Chandeleur Islands

The Chandeleur Islands are a barrier island chain located in easternmost St. Bernard and Plaquemines Parishes, approximately 70 miles east of New Orleans, Louisiana. This barrier island chain separates the Chandeleur and Breton Sounds from the Gulf of Mexico. The curve of the Chandeleur Islands, approximately 45 miles in length, connects the Mississippi gulf coast to the delta of the Mississippi River. Like all barrier islands, the Chandeleur Islands form a thin protective wall between the open sea and the mainland. The islands absorb the strongest waves, sheltering the mainland during large storms.

This measure will enhance flood protection and restore island habitat. Dredged material from offshore borrow areas is needed to rebuild the islands to an elevation of 6 ft above MSL. Restoration of the barrier islands will reduce wave height and wave energy that enter Chandeleur Sound (fair weather and storm generated), and reduce storm surge elevations east of the barrier islands that impact the Biloxi Marsh. Habitat restoration includes re-vegetation, which will be implemented simultaneously with beach nourishment activity in the barrier island dune and lagoon habitats. This measure will support the preservation and enhancement of saline marshes, bird rookery, recreational and commercial fishing, and maintain benefits of the National Wildlife Refuge.

1-7. Maintain and Restore the Biloxi Land Bridge and Barrier Reefs- South

The Biloxi Land Bridge South is a brackish marsh/oyster reef system that is situated in a southwest-to-northeast alignment, extending from easternmost St. Bernard Parish and north to Pelican Point. The Drum Bay and the Chandeleur Sound are east of the Biloxi Land Bridge South, and Bay Boudreau is located along the west side.

To maintain and restore the Biloxi Land Bridge and Barrier Reefs marsh areas have to be restored. This measure includes the marsh restoration of a 33,000 acres Biloxi Marsh area, which includes the placement of 5ft of dredged material and the creation of a 21 mile long and 400 ft wide ridge. Vegetative planting in the marsh area is part of this measure and black mangrove and matrimony vines will be placed on the crown of the ridge. Smooth hard grass will be planted on the water sides of the ridge and the containment berm. Offshore borrow material will be used in this effort.



1-8. Maintain and Restore the Biloxi Land Bridge and Barrier Reefs- North

The Biloxi Land Bridge North is a brackish marsh/oyster reef system that is situated in a southwest-to-northeast alignment, extending from the northeast area of the Biloxi Wildlife Management Area and northeast to Isle Aux Pass. Bay Boudreau is located along the southeast of the Biloxi Land Bridge North, and Lake Borgne is located to the west.

To maintain and restore the Biloxi Land Bridge and Barrier Reefs marsh areas have to be restored. This measure includes the marsh restoration of a 25,000 acres Biloxi Marsh area, which includes the placement of 5ft of dredged material and the creation of an 11 mile long and 400 ft wide ridge. Vegetative planting in the marsh area is part of this measure and black mangrove and matrimony vines will be placed on the crown of the ridge. Smooth hard grass will be planted on the water sides of the ridge and the containment berm. Offshore borrow material will be used in this effort.

1-9. Restore Bayou LaLoutre Ridge

The Bayou LaLoutre Ridge is a natural ridge that extends from the east bank of the Mississippi River Gulf Outlet (MRGO) south of Old Shell Beach eastward along the south boundary of the Biloxi Wildlife Management Area. To restore the Bayou LaLoutre Ridge, a constriction (rock) of the MRGO to GIWW dimensions is required at the ridge, along with a rebuilding and reforesting of the natural ridge using dredged material, and the plantings of hardwoods is needed. Restoration of the Bayou LaLoutre Ridge will in the long-term assist in sustaining the Biloxi Land Bridge South, and in reducing wave/wake, and storm surge impacts to the entire area encompassing the ridge and land bridge. Habitat restoration will provide refuge for indigenous ridge species.

1-10. Construct Jefferson Parish Fringe Marsh Buffer

The Jefferson Fringe Marsh area is located on the south shore of Lake Pontchartrain (north Jefferson Parish shoreline) between the Causeway Bridge and west to the New Orleans Airport. This measure includes an approximately 9-mile-long foreshore dike (rock) and marsh restoration between the dike and the shore, to reduce shoreline and berm erosion lakeward of the Hurricane Protection Levee. The dike is on average 300 ft away from the shoreline. Restoration of intermediate and fringe marshes must be integral to shoreline protection to provide sustainable shoreline. Marsh restoration provides critical marsh nursery, recreational fishing, birding, and other outdoor activities

1-11. Maintain Lake Borgne Land Bridge Including Shoreline Protection

The Lake Borgne Land Bridge is the area along the Lake Borgne shoreline between Doulluts Canal and Jahnckes Ditch and along the north bank of the Mississippi River Gulf Outlet (MRGO) between Doulluts Canal and Lena Lagoon in St. Bernard Parish, Louisiana. To maintain the land bridge, the marsh between Lake Borgne and the MRGO must be protected and maintained to prevent further shoreline erosion. This measure includes marsh restoration of the deteriorated land bridge between Lake Borgne and the MRGO, which includes approximately 14,000 acres. Bankline stabilization along the Lake Borgne shoreline of the land bridge is included in this measure. Bankline stabilization along the MRGO is included in measure 1-5a and not included in this measure.

1-12. Maintain Critical Marsh Shorelines and Ridges of the East Orleans Land Bridge

The East Orleans Land Bridge consists of the land bridge and marsh area located between the western shoreline of Lake Borgne and the eastern shoreline of Lake Pontchartrain. The area encompasses the eastern portion of the Bayou Sauvage National Wildlife Sanctuary, the Chef Menteur Pass, the Rigolets Pass, and Lake St. Catherine. The Gulf Intracoastal Waterway (GIWW) runs through the middle of this area.



This measure restores and maintains the East Orleans Land Bridge. Rock armoring along Lake Pontchartrain and Lake Borgne bankline is included. Dedicated dredging and marsh restoration are components of this measure; approximately 43,000 acres will be restored, excluding 40 % of total acreage to account for open bays, channels, passes, uplands and transportation infrastructure. Maintaining the land bridge, marshes, and natural ridges is essential to providing flood protection, as well as sustainable habitat.

1-13. Construct the Violet Reintroduction to Maintain Target Salinity in Louisiana and Mississippi

The diversion site is located on the east bank of the Mississippi River, between the Mississippi River and the Mississippi River Gulf Outlet (MRGO). The measure will divert Mississippi River water and sediments into the swamp and marsh areas of Lake Borgne southeast of the East Orleans Land Bridge. The objective is to maintain target salinities, reduce additional saltwater intrusion, allow the marshes to develop into more mature, denser wetland forest, enhance oyster growth, and increase secondary productivity such as shrimp, blue crab, and oysters to benefit recreational and commercial fishing.

1-14. Diversion at American/California Bay with Sediment Enrichment

The American/California Bay is located off the east bank of the Mississippi River, east of Sulphur, Louisiana. The objective of this measure is to provide a non-structural, uncontrolled diversion from the Mississippi River at American/California Bays. The diversion feature will consist of an armored crevasse (200,000 cfs) through the existing un-leveed riverbank into the fringe marsh and open water of the bay system. The introduction of additional sediment from dedicated dredging will facilitate organic and mineral deposition, improve biological productivity, and prevent further deterioration of existing marshes, thereby providing increased attenuation of wave/wake energy and storm surge elevation.

1-15. Benneys Bay Sediment Diversion

The Benneys Bay diversion site is located on the east bank of the Mississippi River, in Plaquemines Parish, Louisiana, 7.5 miles from Above Head of Passes. This measure will divert Mississippi River water and sediments into Benneys Bay as well as utilize sediment enrichment. The objective is to restore vegetated wetlands in an area that is currently shallow open water. The measure will divert sediments in an effort to restore, nourish, and maintain approximately 5,828 acres of fresh to intermediate marsh in the Benneys Bay area over the 20-year project life. The measure consists of a conveyance channel for the large scale diversion of water and sediments from the river. The conveyance channel would be constructed in two phases: (1) construction of an initial channel with an average discharge of 20,000 cubic feet per second (cfs); (2) after a period of intensive monitoring, enlargement of the channel to a 50,000-cfs discharge. Material from the construction of the channel would be used to restore wetlands in the diversion outfall area.

The diversion would induce shoaling in the main navigation channel of the Mississippi River. Dredging of the channel is accomplished under the U.S. Army Corps of Engineers' ongoing Operations and Maintenance Program for the river. The Pilottown anchorage area is not maintained under the Operations and Maintenance Program. The additional dredging of the induced shoaling in the navigation channel and anchorage area would be an added feature and cost of the project. The dredged material removed from these areas would be used to restore wetlands where possible.

1-16. Add Breakwater (in Lake Borgne from Southwest Corner to Biloxi Wildlife Management Area)

The breakwater in Lake Borgne Bankline would extend from the southwest corner of the lake to the Biloxi Wildlife Management Area. Increased lake shoreline protection will be accomplished by adding a breakwater



structure (20 feet above MSL). This project proposes to construct a series of breakwater groins constructed within Lake Borgne to dissipate the forces induced by breaking waves. Each breakwater will be diagonally spaced and will be approximately 1,000 feet long, 20 ft wide at the crown, 39 ft high (total – incl. settlement), 50 ft apart, and will overlap 25 feet on each end. The measure will limit tidal forces and wind-driven wave actions originating from the Gulf of Mexico and Lake Borgne, assist in the retardation of saltwater migration, and improve retention of fresh water within the adjacent marshes north of the structures and will be built to an elevation of 20 feet above MSL.

1-17. St. Tammany Marsh Restoration and Shoreline Protection with Dredge Material and Vegetative Planting

The St. Tammany shoreline and marsh area extends along the north shoreline of Lake Pontchartrain from Madisonville to the Louisiana border. Dredged material will be placed strategically along the St. Tammany shoreline (approximately 330 acres) to improve protection to inland areas from wave propagation. This measure will be combined with planned vegetative planting, so that the marsh areas would continue to naturally expand and also aid in beach nourishment.

1-18. Adaptive Management through Maintenance of Existing Crevasses and Construction of New Crevasses

This measure applies to the Lower Mississippi River and Delta area. This measure includes the implementation of four crevasses in the first year. Each crevasse is assumed to have a flow of 2,500 cfs and allows for delta building processes. In the second year, three different crevasses will be opened and the four crevasses from the previous year are assumed to silt in during this period. This procedure will continue throughout the next 100 years.

1-19. Maximize Beneficial Use of Dredged Material

The areas within Planning Unit 1 where beneficial uses of dredged material could be placed from river and other sediment sources include Biloxi Marsh area, Breton Sound area, and all marsh areas that have eroded away in the vicinity of the MRGO on the east side of the Mississippi River, as well as the Chandeleurs, a national wildlife refuge. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial use of dredged material.

Increasing and maximizing the beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 1 and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

1-20. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans

This measure, Non-structural Protection to Assets Located Outside of the Hurricane Protection Levee System., applies to all areas of the Planning Unit that are identified as being at risk from storm surge inundation by the 1% annual probability storm event (1 in 100-year event) that are not protected by a hurricane levee or levees.

It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or,



where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.



3.0 Planning Unit 2 – Mississippi River to Bayou Lafourche

There were ninety-eight proposed measures considered for alternatives one and two, including stakeholders' measures. Thirty-two of these measures were selected to represent the two alternatives, and are described briefly by alternative below. The analysis and model runs on these alternative measures resulted in sixteen measures to represent the preferred plan.

3.1 Alternative 1

2-1. USACE Levee Alignment No. 1: Hurricane Protection (30-ft Storm Surge at the Coastline) Along the GIWW South from Golden Meadow to City Price, Modified to Include Lafitte and Barataria

- The U. S. Army Corps of Engineers (USACE) Louisiana Coastal Protection and Restoration (LaCPR)- Preliminary Technical Report Levee Alignment No. 1 starts near the Mississippi River south of Belle Chasse, three miles north of City Price/Diamond in Plaquemines Parish and extends along the southern bank of the Gulf Intracoastal Waterway (GIWW) and connects to the existing Larose to Golden Meadow levee in Lafourche Parish. The alignment would include a southern loop around the developed areas of Lafitte and Barataria. Existing levees would be upgraded, and where no levees exist, new levees would be constructed to provide protection against a storm surge of 30 feet hitting the coastline of Louisiana (0.2% annual probability storm event—1 in 500-year event).

This Levee Alignment will provide increased surge protection to concentrated (cities, towns, communities, or important industrial infrastructure) and distributed (e.g., highways) assets located within the Planning Unit 2 study area. Currently, the Modified GIWW alignment is the preferred alignment for the Donaldsonville to the Gulf Feasibility Study sponsors, Lafourche Levee District, and many state and local representatives.

2-2. New Orleans to Venice Hurricane Protection Project (HPP): City Price to Venice Segment – Improve Existing Levees to Provide 100-year Storm Frequency Level of Protection

This levee alignment is along the west bank of the Mississippi River beginning at City Price in Plaquemines Parish and extending down river to the Venice, Louisiana.

The Mississippi River Levee (MRL) protects the west bank of Plaquemines Parish from river flooding and also serves to protect the region from hurricane-induced tidal surges in conjunction with the NOV Hurricane Protection System. The west bank NOV extends from St. Jude/Diamond to Venice, a distance of 34 miles.

2-3. Grand Isle and Vicinity Project: Provide Maximum Technically Feasible Hurricane Protection

The proposed measure is located on the Gulf Coast of southern Jefferson Parish, Louisiana. It is about 50 miles south of New Orleans and 45 miles northwest of the mouth of the Mississippi River. Grand Isle is the only inhabited barrier island in Louisiana. The island is bounded by Caminada Bay to the north, Caminada Pass to the west, the Gulf of Mexico to the south, and Barataria Pass to the east. Louisiana Highway 1 connects Cheniere Caminada to western Grand Isle through a bridge that passes over the Caminada Pass tidal inlet. The highway extends to the eastern end of the island near Grand Isle State Park. Grand Isle extends about 7.5 miles in a northeast-to-southwest direction. The island width is about 0.75 mile at the center.

The measure consists of raising the height of the levee on the gulf side from 12 to 14 feet; constructing a levee along the bayside to an elevation of 14 feet; elevating Highway 1 approximately 1.5 feet to an elevation of 5 feet



from Port Fourchon to its terminus at the eastern end of Grand Isle; and, construction of segmented breakwaters along the bayside of Grand Isle. In addition to these structural measures proposed on the island, restoration of adjacent barrier islands that provide protection to Grand Isle is also recommended.

2-4. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

2-4a. Barataria Basin Barrier Shoreline Restoration Caminada Headland and Shell Island

Caminada Headland is an area between Belle Pass and Caminada Pass, and Shell Island is a barrier island in the Plaquemines barrier island system. These barrier shoreline segments are critical components of the Barataria Shoreline.

This restoration feature involves mining offshore sediment sources to reestablish sustainable barrier islands. The feature is based on designs developed in the LCA Barataria Barrier Island Restoration Study (an early coastal interim report) and assumes a 3,000-foot-wide island footprint. The Caminada Headland and Shell Island are critical components of the Barataria shoreline. Objectives for the Caminada Headland are to: 1) Preserve a critical barrier headland without disrupting the natural hydrologic regime, 2) Preserve the integrity of the barrier headland by closing existing breeches, 3) Sustain and improve shoreline, dune and interior marsh habitat quality for essential fish and wildlife species, and 4) Reduce wave energy transmission by providing a natural storm protective buffer for interior marsh and Chenier ridge habitats north of the Caminada Headland.

2-4b. Small Bayou Lafourche Reintroduction

The Bayou Lafourche reintroduction is located in the Upper Basin near Donaldsonville on the west bank of the Mississippi River. Channel improvements to Bayou Lafourche to allow the exiting pump to operate at maximum capacity are proposed. In 1955, a pump/siphon system with a capacity to reintroduce approximately 340 cfs was installed on the levee at Donaldsonville. Because of channel constraints, this existing pump/siphon currently provides approximately 200 cfs of river water into the bayou.

2-4c. Medium Diversion with Dedicated Dredging at Myrtle Grove

Myrtle Grove is located on the west bank of the Mississippi River between Ironton and Deer Range and directly across from Phoenix. The proposed restoration feature considers a diversion ranging from 2,500 to 15,000 cfs coupled with dedicated dredging for the restoration of up to 19,700 acres of wetlands. The diversion will allow the reintroduction of freshwater, sediment and nutrients into the critically affected area of the Barataria Basin in a manner similar to the rise and fall of the river's hydrologic cycle. The rate of reintroduction would be optimized according to the overall planning objectives of the LCA restoration effort to maintain hydrogeomorphic diversity and connectivity, as well as habitat diversity. The dedicated dredging component of the Myrtle Grove measure would allow immediate recovery of former wetland areas already converted to open water. The combination is also expected to maximize the amount of acreage created per yard of sediment placed by capitalizing on incremental accretion of diverted sediment.

2-4d. Re-authorization of Davis Pond – Optimize for Marsh Creation

Davis Pond Freshwater Diversion is located on the west bank of the Mississippi River, between Luling and Ama, in the vicinity of a historic crevasse. Necessary changes in the operation of Davis Pond project to increase wetland creation and restoration outputs will be assessed. Modified operation of this structure could potentially result in an increase in the freshwater introduction rate, perhaps 5,000 cfs on average, to accommodate the wetland building function of the system. This measure would identify operation changes that would increase restoration outputs.



The introduction of additional freshwater would facilitate organic and sediment deposition, improve biological productivity, and prevent further deterioration of the marshes.

2-4e. Mississippi River Hydrodynamic Study

The proposed study area would encompass the existing Mississippi and Atchafalaya River systems necessary to properly assess the operation and parameters of the system with respect to water and sediment transport, flood control, and navigation. The western side of the Mississippi River system is located in Planning Unit 2. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly development of new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration projects. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features, and to evaluate adaptive management and adjustments to restoration features.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-4f. Mississippi River Delta Management Study

The Barataria and Mississippi River Delta basins would be the locations benefited in Planning Unit 2. The restoration strategy is to investigate methods of harnessing the river to restore wetlands in southeast Louisiana by greatly increasing the deposition of Mississippi River sediments on the shallow continental shelf, while ensuring navigation interests are protected. The study would analyze two types of projects including large diversions (greater than 50,000 cfs) from the Mississippi River, and alternative navigation channel alignments. The large-scale river diversions could potentially maximize the river’s sediment and freshwater resources available for ecosystem maintenance. Diversion sites, capacities, and outfall management measures would also be assessed to help optimize diversion plans. Such massive diversions, however, may cause adverse impacts to the existing navigation channel; so alternative scenarios must be investigated to accommodate navigation needs. Alternate navigation scenarios include new channels to the east or west of the current river while providing navigation either in the new channel or by maintaining the existing channel as a slack-water channel by the construction and operation of a lock system. In addition, the study would evaluate potential impacts of natural and man-made factors on the environment and economy.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-4g. Third Delta Study

The Third Delta Study conveyance channel, as proposed, would follow the eastern slope of the natural Bayou Lafourche levee system, and split into two channels near Raceland. The eastern channel, located in Planning Unit 2, would terminate in Little Lake in Barataria Basin.

The purpose of the Third Delta Study is to examine large-scale alternatives for the restoration of the lower areas of Terrebonne, Lafourche, and Jefferson Parishes in the region of the Barataria-Terrebonne National Estuary. This restoration concept involves constructing a conveyance channel parallel to Bayou Lafourche that would carry Mississippi River water and sediment to the western Barataria and eastern Terrebonne Basins in order to create two new deltas in this estuarine complex. The proposed two new deltas would be formed by sediment carried through a constructed conveyance channel. To reduce channel construction cost and increase availability of



sediment in the created delta, a pilot channel would be constructed, and natural riverine processes would erode the conveyance channel to its final design width and discharge.

2-5. Barrier Shoreline Restoration Projects- Restoring the Barataria Barrier Islands

The Barataria Barrier Islands form a barrier island chain which separates Barataria Bay from the Gulf of Mexico and stretches from the Mississippi River in the east to Bayou Lafourche in the west. This restoration feature involves mining offshore sediment sources to reestablish sustainable barrier islands. Enhanced flood protection and habitat restoration are the performance goals for the Barataria Barrier Islands. Beach nourishment with sand, shell, and/or beneficial use of dredged sediments are needed along the islands coasts to stabilize and build up the islands' coasts to reduce wave height and wave energy that enter Barataria Bay (fair weather and storm generated). Habitat restoration, to include re-vegetation can be implemented simultaneously with beach nourishment activity in that barrier island dune and lagoon habitats will be improved to protect and enhance the saline marshes, bird rookery, recreational and commercial fishing, and to maintain benefits of barrier island ecosystem.

2-6. Adaptive Management through Maintenance of West Bay Crevasse

The existing West Bay Crevasse is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, 4.7 miles above Head of Passes. The diversion outfall area is a large, shallow, open-ended inter-distributary basin, situated between the main river channel on the east, Grand Pass on the west, and Zinzin Bay on the south. The measure area is composed of 12 percent freshwater marsh and tidal flats and 88 percent open water, totaling 12,294 acres. Sediment diversion is to promote the formation of emergent marsh through construction of a crevasse and the placement of dredged material. The location of the receiving basin, along with the shallow depth and open-end configuration, maximizes the potential for emergent marsh creation. Adaptive management and maintenance of the existing crevasse will keep the main navigation channel of the Mississippi River and the adjacent Pilottown anchorage area open to navigation, and direct dredged material, riverine sediments, and fresh water into critical marsh areas where sediments and nutrients will better be retained for marsh-building processes to occur.

2-7. Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms in Fringing Marsh and Middle Basin Marsh Areas, Including the LA-1 Marsh Creation Project Area

The areas targeted for strategic marsh platform restoration are across the Fringing Marsh and Middle Basin Marsh areas of the Barataria Basin and include marsh restoration adjacent to back levees in Plaquemines Parish, at strategic locations on the Barataria Land Bridge in Jefferson Parish, and along Bayou L'Ours and LA-1 near Golden Meadow in Lafourche Parish. The objective of this measure is to develop a Tri-Parish restoration project that utilizes proven sediment transfer methods for restoration activities. The measure would initiate marsh/wetland development in close proximity to levees and evacuation routes to provide added hurricane protection; regenerate marsh at strategic locations along the Barataria Land Bridge, focusing on areas where synergy can be created between existing and planned diversions and shoreline stabilization projects; and provide sediments, nutrients, and fresh water to counteract marsh breakup and nourish marsh within the Barataria Basin. Sediments would be mined from the Mississippi River and delivered to sites across the basin via slurry pipelines with pumps and outlet units for slurry distribution.

2-8. Backfill and/or Plug Non-essential Oil and Gas Canals

The primary measure area is sited in Jefferson Parish approximately 2 miles south of The Pen, within the portion of the Lafitte Oil and Gas Field which is east of the Dupre Cut area of the Barataria Bay Waterway and would also include other areas within the Barataria Basin. This measure would close several breaches in the area of the Lafitte Oil and Gas Field, and in other locations within the basin, by plugging abandoned location canals, as



allowed by ongoing production operations. The first step would be to identify canals that may be eliminated, while maintaining operational access through alternate routes. The canals marked for elimination would then be permanently plugged and/or backfilled thereby mitigating the adverse effects of unchecked tidal exchanges. Backfilling is a method of managing dredged material banks after the abandonment of a dredging site by returning dredged material from the banks to the canal, or using it to construct plugs, and allowing marsh vegetation to reestablish on the degraded dredged material banks and within the filled canal. The proposed canal plugs would also act as retention features for future sediment deposits. In conjunction with future dedicated dredging projects to introduce sediments dredged from the Mississippi River into adjacent deteriorated marsh areas, this project will assist in protecting Plaquemines Parish back levees, and will enhance storm surge protection to New Orleans and oil and gas industry production infrastructure within the direct vicinity.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-9. Develop a Watershed Management Plan that Redirects Freshwater and Sediment, Storm Water, and Treated Sewage Water to Sustain Upper Basin Swamps and Middle Basin and Middle Basin Freshwater Marsh

The Upper Basin and Middle Basin Freshwater Marsh ecosystem units within the Barataria Basin would be the locations benefited in Planning Unit 2. Development of a flexible framework for managing water resource quality and quantity within watersheds in the basin is proposed.

2-10. Small Diversions at Strategic Locations in Upper Basin

The Upper Basin is located in the area south of Donaldsonville and north of Highway 90, between the Mississippi River and Bayou Lafourche.

The proposed restoration feature considers freshwater, nutrient, and sediment reintroduction by diverting some Mississippi River flows into the Upper Basin swamps. A small diversion is defined as diversion ranging in size from 1,000 to 5,000 cfs. Sediment enhancement using dedicated dredged material would be included as appropriate. The rate of reintroduction would be optimized according to the overall planning objectives of the Louisiana Coastal Area (LCA) restoration effort to maintain hydrogeomorphic diversity and connectivity, as well as habitat diversity. Negative impacts on flood control and drainage would also be avoided. The feasibility of utilizing a design that would allow for introduction of river water and removal of storm water would be investigated.

2-11. Maximize Beneficial Use of Dredged Material Where Feasible

The areas within Planning Unit 2 where beneficial uses of dredged material could be maximized include barrier islands in the vicinity of Bayou Rigaud and the Barataria Bay Waterway, marsh and open water areas adjacent to the Barataria Bay Waterway and Bayou Segnette Waterway, and marsh and open water areas near the Head of Passes and Southwest Pass. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial uses of dredged material.

Increasing and maximizing beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 2 and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow.



This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-12. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans

This measure, Non-structural Protection to Assets Located Outside of the Hurricane Protection Levee System., applies to all areas of the Planning Unit that are identified as being at risk from storm surge inundation by the 1% annual probability storm event (1 in 100-year event) that are not protected by a hurricane levee or levees.

It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or, where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3.2 Alternative 2

2-1. West Bank and Vicinity Hurricane Protection Levee (WBVHPL) from Davis Pond to Oakville: Improve Existing Levee to Provide for Hurricane Protection (30-ft Storm Surge at the Coastline)

The West Bank and Vicinity Hurricane Protection Levee is located on the west bank of the Mississippi River in the vicinity of New Orleans and in Jefferson, Orleans, and Plaquemines Parishes. East of the Harvey Canal, the levee alignment begins at Oakville below Belle Chasse in Plaquemines Parish and extends to the Harvey Canal Floodgate. West of Harvey Canal, the levee alignment extends from the Harvey Canal down to the V-Levee near the Jean Lafitte National Historical Park and back up to the town of Westwego. At Westwego, the alignment follows the Lake Cataouatche levee alignment west to the east guide levee of Davis Pond.

This measure is to increase the level of protection afforded the West Bank New Orleans metropolitan area by raising the elevation of the WBVHPL to protect against a 500-year frequency storm, and, if needed, will include increasing the height of the Mississippi River Levee from Oakville to Davis Pond

2-2. USACE Levee Alignment No. 3: Provide 100 Year Storm Protection via the Highway 90 Alignment from Golden Meadow to Davis Pond Segment and from Oakville to Venice in the Plaquemines Parish Segment

The USACE LaCPR Levee Alignment No. 3 Highway 90 Alignment would cross the basin parallel to and south of U.S. Highway 90 and connect to the Larose to Golden Meadow hurricane protection levee at the west guide levee of Davis Pond and, to the east, connect to the Oakville to Venice hurricane protection levee.

The proposed levee alignment will provide surge protection (100-year frequency storm) from Davis Pond to Golden Meadow and from Oakville to Venice. The levee alignment would tie into the West Bank and Vicinity Hurricane Protection Levee at its eastern and western most reaches, and consists of three segments:

- Donaldsonville to the Gulf Highway 90 Alignment
- Larose to Golden Meadow



- Oakville to Venice

2-3. Ring Levees around Lafitte, Barataria, and Crown Point: Provide Maximum Technically Feasible Hurricane Protection

Jean Lafitte, Barataria, and Crown Point are located south of New Orleans in Jefferson Parish, Louisiana. Jean Lafitte is on the eastern bank of Bayou Barataria, and Barataria is on the western bank of Bayou Barataria. Crown Point is located east of the Lafitte-Larose Highway, bordered on the north and south by Bayou des Familles and Bayou Barataria, respectively. This measure is to provide hurricane protection to the 1% probability level through improvements to existing levees and, where no levees exist, construct new levees. All levees would be designed and constructed to federal standards.

2-4. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

2-4a. Barataria Basin Barrier Shoreline Restoration Caminada Headland and Shell Island

Caminada Headland is an area between Belle Pass and Caminada Pass, and Shell Island is a barrier island in the Plaquemines barrier island system. These barrier shoreline segments are critical components of the Barataria Shoreline. This restoration feature involves mining offshore sediment sources to reestablish sustainable barrier islands. The feature is based on designs developed in the LCA Barataria Barrier Island Restoration Study (an early coastal interim report) and assumes a 3,000-foot-wide island footprint. The Caminada Headland and Shell Island are critical components of the Barataria shoreline. Objectives for the Caminada Headland are to: 1) Preserve a critical barrier headland without disrupting the natural hydrologic regime, 2) Preserve the integrity of the barrier headland by closing existing breeches, 3) Sustain and improve shoreline, dune and interior marsh habitat quality for essential fish and wildlife species, and 4) Reduce wave energy transmission by providing a natural storm protective buffer for interior marsh and chenier ridge habitats north of the Caminada Headland.

2-4b. Small Bayou Lafourche Reintroduction

The Bayou Lafourche reintroduction is located in the Upper Basin near Donalsonville on the west bank of the Mississippi River. Upgrading the existing pump/siphon facility to operate at the full 340 cfs capacity and constructing a 660 cfs new pump/siphon facility to bring the total diversion capacity to 1000 cfs. This project will be implemented in accordance with the Louisiana Department of Natural Resources, Mississippi River Water Reintroduction into Bayou Lafourche, Final Phase 2 Design Report, March 2006.

2-4c. Medium Diversion with Dedicated Dredging at Myrtle Grove

Myrtle Grove is located on the west bank of the Mississippi River between Ironton and Deer Range and directly across from Phoenix. The proposed restoration feature considers a diversion ranging from 2,500 to 15,000 cfs coupled with dedicated dredging for the restoration of up to 19,700 acres of wetlands. The diversion will allow the reintroduction of freshwater, sediment and nutrients into the critically affected area of the Barataria Basin in a manner similar to the rise and fall of the river's hydrologic cycle. The rate of reintroduction would be optimized according to the overall planning objectives of the LCA restoration effort to maintain hydrogeomorphic diversity and connectivity, as well as habitat diversity. The dedicated dredging component of the Myrtle Grove measure would allow immediate recovery of former wetland areas already converted to open water. The combination is also expected to maximize the amount of acreage created per yard of sediment placed by capitalizing on incremental accretion of diverted sediment.

2-4d. Re-authorization of Davis Pond – Optimize for Marsh Creation

Davis Pond Freshwater Diversion is located on the west bank of the Mississippi River, between Luling and Ama, in the vicinity of a historic crevasse. Necessary changes in the operation of Davis Pond project to increase wetland



creation and restoration outputs will be assessed. Modified operation of this structure could potentially result in an increase in the freshwater introduction rate, perhaps 5,000 cfs on average, to accommodate the wetland building function of the system. This measure would identify operation changes that would increase restoration outputs. The introduction of additional freshwater would facilitate organic and sediment deposition, improve biological productivity, and prevent further deterioration of the marshes.

2-4e. Mississippi River Hydrodynamic Study

The proposed study area would encompass the existing Mississippi and Atchafalaya River systems necessary to properly assess the operation and parameters of the system with respect to water and sediment transport, flood control, and navigation. The western side of the Mississippi River system is located in Planning Unit 2. The study effort would include data collection, data synthesis, extension of existing modeling, and possibly development of new models. The comprehensive study would assist in determining the need, location, size, and seasonal variations for planned diversions and future restoration projects/measures. After a comprehensive model is developed, calibrated, and verified for existing conditions, it would be used to simulate a new base condition for the coastal area, simulating the collective impacts of near-term features and any other existing planned projects that affect the river system. The model would also be used to evaluate the impacts of potential large-scale restoration features, and to evaluate adaptive management and adjustments to restoration features.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-4f. Mississippi River Delta Management Study

The Barataria and Mississippi River Delta basins would be the locations benefited in Planning Unit 2. The restoration strategy is to investigate methods of harnessing the river to restore wetlands in southeast Louisiana by greatly increasing the deposition of Mississippi River sediments on the shallow continental shelf, while ensuring navigation interests are protected. The study would analyze two types of projects including large diversions (greater than 50,000 cfs) from the Mississippi River, and alternative navigation channel alignments. The large-scale river diversions could potentially maximize the river’s sediment and freshwater resources available for ecosystem maintenance. Diversion sites, capacities, and outfall management measures would also be assessed to help optimize diversion plans. Such massive diversions, however, may cause adverse impacts to the existing navigation channel; so alternative scenarios must be investigated to accommodate navigation needs. Alternate navigation scenarios include new channels to the east or west of the current river while providing navigation either in the new channel or by maintaining the existing channel as a slack-water channel by the construction and operation of a lock system. In addition, the study would evaluate potential impacts of natural and man-made factors on the environment and economy.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-4g. Third Delta Study

The Third Delta Study conveyance channel, as proposed, would follow the eastern slope of the natural Bayou Lafourche levee system, and split into two channels near Raceland. The eastern channel, located in Planning Unit 2, would terminate in Little Lake in Barataria Basin.

The purpose of the Third Delta Study is to examine large-scale alternatives for the restoration of the lower areas of Terrebonne, Lafourche, and Jefferson Parishes in the region of the Barataria-Terrebonne National Estuary. This restoration concept involves constructing a conveyance channel parallel to Bayou Lafourche that would carry



Mississippi River water and sediment to the western Barataria and eastern Terrebonne Basins in order to create two new deltas in this estuarine complex. The proposed two new deltas would be formed by sediment carried through a constructed conveyance channel. To reduce channel construction cost and increase availability of sediment in the created delta, a pilot channel would be constructed, and natural riverine processes would erode the conveyance channel to its final design width and discharge.

2-5. Barrier Shoreline Restoration Projects- Restoring the Barataria Barrier Islands

The Barataria Barrier Islands form a barrier island chain which separates Barataria Bay from the Gulf of Mexico and stretches from the Mississippi River in the east to Bayou Lafourche in the west.

This restoration feature involves mining offshore sediment sources to reestablish sustainable barrier islands. Enhanced flood protection and habitat restoration are the performance goals for the Barataria Barrier Islands. Beach nourishment with sand, shell, and/or beneficial use of dredged sediments are needed along the islands coasts to stabilize and build up the islands' coasts to reduce wave height and wave energy that enter Barataria Bay (fair weather and storm generated). Habitat restoration, to include revegetation can be implemented simultaneously with beach nourishment activity in that barrier island dune and lagoon habitats will be improved to protect and enhance the saline marshes, bird rookery, recreational and commercial fishing, and to maintain benefits of barrier island ecosystem.

2-6. Adaptive Management through Maintenance of West Bay Crevasse

The existing West Bay Crevasse is located on the west bank of the Mississippi River, in Plaquemines Parish, Louisiana, 4.7 miles above Head of Passes. The diversion outfall area is a large, shallow, open-ended inter-distributary basin, situated between the main river channel on the east, Grand Pass on the west, and Zinzin Bay on the south. The measure area is composed of 12 percent freshwater marsh and tidal flats and 88 percent open water, totaling 12,294 acres. Sediment diversion is to promote the formation of emergent marsh through construction of a crevasse and the placement of dredged material. The location of the receiving basin, along with the shallow depth and open-end configuration, maximizes the potential for emergent marsh creation. Adaptive management and maintenance of the existing crevasse will keep the main navigation channel of the Mississippi River and the adjacent Pilottown anchorage area open to navigation, and direct dredged material, riverine sediments, and fresh water into critical marsh areas where sediments and nutrients will better be retained for marsh-building processes to occur.

2-7. Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms in Fringing Marsh and Middle Basin Marsh Areas, Including the LA-1 Marsh Creation Project Area

The areas targeted for strategic marsh platform restoration are across the Fringing Marsh and Middle Basin Marsh areas of the Barataria Basin and include marsh restoration adjacent to back levees in Plaquemines Parish, at strategic locations on the Barataria Land Bridge in Jefferson Parish, and along Bayou L'Ours and LA-1 near Golden Meadow in Lafourche Parish.

The objective of this measure is to develop a Tri-Parish restoration project that utilizes proven sediment transfer methods for restoration activities. The measure would initiate marsh/wetland development in close proximity to levees and evacuation routes to provide added hurricane protection; regenerate marsh at strategic locations along the Barataria Land Bridge, focusing on areas where synergy can be created between existing and planned diversions and shoreline stabilization projects; and provide sediments, nutrients, and fresh water to counteract marsh breakup and nourish marsh within the Barataria Basin. Sediments would be mined from the Mississippi River and delivered to sites across the basin via slurry pipelines with pumps and outlet units for slurry distribution.



2-8. Backfill and/or Plug Non-essential Oil and Gas Canals

The primary measure area is sited in Jefferson Parish approximately 2 miles south of The Pen, within the portion of the Lafitte Oil and Gas Field which is east of the Dupre Cut area of the Barataria Bay Waterway and would also include other areas within the Barataria Basin. The objective of this measure is to develop a Tri-Parish restoration project that utilizes proven sediment transfer methods for restoration activities. The project would initiate marsh/wetland development in close proximity to levees and evacuation routes to provide added hurricane protection; regenerate marsh at strategic locations along the Barataria Land Bridge, focusing on areas where synergy can be created between existing and planned diversions and shoreline stabilization projects; and provide sediments, nutrients, and fresh water to counteract marsh breakup and nourish marsh within the Barataria Basin. Sediments would be mined from the Mississippi River and delivered to sites across the basin via slurry pipelines with pumps and outlet units for slurry distribution.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-9. Develop a Watershed Management Plan that Redirects Freshwater and Sediment, Storm Water, and Treated Sewage Water to Sustain Upper Basin Swamps and Middle Basin and Middle Basin Freshwater Marsh

The Upper Basin and Middle Basin Freshwater Marsh ecosystem units within the Barataria Basin would be the locations benefited in Planning Unit 2. This measure would close several breaches in the area of the Lafitte Oil and Gas Field, and in other locations within the basin, by plugging abandoned location canals, as allowed by ongoing production operations. The first step would be to identify canals that may be eliminated, while maintaining operational access through alternate routes. The canals marked for elimination would then be permanently plugged and/or backfilled thereby mitigating the adverse effects of unchecked tidal exchanges. Backfilling is a method of managing dredged material banks after the abandonment of a dredging site by returning dredged material from the banks to the canal, or using it to construct plugs, and allowing marsh vegetation to reestablish on the degraded dredged material banks and within the filled canal. The proposed canal plugs would also act as retention features for future sediment deposits. In conjunction with future dedicated dredging projects to introduce sediments dredged from the Mississippi River into adjacent deteriorated marsh areas, this project will assist in protecting Plaquemines Parish back levees, and will enhance storm surge protection to New Orleans and oil and gas industry production infrastructure within the direct vicinity.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-10. Small Diversions at Strategic Locations in Upper Basin

The Upper Basin is located in the area south of Donaldsonville and north of Highway 90, between the Mississippi River and Bayou Lafourche. The proposed restoration feature considers freshwater, nutrient, and sediment reintroduction by diverting some Mississippi River flows into the Upper Basin swamps. A small diversion is defined as diversion ranging in size from 1,000 to 5,000 cfs. Sediment enhancement using dedicated dredged material would be included as appropriate. The rate of reintroduction would be optimized according to the overall planning objectives of the Louisiana Coastal Area (LCA) restoration effort to maintain hydrogeomorphic diversity and connectivity, as well as habitat diversity. Negative impacts on flood control and drainage would also be avoided. The feasibility of utilizing a design that would allow for introduction of river water and removal of storm water would be investigated.



2-11. Maximize Beneficial Use of Dredged Material Where Feasible

The areas within Planning Unit 2 where beneficial uses of dredged material could be maximized include barrier islands in the vicinity of Bayou Rigaud and the Barataria Bay Waterway, marsh and open water areas adjacent to the Barataria Bay Waterway and Bayou Segnette Waterway, and marsh and open water areas near the Head of Passes and Southwest Pass. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial uses of dredged material.

Increasing and maximizing beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 2 and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-12. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans

This measure, Non-structural Protection to Assets Located Outside of the Hurricane Protection Levee System., applies to all areas of the Planning Unit that are identified as being at risk from storm surge inundation by the 1% annual probability storm event (1 in 100-year event) that are not protected by a hurricane levee or levees.

It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or, where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

2-13. Small Diversion at Port Sulphur

Port Sulphur is located on the west bank of the Mississippi River in Plaquemines Parish, Louisiana. This measure provides for a 5,000 cfs diversion at 50 percent duration river stage diverted in the Freeport Sulphur Canal. Annual diversion corresponds to annual river stage hydrograph for the controlled structure.

2-14. Ridge Restoration in the Barataria Basin

Ridges in the Barataria Basin include: Bayou Lafourche ridge, Bayou L’Ours ridge, Bayou Grande Cheniere ridge, Caminada Cheniere ridges, Bayou Dupont ridge, Bayou Barataria ridge, Bayou Long-Bayou Fontanelle ridge (Empire Waterway) and Bayou Grand Liard ridge. The restoration of ridges within the Barataria Basin complement hurricane protection features by providing outer lines of defense. Restoration would include increasing ridge elevation and width with dredged material, and would also included woody vegetation and native wetland plants.

2-15. North Barataria Bay Shoreline Wave Breaks

The measure extends across the northern rim of Barataria Bay, from the northwest shore of Wilkerson Bayou, westward, across the northern lobes of the Bay and around St. Mary’s Point, and then southwestward to the Barataria Bay Waterway. This project proposes to construct a series of breakwater groins, totaling approximately



64,020 linear feet, constructed approximately 500 feet off the shoreline, so as to dissipate the forces induced by breaking waves. Each breakwater will be approximately 350 feet long, and adjacent groins will be spaced at 400-ft intervals, so as to provide 50-ft gaps between the breakwater segments to allow for adequate levels of hydrologic exchange within the inland bays and channels. The measure will limit tidal forces and wind-driven wave actions originating from the Gulf of Mexico and inland bays, assist in the retardation of saltwater migration, and improve retention of fresh water within the adjacent marshes north of the structures.



4.0 Planning Unit 3a - Bayou Lafourche to Bayou De West

Forty-six measures were considered in the initial stages. Small measures and measures that were in the process of planning and design were rejected and twenty-nine measures were considered for alternatives selection. Twenty-two measures were selected for alternatives one and two, and are described briefly by alternative below. The analysis and model runs on these alternative measures resulted in twelve measures represented in the preferred plan.

4.1 Alternative 1

3a-1 Morganza to the Gulf Hurricane Protection Levee Alignment and LAR Barrier Plan Alignment (30-ft storm surge at coastline)

The Flood Control, Mississippi River & Tributaries, Morganza, LA, to the Gulf of Mexico Hurricane Protection (Morganza to the Gulf) study area is located in coastal Louisiana, approximately 60 miles southwest of New Orleans, and includes portions of Terrebonne and Lafourche Parishes. The area is bounded on the west by Bayou Boeuf Lock, on the east by Bayou Lafourche, and on the south by the Gulf of Mexico and includes concentrated assets within Houma, Thibodeaux, and Morgan City.

The measure consists of approximately 134 miles of new earthen levee (inclusive of raising existing levee heights), five floodgate structures, nine 56-foot sector gates, two pump stations, and a lock complex consisting of a lock in the Houma Navigation Canal (HNC) measuring 110 ft by 800 ft, and an adjoining floodgate measuring 200 ft. in width, all designed for 500-year storm surge protection. The structural features would be integrated into the levee alignment to provide flood protection, drainage, environmental benefits, and navigational passage.

3a-2. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

3a-2a Small Bayou Lafourche Reintroduction Including Small Company Canal Diversion

The Bayou Lafourche reintroduction is located in the Upper Basin near Lockport, on the GIWW. Channel improvements to Bayou Lafourche to allow the exiting pump to operate at maximum capacity are proposed. In 1995, a pump/siphon system with a capacity to reintroduce approximately 340 cfs was installed on the levee at Donaldsonville. Because of channel constraints, this existing pump/siphon currently provides approximately 200 cfs of river water into the bayou.

3a-2b Multi-Purpose Operation of Houma Navigation Canal (HNC) Lock

The location is 1.75 miles south of the intersection of Bayou Sale and the HNC. This restoration feature involves the multi-purpose operation of the proposed HNC Lock for environmental benefits; implementation of this measure is dependent upon construction of the HNC as proposed in the Morganza to the Gulf Levee Alignment. The objective of this feature is to make more efficient use of Atchafalaya River waters and sediment flow, as well as maintain salinity regimes favorable for area wetlands. The proposed structure would be operated to restrict saltwater intrusion and distribute fresh water and sediment during times of high Atchafalaya River flow. The current measure is designed to limit saltwater intrusion, but with a minor modification would provide additional benefits to the wetlands by increasing retention time of Atchafalaya River water in the Terrebonne Basin wetlands. An increased retention time would provide additional sediment and nutrients to nourish the wetlands and would benefit the forested wetlands, and fresh, intermediate, and brackish marshes adjacent to the lock and canal; the Lake Boudreaux wetlands to the north; the Lake Mechant wetlands to the west; and the Grand Bayou wetlands to the east.



3a-2c Terrebonne Basin Barrier Shoreline Restoration

The measure includes the Isles Dernieres and East Timbalier Island reaches of the Terrebonne barrier-shoreline chain. This measure proposes to restore the barrier islands by using materials dredged from offshore areas and building up the barrier islands, so as to dissipate the forces induced by breaking waves. Construction of the barrier island segments will allow for adequate levels of hydrologic exchange within the inland bays and channels. The measure will limit tidal forces and wind-driven wave actions originating from the Gulf of Mexico and inland bays, assist in the retardation of saltwater migration, and improve retention of fresh water within the adjacent marshes north of the structures.

3a-2d Maintain Land Bridge between Caillou Lake and Gulf of Mexico

The measure area is between Caillou Lake and the Gulf of Mexico, bordered on the west by East Bay Junop, and on the east by Lake Pelto. This restoration feature would maintain the land bridge between the Gulf and Caillou Lake by placing shore protection in Grand Bayou du Large to minimize saltwater intrusion. This feature would involve rock armoring or marsh restoration to plug/fill broken marsh areas on the west bank of lower Grand Bayou du Large, to prevent a new channel from breaching the bayou bank and allowing a new connection with Caillou Lake. Some gulf shore armoring would be needed to protect these features from erosion on the gulf shoreline. Gulf shoreline armoring might be required where shoreline retreat and loss of shoreline oyster reefs has allowed increased water exchange between the gulf and the interior water bodies between Bay Junop and Caillou Lake. Some newly opened channels would be closed to restore historic cross sections of exchange points. By reducing marine influences in these interior areas, this feature would allow increased freshwater influence from Four League Bay to benefit area marshes.

3a-2e Convey Atchafalaya River Water to Northern Terrebonne Marshes

The measure area is located east of the Avoca Island Levee and includes the wetlands located north and south of the GIWW and east and west of the HNC below Gibson, Houma, Lockport, and Larose. This restoration feature would increase existing Atchafalaya River influence to central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes via the GIWW by introducing flow into the Grand Bayou Basin by enlarging the connecting channel (Bayou L'Eau Bleu) to capture as much of the surplus flow (maximum 2,000 to 4,000 cfs) that would otherwise leave/ circumvent the Terrebonne Basin. Several alternatives would be evaluated through hydrologic models; however, in all cases, control structures would be installed to restrict channel cross section to prevent increased saltwater intrusion during the late summer and fall when riverine influence is typically low. Some alternatives may include auxiliary freshwater distribution structures. This feature also includes increasing freshwater supply through repairing banks along the GIWW, enlarging constrictions in the GIWW, and diverting additional Atchafalaya River fresh water through the Avoca Island Levee and into Bayou Chene/GIWW system.

3a-2f Third Delta Study

The Third Delta Study area includes the Barataria-Terrebonne National Estuary, and Lower areas of Terrebonne, Lafourche, and Jefferson Parishes. The Barataria-Terrebonne estuarine complex is bounded by the Mississippi and Atchafalaya Rivers. Bayou Lafourche separates this complex into two basins, Barataria Basin to the east, and Terrebonne Basin to the west. Restoration of the lower areas of Barataria-Terrebonne National Estuary, and especially the eastern Terrebonne marshes on the western side of Bayou Lafourche, has been confounded by the long distances sediment must travel from the Mississippi River. The Third Delta concept involves creating a new delta between the Atchafalaya River and Mississippi River Birdfoot Deltas. The proposed two new deltas would be formed by sediment carried through a constructed conveyance channel. To reduce channel construction cost and increase availability of sediment



in the created delta, a pilot channel would be constructed, and natural riverine processes would erode the conveyance channel to its final design width and discharge. The conveyance channel, as proposed, would follow the eastern slope of the natural Bayou Lafourche levee system, and split into two channels near Raceland. The eastern channel would terminate in Little Lake in the Barataria Basin, and the western channel would cross Bayou Lafourche and carry sediment to the Terrebonne Basin, ending near the Pointe au Chene Wildlife Management Area, north of Lake Felicity and Lake Raccourci.

3a-2g Upper Atchafalaya Basin Study

The measure is in the Upper Atchafalaya Basin. The study purpose is to conduct a system-wide comprehensive analysis of the problems and opportunities related to flood control, navigation, and ecosystem sustainability for the lower Red River, Old River, Mississippi River, and Atchafalaya River Basins. This study relates primarily to the Mississippi River and Tributaries (MR&T) Project and, as such, would be funded under that project. The study is discussed in this report because it would link closely with the Mississippi River Hydrodynamic Study (via the modeling to be developed) and because several proposed Louisiana Coastal Area (LCA) features would either impact the operation of the Old River Control Structure (ORCS) and/or effect changes to the Atchafalaya Basin, the Mississippi River, and the coastal zone. As such, any potential LCA alternatives would have to assess the potential impacts to the existing river systems.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-3 Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms

The Terrebonne Wetlands are located between the west bank of Bayou Lafourche, the south bank of the Gulf Intracoastal Waterway (GIWW), and east of Bayou Hammock. The objective of this measure is to counteract marsh breakup by providing sediment and nutrients to renourish the area using a pipeline conveyance system. Sediments would be mined from the Mississippi River, the Atchafalaya River, and from the Gulf of Mexico into the eastern, central, and western Terrebonne Basin. Sediment would be placed in shallow open water and in areas to nourish degraded marshes..

3a-4. Plugging and/or Backfilling Pipeline Canals to Restore Hydrology and Regulate Salt Water Movement

Five main areas were identified (from west to east) as part of this measure: (1) south of Lake Decade between Lake Mechant and Bayou du Large, (2) east of Bayou du Large and west of Houma Navigation Canal (HNC), (3) north of Lake Boudreaux, (4) north of Lake Barre and south of Lake Tambour, and (5) west of Catfish Lake. This measure would close several breaches in areas within the basin, by plugging abandoned location canals, as allowed by ongoing production operations. The first step would be to identify canals that may be eliminated, while maintaining operational access through alternate routes. The canals marked for elimination would then be permanently plugged and/or backfilled thereby mitigating the adverse effects of unchecked tidal exchanges. Backfilling is a method of managing dredged material banks after the abandonment of a dredging site by returning dredged material from the banks to the canal, or using it to construct plugs, and allowing marsh vegetation to reestablish on the degraded dredged material banks and within the filled canal. The proposed canal plugs would also act as retention features for future sediment deposits. In conjunction with future dedicated dredging projects to introduce sediments dredged from the Mississippi River, nearby lakes, and the Atchafalaya River into adjacent deteriorated marsh areas, this project will assist in protecting the back levees, and will enhance storm surge protection to Montegut, Chauvin, south Houma and oil and gas industry production infrastructure within the direct



vicinity. This measure assumes that 25 plugs would be constructed at four geographic locations within the Terrebonne Basin, for a total of 100 plugs.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-5. Bankline Protection for the Houma Navigation Canal

The measure area is the Houma Navigation Canal from its confluence with the Gulf Intracoastal Waterway (GIWW) south into the Gulf of Mexico. This measure includes rock armoring along the east and west bank of the HNC from the confluence of the HNC and the GIWW south to Terrebonne Bay (total of 56 miles).

3a-6. Bankline Protection for the GIWW

The measure is located in the Terrebonne Basin along the Gulf Intracoastal Waterway (GIWW) reach from Morgan City to Larose. This measure will restore critical lengths of deteriorated channel banks (approximately 108 miles) and stabilize selected critical lengths of deteriorated channel banks with hard shoreline stabilization materials.

3a-7. Protection to Distributed Assets South of Morganza to the Gulf Hurricane Protection Alignment by Elevated Structures and Protected Hurricane Evacuation Routes

There are four areas associated with protection of assets outside the levee protected areas (Morganza to the Gulf of Mexico Alignment) including (1) south of Lake Boudreaux, (2) south of Montegut and west of Bayou Pointe au Chene, (3) south of Montegut and east of Bayou Pointe au Chene, and (4) south of the levee alignment near Golden Meadow and southeast of Catfish Lake.

The purpose of this measure is to provide a reasonable amount of protection to distributed assets outside the levee alignment, by creating surrounding marsh areas, particularly for roads that allow for evacuation from at risk areas south of these assets. The strategy is to identify highways and other distributed assets that would be gulfward of the hurricane protection and develop plans to either elevate or relocate those assets. With the alignment described, there are a number of assets gulfward of the line of protection. A complete survey will be needed over the entire reach. Maintain highways in good travel condition at all times. Prior to annual hurricane seasons, recommend a thorough inspection of the emergency/evacuation highways to ensure good travel conditions exist along all reaches of the road. Identify areas of potential bottlenecks and investigate ways of elimination or, at a minimum, improvement.

3a-8. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside Hurricane Protection Plans

This measure, Non-Structural Protection to Assets Located Outside of the Hurricane Protection Levee System, applies to all areas of the Planning Unit 3a that are identified as being at risk from storm surge inundation by the 1% annual probability storm event (1 in 100 year event) that are not protected by a hurricane levee or levees.

It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or, where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.



3a-9. Implement Chacahoula Basin Plan and Other Projects to Alleviate Inundation Issues in the Verret Sub-Basin

The Chacahoula Basin Watershed is enclosed by man-made boundaries. The basin comprises approximately 107,179 acres and is bounded to the north by Louisiana Highway 1, US Highway 90 to the south, Louisiana Highway 662 and Louisiana Highway 398 to the west, and to the east by Louisiana Highway 311 and Louisiana Highway 20. The purpose of this measure is to optimize and actively manage the water levels to decrease flooding and to encourage “good seed years” for the cypress and tupelo. To be able to effectively manage water levels in the basin, pump station installation at three locations is recommended: (1) at the Eliot Jones Canal (4500 cfs), (2) at the Hanson Canal (600 cfs), and (3) at the Minors Canal (400 cfs).

3a-10. Maximize Beneficial Use of Dredged Material Where Feasible

The areas within Planning Unit 3a where beneficial uses of dredged material could be maximized include barrier islands, marsh and open water areas adjacent to the Bayou Lafourche, Lake Tambour, the HNC, Bayou du Large. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial uses of dredged material.

Increasing and maximizing beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 3a and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow. The existing federal programs for navigation maintenance do not provide adequate funding for the U.S. Army Corps of Engineers (USACE) to take full advantage of the available sediment resources.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

4.2 Alternative 2

3a-1 Morganza to the Gulf Hurricane Protection and LAR Barrier Plan Alignment (20-ft storm surge at coastline)

The Flood Control, MR&T, Morganza, LA, to the Gulf of Mexico Hurricane Protection measure area is located in coastal Louisiana, approximately 60 miles southwest of New Orleans, and includes portions of Terrebonne and Lafourche Parishes. The area is bounded on the west by Bayou Boeuf Lock, on the east by Bayou Lafourche, and on the south by the Gulf of Mexico and includes concentrated assets within Houma, Thibodeaux, and Morgan City.

The measure consists of approximately 113.5 miles of new earthen levee (inclusive of raising existing levee heights), five 125-ft floodgates, and nine 56-foot sector gates all designed for 100-year storm surge protection. The structural features would be integrated into the levee alignment to provide flood protection, drainage, environmental benefits, and navigational passage.

3a-2. Internal Hurricane Levee Alignment (30-ft Storm Surge at Coastline)

This levee alignment begins in Gibson, follows the Terrebonne Levee and Conservation District Barrier Plan to Minors Canal crosses the HNC just south of the Terrebonne Port and then proceeds to the Gulf Intracoastal Waterway (GIWW) below Bourg to Larose.

The measure consists of approximately 52 miles of new earthen levee, four floodgate structures, and two pump stations. The purpose of the project is to reduce hurricane and flood damages in an environmentally sustainable



manner in the Houma/Thibodeaux area. The measure would protect over 200,000 people and 2,000 square miles of fresh and saline marshes, farmlands, heavy and light industry, residential, and other developed areas.

3a-3. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

3a-3a. Small Bayou Lafourche Reintroduction Including Small Company Canal Diversion

The Bayou Lafourche reintroduction measure is located in the Upper Basin near Lockport, on the GIWW. Upgrade the existing pump/siphon facility to operate at the full 340 cfs capacity and constructing a 660 cfs new pump/siphon facility to bring the total diversion capacity to 1000 cfs. This project will be implemented in accordance with the Louisiana Department of Natural Resources, Mississippi River Water Reintroduction into Bayou Lafourche, Final Phase 2 Design Report, March 2006.

3a-3b. Multi-Purpose Operation of Houma Navigation Canal (HNC) Lock

The measure area is 1.75 miles south of the intersection of Bayou Sale and the HNC. This restoration feature involves the multi-purpose operation of the proposed HNC Lock for environmental benefits. The objective of this feature is to make more efficient use of Atchafalaya River waters and sediment flow, as well as maintain salinity regimes favorable for area wetlands. The proposed structure would be operated to restrict saltwater intrusion and distribute fresh water and sediment during times of high Atchafalaya River flow. The current measure is designed to limit saltwater intrusion, but with a minor modification would provide additional benefits to the wetlands by increasing retention time of Atchafalaya River water in the Terrebonne Basin wetlands. An increased retention time would provide additional sediment and nutrients to nourish the wetlands and would benefit the forested wetlands, and fresh, intermediate, and brackish marshes adjacent to the lock and canal; the Lake Boudreaux wetlands to the north; the Lake Mechant wetlands to the west; and the Grand Bayou wetlands to the east.

3a-3c. Terrebonne Basin Barrier Shoreline Restoration

The measure area includes the Isles Dernieres and East Timbalier Island reaches of the Terrebonne barrier-shoreline chain. This measure proposes to restore the barrier islands by using materials dredged from offshore areas and building up the barrier islands, so as to dissipate the forces induced by breaking waves. Construction of the barrier island segments will allow for adequate levels of hydrologic exchange within the inland bays and channels. The measure will limit tidal forces and wind-driven wave actions originating from the Gulf of Mexico and inland bays, assist in the retardation of saltwater migration, and improve retention of fresh water within the adjacent marshes north of the structures.

3a-3d. Maintain Land Bridge between Caillou Lake and Gulf of Mexico

The measure area is between Caillou Lake and the Gulf of Mexico, bordered on the west by East Bay Junop, and on the east by Lake Pelto. This restoration feature would maintain the land bridge between the Gulf and Caillou Lake by placing shore protection in Grand Bayou du Large to minimize saltwater intrusion. This feature would involve rock armoring or marsh restoration to plug/fill broken marsh areas on the west bank of lower Grand Bayou du Large, to prevent a new channel from breaching the bayou bank and allowing a new connection with Caillou Lake. Some gulf shore armoring would be needed to protect these features from erosion on the gulf shoreline. Gulf shoreline armoring might be required where shoreline retreat and loss of shoreline oyster reefs has allowed increased water exchange between the gulf and the interior water bodies between Bay Junop and Caillou Lake. Some newly opened channels would be closed to restore historic cross sections of exchange points. By reducing marine influences in these



interior areas, this feature would allow increased freshwater influence from Four League Bay to benefit area marshes.

3a-3e. Convey Atchafalaya River Water to Northern Terrebonne Marshes

The measure area is located east of the Avoca Island Levee and includes the wetlands located north and south of the GIWW and east and west of the HNC below Gibson, Houma, Lockport, and Larose. This restoration feature would increase existing Atchafalaya River influence to central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes via the GIWW by introducing flow into the Grand Bayou Basin by enlarging the connecting channel (Bayou L'Eau Bleu) to capture as much of the surplus flow (maximum 2,000 to 4,000 cfs) that would otherwise leave/ circumvent the Terrebonne Basin. Several alternatives would be evaluated through hydrologic models; however, in all cases, control structures would be installed to restrict channel cross section to prevent increased saltwater intrusion during the late summer and fall when riverine influence is typically low. Some alternatives may include auxiliary freshwater distribution structures. This feature also includes increasing freshwater supply through repairing banks along the GIWW, enlarging constrictions in the GIWW, and diverting additional Atchafalaya River fresh water through the Avoca Island Levee and into Bayou Chene/GIWW system.

3a-3f. Third Delta Study

The Third Delta Study area includes the Barataria-Terrebonne National Estuary, and Lower areas of Terrebonne, Lafourche, and Jefferson Parishes. The Barataria-Terrebonne estuarine complex is bounded by the Mississippi and Atchafalaya Rivers. Bayou Lafourche separates this complex into two basins, Barataria Basin to the east, and Terrebonne Basin to the west. Restoration of the lower areas of Barataria-Terrebonne National Estuary, and especially the eastern Terrebonne marshes on the western side of Bayou Lafourche, has been confounded by the long distances sediment must travel from the Mississippi River. The Third Delta concept involves creating a new delta between the Atchafalaya River and Mississippi River Birdfoot Deltas. The proposed two new deltas would be formed by sediment carried through a constructed conveyance channel. To reduce channel construction cost and increase availability of sediment in the created delta, a pilot channel would be constructed, and natural riverine processes would erode the conveyance channel to its final design width and discharge. The conveyance channel, as proposed, would follow the eastern slope of the natural Bayou Lafourche levee system, and split into two channels near Raceland. The eastern channel would terminate in Little Lake in the Barataria Basin, and the western channel would cross Bayou Lafourche and carry sediment to the Terrebonne Basin, ending near the Pointe au Chein Wildlife Management Area, north of Lake Felicity and Lake Raccourci.

3a-3g. Upper Atchafalaya Basin Study

The proposed measure is in Upper Atchafalaya Basin. The measure is in the Upper Atchafalaya Basin. The study purpose is to conduct a system-wide comprehensive analysis of the problems and opportunities related to flood control, navigation, and ecosystem sustainability for the lower Red River, Old River, Mississippi River, and Atchafalaya River Basins. This study relates primarily to the Mississippi River and Tributaries (MR&T) Project and, as such, would be funded under that project. The study is discussed in this report because it would link closely with the Mississippi River Hydrodynamic Study (via the modeling to be developed) and because several proposed Louisiana Coastal Area (LCA) features would either impact the operation of the Old River Control Structure (ORCS) and/or effect changes to the Atchafalaya Basin, the Mississippi River, and the coastal zone. As such, any potential LCA alternatives would have to assess the potential impacts to the existing river systems.



This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-4. Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms

The Terrebonne Wetlands are located between the west bank of Bayou Lafourche, the south bank of the Gulf Intracoastal Waterway (GIWW), and east of Bayou Hammock. The objective of this measure is to counteract marsh breakup by providing sediment and nutrients to renourish the area using a pipeline conveyance system. Sediments would be mined from the Mississippi River, the Atchafalaya River, and from the Gulf of Mexico into the eastern and central Terrebonne Basin. Sediment would be placed in shallow open water and in areas to nourish degraded marshes.

3a-5. Implement Chacahoula Basin Plan and Other Projects to Alleviate Inundation Issues in the Verret Sub-Basin

The Chacahoula Basin Watershed is enclosed by man-made boundaries. The basin comprises approximately 107,179 acres and is bounded to the north by Louisiana Highway 1, US Highway 90 to the south, Louisiana Highway 662 and Louisiana Highway 398 to the west, and to the east by Louisiana Highway 311 and Louisiana Highway 20. The purpose of this measure is to optimize and actively manage the water levels to decrease flooding and to encourage “good seed years” for the cypress and tupelo. To be able to effectively manage water levels in the basin, pump station installation at three locations is recommended: (1) at the Eliot Jones Canal (4500 cubic feet per second [cfs]), (2) at the Hanson Canal 600 cfs), and (3) at the Minors Canal (400 cfs). Pump stations (2) and (3) are included in this plan, however, pump station (1) (1) is part of the LAR Barrier Plan. Costs were estimated for 2 pump stations; the 3rd is included with cost for the levee alignment and associated structure costs.

3a-6. Freshwater Introduction via Blue Hammock Bayou

The measure area is located between Four League Bay and Bayou du Large, encompassing Lake Mechant and the marshes north to Bayou Decade. The purposes of the proposed measure are 1) Conduct hydrologic modeling to determine appropriate channel sizes to accomplish the goals of the project; 2) Construct a weir in Grand Pass; 3) Construct a weir in Buckskin Bayou; 4) construct armored plugs; 5) Dredge Blue Hammock Bayou to increase the cross section; and 6) Create 229 acres of marsh with the material dredged from Blue Hammock Bayou.

3a-7. Freshwater Introduction to South of Lake De Cade and Shoreline Protection

The measure is located in Terrebonne Parish, approximately 15 miles southwest of Houma, Louisiana. Proposed components include installing three control structures along the south rim of the lake and enlarging Lapeyrouse Canal to allow the controlled diversion of Atchafalaya River water, nutrients, and sediments south into project area marshes. Outfall management structures are planned in the marsh interior to provide better distribution of river water. In addition, approximately 1.6 miles of foreshore rock dike is planned to protect the critical areas of the south lake shoreline from breaching. Measure implementation is expected to increase knowledge about floating marshes and help identify management techniques for potential large-scale applications.

3a-8. Penchant Basin Plan

The measure is bounded on the north by the Gulf Intracoastal Waterway (GIWW), the east by a north/south line from Lake De Cade to the GIWW, the south by Lake Mechant and Lost Lake, and to the west by a north/south line from Lost Lake to Avoca Island in Terrebonne Parish, Louisiana.

The measure will combine the long-term realignment of Penchant Basin hydrology with restoration and protection measures aimed at maintaining the physical integrity of the area during the transition toward greater riverine influence. Proposed measure components may include: a rock weir with a barge bay in the northern end of Big Carencro Bayou at its intersection with Bayou Penchant; a steel sheet-pile weir with variable crest sections



and flap gates in the Bayou Mauvais Bois at its intersection with the Superior Canal; rock bank stabilization; dredging and marsh creation at the mouth of Bayou Penchant; a rock weir with a barge bay at the southern shoreline of Raccourci Bay; maintenance of existing weirs along Bayou De Cade; shell plugs with rock riprap cover along Bayou De Cade; three steel sheet-pile variable crest weirs along Bayou De Cade; two steel sheet-pile variable crest weirs with boat bays along Bayou De Cade; a rock liner in Little Deuce Bayou at its intersection with Bayou De Cade; a rock weir with barge bay in Bayou la Loutre at its intersection with the Superior Canal; a steel sheet-pile weir with boat bay and variable crest sections in Brady Canal at its intersection with Bayou Penchant; an earthen bank stabilization along Bayou De Cade; and bank maintenance. The measure is expected to divert water and potentially reduce water levels in the northwestern portion of the project area and divert that fresh water southeastward to where it is needed. This is expected to increase marsh, fisheries, and wildlife production.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-9. Protection to Distributed Assets South of Morganza to the Gulf Hurricane Protection Alignment by Elevated Structures and Protected Hurricane Evacuation Routes

There are four areas associated with protection of assets outside the levee protected areas (Morganza to the Gulf of Mexico Alignment) including (1) south of Lake Boudreaux, (2) south of Montegut and west of Bayou Pointe au Chene, (3) south of Montegut and east of Bayou Pointe au Chene, and (4) south of the levee alignment near Golden Meadow and southeast of Catfish Lake. The purpose of this measure is to provide a reasonable amount of protection to distributed assets outside the levee alignment, particularly roads that allow for evacuation from at risk areas south of these assets. The strategy is to identify highways and other distributed assets that would be gulfward of the hurricane protection and develop plans to either elevate or relocate those assets. With the alignment described, there are a number of assets gulfward of the line of protection. A complete survey will be needed over the entire reach. Maintain highways in good travel condition at all times. Prior to annual hurricane seasons, recommend a thorough inspection of the emergency/evacuation highways to ensure good travel conditions exist along all reaches of the road. Identify areas of potential bottlenecks and investigate ways of elimination or, at a minimum, improvement.

3a-10. Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside Hurricane Protection Plans

This measure, non-structural protection to assets located outside of the hurricane protection levee system, applies to all areas of the Planning Unit 3a that are identified as being at risk from storm surge inundation by the 1% annual probability storm event (1 in 100 year event) that are not protected by a hurricane levee or levees. It is necessary to prepare, and implement, a comprehensive plan to provide for non-structural protection of properties outside the levee system. The plan will define whether it is more appropriate to raise properties or, where future risks are likely to be so great as to make long-term occupancy unrealistic, relocate occupants. Surveys of areas not protected by levees to identify and prioritize requirements for non-structural protection and a review of potential funding sources will be included.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-11. Stabilize/Maintain Northern Shorelines of Terrebonne/Timbalier Bays

The measure includes the north shoreline of Terrebonne/Timbalier Bays. This feature provides for the stabilization and maintenance (rehabilitation) of the northern shorelines of Terrebonne/Timbalier Bays with a



segmented breakwater from the Seabreeze area to the Little Lake area. This feature would rebuild and maintain the historic shoreline integrity around Terrebonne and Timbalier Bays by constructing segmented barriers along the west side of Terrebonne Bay, across the historic shoreline alignment along the northern sides of both bays, and along the eastern side of Timbalier Bay

3a-12. Short-Term Freshwater Redirections to Nourish and Sustain Intermediate Marshes that are being Affected by Salt Water

There are seven locations where diversions are proposed as part of this measure. Three diversions are near the Gulf Intracoastal Waterway (GIWW) north of the internal levee alignment (near Boudreaux Canal, Bayou La Cache, and Bayou Pointe-au-Chiène). Two diversions are located near the HNC, one is south of Southdowns (near to the confluence of the HNC and the GIWW), the other is west of the HNC, south of the GIWW, and on Grand Bayou. Two diversions are located near the mouth of Bayou du Large. This measure includes several diversions that will manage increased freshwater introduction into depleted marsh areas during high water stages of the GIWW, HNC, and the interconnecting canals utilizing pump stations. The pump stations will be operated at 100 cfs during high water stages. Pump station installation includes pump station intake structures, intake lines, pump pit structures, mechanical and electrical installation, discharge piping and discharge structures. They will be allowed to divert fresh water, sediment, and nutrients to the marsh areas specified above.

3a-13. Protect and Maintain Ridges

The measure includes multiple ridges in the Terrebonne Basin. The restoration of ridges within the Terrebonne Basin complement hurricane protection features by providing outer lines of defense. Restoration would include increasing ridge elevation and width with dredged material, and planting of woody vegetation and native wetland plants.

3a-14. Maximize Beneficial Use of Dredged Material Where Feasible

The areas within Planning Unit 3a where beneficial uses of dredged material could be maximized include barrier islands, marsh and open water areas adjacent to the Bayou Lafourche, Lake Tambour, the HNC, Bayou du Large. Other areas adjacent to navigable waterways and drainage canals subject to maintenance dredging could also provide opportunities to maximize beneficial uses of dredged material. Increasing and maximizing beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur, and allow marsh recovery to take place. Approximately 100 acre/ft of marsh can be restored with 1 MCY of dredged material, thus, the potential is great for considerable marsh restoration to occur in PU 3a and throughout coastal Louisiana using river sediments, dedicated dredging outside navigation channels, and off-shore borrow.

The existing federal programs for navigation maintenance do not provide adequate funding for the U.S. Army Corps of Engineers (USACE) to take full advantage of the available sediment resources.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3a-15. Bankline Protection for the Houma Navigation Canal

The measure area is the Houma Navigation Canal from its confluence with the Gulf Intracoastal Waterway (GIWW) south into the Gulf of Mexico. This measure includes rock armoring along the east and west bank of the HNC from the confluence of the HNC and the GIWW south to Terrebonne Bay (total of 56 miles). This measure is expected to prevent saltwater intrusion from the Gulf of Mexico into the adjacent marshes along the HNC, and prevent wave energy impacts to adjacent marsh and wetland areas that occur with waterborne traffic along the HNC.



3a-16. Bankline Protection for the GIWW

The measure is located in the Terrebonne Basin along the Gulf Intracoastal Waterway (GIWW) reach from Morgan City to Larose. This measure will restore critical lengths of deteriorated channel banks (approximately 108 mile) and stabilize selected critical lengths of deteriorated channel banks with hard shoreline stabilization materials.



5.0 Planning Unit 3b – Bayou De West to Freshwater Bayou

Twenty-six measures, including additional measures suggested by stakeholders, were considered for Planning Unit 3b. Seventeen measures were selected to represent alternative one and two, and are described briefly by alternative below. The analysis and model runs on these alternative measures resulted in eighteen measures to represent the preferred plan.

5.1 Alternative 1

3b-1. Construct Hurricane Protection (30-ft Storm Surge at the Coastline) for Berwick and Patterson and Levee Alignment South of the GIWW from the Wax Lake Outlet to Freshwater Bayou

Location of this measure is from the west side of Wax Lake Outlet Structure to the intersection of the Gulf Intracoastal Waterway (GIWW) and Freshwater Bayou. The measure will reduce or eliminate storm surge damage to cities, towns, and small communities as well as industry and infrastructure. The alignment is along the south bank of the GIWW. The construction of levee along this alignment would close some openings that accelerate erosion between the GIWW and the bays, and eliminates freshwater flow into the bays. The length of levee is 107.5 miles (from attribute file). Stone protection is provided on the protected side of levee toe.

3b-2. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

3b-2a. Stabilize Gulf Shoreline at Point Au Fer Island

The measure is located at Point au Fer Island in the southeastern area of St. Mary Parish, south and slightly east of the mouth of the Atchafalaya River. The gulf shoreline is part of the Louisiana Barrier Shoreline System. Implementation of a measure to minimize losses of shoreline to protect the integrity of the barrier is proposed. It is part of the LCA Near-Term Critical Restoration Features Recommended for Study and future congressional authorization. Detached near-shore stone breakwater, 250-feet in length, 5-feet in height, and 5-feet in top width with 50-foot gaps between segments are proposed. They should be placed in water two-feet deep approximately 100 feet from shoreline. This feature would stabilize the gulf shoreline of Point au Fer Island, prevent direct connections forming between the gulf and interior water bodies as the barrier island eroded, and prevent bay-side water circulation patterns from being influenced directly by the gulf. This measure seeks to limit erosion on the edge of an extensive wetland area remote from population and thus provides limited direct hurricane protection benefits.

3b-2b. Convey Atchafalaya River Water to Northern Terrebonne Marshes

The measure area includes modifications to the Atchafalaya River flow into the Terrebonne Estuary system via the Gulf Intracoastal Waterway (GIWW). The primary location of need is central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes.

The measure would affect existing wetlands, enhance storm-buffering capacity, and provide fresh water and nutrients to reduce saltwater intrusion and enhance marsh growth. Several features will produce enhanced areas for both the Larose to Houma reach and Houma to Morgan City reach through feature components such as a small diversion in the Avoca Island levee, repairing eroding banks of the GIWW, and enlarging constrictions in the GIWW below Gibson and in Houma and Grand Bayou conveyance channel construction/enlargement. Several alternatives would be evaluated through hydrologic models. However, in all cases, gated control structures would be installed to restrict channel cross section to prevent increased saltwater intrusion during the late summer and fall when riverine influence is typically



low. Some alternatives may include auxiliary freshwater distribution structures. The water and sediment source for this measure is the Atchafalaya River discharge. The area for utilization is Planning Unit 3a.

3b-2c. Acadiana Bays Estuarine Restoration Feasibility Study

The Acadiana Bays area of Louisiana is located in the central part of coastal Louisiana including Four League, Atchafalaya, East Cole Blanche, Weeks, and Vermilion Bays. The goal of the study is to evaluate the potential for reestablishing historic water quality conditions and viable estuarine fisheries in the Acadiana Bays system while maintaining a growing delta system in Atchafalaya Bay.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3b-2d Upper Atchafalaya Basin Study

The location of the Upper Atchafalaya Basin study includes the leveed reach in the vicinity of Simmesport, LA and on the Old River Control Structure Complex, as well as the interior and lower floodway.

The proposed measure is in Upper Atchafalaya Basin. The measure is in the Upper Atchafalaya Basin. The study purpose is to conduct a system-wide comprehensive analysis of the problems and opportunities related to flood control, navigation, and ecosystem sustainability for the lower Red River, Old River, Mississippi River, and Atchafalaya River Basins. This study relates primarily to the Mississippi River and Tributaries (MR&T) Project and, as such, would be funded under that project. The study is discussed in this report because it would link closely with the Mississippi River Hydrodynamic Study (via the modeling to be developed) and because several proposed Louisiana Coastal Area (LCA) features would either impact the operation of the Old River Control Structure (ORCS) and/or effect changes to the Atchafalaya Basin, the Mississippi River, and the coastal zone. As such, any potential LCA alternatives would have to assess the potential impacts to the existing river systems.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3b-3. Create Marsh at Weeks Bay

This measure is located in Iberia Parish, Louisiana, in the northeastern area of Vermilion and Weeks Bays. Measures are to reduce erosion rates along the northern shoreline of Vermilion/Weeks Bay and provide protection to Weeks Island and adjacent interior wetlands by restoring the isthmus that existed between Weeks Bay and the Gulf Intracoastal Waterway (GIWW). The components under this measure will include constructing retention levees for placement of dedicated dredged material from off-shore borrow sources to restore the isthmus to 1.0-foot above MSL (mean sea level), repairing critical areas along the northern shoreline of the GIWW, and protecting the shoreline of Vermilion Bay/Weeks Bay. Shoreline protection will be vegetative.

3b-4. Restore Marsh at Marsh Island South Shoreline and Rainey Marsh via Dedicated Dredging

The measure location is Marsh Island in Iberia Parish, Louisiana, in the Marsh Island State Wildlife Refuge, also known as Russell Sage Refuge. The goal of the measure is to restore brackish marsh habitat in the open water areas of the interior marsh primarily caused by hurricane damage. The project will restore acres of interior emergent marsh with hydraulically dredged material from East Cote Blanche Bay. The restored areas will be planted with plugs of smooth cordgrass on approximately 3-foot centers.



3b-5. Maintain Northern Shore of East Cote Blanche Bay and Point Marone

The measure is located at Point Marone, approximately 10 miles southwest of Franklin, Louisiana, in St. Mary Parish. It is a point land feature along the north shore of West and East Blanche Bays that separate the two bays. A barrier along 4,140 feet of shoreline between Jackson Bayou and the British American Canal to protect the shoreline was constructed. For this measure, the barrier was a PVC sheet-pile wall and the construction of low-level weirs across seven major water exchange avenues.

3b-6. Restore Vermilion Bay and East and West Cote Blanche Bays Shoreline via Beneficial Use of Dredged Material and/or Detached Breakwaters

This location includes all shorelines in Vermilion Bay, West Cote Blanche Bay, and East Cote Blanche Bay. Within this broad area many miles of shoreline have been stabilized through smaller individual projects, and there are some projects such as Weeks Bay that are in initial stages of a local project. One area is east of Weeks Bay to near the area called Jaws. Another area is Red Fish Point east to the west point of Southwest Pass. A third area is the shoreline along the northern edge of Marsh Island from Southwest Pass to the western point of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Restoration site TV-14. Generally, restoration or stabilization work is accomplished with near-shore or toe stone and/or vegetative plantings or a combination of both. The three reaches' estimates are: (1) Cyremont Point - at 77,000 feet; (2) Red Fish Point - at 77,000 feet; and (3) northern shore of Marsh Island - at 65,000 feet.

3b-7. Maintain Vermilion Bay and East and West Cote Blanche Bays as Brackish Environments

The measure includes Vermilion, East, and West Cote Blanche Bays are part of the Acadiana Bays and located west of Wax Lake Delta. No specific measures have been identified, other than the general strategy of restoring shorelines via beneficial uses of dredged material and/or detached breakwaters. This measure's goals are to achieve the objective while planning other measures in the region that could affect bay salinities.

3b-8. Strategize and Implement Plan to Elevate and/or Relocate Assets Outside Hurricane Protection Plan

The measure begins on the west side of Wax Lake Outlet and covers the width of the Planning Unit north of the bays over to the Vermilion River. The hurricane protection levee is located along an alignment south of the Gulf Intracoastal Waterway (GIWW) from the Wax Lake Outlet to Freshwater Bayou with the exception that the levee would follow Bayou Sale along an existing levee alignment to a point near the bay and then back to the alignment south of the GIWW. The strategy is to identify assets that would be gulfward of the hurricane protection and develop plans to either elevate or relocate those assets. With the alignment described, there are few assets gulfward of the protection. At the south end of Bayou Sale there is one small community, Burns which will need to be evaluated. A complete survey will be needed over the entire reach.

This measure was labeled as "not being tied to a specific geographic location" and was, therefore, not shown on the Alternative maps.

3b-9. Freshwater Bayou Bank Stabilization – Belle Isle to Lock

This measure is located in Vermilion Parish, Louisiana, along the eastern bank of the Freshwater Bayou Canal between Freshwater Bayou Lock and Belle Isle Bayou. The objective of the measure is to halt bank erosion through the construction of a stone dike in high-energy areas along the eastern bank of Freshwater Bayou Canal between Belle Isle Bayou and Freshwater Lock. The dike would stabilize the bank and reduce the amount of water exchange between the canal and interior marshes, thus protecting the marshes from erosion. A 40,000-foot-long near-bank rock dike is to be constructed. The dike will be continuous except for openings left at the mouths of several oil well canals where the dike will be tied into the bank on both sides of each canal.



5.2 Alternative 2

3b-1. Construct Hurricane Protection (30 ft Storm Surge at the Coastline) for Berwick and Patterson and Levee Alignment from Wax Lake Outlet to the Vermillion River Following the U.S. Army Corp of Engineers (USACE) West Levee Alignment 3A

This measure involves using an earthen levee for hurricane protection for Berwick and Patterson using existing levee alignment Morgan City to Wax Lake outlet west to Vermillion River following old existing levee alignments and the U.S. Army Corp of Engineers (USACE) west levee alignment 3. Strategy is to identify assets that would be gulfward of the hurricane protection and develop plans to either elevate or relocate those assets. With the alignment described, there are a number of assets gulfward of the line of protection.

3b-2. Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan including:

3b-2a. Stabilize Gulf Shoreline at Point Au Fer Island

The measure is located at Point au Fer Island in the southeastern area of St. Mary Parish, south and slightly east of the mouth of the Atchafalaya River. The gulf shoreline is part of the Louisiana Barrier Shoreline System. The plan is to minimize losses of shoreline, protect existing marshes, and to protect the integrity of the barrier is proposed. It is part of the LCA Near-Term Critical Restoration Features Recommended for study and future congressional authorization. Using segmented stone breakwater is recommended. Stone segments 250-feet in length, 5-feet in height and 5-feet in top width with 50-foot gaps between segments should be placed in water two-feet deep approximately 100 feet from shoreline. This feature would stabilize the gulf shoreline of Point au Fer Island, prevent direct connections forming between the gulf and interior water bodies as the barrier island eroded, and prevent bayside water circulation patterns from being influenced directly by the gulf. This measure seeks to limit erosion on the edge of an extensive wetland area remote from population and thus provides limited direct hurricane protection benefits.

3b-2b. Convey Atchafalaya River Water to Northern Terrebonne Marshes

This measure area includes modifications to maximize the Atchafalaya River freshwater and sediment flow. The location of need is the Terrebonne Estuary system via the Gulf Intracoastal Waterway (GIWW). The central (Lake Boudreaux) and eastern (Grand Bayou) Terrebonne marshes are the most critical areas to be nourished and restored. Convey Atchafalaya River Water to Northern Terrebonne Marshes. The measure would affect existing wetlands, enhance storm-buffering capacity, and provide fresh water and nutrients to reduce saltwater intrusion and enhance marsh growth. This feature would produce enhanced areas for both the Larose to Houma reach and Houma to Morgan City reach through feature components such as a small diversion in the Avoca Island levee, repairing eroding banks of the GIWW, and enlarging constrictions in the GIWW below Gibson and in Houma and Grand Bayou conveyance channel construction/enlargement. Several alternatives would be evaluated through hydrologic models; however, in all cases, gated control structures would be installed to restrict channel cross-section to prevent increased saltwater intrusion during the late summer and fall when riverine influence is typically low. Some alternatives may include auxiliary freshwater distribution structures. The source for this measure is the Atchafalaya River discharge. The area for utilization is Planning Unit 3a.

3b-2c. Acadiana Bays Estuarine Restoration Feasibility Study

The Acadiana Bays area of Louisiana is located in the central part of coastal Louisiana including Four League, Atchafalaya, East Cole Blanche, Weeks, and Vermilion Bays. The goal of the study is to



evaluate the potential for reestablishing historic water quality conditions and viable estuarine fisheries in the Acadiana Bays system while maintaining a growing delta system in Atchafalaya Bay.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3b-2d. Upper Atchafalaya Basin Study

The location of the Upper Atchafalaya Basin study includes the leveed reach in the vicinity of Simmesport, LA and on the Old River Control Structure Complex, as well as the interior and lower floodway. The study has not been implemented. Detailed studies of this proposal would include determination of impacts to the interior of the Atchafalaya Basin, the degree to which flow, and sediment distributions would be required.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3b-3. Increase Sediment Transport from the Atchafalaya River Down Wax Lake Outlet

Wax Lake Outlet is located in St. Mary Parish at the eastern side of East Cote Blanche Bay. The structure discharges a portion of the flow carried by the Atchafalaya River into East Cote Blanche Bay. A delta formed and is growing as a result of the sediment carried by Wax Lake Outlet from the Atchafalaya. There is a need to have even greater amounts of sediments entering the Bay from the Atchafalaya River via Wax Lake Outlet. The measure is to relocate the alignment of the Wax Lake Outlet inflow channel to a more direct route to the Atchafalaya River channel with a deeper inflow channel, capturing additional sediment to be deposited in the delta of Wax Lake. One consideration is a channel 16.5-miles long going through Cypress Island. The south side of the inflow channel will have rock bank protection to guard against excessive bank erosion as the discharge makes greater than 90 degree to enter the new channel. The protected section would be 1,000-feet in length, cover 40 feet of the channel bottom, and extend 10 feet beyond the top bank. This measure would provide a more sediment rich alignment

3b-4. Stabilize Banks of Southwest Pass off Marsh Island

The measure includes Southwest Pass, which is located in Vermilion Parish, Louisiana on the west side of Marsh Island. It is a pass or open channel between the Gulf of Mexico and Vermilion Bay. The need is to stabilize Southwest Pass with rock to minimize further increase in erosion due to the high energy levels. This would entail the construction of in-water stone dikes to restore the bank along the west side of Southwest Pass and armoring of the east bank of the Pass. The strategy is to maintain existing Pass dimensions. The features would be a total of 9.0 miles of stone dike along the top bank of either side of the present channel (4.5 miles plus 4.5 miles). Dikes would be 6-feet high, 3-feet in water and 3-feet above water. A 500-foot section on the west bank would be 33-feet in the water and 3-feet above water. The dikes would follow along the top bank.

3b-5. Stabilize Banks of GIWW

For this planning unit, the GIWW begins on the west side of the Atchafalaya River at the south side of the Patterson/Berwick ring levee and proceeds west to Wax Lake Outlet and from the west side of Wax Lake Outlet, it proceeds west to an intersection with the Vermilion River/Freshwater Bayou. This represents a distance of 62 miles or 327,360 feet. The strategy is to stabilize the banks of the GIWW using stone dikes along the banks in high energy areas. The toe of the stone dike would be against the underwater bank and reach a height one or two feet above ground or marsh level. There would be an area of water behind the dike, which would result in land building by catching any materials being eroded from the marsh or wetland as a result of boat wakes.



3b-6. Restore Vermilion Bay and East and West Cote Blanche Bays Shoreline via Beneficial Use of Dredged Material and/or Detached Breakwaters

The site is the gulf shoreline between the east bank of Freshwater Bayou (the western limit of Planning Unit 3b) and the west bank of Southwest Pass. It is in Vermilion Parish, Louisiana. The purpose of the measure is to stabilize shore lines from Freshwater Bayou boundary past Tigre Point to Southwest Point using near-shore segmented stone breakwaters. The segments are to be placed on filter cloth in water 2 to 4-feet deep if the foundation is soft. Segments will be constructed 250-feet long with 50-foot gaps between each segment. Individual segments should have 1 on 5-foot side slope and 5 to 10-foot crest width. Breakwater is to be constructed parallel to the shoreline at a distance of 150 to 200-feet offshore depending on depth of the water. Planning involves assuming a 1-foot settlement and constructing to 3.5 feet above mean high tide (MHT). The strategy is to trap and retain sediment from gulf waters in this part of the gulf shoreline. A demonstration project located east of Cheniere Au Tigre along the shoreline in southern Vermilion Parish, completed in 2001, has experienced a large amount of sediment accretion behind the structures. The length of the demonstration structure is 1,800 feet. It is located about mid-length and will need to be taken into consideration. The full length of the reach for this project is 89,760 feet.

3b-7. Stabilize Shorelines Across South Shoreline of Marsh Island from Lighthouse Point to South Point (East of Mound Point) using Dredged Sediments and/or Breakwaters

The site is the gulf shoreline between the east bank of Freshwater Bayou (west end of Marsh Island) and South Point (eastern tip of Marsh Island). Dredged sediment from off shore would be source material for this measure. Assume 107,545-feet of area for deposits located at the edge of the marsh area, and place material just into the marsh at 6- to 12-inches deep in thin layers. The placed volume is estimated at 597,474 cubic yards

3b-8. Beneficial Use of Dredged Material and Dedicated Dredging Wherever Possible to Rebuild Marsh Shorelines, Historic Reefs, and Barrier Islands

The measure area is damaged historic reefs. U.S. Geological Survey (USGS) quadrangles indicate an historic reef alignment beginning at the western tip of the gulf shoreline of Point au Fer Island and extending westward toward the eastern tip of Marsh Island. Another historic reef is located between Point Chevreuil, in East Cote Blanche Bay, and east side of Marsh Island along the line of an historic oyster shell reef that has been mined. One segment, Point au Fer Island to Eugene Island, a distance of 22,700 feet, could be a reef build with shell, limestone aggregate reef, or a barrier built with dedicated dredged material from the Atchafalaya Bay area. Another segment, estimated at 107,700 feet, extends from Eugene Island to South Point on the east end of Marsh Island. If shell is available and economical, shell that would be the preferred material to rebuild the reef. If not economical or available and limestone aggregate is also not available, it is suggested to consider segmented breakwaters or dedicated dredged material. The length of the project from Point Chevreuil to Marsh Island is 71,300 feet. The top of the rebuilt reef should be at or near low tide so that the top of the reef would just be exposed or slightly under water. In some areas the depth of water could be zero at low tide, while in other locations along the alignment water depth could be 5 or 6 feet. The design for segmented breakwaters is 250-foot segments, 50-foot gaps, with 1 on 5-foot slopes and 5 to 10-feet wide at the top.

3b-9. Strategize and Implement Plan to Evaluate and/or Relocate Assets Located Outside of the Hurricane Protection Plans

The location for consideration begins on the west side of Wax Lake Outlet and covers the width of the Planning Unit 3a north of the bays over to the Vermilion River. Hurricane protection begins on the west side of Wax Lake Outlet and follows old levee alignments and the U.S. Army Corp of Engineers West Levee Alignment 3 shown in red on the levee alignment map. The strategy is to identify assets that would be gulfward of the hurricane



protection and develop plans to either elevate or relocate those assets. With the alignment described, there are a number of assets gulfward of the line of protection. A complete survey will be needed over the entire reach.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

3b-10. Freshwater Bayou Bank Stabilization – Belle Isle Bayou to Freshwater Lock

This measure is located in Vermilion Parish, Louisiana, along the eastern bank of the Freshwater Bayou Canal between Freshwater Bayou Lock and Belle Isle Bayou. The objective of the project is to halt bank erosion in high-energy areas through the construction of a stone dike along the eastern bank of Freshwater Bayou Canal between Belle Isle Bayou and Freshwater Lock. The dike would stabilize the bank and reduce the amount of water exchange between the canal and interior marshes, thus protecting the marshes from erosion.

A 40,000-foot-long near-bank rock dike is to be constructed. The dike will be continuous except for openings left at the mouths of several oil-well canals where the dike will be tied into the bank on both sides of each canal.



6.0 Planning Unit 4 – Freshwater Bayou to Sabine River

Fifty-two measures, including additional measures suggested by stakeholders, were considered for alternatives one and two. Thirty-six measures were selected to represent alternative one and two, and are described briefly by alternative below. The analysis and model runs on these alternative measures resulted in eighteen measures to represent the preferred plan.

6.1 Alternative 1

4-1. Proposed Hurricane Protection Levee for 30-foot Storm Surge at Coastline

This levee begins at the levee in Planning Unit 3b and runs along the south bank of the Gulf Intracoastal Waterway (GIWW) to the Calcasieu/Sabine divide. At that point it turns north and crosses I-10 about 8 miles to the north of the GIWW. It continues to the north for about more 7 miles and into high ground.

The Levee Alignment No.1 will provide surge protection to communities, industries, and other assets located north of the GIWW. This alignment runs generally parallel to the coast and from 10 to 20 miles inland. It will provide protection to major highways and evacuation routes. The project will include gated structures across the Vermilion River, the Mermentau River, and the Calcasieu River. It will provide a structure at the GIWW where the levee turns north toward high ground. These structural features will be integrated into the levee design and will provide flood protection, drainage, navigational passage, and environmental benefits including salinity control, freshwater management, and reduction of wetland flooding. This alignment can be designed to meet the objectives in this planning unit and to minimize the impact of the levee on the existing ecosystem units. The length of levee is 111.0 miles. This approach is within the objectives of the Louisiana Comprehensive Coastal Protection Master Plan (2006).

4-2. Complete/Accelerate the Chenier Plain Freshwater and Sediment Management and Allocation Reassessment Study which was included in the LCA Near-term

The location of this measure is the Chenier Plain, western Louisiana. These studies and their resultant projects/measures, if authorized and constructed, could significantly restore environmental conditions that existed prior to large-scale, alteration of the natural system.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

4-3. Maximize Freshwater Inflow from Sabine River

This measure is proposed in the lower Sabine River. Freshwater sources and quantities in western Louisiana are limited the majority of time. The supplies from the Sabine River under current conditions are not adequate most of the time to minimize salt water intrusion. Loss of a portion of this source could result from an export measure and this would increase an already stressful condition to marsh and wetland east of Sabine lake. A thorough study of potential mitigation opportunities is needed to address this potential loss of freshwater source.

4-4. Salinity Control Structures along East Shoreline of Sabine Lake near Blue Buck Point, Sabine Island and Black Bayou

The measure is located along the east shoreline of Sabine Lake near Blue Buck Point, Sabine Island, and Black Bayou. This measure is composed of several salinity control structures along the eastern shore of Sabine Lake. Salinity control at Black Bayou (CS-27; the number represents CWPPRA projects) is described as a structure with a boat bay at the mouth of Black Bayou (either gated structure or a rock weir) located at the intersection of Black Bayou and the northeastern shoreline of Sabine Lake. The other salinity control structures along the lake



shoreline are: Black Bayou Culverts Hydrologic Restoration (CS-29); and East Sabine Lake Hydrologic Restoration Project (CS-32)

4-5. Beneficial Use of Dredged Material Program: Utilize Sediment from Sabine Ship Channel and Dedicated Dredging for Marsh Enhancement and Construction of Terraces

The measure location is the land east of the Sabine River and west of Lake Calcasieu. Maximizing the beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur. This measure complements and is patterned after the Sabine National Wildlife Project (CS-28, Cycles 1-5), which consist of constructing five marsh creation sites using material dredged out of the Calcasieu River Ship Channel.

4-6. Salinity Control Structure at Sabine Pass near Highway 82 Causeway

The measure area is the Sabine River near the Gulf of Mexico. Salinity control could be established by installing a gate, lock, or other saltwater barrier in Sabine Pass. The primary goal of this strategy is to reduce peak salinities. It would be operated on a limited basis during peak seasons. During non-peak salinities, navigation would be unaffected. This strategy is expected to preserve a substantial amount of marsh by 2050 by reducing salinities. Salinity and tidal amplitude control at Sabine Pass sufficient to restore and protect wetlands while maintaining control on the east shoreline of Sabine Lake and Sabine Pass are included as Regional Ecosystem Strategies for Coast 2050 for Region Planning Unit 4.

4-7. Stabilize Gulf Shoreline and Beach West of Calcasieu River to Sabine River using Dredged Sediment or Breakwaters

This measure extends from the Sabine River to the Calcasieu Ship Channel. This measure complements Alternative 1, Measure 4-24 Alternative 2, Measure 4-7: Maintain Highway 82 for Hurricane Evacuation and Marsh Protection. A portion of the coastline to the west of the Calcasieu River is already protected using detached breakwater dikes. The highway was preserved during Hurricane Rita. Because of the proximity of Louisiana Highway 82 to the coastline, the continued use of these riprap dikes is recommended for shore protection. These structures facilitate the deposition of sediment on the beach area. However, off-shore borrow sources of dredged material could also be used to accelerate the growth of beach area. Length of measure is 160,500 feet. Subaqueous rock reef placed 150 feet from shore in 2 to 5 feet of water, individual segments 250 feet long with 50-foot gaps between segments. Crest width is 5 feet constructed to a level 2 feet above MSL.

4-8. Stabilize Gulf Shoreline and Beach East of Calcasieu River to Freshwater Bayou using Dredged Sediment or Breakwater

This measure extends from the Calcasieu Ship Channel east to Freshwater Bayou. This Measure complements Alternative 1, Measure 4-24 and Alternative 2, Measure 4-17: Maintain Highway 82 for Hurricane Evacuation and Marsh Protection. A small portion of the coastline to the west of the Calcasieu River is already protected using detached breakwaters. The protection should also be applied to the east of the Calcasieu Ship Channel. Because of the proximity of evacuation route Louisiana Highway 82 to the coast, the continued use of near-shore blocked breakwater dikes is recommended for shore line protection. These structures facilitate the deposition of sediment on the beach area. The length between Calcasieu River and Freshwater Bayou is 338,976 feet. There is however a length of beach that is already protected. This reach is 51,000-feet long. The reach is located from Mermentau Ship Channel to near Rollover Bayou east of Rockefeller Refuge. The project is ME-18. The remaining protection, 278,976 feet, will be segmented breakwater protection. The segments of rock will be 250-foot long with 50-foot gaps. The individual segments will be placed in water 2- to 5-feet deep. Crest width will be 5 feet.



4-9. Salinity Control Structure in Calcasieu Ship Channel near Ferry

The measure is located in Calcasieu Ship Channel near the Gulf of Mexico. Salinity control could be established by installing a gate, lock, or other saltwater barrier in near the gulf. The primary goal of this strategy is to reduce peak salinities. The salinity control structure would be operated on a limited basis during peak seasons. During non-peak salinities, navigation would be unaffected. This strategy is expected to prevent salt water intrusion into the area around Calcasieu Lake and, thereby, preserve a substantial amount of marsh by reducing salinities.

4-10. Beneficial Use of Dredged Material Program: Utilize Sediment and Dedicated Dredging for Marsh Enhancement and Construction of Terraces in Vicinity of Calcasieu Lake

This measure includes the marsh and wetlands around Calcasieu Ship Channel. The Calcasieu Ship Channel is maintained at 40-feet deep by 400-feet wide and extends from the Gulf of Mexico to Lake Charles, Louisiana. Maximizing the beneficial use of dredged material will restore lost marsh acres and provide stronger foundations for marsh-building processes to occur. This measure was approved by CWPPRA Task Force as a part of Priority Project List 8. The measure consists of constructing five marsh-restoration sites within the Sabine National Wildlife Refuge using material dredged from the Calcasieu River Ship Channel (CS-28, Cycles 1 to 5).

4-11. Salinity Control Structures at Points on East Side of Calcasieu

This measure is located at Eastern Calcasieu Lake, southwest Louisiana on the Calcasieu River. The strategy is to establish newly constructed structures and modify existing structures to reduce salinity influences into the interior Chenier plain marshes. The installation or modification of water control structures will facilitate the flow of floodwater out of the basin while preventing salt water from entering the basin from the Calcasieu Ship Channel. Two projects; Highway 384 Hydrologic Restoration Project (CS-21); Cameron-Creole Watershed Management Project (CS-04a) consists of five large control structures and a 19-mile levee, have benefited the area.

4-12. Maximize Freshwater Inflow to Tributaries of Mermentau River from Outside Sources

The measure location is Mermentau river drainage basin at or above interstate 10 and adjoining drainage basins. The area in the southwest portion of this Planning Unit 4 annually experiences high salinity concentrations in the surface water and in the ground water aquifers. They are the result of salt-water intrusion from the Gulf coast through channels that are maintained for navigation in the Mermentau Rivers. The runoff patterns from the Mermentau are not prolonged in duration and can be infrequent. Freshwater from inside and outside sources are needed to supplement existing periodic deficits from the desired measure.

4-13. Maximize Freshwater Inflow to Mermentau River from Outside Sources

The location of this measure is the Mermentau River at or north of interstate 10. The magnitude of the problem calls for a study to research potential sources of freshwater both inside and outside the Mermentau drainage basin. A study is recommended.

4-14. Stabilize Grand Lake Shoreline and Land Bridge

The measure is located on Grand Lake, which is east of Calcasieu Lake. The strategy is to protect or minimize future shoreline erosion by constructing stone breakwater along the full shoreline, particularly in the areas where the lake shoreline is breaching or near breaching into the Gulf Intracoastal Waterway (GIWW). Stone breakwater will rise two feet above sea level. Fish dips every 1,000 feet, 46-feet wide at the top, will extend to the lake bottom and be lined with concrete aprons. A 6-feet deep flotation canal with a 1:4 side slope will be at least 35 feet from the centerline of the dike, and material from the flotation canal will be cast inside the breakwater. The total length of the proposed rock dike is roughly 45 miles around the banks of the lake, or 238,000 feet. This complements the Grand Lake Shoreline Protection Project (ME-21), and the Grand -White Lakes Land Bridge Protection Project (ME-19).



4-15. Fresh water Introduction/Retention Structure or Sill on Little Pecan Bayou

Little Pecan Bayou is located south of Grand Lake and north of Highway 82 near and east of the Mermentau River. This strategy complements Little Pecan Bayou Hydrologic Restoration (ME-17). Strategy is to evacuate excess water from the Grand and White Lakes subbasin and provide the fresh water to the Chenier subbasin. The outfall of the culvert or culverts will be adequately protected against scouring during discharge events.

4-16. Freshwater Introduction/Retention Structure or Sill on Rollover Bayou

Rollover Bayou is south of Highway 82, located in east Rockefeller State Wildlife Refuge. The strategy is to evacuate the excess water from the Lakes Subbasin and provide it to the Chenier Subbasin. The proposed project components include installation of approximately four freshwater introduction water control structures, plug removal, one structure modification, and canal enlargement north of Louisiana Highway 82 to allow water flow under the highway from the Lakes subbasin south into the Chenier subbasin.

4-17. Stabilize White Lake Shoreline

White Lake is located east of Grand Lake between Grand Lake and Freshwater Bayou in western Louisiana. The strategy is to protect the shoreline of White Lake with a near-shore stone breakwater to minimize and/or eliminate future shoreline erosion. The plan is to copy the design used in Grand Lake. A 45-foot flotation channel, 6-foot deep, cast material to bankline and stone breakwater will be constructed between the flotation channel and the bankline. Fish-dips will be built every 1,000 feet. The fish-dips, 46-feet wide at the top, will extend to the lake bottom and be lined with concrete aprons. The total amount of shoreline around the lake is 211,700 feet. There are two projects (ME-19) and (ME-21) that complement the project under consideration. These projects are in place.

4-18. Stabilize Banks from Schooner Bayou to GIWW along Freshwater Bayou and Along GIWW near White Lake

This measure is located from Schooner Bayou to GIWW along Freshwater Bayou and the Gulf Intracoastal Waterway (GIWW). The measure is on the west bankline. Strategy is to protect the bankline of Freshwater Bayou with a near-shore stone breakwater to minimize and/or eliminate future bankline erosion. The total amount of shoreline around the lake is 17,500 feet. Design is to place a stone dike located near the bankline but in the water. The landward toe of the dike should be near the waters edge but in the water. The height of the dike should be 2- to 3-feet above the level of the marsh. Assuming the water depth to be no more than 2 feet, then the vertical height of the dike should be no more than 5 feet.

4-19. Salinity Control on Black Lake Bayou near Hackberry

Location of this measure is Black Lake Bayou north of Hackberry near the Calcasieu Ship Channel. Strategy is construction of a salinity control structure in Long Point Bayou with a gated structure or rock weir located in Long point Bayou north of Sabine National Wildlife Refuge (NWR) near Highway 27, west of the Calcasieu Ship Channel. The existing dimensions are 40-feet wide by 5-feet deep. The structure's approximate dimensions are 10- to 15-feet wide by 4-feet deep boat bay.

4-20. Build New Chamber for Navigation at Calcasieu Lock on GIWW and Use Old Lock to Evacuate Excess Water

This measure includes the existing Calcasieu Lock on the Gulf Intracoastal Waterway (GIWW) south of Lake Charles, Louisiana. Strategy is construction of a new chamber for navigation and use the old lock chamber for freshwater introduction to the upper Calcasieu Estuary from the Mermentau Basin. Measure also provides for freshwater introduction via the Black Bayou culverts at the intersection of Black Bayou and Highway 384. New lock size is 1,200-feet in length, 75-feet wide, sill elevation at -13 feet.



4-21. Stabilize Banks of Freshwater Bayou

The measure is located on the west bank of Freshwater Bayou south of the intersection of Freshwater Bayou and the Gulf Intracoastal Waterway (GIWW) beginning at Schooner Bayou and going south to the Freshwater Lock. The strategy is construction of stone (rock) dike along the toe of the existing bankline. Two reaches in CWPPRA cover the reach from Six Mile Canal south to the Freshwater Lock. By placing riprap in front of the existing shoreline, further wetland loss will be decreased dramatically. It is anticipated that open water areas behind the rock structures will accumulate sediments and eventually become vegetated.

4-22. Stabilize Eastern Shore of Lake Calcasieu

The measure is located on the eastern shore of Lake Calcasieu, which is located south of Lake Charles, Louisiana. There is an existing 16-mile-long earthen levee along the eastern side of Calcasieu Lake (84,480 feet). Marsh restoration from land building could result with additional protection feature in front of the stone dike because erosion is continuing behind the dike.

4-23. Develop a Plan to Elevate and/or Relocate Assets Located Outside of the Hurricane Protection Levee

The measure includes all areas of Planning Unit 4 that are not protected by hurricane levee or levees and that can be impacted by hurricane surges. Strategy is to conduct surveys in areas not protected by proposed protection works to identify assets to elevate and determine how much and if relocation is practical.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

4-24. Maintain Hwy 82 for Hurricane Evacuation and Marsh Protection

The measure is located along Highway 82, which traverses the lower coast area across all of Planning Unit 4. Maintain Highway 82 in good travel condition at all times. Prior to annual hurricane seasons, recommend a thorough inspection of the highway to ensure good travel conditions exist along all reaches of the road. Identify areas of potential bottlenecks and investigate ways of elimination or, at minimum, improvement. The shoulder and embankment slopes on the north side of the road bed should be protected against erosion from overtopping of the roadway. Prevention of numerous gullies and/or significant blowouts of the roadbed would benefit recovery efforts in the area.

4-25. Provide Water Control Structures at Strategic Locations along Highways 82 and 27

The measure is identified in three locations: (1) Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge; (2) Chenier subbasin west of Rockefeller Refuge at the Thibodeaux Bridge; and (3) Chenier subbasin, Hog Bayou Watershed. The strategy is to pass the excess freshwater through or under Highway 82 to the Chenier subbasin. Two CWPPRA projects, M-16, and M-17, cover the area described by (1), (2) and (3) designated in the “Location” paragraph above. Restoration strategy for ME-17 states that measures along the perimeter of Little Pecan Bayou would reduce marsh salinity levels and allow fresh water to be conveyed to the area south of Louisiana Highway 82. Planning and modeling are underway for ME-17. M-16 includes installation of four freshwater introduction water control structures; plug removal; canal enlargement north of Louisiana Highway 82 to allow water flow under the highway from the Lakes subbasin south into the Chenier subbasin.

4-26. Manage Watershed to Reduce Rapid Inflows into Mermentau Subbasin

Location of this measure is the Mermentau River and watershed, east of and to the north of Lake Charles, Louisiana. The strategy is to manage watershed runoff to minimize the rapid accumulation of runoff in the lower



reaches of the drainage basin. Design is to obtain and construct a dry storage area of 10-square-miles upstream of Mermentau, Louisiana. The 10-square-miles will be surrounded by levees or embankments, at a height of 5 feet. A two-mile long section is provided in the embankment that parallels the river. The crest of this section is two-feet above ground level. Construct a gated section at the downstream corner of the dry impoundment to evacuate stored water after a runoff event. Another element would be to widen the existing channel downstream of Catfish Bayou control structure. Recommend increasing existing channel width 50-feet downstream to Upper Mud Lake, a distance of 16 miles. This would provide a greater channel cross-section area downstream of the structure thus increasing the opportunity for greater hydraulic efficiency with a slight increase in water elevation across structure.

4-27. Restore Marsh by Filling Abandoned Canals

Measure location is throughout the coastal marsh region in Planning Unit 4. The strategy is to identify all unused, abandoned, or minimally used canals and develop a program to fill the canals and re-establish marsh. Inquiries identified 25 miles of canals that fall into the abandoned category. The strategy used is to place plugs at one mile intervals in the channels identified.

4-28. Utilize Freshwater Inflow from the Atchafalaya River

Measure location is the GIWW (Gulf Intracoastal Waterway) beginning at the west bank of Wax Lake Outlet Structure in Planning Unit 3b. The strategy is to use this source (freshwater inflow from the Atchafalaya River) as it could be available for longer durations and not have the rapid influx that the Mermentau can produce. Caution needs to be stated. The GIWW annually experiences erosion of its banks creating many holes or leaks. Currently, minimal amounts of the Atchafalaya River flowing through GIWW reach Freshwater Bayou. There is a measure in Planning Unit 4 and a similar measure in Planning Unit 3b that calls for stabilizing the banks of the GIWW. These measures would help to close some of the leaks or at least slow the leaks down. Also, Alternative 1 in both in both Planning Units has a levee measure along the south bank of the GIWW. These measures would also aid in minimizing losses of fresh water from the GIWW. In summary, measures already described will benefit the need in the subject measure. Constructing gates the Charenton Canal, repairing banklines at Weeks Bay, and installing gates at Freshwater Bayou would go even further to conveying more fresh water to the Grand Lake region in Planning Unit 4.

4-29. Improve Hydrology of the Old Mermentau River Channel between Mud Lake and Gulf of Mexico

Location of the measure is near where the Mermentau River enters the Gulf of Mexico, which is east of the Calcasieu Ship Channel. At the present time the flow of the Mermentau River is divided at the point where the Mermentau meets Mud Lake. It appears that at one time the river channel may have been separated from Mud Lake by a shoal area, but now there is a channel coming from the Mermentau through Mud Lake into the gulf. Part of the river flow is going through this channel. Since this provides two entrances from the gulf and by having a split flow Mermentau River velocities would be reduced, the strategy is that restoring to the original single channel, the opportunities for saltwater intrusion would be reduced. The measure would be to close the channel going through Mud Lake and in the process construct an embankment along the line of the existing shoal area, closing all openings between the Mermentau River and Mud Lake.

4-30. Stabilize Banks of GIWW

The location of this measure is from the west bank of Freshwater Bayou to the west Louisiana state boundary line. A distance of 101 miles. The strategy is to construct rock dikes parallel to the bankline with the landward toe of the stone dike located at the underwater toe of the bankline. Dikes would be on both sides of the waterway. The cross-section of the dike is 5-feet-high, 3-foot-wide crest, with side slopes of 1:3.



6.2 Alternative 2

4-1. Storm Surge Protection for Lake Charles Metropolitan Using Ring Levee

Location of this measure is the Lake Charles metropolitan area and surrounding communities. The strategy is to provide protection from hurricane surge via construction of a levee around the Lake Charles area and surrounding communities. The proposed alignment of this levee would start on the south side of Interstate 10 east of the Calcasieu River. From this point the levee would proceed southwestward in a gentle arc until it is south of I-10 and Highway 90 where I-10 and Highway 90 intersect on the east side of the Calcasieu River. The levee would continue west on a straight line until it crossed the Calcasieu River. Shortly after crossing the river the alignment would start a slow arc upward toward I-10 intersecting with I-10 west of the Calcasieu. The length of the levee section would be 25 miles or 132,000 feet. The disastrous 2005 hurricane season demonstrated that flood protection is urgently needed.

4-2. Storm Surge Protection for Lafayette

Measure location is Lafayette, Louisiana, the metropolitan area, and surrounding communities. The strategy is to provide protection from hurricane surge via construction of a levee around the Lafayette metropolitan area. The disastrous 2005 hurricane season demonstrated that protection is urgently needed.

4-3. Storm Surge Protection for Gueydan, Kaplan, and Vinton

Locations for this measure are Gueydan, Kaplan, and Vinton, Louisiana. The strategy is to provide protection from hurricane surge via construction of ring levees around each town/community listed. The disastrous hurricane season of 2005 demonstrated that flood protection is urgently needed.

4-4. Complete/Accelerate the Chenier Plain Freshwater and Sediment Management and Allocation Reassessment Study which was included in the LCA Near-Term Plan

The location of this measure is the Chenier Plain, western Louisiana. These studies and their resultant projects, if authorized and constructed, could significantly restore environmental conditions that existed prior to large-scale, alteration of the natural system.

This measure was labeled as “not being tied to a specific geographic location” and was, therefore, not shown on the Alternative maps.

4-5. Maximize Freshwater Inflow from Sabine River

This measure is the lower Sabine River. Returning the freshwater supply to the historical volume using flows from the Sabine River would aid in expelling the sea water that is now intruding because of the reduction in freshwater inflow from the Sabine River. If additional fresh water could be brought in (redistributed or diverted) from outside sources these waters could give more flexibility for controlling the salinity gradient. The GIWW could act as a manifold to deliver this water to strategic points along the Calcasieu/Sabine Basin. However, the conditions of the channel are not conducive to effectively acting as a manifold to deliver water. A measure is to build a 1,000-cfs pumping station on Moss Lake, Calcasieu River. The plan includes construction of a channel (50-ft by 10-ft) from Moss Lake southwest to intersect with the GIWW at Goose Lake. It will stabilize banks of GIWW and control outflow to marshes by closing the south bank openings to the Sabine River. Two closures are needed, one on Bayou Choupique and one on the south bank where the GIWW intersects Black Bayou. Pumping should be primarily during runoff periods on the Calcasieu River. Maintenance dredging of the GIWW segment to restore design dimensions (125-ft by 12-ft) is also recommended.



4-6. Beneficial Use of Dredged Material Program: Utilize Sediment from Sabine Ship Channel and Dedicated Dredging for Marsh Enhancement and Construction of Terraces

The measure location is the land east of the Sabine River and west of Lake Calcasieu. Maximizing the beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur. This measure complements and is patterned after the Sabine National Wildlife Project (CS-28, Cycles 1-5), which consist of constructing five marsh-creation sites using material dredged from the Calcasieu River Ship Channel.

4-7. Allow Calcasieu Lake and Surrounding Area to Become and Remain Brackish to Saline

Location of this measure is Calcasieu Lake, which is directly south of Lake Charles, Louisiana. The proposed plan is to cease salinity control efforts and allow the subbasin to return to conditions that existed prior to efforts to regulate salinity in the lake. The Louisiana Coastal Protection and Restoration 2006 Report notes in Planning Unit 4 a significant change in the long-term approach to sustainability is identified by allowing Calcasieu Lake and surrounding areas to become and remain brackish to saline.

4-8. Stabilize Gulf Shoreline and Beach West of Calcasieu River to Sabine River using Dredged Sediment or Breakwaters

This measure extends from the Sabine River to the Calcasieu River. A portion of the coastline to the west of the Calcasieu River is already protected using near-shore detached breakwaters. The rest of the highway was exposed during Hurricane Rita. Because of the proximity of Louisiana Highway 82 to the coastline, the continued use of these riprap dikes is recommended for shore protection and land-building. These structures facilitate the deposition of sediment on the beach area. However, dredged material could also be used to accelerate the growth of beach area. The length of measure is 160,500 feet. Subaqueous rock reef will be placed 150 feet from shore in 2 to 5 feet of water, individual segments 250-foot long with 50-foot gaps between segments. Crest width is 5 feet constructed to a level 2-feet above MSL.

4-9. Stabilize Gulf Shoreline and Beach East of Calcasieu River to Freshwater Bayou using Dredged Sediment or Breakwater

This measure extends from the Calcasieu River to Freshwater Bayou. A portion of the coastline to the west of the Calcasieu River is already protected using detached breakwaters. The protection should also be applied to the east of the Calcasieu Ship Channel. Because of the proximity of evacuation route Louisiana Highway 82 to the coast, the continued use of riprap dikes is recommended for shore line protection. These structures facilitate the deposition of sediment on the beach area. The length between Calcasieu River and Freshwater Bayou is 338,976 feet. There is, however, a length of beach that is already protected. This reach is 51,000-feet long. The reach is located from Mermentau Ship Channel to near Rollover Bayou, east of Rockefeller Refuge. The project is CWPPRA ME-18. The remaining protection, 278,976 feet, will be segmented breakwater protection. The segments of rock will be 250-foot long with 50-foot gaps. The individual segments will be placed in water 2- to 5-foot deep. Crest width will be 5 feet.

4-10. Stabilize Grand Lake and Land Bridge

Measure location is the Grand Lake located east of Calcasieu Lake. The strategy is to protect or minimize future shoreline erosion by constructing stone breakwater along the full shoreline, particularly in the areas where the lake shoreline is breaching or near breaching into the Gulf Intracoastal Waterway (GIWW). Stone breakwater will rise 2 feet above sea level. Fish-dips every 1000 feet, 46-feet wide at the top, will extend to the lake bottom and be lined with concrete aprons. A 6-foot deep flotation canal with a 1:4 side slope will be at least 35 feet from the centerline of the dike, and material from the flotation canal will be cast inside the breakwater. The total length of the proposed rock dike is roughly 45 miles around the banks of the lake, or 238,000 feet. This complements the



Grand Lake Shoreline Protection Project (ME-21), and the Grand -White Lakes Land Bridge Protection Project (ME-19).

4-11. Stabilize White Lake Shoreline and Landbridge

This measure is located at White Lake, which is east of Grand Lake between Grand Lake and Freshwater Bayou in western Louisiana. The strategy is to protect the shoreline of White Lake with a stone breakwater to minimize and/or eliminate future shoreline erosion. The measure is to create a stone breakwater. The plan is to copy the design used in Grand Lake. A 45-foot flotation channel, 6-feet deep, cast material to bankline. Construct stone breakwater between flotation channel and the bankline. Fish-dips will be built every 1,000 feet. The fish-dips, 46 feet wide at the top, will extend to the lake bottom and be lined with concrete aprons. The total amount of shoreline around the lake is 211,700 feet. There are two projects (ME-19) and (ME-21) that complement the measure under consideration. These projects are in place.

4-12. Beneficial Use of Dredged Material Program: Utilize Sediment and Dedicated Dredging for Marsh Enhancement and Construction of Terraces in Calcasieu Lake

This measure addresses the marsh and wetlands around Calcasieu Ship Channel. The Calcasieu Ship Channel is maintained at 40-feet deep by 400-feet wide and extends from the Gulf of Mexico to Lake Charles, Louisiana. Maximizing the beneficial uses of dredged material will provide stronger foundations for marsh-building processes to occur. This project was approved by Task Force as a part of priority Project List 8. The measure consists of constructing five marsh restoration sites within the Sabine National Wildlife Refuge using material dredged out of the Calcasieu River Ship Channel (CS-28, Cycles 1 to 5).

4-13. Dedicated Dredging from the Gulf of Mexico for Marsh Creation and Enhancement

This measure is located in the Sabine Wildlife Refuge vicinity in shallow water south of Highway 82 at approximately the southern boundary of the Wildlife Refuge. The location is in Sabine Wildlife Refuge in shallow water north of and parallel to Highway 82. The plan is to restore 5,000 acres or more on Sabine NWR and adjacent properties by utilizing dedicated dredging from the Gulf of Mexico for marsh creation and enhancement. Average water depth is 1.5 to 2 feet.

4-14. Bank Stabilization along Freshwater Bayou

This measure is located on the west bank of Freshwater Bayou, south of the intersection of Freshwater Bayou and the Gulf Intracoastal Waterway (GIWW), beginning at Schooner Bayou and going south to the Freshwater Lock. The strategy is to construct stone (rock) dike along the toe of the existing bankline. Two reaches in CWPPRA cover the reach from Six Mile Canal south to the Freshwater Lock.

4-15. Manage Watershed to Reduce Rapid Inflows into Mermentau Subbasin

Location of this measure is the Mermentau River and watershed, east of and to the north of Lake Charles, Louisiana. The strategy is to manage watershed runoff to minimize the rapid accumulation of runoff in the lower reaches of the drainage basin. Design is to obtain and construct a dry storage area of 10 square miles upstream of Mermentau, Louisiana. The 10-square-miles will be surrounded by levees or embankments, at a height of 5 feet. A two-mile-long section is provided in the embankment that parallels the river. The crest of this section is 2-feet above ground level. A gated section will be constructed at the downstream-corner of the dry impoundment to evacuate stored water after a runoff event. Another element would be to widen the existing channel downstream of Catfish Bayou control structure. Increasing the existing channel 50-feet wider downstream to Upper Mud Lake, a distance of 16 miles is recommended. This would provide a greater channel cross-section area downstream of



the structure, thus increasing the opportunity for greater hydraulic efficiency with a slight increase in water elevation across structure.

4-16. Bank Stabilization from Schooner Bayou to GIWW along Freshwater Bayou

This measure is located from Schooner Bayou to the Gulf Intracoastal Waterway (GIWW) along Freshwater Bayou. The strategy is to protect the bankline of Freshwater Bayou with a stone dike to minimize and/or eliminate future bankline erosion. The amount of bankline along the reach is 17,500 feet. A potential design is to place a near-band or toe stone dike near the water's edge in the water. The height of the dike should be 2- to 3-feet above the level of the marsh. Assuming the water depth to be no more than 2 feet, then the vertical height of the dike should be 5 feet.

4-17. Maintain Hwy 82 for Hurricane Evacuation and Marsh Protection

The measure is located along Highway 82, which traverses the lower coast area across all of Planning Unit 4. Maintain Highway 82 in good travel condition at all times. Prior to annual hurricane seasons, recommend a thorough inspection of the highway to ensure good travel conditions exist along all reaches of the road. Identify areas of potential bottlenecks and investigate ways of elimination or, at minimum, improvement. The shoulder and embankment slopes on the north side of the road bed should be protected against erosion from overtopping of the roadway. Prevention of numerous gullies and/or significant blowouts of the roadbed would benefit recovery efforts in the area.

4-18. Provide Water Control Structures at Strategic Locations along Highways 82 and 27

This measure is identified in three locations: (1) Highway 82 area between Rollover Bayou and Superior Canal to the eastern portion of Rockefeller Refuge; (2) Chenier subbasin west of Rockefeller Refuge at the Thibodeaux Bridge; and (3) Chenier subbasin, Hog Bayou Watershed. The strategy is to pass the excess fresh water through or under Highway 82 to the Chenier subbasin. Two CWPPRA projects, M-16, and M-17, cover the area described by (1), (2) and (3) designated in the "Location" paragraph above. Restoration strategy for ME-17 states that measures along the perimeter of Little Pecan Bayou would reduce marsh salinity levels and allow fresh water to be conveyed to the area south of Louisiana Highway 82. Planning and modeling are underway for ME-17. M-16 includes installation of four freshwater introduction water-control structures; plug removal; canal enlargement north of Louisiana Highway 82 to allow water flow under the highway from the Lakes subbasin south into the Chenier subbasin.

4-19. Develop a Plan to Elevate and/or Relocate Assets Located Outside of the Hurricane Protection Levee

The measure includes all areas of Planning Unit 4 that are not protected by hurricane levee or levees and that can be impacted by hurricane surges. The strategy is to conduct surveys in areas not protected by proposed protection works to identify assets to elevate and determine what assets should be relocated if practical.

This measure was labeled as "not being tied to a specific geographic location" and was, therefore, not shown on the Alternative maps.

4-20. Stabilize Banks of GIWW

The GIWW (Gulf Intracoastal Waterway) goes across the entire gulf coast from the west Louisiana state line to Florida. The location of this measure is from the west bank of Freshwater Bayou to the west Louisiana state boundary line, a distance of 101 miles. The strategy is to construct rock dikes parallel to the bankline with the landward toe of the stone dike located at the underwater toe of the bankline. Dikes would be on both sides of the waterway. The cross-section of the dike is 5-feet high, 3-foot wide crest, with side slopes of 1:3.



4-21. Utilize Freshwater Inflow from the Atchafalaya River

Measure location is the Gulf Intracoastal Waterway (GIWW) beginning at the west bank of Wax Lake Outlet Structure in Planning Unit 3b. The strategy is to use this source (freshwater inflow from the Atchafalaya River) as it could be available for longer durations and not have the rapid influx that the Mermentau can produce. Caution needs to be stated. The GIWW annually experiences erosion of its banks creating many holes or leaks. Currently, minimal amounts of the Atchafalaya River flowing through GIWW reach Freshwater Bayou. There is a measure in Planning Unit 4 and a similar measure in Planning Unit 3b that calls for stabilizing the banks of the GIWW. These measures would help to close some of the leaks or at least slow down the leaks. Also, Alternative 1 in both in both Planning Units has a levee measure along the south bank of the GIWW. These measures would also aid in minimizing losses of fresh water from the GIWW. In summary, measures already described will benefit the need in this measure. Constructing gates at the Charenton Canal, repairing banklines at Weeks Bay, and installing gates at Freshwater Bayou would go even further to conveying more fresh water to the Grand Lake region in Planning Unit 4

4-22. Build New Chamber for Navigation at Calcasieu Lock on GIWW and Use Old Lock to Evacuate Excess Water

This measure includes the existing Calcasieu Lock on the Gulf Intracoastal Waterway (GIWW) south of Lake Charles, Louisiana. The strategy is construction of a new chamber for navigation and to use the old lock chamber for freshwater introduction to the upper Calcasieu Estuary from the Mermentau Basin. The measure also provides for freshwater introduction via the Black Bayou culverts at the intersection of Black Bayou and Highway 384. The new lock size is 1,200-feet in length, 75-feet wide, and sill elevation at –13 feet.



7.0 TABLES

Table C.1 Planning Unit 1 - List of Proposed Measures

No	Measure	Source
1	Levee Alignment No. 1 (Storm Surge Protection to 30 feet)	USACE/LACPR
2	East Levee Alignment 6 (South of GIWW - Storm Surge Protection to 30 feet)	USACE/LACPR
3	Open-System Pontchartrain Basin Hurricane Protection Levee Alignment Alternative	USFWS
4	Suggested Modification of Lake Pontchartrain Basin Barrier Plan Levee Alignment	USFWS
5	Construct New Floodgate at Bohemia (Mississippi River)	St Bernard Plan
6	Raise Both Sides of Levee on Mississippi R. (East Bank, East of Jefferson P.)	St Bernard Plan
7	Connect 40 Arpent Levee System through Verret	St Bernard Plan
8	Raise 40 Arpent Levee to 17.5' (from Industrial Canal to Verret)	St Bernard Plan
9	Construct New MRGO Lock and Extend MRGO Eastbank Levee	St Bernard Plan
10	Construct 4 New Floodgates	St Bernard Plan
11	Construct a Sill at Seabrook (Industrial Canal at Lake Pontchartrain)	2050
12	Maintain Lake Borgne Landbridge/Shoreline Protection	PCLDP/CWPPRA/ESF-14/USFWS
13	Restore the Bayou LaLoutre Ridge (Includes Constriction of MRGO to GIWW Dimensions)	PCLDP/ESF-14/ St. Bernard Plan/USFWS
14	Restore the Chandeleur Barrier Islands	PCLDP/CWPPRA/ESF-14/USFWS
15	Construct the Jefferson Parish Fringe Marsh Buffer	PCLDP
16	Construct the Violet Reintroduction to Maintain Target Salinity in LA and MS	PCLDP/ESF-14
17	Maintain and Restore Biloxi Marsh Landbridge and Barrier Reefs - South	PCLDP/ESF-14/USFWS
18	Maintain and Restore Biloxi Marsh Landbridge and Barrier Reefs - North	PCLDP/ESF-14/USFWS
19	Maintain Critical Marsh Shorelines and Ridges of the East Orleans Landbridge	PCLDP
20	Maintain and Restore Breton Landbridge with Caernarvon and Marsh Creation	PCLDP/CWPPRA/LCA
21	Maintain and Enhance the Maurepas Landbridge with Maurepas Reintroduction	PCLDP
22	1,000 cfs Diversion at Convent/Blind River	LCA
23	5,000 cfs Diversion at Convent/Blind River	LCA/USFWS
24	10,000 cfs Diversion at Convent/Blind River	LCA
25	1,000 cfs Diversion at Hope Canal	LCA
26	1,000 cfs Diversion at Reserve Relief Canal	LCA
27	5,000 cfs Diversion at Bonnet Carre Spillway	LCA
28	10,000 cfs Diversion at Bonnet Carre Spillway	LCA
29	6,000 cfs Diversion at White's Ditch	LCA
30	10,000 cfs Diversion at White's Ditch	LCA
31	15,000 cfs Diversion at American/California Bay	LCA
32	110,000 cfs Diversion at American/California Bay with Sediment Enrichment	LCA
33	250,000 cfs Diversion at American/California Bay with Sediment Enrichment	LCA
34	12,000 cfs Diversion at Bayou Lamoque	LCA/ESF-14
35	15,000 cfs Diversion at Fort St. Phillip	LCA
36	26,000 cfs Diversion at Fort St. Phillip with Sediment Enrichment	LCA
37	52,000 cfs Diversion at Fort St. Phillip with Sediment Enrichment	LCA
38	Sediment Delivery by Pipeline at American/California Bay	LCA



No	Measure	Source
39	Sediment Delivery by Pipeline at Central Wetlands	LCA
40	Sediment Delivery by Pipeline at Fort St. Phillips	LCA
41	Sediment Delivery by Pipeline at Golden Triangle	LCA
42	Sediment Delivery by Pipeline at LaBranche	LCA
43	Sediment Delivery by Pipeline at Quarantine Bay	LCA
44	Increase Amite River Influence by Gapping Dredged Material Banks on Diversion Canals	LCA
45	Marsh Nourishment on the New Orleans East Landbridge	LCA
46	Mississippi River Gulf Outlet Environmental Features and Salinity Control Study	LCA
47	Rehabilitate Violet Siphon and Post Authorization Change for the Diversion of Water through Inner Harbor Navigation Canal for Enhanced Influence to the Central Wetlands	LCA/USFWS
48	Opportunistic Use of the Bonnet Carre Spillway	LCA/CWPPRA
49	Restore Breton Island/Chandeleur Island Chain with Dredge Material from Proposed Freshwater Channel (With Tie-in Point to Gulfport Channel)	St Bernard Plan
50	Restore Baptiste Colette Ridge with Dredge Material	St Bernard Plan
51	Remove Old Grand Prairie Levee	St Bernard Plan
52	Add New Bank Line Stabilization (Lake Borgne Corner at GIWW to Verret)	St Bernard Plan/USFWS
53	Add Breakwater (in Lake Borgne from Southwest Corner to Biloxi Wildlife Management Area)	St Bernard Plan/ESF-14
54	Close and Restore the MRGO to Protect and Sustain Natural Protection Features	USFWS
55	Create Marsh in Interior Open Water Areas and Install Shore Protection Features on the North Shore of Lake Pontchartrain.	USFWS
56	Construct 3 or 4 Small Mississippi River Spillways through the Protected Corridor between Carlisle and Bohemia.	USFWS
57	Remove the Gates from the Existing Bayou Lamoque Diversion Structure.	USFWS
58	Construct two 5,000 cfs Diversions into the Maurepas Swamps	USFWS
59	Construct a Band of Marsh Across the Basin from Point-a-la-Hache Northeastward to MRGO Spoilbank at the Heads of the Major Bays and Lakes	USFWS
60	Goose Point (Protects NO Landbridge)	CWPPRA
61	LaBranch Wetlands Terracing, Planting, Shoreline Protection	CWPPRA
62	Bayou Chevee Shoreline Protection	CWPPRA
63	Delta Building Diversion North of Fort St. Phillip	CWPPRA
64	Hopedale Hydrologic Restoration	CWPPRA
65	MRGO Disposal Area Marsh Protection	CWPPRA
66	Diversion into LaBranche Wetlands	2050/CWPPRA
67	Maintain Shoreline Integrity of Lake Pontchartrain	2050/CWPPRA/ESF-14
68	Resolve/Close MRGO to Deep Draft Navigation	2050
69	Restore St. Tammany Marsh	ESF-14
70	Design Storm Surge Barrier Across Lake Borgne	ESF-14
71	Lake Leary Marsh Restoration and Freshwater Diversion	ESF-14
72	Mississippi River Delta Management Study	LCA
73	Develop Cypress Islands Project Study	ESF-14
74	Extend the marsh restoration area along the north of Biloxi marsh (1-8 of Alt 2) westward to Malheureux Point.	Proposed



No	Measure	Source
75	Provide barrier reef/shoreline protection between the east side of the Biloxi marsh and the Chandeleur Sound.	Proposed
76	Conduct sediment mining in Southwest Pass for marsh restoration purposes.	Proposed
77	Increase freshwater diversion capacity at Violet, Bayou Lamoque, Whites Ditch, and other sites, and decrease the proposed capacity at Caernarvon and American Bay.	Proposed
78	Utilize a full protection/restoration concept as the preferred alternative.	Proposed
79	Model levee alignment 5. In the "funnel" area near Michoud, agencies want a different levee alignment which will enclose less existing marsh while providing protection to east New Orleans.	Proposed
80	The Biloxi Marsh Stabilization and restoration Plan	Proposed
81	Note: The National Estuary Program (EPA) has Lake Pontchartrain Basin Listed in its Priority Program, and May Overlap with Some of the Recommendations Above	USEPA

CWPPRA - Coastal Wetlands Planning, Protection and Restoration Act

EPA - Environmental Protection Agency

ESF-14 - Emergency Support Function 14

GIWW - Gulf Intracoastal Water Way

LACPR - Louisiana Coastal Protection Restoration

LCA - Louisiana Coastal Authority (USACE)

MRGO - Mississippi River Gulf Outlet

MS - Mississippi

NO - New Orleans

PCLDP - Pontchartrain Coast Line of Defense Plan

USACE - United States Army Corps of Engineers

2050 - Coast 2050 (USACE)

USEPA- United States Environmental Protection Agency



Table C.2 Planning Unit 2 - List of Proposed Measures

No	Measure	Source
1	5,000 cfs Diversion at Bastian Bay/Buras	LCA
2	130,000 cfs Diversion Bastian Bay/Buras	LCA
3	120,000 cfs Diversion. near Bayou Lafourche	LCA
4	60,000 cfs Diversion at Boothville w/ Sediment Enrichment	LCA
5	1,000 cfs Diversion at Donaldsonville	LCA
6	5,000 cfs Diversion at Donaldsonville w/ Sediment Enrichment	LCA
7	1,000 cfs Diversion at Edgard	LCA
8	5,000 cfs Diversion at Edgard w/ Sediment Enrichment	LCA
9	5,000 cfs Diversion at Empire	LCA
10	90,000 cfs Diversion at Empire	LCA
11	5,000 cfs Diversion at Fort Jackson	LCA
12	60,000 cfs Diversion at Fort Jackson	LCA
13	60,000 cfs Diversion at Fort Jackson w/ Sediment Enrichment	LCA
14	90,000 cfs Diversion at Fort Jackson w/ Sediment Enrichment	LCA
15	150,000 cfs Diversion at Fort Jackson w/ Sediment Enrichment	LCA
16	1,000 cfs Diversion at Lac des Allemands	LCA
17	5,000 cfs Diversion at Lac des Allemands w/ Sediment Enrichment	LCA
18	5,000 cfs Diversion at Myrtle Grove	LCA
19	15,000 cfs Diversion at Myrtle Grove	LCA
20	38,000 cfs Diversion at Myrtle Grove w/ Sediment Enrichment	LCA
21	75,000 cfs Diversion at Myrtle Grove w/ Sediment Enrichment	LCA
22	150,000 cfs Diversion at Myrtle Grove w/ Sediment Enrichment	LCA
23	5,000 cfs Diversion at Oakville	LCA
24	1,000 cfs Diversion at Pikes Peak	LCA
25	5,000 cfs Diversion at Pikes Peak w/ Sediment Enrichment	LCA
26	5,000 cfs Diversion at Port Sulphur	LCA
27	Barrier Island Restoration at Barataria Shoreline	LCA
28	Marsh Creation at Wetland Creation and Restoration Feasibility Study Sites	LCA
29	Mississippi Delta Management Study	LCA
30	Reauthorization of Davis Pond	LCA
31	Relocation of Deep Draft Navigation Channel	LCA
32	Sediment Delivery via Pipeline at Bastin Bay / Buras	LCA
33	Sediment Delivery via Pipeline at Empire	LCA
34	Sediment Delivery via Pipeline at Main Pass (Head of Passes)	LCA
35	Sediment Delivery via Pipeline at Myrtle Grove	LCA
36	Third Delta Study	LCA
37	Barataria Bay Waterway Wetland Restoration	CWPPRA
38	Mississippi River Reintroduction to Bayou Lafourche	CWPPRA
39	Grand Isle and Vicinity	USACE
40	Oakville to Lareussite Study	USACE
41	Paillet Basin Study	USACE
42	SE Louisiana Jefferson Parish Flood Control	USACE
43	West Bank and Vicinity Hurricane Protection	USACE
44	Freshwater and Sediment Diversions	BTNEP
45	Dedicated Dredging on Barataria Landbridge	DNR/USFWS
46	Little Lake Shoreline Protection/Dedicated Dredging @ Round Lake	DNR/USFWS
47	Barataria Basin Is. Complex (Pelican Is. & Pass La Mer to Chalance)	DNR/USFWS



No	Measure	Source
48	Riverine Sand Mining/Scofield Island Restoration	DNR/USFWS
49	S. Shore of Pen Shoreline Protection and Marsh Creation	DNR/USFWS
50	Bayou Lafourche Siphon	DNR/CWPPRA
51	Myrtle Grove Siphon	DNR/CWPPRA
52	Vegetative Planting of Dredged Material Disposal @ Grand Terre Island	DNR/CWPPRA
53	Stabilize Lafitte and Barataria Shoreline	ESF-14
54	Dredge Barataria Basin Landbridge	ESF-14
55	Implement Shoreline Protection Measures	ESF-14
56	Implement the Ships for Shores Project	ESF-14
57	Restore Jefferson Barrier Islands	ESF-14
58	Restore Rigoletes/Barataria Waterway Wetland	ESF-14
59	Bayou Dupont Sediment Delivery Expansion	JPCP
60	PR-1 B. Rigoletes, Perot and Harvey Cut Channel Management	JPCP
61	PR-2 Dupre Cut/Barataria Bay Waterway Channel Management	JPCP
62	PR-7 Land Bridge Shoreline Protection Ext. and Wetland Restore.	JPCP
63	NA-3 Goose Bayou to Cypress Bayou Shoreline Protection	JPCP
64	MG-1 Myrtle Grove Natural Ridge Restoration	JPCP
65	MG-2 Lafitte Oil and Gas Field (East) Restoration	JPCP
66	PR-5 Shoreline Stabilization at Grand Isle Water Tank	JPCP
67	PR-6 Delta Farms Oil and Gas Field Restoration	JPCP
68	BI-5 Grand Isle Oil and Gas Pipeline Corridor Shoreline Protection	JPCP
69	PR-11 Bayou Perot/Bayou Rigoletes Peninsula Restoration	JPCP
70	NA-8 Goose Bayou to Lafitte Levee	JPCP
71	BI-3 Elmer's Island Acquisition and Preservation	JPCP
72	CS-4 Wetland Harbor Activities Recreational Facility	JPCP
73	BB-1 North Barataria Bay Shoreline Wave Breaks	JPCP
74	NA-1 Naomi Siphon Sediment Enrichment	JPCP
75	NA-6 Rosethorn Wetlands Sewage Effluent Division	JPCP
76	CS-3 Bayou Segnette Wetlands Sewage Effluent Diversion	JPCP
77	BI-6 Grand Isle Plan, Part 1-NW GI Breakwater Enhancement	JPCP
78	FN-1 Caminada Chenier Restoration	JPCP
79	BI 4 Elmer's Island & West Grand Terre Oak Ridge Restoration	JPCP
80	BS-1 Grand Pierre Island Restoration (PPL 3 XBA-1c)	JPCP
81	MG-3 Dupre Cut Project (BA-26) Wetland Restoration	JPCP
82	D to G: GIWW Alignment	USACE
83	D to G: Hwy 90 Alignment	USACE
84	D to G: Ring Levee Alignment - Larose to Donaldsonville	USACE
85	D to G: Ring Levee Alignment - Donaldsonville to Avondale	USACE
86	D to G: Pipeline Canal Alignment	USACE
87	D to G: GIWW Modified Alignment	USACE
88	New Orleans to Venice Hurricane Protection Project	USACE
89	Mississippi River Hydrodynamic Study	LCA
90	West Bay Crevasse Adaptive Management	CWPPRA
91	Backfill or Plug Non-essential Oil and Gas Canals	Proposed
92	Watershed Management Plan for Upper Barataria Basin	Proposed
93	Strategize and Implement Plan to elevate and/or relocate assets located outside the hurricane protection plans.	Proposed



No	Measure	Source
ADDITIONAL MEASURES PROPOSED BY STAKEHOLDERS		
95	Increase freshwater diversion capacity at Myrtle Grove, West Pointe a la Hache, Port Sulphur, Buras and Jackson, for a total capacity of 163,000 cfs. This combines with a strategy of switching the majority of freshwater flows from the East bank of the River to the West Bank on a periodic basis.	
96	Provide for a band of marsh restoration in the north bay-shore protection alternative rather than shoreline protection only. Consider possible armoring the south side of this new marsh fringe to protect from wave action.	
97	Add more marsh restoration areas as described in the alternatives for the Third Delta report.	
98	Model levee alignment 3, but without the Category 5 levees in lower Plaquemines below River Mile 70, and include ring levees for Lafitte, Crown Point, and Barataria. They are adamantly opposed to the GIWW alignment because of the great impacts on existing marshes.	
99	Town of Jean Lafitte Hurricane Protection Plan	

- BTNEP - Barataria Terrebonne National Estuary Program
- CWPPRA - Coastal Wetlands Planning, Protection and Restoration Act
- DNR - Department of Natural Resources
- D to G - Donaldsonville to the Gulf Hurricane Protection Project
- ESF-14 - Emergency Support Function 14
- GIWW - Gulf Intracoastal Water Way
- JPCP - Jefferson Parish Conservation Plan
- LCA - Louisiana Coastal Authority (USACE)
- USACE - United States Army Corps of Engineers
- USFWS - United States Fish & Wildlife Service



Table C.3 Planning Unit 3a - List of Proposed Measures

No	Measure	Source
1	Initiate the LA-1 Marsh Creation Project	ESF-14
2	Backfill Pipeline Canals	LCA
3	Bayou Lafourche 1000 cfs	LCA
4	Convey Atchafalaya River Water to Terrebonne Marshes	LCA
5	Freshwater Introduction South of Lake Decade (Avoca Island)	LCA
6	Freshwater Introduction via Blue Hammock Bayou	LCA
7	Maintain Land Bridge Between Bayous Du Large and Grand Bayou	LCA
8	Maintain Land Bridge Between Caillou Lake and Gulf of Mexico	LCA
9	Maintain Timbalier Land Bridge	LCA
10	Multi-Purpose Operation of the Houma Navigational Canal Lock System	LCA
11	Optimize flows and Atchafalaya River Influence in Penchant Basin	LCA
12	Rehabilitate Northern Shorelines of Terrebonne/Timbalier Bays	LCA
13	Restore Terrebonne Barrier Islands	LCA
14	Alternative Operational Schemes of the Old River Control	LCA
15	Lower Water Levels in Upper Penchant	LCA
16	Enhance Atchafalaya Flow to Lower Penchant	LCA
17	Improve Hydrology and Drainage in the Verret Sub-basin	LCA
18	Stabilize Banks of Navigation Channels for Water Conveyance (HNC, GIWW, etc.)	LCA
19	Protect and Maintain Ridges	LCA
20	Third Delta Study	LCA
21	Upper Atchafalaya Basin Study	LCA
22	Maximize Beneficial Use of Dredge Material	LCA
23	Morganza to the Gulf of Mexico Hurricane Protection Study	USACE
24	State/Parish Barrier Plan (Reaches, 1,2, and 3)	Parish Plan
25	Reach 5 (LHR) and Reach 6 (HMCR) Storm Surge Protection	USACE
26	Internal Levee Alignment	Proposed
27	Madison Bay Marsh Creation and Terracing Project	CWPPRA
28	West Bell Pass Barrier Headland Restoration Project	CWPPRA
29	Falgout Canal Freshwater Enhancement Project	CWPPRA
30	Timbalier Island East Restoration	CWPPRA
31	Chacahoula Basin Plan	Proposed
32	Strategy Plan to Evaluate or Relocate Assets Outside of Protected Areas	Proposed
35	Include Ridge Restoration	USFWS
36	Include Houma Freshwater Bypass Channel	USFWS
37	Include Landbridge from Grand Caillou to Dularge Road Ending	USFWS
<u>ADDITIONAL MEASURES</u>		
38	Include Marsh Restoration Along Twin Pipelines for Landbridge Establishment	Proposed
39	Include More Marsh Restoration as Described in Third Delta Report	Proposed
40	Include ridge restoration as shown in the prior Environmental Alternative presentation made by the US Fish and Wildlife Service.	USFWS
41	Include a Houma Freshwater Bypass Channel, per the US Fish and Wildlife Service plan.	USFWS



No	Measure	Source
42	Include Conveying Atchafalaya River Water at GIWW/Grand Bayou and Widen Intersection of Two Waterways	Proposed
43	Include a "Convey Atchafalaya water" feature at the GIWW at Grand Bayou, and widen the intersection of the two waterways.	Proposed
44	Model Levee Alignment 5 as Category 5 (Morganza Levee Assumed in Place)	Proposed
45	Use Morganza Levee Alignment from EIS - (not as shown with lobe extending down Bayou du Large below Falgout Canal)	Proposed
46	Include St. Mary Parish Storm Surge Protection Study	Proposed
	CWPPRA - Coastal Wetlands Planning, Protection and Restoration Act	
	ESF-14 - Emergency Support Function 14	
	LCA - Louisiana Coastal Authority (USACE)	
	USACE - United States Army Corps of Engineers	
	USFWS - United States Fish and Wildlife Service	
	2050 - Coast 2050 (USACE)	



Table C.4 Planning Unit 3b - List of Proposed Measures

No	Measure	Source
1	Create Marsh at Weeks Bay	ESF-14
2	Create Marshes at Marsh Island	ESF-14
3	Restore the Vermillion Bay Shoreline	ESF-14
4	Restore Marsh by Filling Abandoned Canals	ESF-14
5	Construct Terraces for Marsh Restoration	ESF-14
6	Stabilize Freshwater Bayou Bank	ESF-14
7	Increase Sediment Transport Down Wax Lake Outlet	LCA
8	Maintain Northern Shore of East Cote Blanche Bay at Pt. Marone	LCA
9	Rebuild Historic Reefs - Rebuild Historic Barrier Between Point Au Fer and Eugene Island	LCA
10	Rebuild Historic Reefs - Segmented Reef Along Historic Point Au Fer Barrier Reef from Eugene Island Extending towards Marsh Island to the West	LCA
11	Acadiana Bay Estuarine Restoration for Old Shell Ridge	LCA
12	Stabilize Gulf Shoreline of Point Au Fer Island	LCA
13	Maintain Vermilion East and West Cote Blanche Bays as Brackish	LCA
14	Reduce Sedimentation in Bays	LCA
15	Optimize GIWW Flow to Marshes and Eliminate GIWW Direct Flows into Bays	LCA
16	Resolve Cote Blanche Bays Salinity and Turbidity Issues	LCA
17	Create an Artificial Reef Complex Including One Extending from Point Chevreuil Southward	LCA
18	Storm Surge Protection- Levee Alignment South of GIWW to Provide Coastal Protection	USACE
19	Storm Surge Protection- Levee Alignment North of GIWW to Provide Coastal Protection	USACE
20	Point Chevreuil Shoreline Protection Project	CWPPRA
21	Deer Island Pass Re-Alignment Project	CWPPRA
22	Vermilion Bay Shoreline Beach Restoration/Vegetative Planting and Maintenance	CWPPRA
23	South Marsh Island Marsh Creation Project	CWPPRA

CWPPRA - Coastal Wetlands Planning, Protection and Restoration Act

ESF-14 - Emergency Support Function 14

GIWW - Gulf Intracoastal Water Way

LCA - Louisiana Coastal Authority (USACE)

USACE - United States Army Corps of Engineers

2050 - Coast 2050 (USACE)



Table C.5 Planning Unit 4- List of Proposed Measures

No	Measure	Source
1	West Levee Alignment 3A (Red)	USACE/LACPR
2	West Levee Alignment 3 (Green)	USACE/LACPR
3	East Levee Alignment 3 (Yellow)	USACE/LACPR
4	Gulf Shoreline Stabilization	LCA
5	Dedicated Dredging for Marsh Restoration	LCA
6	Salinity control at Oyster Bayou	LCA
7	Salinity Control at Long Point Bayou	LCA
8	Salinity Control at Black Lake Bayou	LCA
9	Salinity Control at Alkali Ditch	LCA
10	New Lock at Gulf Intracoastal Waterway East of Alkali Ditch	LCA
11	Modify Cameron-Creole Watershed Control Structures	LCA
12	East Sabine Lake Hydrologic Restoration	LCA
13	Salinity Control at Black Bayou	LCA
14	Salinity Control at Highway 82 Causeway	LCA
15	Freshwater Introduction and Retention at Pecan Island	LCA
16	Freshwater Introduction and Retention at Rollover Bayou	LCA
17	Freshwater Introduction and Retention at Highway 82	LCA
18	Freshwater Introduction and Retention at Little Pecan Bayou	LCA
19	Freshwater Introduction and Retention at South Grand Chenier	LCA
20	Chenier Plain Freshwater and Sediment Management and Allocation Reassessment Study	LCA
21	East Sabine Lake Hydrologic Restoration	CWPPRA
22	Maintain Sabine River Inflow	2050
23	Salinity Control Along the East Shoreline of Sabine Lake	2050
24	Marsh Creation by Sediment Delivery near Calcasieu Lake	2050
25	Salinity Control at the Sabine Causeway and Pass	2050
26	Salinity Control on the GIWW	2050
27	Stabilize Gulf Shoreline in Western Cheniers	2050
28	New Lock for Navigation/Old Lock for Drainage at Calcasieu Lock	2050
29	Operate Locks to Evacuate Excess Water on GIWW	2050
30	Manage Watershed to Reduce Rapid Inflows into Mermentau Lakes Sub-basin	2050
31	Prevent Coalescence of Grand Lake and GIWW	2050
32	Salinity Control at Calcasieu Ship Channel	2050
33	Stabilize Gulf Shoreline in Eastern Cheniers	2050
34	Constrict Calcasieu Ship Channel to Restore River Connection to Gulf	2050
35	Freshwater Introduction and Retention from the Mermentau Basin	2050
36	Move Water South Across Highway 82	2050
37	Maintain Atchafalaya Mud Stream	2050
38	Marsh Creation by Sediment Delivery near Pecan Island	2050
39	Operate Locks to Evacuate Excess Water Between Pecan Island and Abbeville	2050
40	Maintain Atchafalaya Flow	2050
41	Stabilize Grand and White Lakes Shorelines	2050
42	Prevent Coalescence of Grand Lake and White Lake	2050
43	Restore Marsh by Filling Abandoned Canals	ESF-14
44	Construct Terraces for Marsh Restoration	ESF-14
45	Develop Chenier Plain Freshwater Management and Allocation	ESF-14



No	Measure	Source
46	Develop Post-Storm Emergency Action Plan	ESF-14
47	Restore Natural Drainage from Freshwater Basins	ESF-14
48	Stabilize Freshwater Bayou Bank	ESF-14
49	Monitor Elevation in Cameron Parish	ESF-14
50	Establish Stormwater Action Plans	ESF-14
51	Restore Coast Reduce Erosion	ESF-14
52	Restore/Protect Cheniers for Hurricane Protection	ESF-14

CWPPRA - Coastal Wetlands Planning, Protection and Restoration Act

ESF-14 - Emergency Support Function 14

GIWW - Gulf Intracoastal Water Way

LACPR - Louisiana Coastal Protection Restoration

LCA - Louisiana Coastal Authority (USACE)

USACE - United States Army Corps of Engineers

2050 - Coast 2050 (USACE)



Table C.6 Alternative One and Two Measures- Planning Unit 1

Measure	Description
Alternative Plan: 1	
1-1	Levee Alignment No. 1 from Pearl River to Caernarvon (30 ft storm surge at Coastline) and Hurricane Protection from Caernarvon to Point-a-la-Hache (20 ft Storm Surge at Coastline)
1-2	West Shore Lake Pontchartrain Study Levee Alignment
1-3	Re-evaluate Levee Protection at Southshore of Lake Pontchartrain (from LaBranche to Hwy. 11 - including Fronting & Hardening Pump Stations and Construction of 3 New Pump Stations & the Seabrook Floodgate) 30 ft Storm Surge at Coastline
1-4	Resolve/Close MRGO to Deep Draft Navigation
1-5	Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan Including:
1-5a	MRGO Environmental Restoration Features
1-5b	Small Diversion at Hope Canal
1-5c	Small Diversion at Convent/Blind River
1-5d	Increase Amite River Diversion Canal Influence by Gapping Banks
1-5e	Medium Diversion at White Ditch
1-5f	Modification at Caernarvon Diversion
1-5g	* Louisiana/Mississippi Hydrodynamic Study
1-5h	* Mississippi River Hydrodynamic Study
1-5i	* Mississippi River Delta Management Study
1-6	Restore the Chandeleur Islands
1-7	Maintain and Restore Biloxi Landbridge and Barrier Reefs - South
1-8	Restore Bayou LaLoutre Ridge
1-9	Construct Jefferson Parish Fringe Marsh Buffer
1-10	Maintain Lake Borgne Landbridge
1-11	Sediment Delivery by Pipeline at American/California Bay
1-12	Sediment Delivery by Pipeline at Central Wetlands
1-13	Sediment Delivery by Pipeline at Golden Triangle
1-14	Sediment Delivery by Pipeline at LaBranche
1-15	Benneys Bay Sediment Diversion
1-16	Restore Main Pass Ridge with Dredge Material
1-17	Add New Bankline Stabilization (Shoreline of Lake Borgne from Alligator Point to Lake Shore Bayou)
1-18	Goose Point/Pointe Platte Marsh Creation
1-19	Adaptive Management Through Maintenance of Existing Crevasses and Construction of New Crevasses.
1-20	* Maximize Beneficial Use of Dredged Material where Feasible.
1-21	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans
1-22	Maintain and Restore Breton Landbridge with Marsh Creation

* Not tied to specific geographic locations

Measure	Description
Alternative Plan: 2	



Measure	Description
1-1	Levee Alignment No. 1 from Pearl River to Caernarvon (30 ft storm surge at Coastline) and Hurricane Protection from Caernarvon to Point-a-la-Hache (20 ft Storm Surge at Coastline) (No structure at Rigolets Pass & Chef Menteur Pass).
1-2	West Shore Lake Pontchartrain Study Levee Alignment
1-3	Re-evaluate Levee Protection at Southshore of Lake Pontchartrain (from LaBranche to Hwy. 11 - including Fronting & Hardening Pump Stations and Construction of 3 New Pump Stations & the Seabrook Floodgate) 30 ft Storm Surge at Coastline
1-4	Resolve/Close MRGO to Deep Draft Navigation
1-5	Complete/Accelerate the Louisiana Coastal Area (LCA), Louisiana Ecosystem Restoration Study Near-Term Plan Including:
1-5a	MRGO Environmental Restoration Features
1-5b	Small Diversion at Hope Canal
1-5c	Small Diversion at Convent/Blind River
1-5d	Increase Amite River Diversion Canal Influence by Gapping Banks
1-5e	Medium Diversion at White Ditch
1-5f	Modification at Caernarvon Diversion
1-5g	* Louisiana/Mississippi Hydrodynamic Study
1-5h	* Mississippi River Hydrodynamic Study
1-5i	* Mississippi River Delta Management Study
1-6	Restore Chandeleur Islands
1-7	Maintain and Restore Biloxi Landbridge and Barrier Reefs - South
1-8	Maintain and Restore Biloxi Landbridge and Barrier Reefs - North
1-9	Restore Bayou LaLoutre Ridge
1-10	Construct Jefferson Parish Fringe Marsh Buffer
1-11	Maintain Lake Borgne Landbridge Including Landbridge Shoreline Protection
1-12	Maintain Critical Marsh Shorelines and Ridges of the East Orleans Landbridge
1-13	Construct the Violet Reintroduction to Maintain Target Salinity in LA and MS
1-14	Diversion at American/California Bay with Sediment Enrichment
1-15	Benneys Bay Sediment Diversion
1-16	Add Breakwater (in Lake Borgne from Southwest Corner to Biloxi Wildlife Management Area)
1-17	St. Tammany Marsh Restoration and Shoreline Protection with Dredge Material and Vegetative Planting.
1-18	Adaptive Management Through Maintenance of Existing Crevasses and Construction of New Crevasses.
1-19	* Maximize Beneficial Use of Dredged Material
1-20	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.

* Not tied to specific geographic locations



Table C.7 Alternative One and Two Measures- Planning Unit 2

Measure	Description
Alternative Plan: 1	
2-1	USACE Levee Alignment No. 1: Hurricane Protection (30 ft storm surge at the coastline) Along the GIWW South from Golden Meadow to City Price, Modified to include Lafitte and Barataria
2-2	New Orleans to Venice Hurricane Protection Project (HPP): City Price to Venice Segment- Improve Existing Levees to Provide 100-yr Storm Frequency Level of Protection
2-3	Grand Isle and Vicinity Project: Provide Maximum Technically Feasible Hurricane Protection
2-4	Complete/Accelerate the Louisiana Coastal Area (LCA); Louisiana Ecosystem Restoration Study Near-Term Plan Including:
2-4a	Barataria Basin Barrier Shoreline Restoration Caminada Headland and Shell Island
2-4b	Small Bayou Lafourche Reintroduction
2-4c	Medium Diversion with Dedicated Dredging at Myrtle Grove
2-4d	Re-authorization of Davis Pond - Optimize for Marsh Creation
2-4e	* Mississippi River Hydrodynamic Study
2-4f	* Mississippi River Delta Management Study
2-4g	* Third Delta Study
2-5	Barrier Shoreline Restoration Projects - Restoring the Barataria Barrier Islands
2-6	Adaptive Management Through Maintenance of West Bay Crevasse.
2-7	Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms in Fringing Marsh and Middle Basin Marsh Areas, Including the LA-1 Marsh Creation Project Area.
2-8	* Back Fill and/or Plug Non-Essential Oil and Gas Canals
2-9	* Develop a Watershed Management Plan that Redirects Freshwater and Sediment, Storm Water, and Treated Sewage Water to Sustain Upper Basin Swamps Middle Basin Freshwater Marsh.
2-10	Small Diversions at Strategic Locations in Upper Basin.
2-11	* Maximize Beneficial Use of Dredge Material Where Feasible.
2-12	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.

* Not tied to specific geographic locations

Measure	Description
Alternative Plan: 2	
2-1	West Bank Hurricane Protection Levee from Davis Pond to Oakville: Improve Existing Levee to Provide Hurricane Protection (30-ft storm surge at the coastline)
2-2	USACE Levee Alignment No. 3: Provide Hurricane Protection via Highway 90 Alignment from Golden Meadow to Davis Pond Segment and from Oakville to Venice in the Plaquemines parish Segment
2-3	Ring Levees around Lafitte, Barataria, and Crown Point, Provide Maximum Technically Feasible Hurricane Protection
2-4	Complete/Accelerate the Louisiana Coastal Area (LCA); Louisiana Ecosystem Restoration Study Near-Term Plan Including:
2-4a	Barataria Basin Barrier Shoreline Restoration Caminada Headland and Shell Island
2-4b	Small Bayou Lafourche Reintroduction
2-4c	Medium Diversion with Dedicated Dredging at Myrtle Grove
2-4d	Re-authorization of Davis Pond - Optimize for Marsh Creation
2-4e	* Mississippi River Hydrodynamic Study
2-4f	* Mississippi River Delta Management Study



Measure	Description
2-4g	* Third Delta Study
2-5	Barrier Shoreline Restoration Projects - Restoring the Barataria Barrier Islands
2-6	Adaptive Management Through Maintenance of West Bay Crevasse.
2-7	Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms in Fringing Marsh and Middle Basin Marsh Areas, Including the LA-1 Marsh Creation Project Area.
2-8	* Back Fill and/or Plug Non-Essential Oil and Gas Canals
2-9	* Develop a Watershed Management Plan that Redirects Freshwater and Sediment, Storm water, and Treated Sewage Water to Sustain Upper Basin Swamps Middle Basin Freshwater Marsh.
2-10	Small Diversions at Strategic Locations in Upper Basin.
2-11	* Maximize Beneficial Use of Dredge Material Where Feasible.
2-12	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.
2-13	Small Diversion at Port Sulphur
2-14	Ridge Restoration in the Barataria Basin
2-15	North Barataria Bay Shoreline Wave Breaks

* Not tied to specific geographic locations



Table C.8 Alternative One and Two Measures- Planning Unit 3a

Measure	Description
Alternative Plan: 1	
3a-1	Morganza to the Gulf Hurricane Protection Levee Alignment (30-ft storm surge at coastline)
3a-2	Complete/Accelerate the Louisiana Coastal Area (LCA); Louisiana Ecosystem Restoration Study Near-Term Plan Including:
3a-2a	Small Bayou Lafourche Reintroduction
3a-2b	Multi-purpose operation of the Houma Navigation Canal (HNC) Lock
3a-2c	Terrebonne Basin Barrier Shoreline Restoration
3a-2d	Maintain Land Bridge between Caillou Lake and Gulf of Mexico
3a-2e	Convey Atchafalaya River Water to Northern Terrebonne Marshes
3a-2f	* Third Delta Study
3a-2g	* Upper Atchafalaya Basin Study
3a-3	Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms
3a-4	*Plugging and/or Backfilling Oil and Gas Canals to Restore Hydrology and Regulate Salt Water Movement.
3a-5	Bankline Protection for the Houma Navigation Canal (HNC)
3a-6	Bankline Protection for the GIWW
3a-7	Protection to Distributed Assets South of Morganza to the Gulf Hurricane Protection Alignment by Elevated Structures and Protected Hurricane Evacuation Routes.
3a-8	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.
3a-9	Implement Chacahoula Basin Plan and other projects to alleviate inundation issues in the Verret Sub-Basin
3a-10	* Maximize beneficial use of dredge material where feasible.

* Not tied to specific geographic locations

Measure	Description
Alternative Plan: 2	
3a-1	Morganza to the Gulf Hurricane Protection and LAR Barrier Plan Alignment (20-ft storm surge at coastline)
3a-2	Internal hurricane levee alignment (30-ft storm surge at coastline)
3a-3	Complete/Accelerate the Louisiana Coastal Area (LCA); Louisiana Ecosystem Restoration Study Near-Term Plan Including:
3a-3a	Small Bayou Lafourche Reintroduction (cost is based on the LCA estimates, adjusted for inflation to 2006 price level and has been divided between PU 2 and PU 3a)
3a-3b	Multi-purpose operation of the Houma Navigation Canal (HNC) Lock
3a-3c	Terrebonne Basin Barrier shoreline restoration
3a-3d	Maintain Land Bridge between Caillou Lake and Gulf of Mexico
3a-3e	Convey Atchafalaya River Water to Northern Terrebonne marshes
3a-3f	* Third Delta Study
3a-3g	* Upper Atchafalaya Basin Study
3a-4	Pipeline Conveyance of Sediment to Create Strategic Marsh Platforms
3a-5	Implement Chacahoula Basin Plan and other projects to alleviate inundation issues in the Verret Sub-Basin
3a-6	Freshwater Introduction via Blue Hammock Bayou



Measure	Description
3a-7	Freshwater introduction to south of Lake Decade and Shoreline Protection
3a-8	* Penchant Basin Plan
3a-9	Protection to Distributed Assets South Morganza to the Gulf Hurricane Protection Alignment by Elevated Structures and Protected Hurricane Evacuation Routes.
3a-10	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.
3a-11	Stabilize/Maintain Northern Shoreline of Terrebonne/Timbalier Bay
3a-12	Short-term Freshwater Redirections to Nourish and Sustain Intermediate Marshes that are being Affected by Salt Water
3a-13	Protect and Maintain Ridges
3a-14	* Maximize Beneficial Use of Dredge Material Where Feasible.
3a-15	Bankline Protection for the Houma Navigation Canal (HNC)
3a-16	Bankline Protection for the GIWW

* Not tied to specific geographic locations



Table C.9 Alternative One and Two Measures- Planning Unit 3b

Measure	Description
Alternative Plan: 1	
3b-1	Construct Hurricane Protection (30-ft Storm Surge at the Coastline) for Berwick and Patterson and Levee Alignment South of the GIWW from the Wax Lake Outlet to Freshwater Bayou.
3b-2	Complete/Accelerate the Louisiana Coastal Area (LCA) Near-Term Plan including:
3b-2a	Stabilize Gulf Shoreline at Pointe Au Fer Island
3b-2b	Convey Atchafalaya River water to Northern Terrebonne Marshes
3b-2c	* Acadiana Bays Estuarine Restoration Feasibility Study
3b-2d	* Upper Atchafalaya Basin Study
3b-3	Create Marsh at Weeks Bay
3b-4	Restore Marsh at Marsh Island South Shoreline and Rainey Marsh via Dedicated Dredging
3b-5	Maintain North Shore of East Cote Blanche Bay and Point Marone
3b-6	Restore Vermilion Bay and West Cote Blanche Bay Shorelines via Beneficial Uses of Dredged Material and/or Detached Breakwaters
3b-7	Maintain Vermillion Bay, East and West Cote Bay as Brackish Environments
3b-8	* Strategize and Implement Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Plans.
3b-9	Freshwater Bayou Bank Stabilization - Belle Isle to Lock

* Not tied to specific geographic locations

Measure	Description
Alternative Plan: 2	
3b-1	Construct Hurricane Protection (30-ft Storm Surge at the Coastline) for Berwick and Patterson and Levee Alignment from Wax Lake Outlet to the Vermillion River Following the USACE West Levee Alignment 3A
3b-2	Complete/Accelerate the Louisiana Coastal Area (LCA) Near-Term Plan Including:
3b-2a	Stabilize Gulf Shoreline at Pointe Au Fer Island
3b-2b	Convey Atchafalaya River Water to Northern Terrebonne Marshes
3b-2c	* Acadiana Bays Estuarine Restoration Feasibility Study
3b-2d	* Upper Atchafalaya Basin Study
3b-3	Increase Sediment Transport From the Atchafalaya River Down Wax Lake Outlet
3b-4	Stabilize Banks of Southwest Pass Off Marsh Island
3b-5	Stabilize Banks of GIWW
3b-6	Restore Vermilion Bay and East Cote Blanche Bays Shorelines via Beneficial Use of Dredge Material and/or Detached Breakwaters
3b-7	Stabilize Shorelines Across South Shoreline of Marsh Island From Lighthouse Point to South Point (East of Mound Point) Using Dredged Sediments and/or Breakwaters
3b-8	Elevate and/or Relocate Assets Outside Hurricane Protection Plan
3b-9	Stabilize And Implement Plan to Evaluate and/or Relocate Assets Located Outside of the Hurricane Protection Plan.
3b-10	Freshwater Bayou Bank Stabilization - Belle Isle to Freshwater Lock

* Not tied to specific geographic locations



Table C.10 Alternative One and Two Measures - Planning Unit 4

Measure	Description
Alternative Plan: 1	
4-1	Proposed Hurricane Protection Levee for 30-ft Storm Surge at Coastline
4-2	*Complete/ Accelerate the Chenier Plain Freshwater and Sediment Management and Allocation Reassessment Study
4-3	Maximize Freshwater Inflow From Sabine River
4-4	Salinity Control Structures Along the East Shoreline of Sabine Lake Near Blue Buck Point, Sabine Island and Black Bayou
4-5	Beneficial Uses of Dredged Material Program: Utilize Sediment From Sabine Ship Channel and Dedicated Dredging for Marsh Enhancement and Construction of Terraces.
4-6	Salinity Control Structure at Sabine Pass Near Hwy 82 Causeway
4-7	Stabilize Gulf Shoreline and Beach West of Calcasieu River to Sabine River Using Dredged Sediment or Breakwaters
4-8	Stabilize Gulf Shoreline and Beach East of Calcasieu River to Freshwater Bayou Using Dredged Sediment or Breakwaters
4-9	Salinity Control Structure in Calcasieu Ship Channel Near Ferry.
4-10	Beneficial Use of Dredged Material Program: Utilize Sediment And Dedicated Dredging for Marsh Enhancement and Construction of Terraces in Calcasieu Lake.
4-11	Salinity Control Structures at Points on East Side of Calcasieu Lake
4-12	Maximize Freshwater Inflow to Tributaries of the Mermentau River From Outside Sources.
4-13	Maximize freshwater inflow to Mermentau River From Outside Sources
4-14	Stabilize Grand Lake Shoreline and Landbridge
4-15	Freshwater Introduction/Retention Structure or Sill on Little Pecan Bayou
4-16	Freshwater Introduction/Retention Structure or Sill on Rollover Bayou
4-17	Stabilize White Lake Shoreline And Landbridge
4-18	Stabilize Banks from Schooner Bayou to GIWW along Freshwater Bayou and GIWW near White Lake
4-19	Salinity Control Structure on Black Lake Bayou Near Hackberry
4-20	Build New Chamber for Navigation at Calcasieu Lock on GIWW And Use Old Lock to Evacuate Excess Water
4-21	Stabilize Banks of Freshwater Bayou
4-22	Stabilize Eastern Shore of Lake Calcasieu
4-23	Develop a Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Levee
4-24	Maintain Hwy 82 for Hurricane Evacuation And Marsh Protection
4-25	Provide Water Control Structures at Strategic Locations along Hwys 82 and 27
4-26	Manage Watershed to Reduce Rapid Inflows into Mermentau Sub-Basin
4-27	Restore Marsh by Filling Abandoned Canals
4-28	Utilize Freshwater Inflow from Atchafalaya River.
4-29	Improve Hydrology of the Old Mermentau River Channel Between Mud Lake and Gulf of Mexico.
4-30	Stabilize Banks of GIWW

* Not tied to specific geographic locations



Measure	Description
Alternative Plan: 2	
4-1	Storm Surge Protection for Lake Charles Metropolitan Area Using Ring Levee
4-2	Storm Surge Protection for Lafayette
4-3	Storm Surge Protection Around Gueydan, Kaplan, and Vinton
4-4	Complete/ Accelerate the Chenier Plain Freshwater and Sediment Management and Allocation Reassessment Study
4-5	Maximize Freshwater Inflow From Sabine River.
4-6	Beneficial Uses of Dredged Material Program: Utilize Sediment From Sabine Ship Channel and Dedicated Dredging for Marsh Enhancement And Construction of Terraces.
4-7	Allow Calcasieu Lake and Surrounding Area to Become and Remain Brackish to Saline
4-8	Stabilize Gulf Shoreline and Beach West of the Calcasieu River to Sabine River Using Dredged Sediment or Breakwaters
4-9	Stabilize Gulf Shoreline and Beach East of the Calcasieu River to Freshwater Bayou Using Dredged Sediment or Breakwaters
4-10	Stabilize Grand Lake Shoreline and Landbridge
4-11	Stabilize White Lake Shoreline and Landbridge
4-12	Beneficial Use of Dredged Material Program: Utilize Sediment and Dedicated Dredging for Marsh Enhancement and Construction of Terraces in Calcasieu Lake.
4-13	Dedicated Dredging From the Gulf of Mexico for Marsh Creation and Enhancement
4-14	Bank Stabilization Along Freshwater Bayou
4-15	Manage Watershed to Reduce Rapid Inflows into Mermantau Subbasin
4-16	Bank Stabilization From Schooner Bayou to GIWW Along Freshwater Bayou
4-17	Maintain Hwy 82 for Hurricane Evacuation and Marsh Protection
4-18	Provide Water Control Structures at Strategic Locations Along Hwys 82 and 27
4-19	Develop a Plan to Elevate and/or Relocate Assets Located Outside the Hurricane Protection Levee
4-20	Stabilize Banks of GIWW
4-21	Utilize Freshwater Inflow From Atchafalaya River.
4-22	Build New Chamber for Navigation at Calcasieu Lock on GIWW and Use Old Lock to Evacuate Excess Water

* Not tied to specific geographic locations



Table C.11 - Planning Unit 1- Additional Projects Proposed by Stakeholders

Measure	Description
1	Construct New MRGO Lock near Verret and Extend Proposed MRGO East bank Levee
2	Raise 40 Arpent Levee to 17.5 feet from Industrial Canal to Verret
3	Connect 40 Arpent Levees System Through Verret
4	Extend the Marsh Restoration Area Along the North of Biloxi Marsh (1-8 of Alt 2) Westward to Malheureux Point
5	Provide Barrier Reef/Shoreline Protection Between the East Side of Biloxi Marsh and Chandeleur Sound
6	Conduct Sediment Mining in South West Pass for Marsh Restoration Purposes
7	Increase Freshwater Diversion Capacity at Violet, Bayou Lamoque, White Ditch, and Other Sites, and Decrease the Capacity at Caernarvon and American Bay that were Proposed in Alternatives 1 and 2
8	Utilize a Full Protection/Restoration Concept as the Preferred Alternative
9	Model Levee Alignment 5. In the "Funnel" area near Michoud, agencies want a different levee alignment, which will enclose less existing marsh while providing protection to east New Orleans.
10	Implement "Biloxi Marsh Stabilization and Restoration Plan"
11	8,000 cfs Diversion at Hope Canal
12	20,000 cfs Diversion at Caernarvon
13	30,000 cfs Diversion at White Ditch
14	30,000 cfs at Bayou Lamoque

Table C.12 - Planning Unit 2 - Additional Measures Proposed by Stakeholders

Measure	Description
1	Increase Freshwater Diversion Capacity at Myrtle Grove, West Pointe a la Hache, Port Sulphur, Buras and Jackson, for a Total Capacity of 163,000 cfs. This combines with a strategy of switching the majority of freshwater flows from the East Bank of the River
2	Provide for a Band of Marsh Restoration in the North Bay-Shore Protection Alternative rather than Shoreline Protection only. Consider possible armoring the south side of this new marsh fringe to protect from wave action
3	Model Levee Alignment 3, but without Category 5 Levees in Lower Plaquemines below River Mile 70, and include ring levees for Lafitte, Crown Point, and Barataria. They are adamantly opposed to the GIWW alignment because of the great impacts on existing marshes
4	Town of Jean Lafitte Hurricane protection Plan



Table C.13 - Planning Unit 3a - Additional Measures Proposed by Stakeholders

Measure	Description
1	Include more marsh restoration along the twin pipelines to establish a landbridge further south
2	Include more marsh restoration as described in the alternatives for the Third Delta report
3	Include ridge restoration as shown in the prior Environmental Alternative presentation made by the USFWS
4	Include a Houma Freshwater Bypass Channel, per USFWS
5	Include USFWS recommended marsh landbridge from Grand Caillou to approximately the end of the road on Dularge
6	Include a "Convey Atchafalaya Water" feature at the GIWW at Grand Bayou, and widen the intersection of the two waterways
7	Model the levee alignment 5 as category 5, with Morganza Levee assumed in place
8	In levee alignment 1-4, the illustrated Morganza Levee is shown following a part of the Minor's Canal. That Levee, along with a lobe extending down Bayou Dularge below Falgoust Canal, is not part of the authorized Morganza system. Use Morganza Levee alignment plan from EIS
9	St. Mary Parish Storm Surge Protection Study

Table C.14 - Planning Unit 3b - Additional Measures Proposed by Stakeholders

Measure	Description
1	Model a levee alignment that includes only ring levees west of Wax Lake Outlet
2	Conduct Sediment Mining Offshore of Pointe au Fer Island
3	Include a Bayou Shaffer By Pass for enhanced fish and wildlife introduction into the Terrebonne marshes per USFWS plan. This also includes gapping or degrading the existing Avoca Island Levee to increase Atchafalaya sediment and freshwater influence in Western Terrebonne Marshes
4	Bayou Tigre Flood Protection and freshwater Development
5	Lock or Floodgate at Intercoastal Canal

Table C.15 - Planning Unit 4 - Additional Measures Proposed by Stakeholders

Measure	Description
1	Remove the measure providing for control structures on the east side of Sabine Lake
2	Include additional marsh restoration and terrace construction in the area of Black Bayou and east Sabine Lake
3	Fix saltwater/storm water breaches at Mermentau Basin banks
4	Lock or floodgate at Intercoastal Canal
5	Hebert Canal Watershed Resource Plan, Vermilion Parish
6	Raise spoil banks of East West oil field in South Vermilion Parish
7	Raise Hwy 82, 4.0 ft from the Western Parish line eastward 44 miles